SCIENCE WITHOUT BORDERS

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**Volume 3
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**It is devoted to the 95 anniversary of
Academician, Professor, Doctor
Victor Yefimovich Khain**

**Innsbruck
2009**

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In the book are published the transactions of full members and corresponding members of the International Council For Scientific Development/International Academy of Science H&E, and the articles, presented by Academicians of ICSD/IAS H&E.
The content of the book is interdisciplinary and covers the main spheres of modern natural science. During selecting the articles to the book, the special priority was given to scientific researches, which are at the joint of different sciences.
This book is of interest for wide circles of scientists and students in different spheres of science.

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◄ The article was presented on the simposium "Natural cataclysms and global problems of the modern civilization" 23-24 September 2007, Baku.

ECOLOGY AND ENVIRONMENTAL PROTECTION

EARTH SCIENCES

ARCHITECTURE AND CONSTRUCTION

Azerbaijan Republic

Ministry of Emergency Situations

International Council for Scientific Development

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Health and Ecology

NATURAL CATACLYSMS AND GLOBAL PROBLEMS OF THE MODERN CIVILIZATION

Materials of a Symposium
On September, 24-27 2007

Volume 2

Baku - 2007

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GENERAL INFORMATION

Undoubtedly it is hard to forecast all deleterious consequences of natural calamities because such consequences are mostly identified in accordance with geographical and geo-morphological peculiarities, engineering infrastructure, density of population, and level of economic and industrial development of affected regions. Meanwhile undoubtedly there are common problems arising from all natural calamities irrespective of type and nature of a disaster. The conceptual foundation of **INTERNATIONAL COORDINATION OF ACTIVITIES DURING NATURAL CALAMITIES** will be developed just on the basis of such common problems and tasks.

Leading scientists and specialists of various countries will unite their efforts in order to fulfill the above-mentioned task.

The key goal of this workshop consists in integrating efforts of scientists and specialists, prominent public figures, and representatives of governmental, international and public agencies of various countries in order to identify the most difficult problems resulting from severe natural calamities and the possible ways of joint elimination of such problems.

Prominent scientists, principals of prestigious international agencies, officials and principals of superior governmental agencies of various countries, principals of National Academies of Sciences and scientific research institutions, rectors of worldwide reputed universities, prominent public figures and specialists from 35 countries of the world including Azerbaijan, Austria, Germany, USA, Russia, Italy, Pakistan, Brazil, Indonesia, Bulgaria, Turkey, Iran, Japan, Norway, France, Uzbekistan, Kyrgyzstan, Kazakhstan, Georgia, China, Hungary, Moldova, Macedonia, Ukraine, Israel, Vietnam, Denmark, Czech Republic, Slovakia, Poland, Croatia, Slovenia, Romania, UK and India participate in this international workshop.

Totally more than 300 participants have been registered in this workshop and have submitted more than 150 presentations.

The following international and national public agencies specialized in the above-mentioned problems are represented in this workshop:

–ICSD/IAS H&E – INTERNATIONAL COUNCIL FOR SCIENTIFIC DEVELOPMENT – International Academy of Science, Health and Ecology, Innsbruck, Austria

–IUAPPA – The International Union of Air Pollution Prevention and Environmental Protection Associations, Brighton, England;

–EFCA – European Federation of Clean Air and Environmental Protection Associations, Netherlands;

–UNESCO – "Green Chemistry";

–ABEPPOLAR – the Brasilia Association of Ecology and Preservation of the – Environment, Brazil, Sao Paolo;

– FOVGAL – Association of Specialists on Emergency Situations and Security of Human Life Activity, Baku, Azerbaijan;

– INCSAP – Italian National Committee of Studying Atmosphere Pollution, Rome, Italy;

– ARPA – Environmental Protection Agency of Emilia Romagna Region, Reggio Emilia, Italy;

– AMS – Austrian Meteorological Society, Austria, Vienna;

– NAH – Norwegian Association of Health, Oslo, Norway;

– GAK – Geophysical Association of Kazakhstan, Almaty, Kazakhstan.

Among international participants of the workshop there are His Royal Highness Sri Paku Alam IX, The First Vice-Governor of Special Province of Yogyakarta, Indonesia; Dr. Zhelyu Zhelev – Former President of the Republic of Bulgaria (1990-1997), President of the Balkan Political Club and "Dr. Zhelyu Zhelev" Foundation; Dr. Ishfag Ahmad, N.I., H.I., S.I., – President of Academy of Sciences of Pakistan, Special Advisor to the Prime Minister of Pakistan; Prof. Dr. Walter Kofler – President of International Council for Scientific Development "Health and Environment", International Academy of Science, Academician of Russian Academy of Medical Science (Austria, Innsbruck); Dr. Randolpho Lobato – Vice-President of IUAPPA (International Union of Air Pollution Prevention and Environmental Protection Associations) and President of ABEPPOLAR - the Brazil Association of Ecology and Preservation of the Environment); Prof. Dr. Giuseppe Zerbo – Vice-President of IUAPPA; Prof. Dr. Giuseppe Fumarola – President of EFCA (European Federation of Clean Air and Environmental Protection Associations) and Italian National Committee of Studying Atmosphere Pollution; Prof. Dr. Iftikhar Ahmad Malik – Secretary General of Academy of Sciences of Pakistan; Dr. Rudolph Koll – Attorney-General of the Tyrol, Austria; Prof. Dr. Gunnar Tellnes – President of Norwegian Health Association, Ex-President of European Health Organization; Prof. Dr. Reinhold Steinacker – Vice-President of International Academy of Science, President of Austrian Meteorological Union; Prof. Dr. Sudjarwadi – Rector of Gajah Mada University, Yogyakarta, Indonesia; Prof. Dr. Sudakov K.V. Academician, member of Russian Academy of Medical Sciences,– Vice-President of International Academy of Science (IAS), President of Russian Section of IAS, Director of Institute of Normal Physiology named after Anokhin; Prof. Dr. Franz Halberg – Leader of International BIOKOS Program, USA; Prof. Dr. Huseyin Gokcekus– Vice-President of International Academy of Science, Vice-Rector of Middle East University, ICSD/IAS-H&E; Prof. Dr. O.L. Figovsky – Director of International Research Center of Nanotechnologies, President of Israel Association of Inventors, Chairman of "Green Chemistry" division of UNESCO: Dr. Victor Yefimovich Khain – Academician, member of AS of USSR, RAS, National Academy of Sciences of Ukraine, International and European Academies of Sciences, Honored Professor of Moscow State University; Dr. N.B. Koronovskiy – Honored Professor of Moscow State University Head of Department of Dynamic Geology under Moscow State University named after M.V. Lomonosov; Academician, member of Russian Academy of Sciences, Prof. Dr. V. Zilov – Head of Department under

Moscow Medical Academy named after Sechenov and other prominent scientists and specialists, public figures and officials.

All presentations of the workshop participants are classified into four sections:

1. Geo-sphere and space;
2. Bio-sphere;
3. Techno-sphere;
4. Noosphere

Problematic and most interesting presentations are included in special section.

Presentations that cover almost all the above-mentioned problems including the below-listed ones have been submitted to the workshop:

– Forecasting and studying of natural calamities;

– Problems associated with epidemic of bird influenza and other especially dangerous infectious diseases in natural disaster sites and ways of efficient control, diagnostics and treatment of such diseases;

– Medical and psychological rehabilitation of victims of natural calamities;

– Issues of study, control and prevention of environmental pollution of soils, waters and atmosphere;

– Issues of development of nuclear energy and its impact in environment, development of alternative energy sources, eco-energy issues;

– Ways of control and prevention of chemical pollution in natural disaster sites;

– Impact of sun activity and other space factors on human life, bio-sphere and natural phenomena;

– Psychological, philosophical and economical aspects of natural calamities;

– Use of up-to-date technologies in fulfillment of tasks aimed at ensuring of environmental safety and reduction of number of victims and quantity of material damage resulting from natural calamities.

Competency of the workshop participants is the evidence of special topicality of the problems considered during this workshop.

The workshop has united scientists and specialists of various branches of science and human activity from many countries of the world and allowed for more comprehensive consideration of the problems resulting from natural calamities. The submitted presentations testify to existence of many unaddressed problems in this sphere that could be eliminated by joint efforts using interdisciplinary approach.

The key task in the area of elimination of the above-mentioned problems consists of elaboration of conceptual basis for more efficient **INTERNATIONAL COORDINATION OF ACTIVITIES DURING AND AFTER NATURAL CALAMITIES.**

ORGANIZING COMMITTEE

Plenary meeting of International Simposium

Kamaladdin Heydarov, Chairman of Organizing Committee of the Symposium, Minister of Emergency Situations of Azerbaijan, colonel-general.

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Prof.Dr. Elchin Khalilov - Vice President of International Academy of Science H&E, Co-Chairman of Organizing Committee of the Symposium, Baku, Azerbaijan.

Prof.Dr. Victor Khain, Academician of the USSR and RAS, Honorary Professor of Lomonosov State University, Moscow, Russia.

Dr.Gunnar Tellnes, Johan Lund President of the Norwegian Association of Public Health Services, Former President of the European Organization of Public Health Services, Norway, Oslo.

Prof.Dr. Randolpho Lobato Vice President of IUAPPA, President of ABEPPOLAR, Brasil, Sao Paolo.

Prof.Dr. Giuseppe Fumarola President of EFCA (European Federation of Clean Air and Environmental Protection Associations), Italy, Rome.

Prof.Dr. Nikolay Koronovskiy. head of department of dynamic geology of Moscow State University named after Lomonosov, Moscow, Russia.
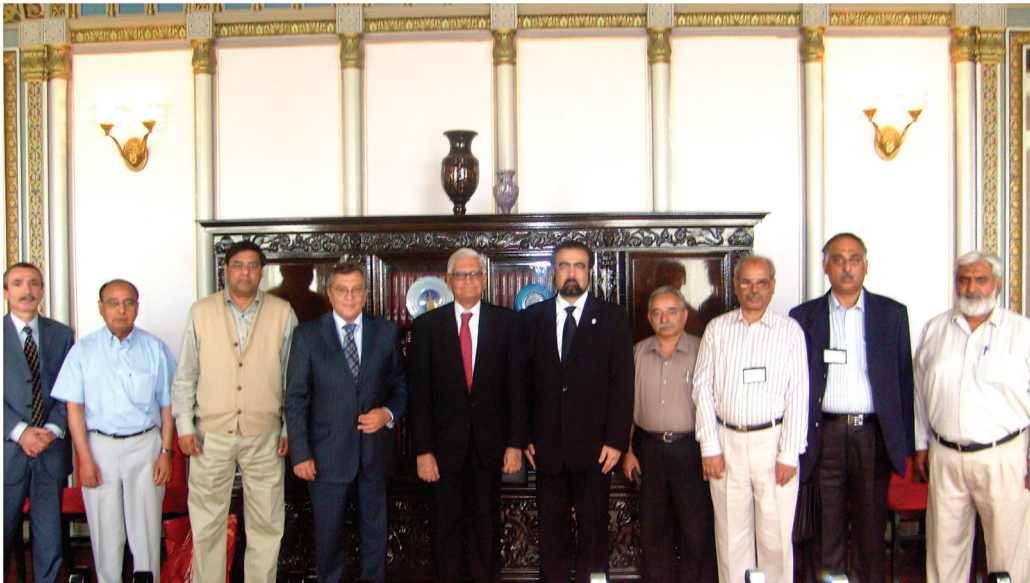
Meeting in Presidium of the National Academy of sciences of Azerbaijan. President of the National Academy of Sciences of Azerbaijan, the Academician, Prof. Dr. Makhmud Kerimov.

Dr. Ishfag Ahmad (Pakistan), Prof.Dr. Walter Kofler (Austria), Dr. Zhelyu Zhelev (Bulgaria), Prof.Dr. Elchin Khalilv (Azerbaijan)

Scientific discussion.

Participants of symposium.

Dr. Yelena Savoley(Germany), Dr. Tamila Khalilova and Dr. Gulnara Jafarova (Azernaijan), Prof.Dr. Karl Hecht (Germany).

Delegation of Pakistan in Baku

Dr. Ishfag Ahmad and Dr. Elchin Khalilov

Delegation of Indonesia in Baku

Conference hall

**Prof.Dr. Nusrat Khalilov (Azerbaijan) and
Prof.Dr. Tursunbay Rashidov (Uzbekistan)**

XXI

Prof. Dr. Victor Yefimovich Khain
Academician of Russian Academy of Science,
Honorary Professor of Moscow State University named after M.V. Lomonosov,
Honorary President of the International Academy of Science H&E

BRIEF BIOGRAPHIC INFORMATION ABOUT ACADEMICIAN OF RUSSIAN ACADEMY OF SCIENCES, HONOURED PROFESSOR OF MSU named after M.V.LOMONOSOV, DOCTOR OF GEOLOGICAL-MINERALOGICAL SCIENCES, HONORARY PRESIDENT OF INTERNATIONAL ACADEMY OF SCIENCE H&E VICTOR YEFIMOVICH KHAIN

Academician of Academy of Sciences of the USSR and Russian Academy of Sciences, many national and international academies, outstanding scientist and geologist Professor Victor Yefimovich Khain is loved and respected by everyone, who has ever met him. A great number of his pupils and followers feel deep gratitude and warmth to this wonderful person - humanist, sincere and honest, incredibly hard-working and responsive, in a fatherly manner diligent and attentive to his pupils, excellent teacher and mentor.

In this section we don't set as an object to embrace, even briefly, the extensive scientific, pedagogical and scientific-organizational activity of the outstanding geologist of the present Victor Yefimovich Khain, because even the whole scope of this book will not be enough for it. This is just brief biographic information.

Victor Yefimovich was born in the capital of Azerbaijan – in Baku, on 26 February, 1914. He graduated from geologic-research department of mining faculty of Azerbaijan Industrial Institute (now Oil Academy). He worked in AzOILSEARCH till 1938. In 1938 he changed for Azerbaijan Oil Scientific-Research Institute, where he worked till 1941. In 1940 in Central Scientific-research geological-search Institute (in Leningrad) he defended a Candidate's dissertation. From 1941 to 1945 he was called up for military service in Red Army and served in the regiment of Baku army of anti-aircraft defence till 1945.

From 1945 he changed for working at the Institute of geology of Azerbaijan AS, where he was soon assigned as a head of department of regional geology, and at the same time he taught the course of geotectonics in Azerbaijan Industrial Institute. Under his direction there was published a monograph "Geology of Azerbaijan", geologic and tectonic maps of Azerbaijan. In 1947 he defended a Doctoral dissertation on geologic structure and of oil-and-gas content of the South-East Caucasus at the Institute of geology of Azerbaijan AS. In 1949 he got a title of Professor in the Department of geology of oil and gas and worked there till 1954, having published the fundamental monograph "Geotectonic bases of searching the oil". In 1954 he moved to Moscow. The selfless work of the scientist-geologist was highly praised, and in 1966 V.Y. Khain was chosen as corresponding member of AS of the USSR, and in 1987 as the Academician

of AS of the USSR on geotectonics and geophysics. In the same year he was honored with State Prize of the USSR.

In 1992 AS of the USSR awarded him with A.P.Karpinskiy's gold medal.

In 1993 for the series of works "Global tectonics of the Earth" V.Y.Khain was honored with the first prize of M.V.Lomonosov.

V.Y.Khain is a member of editorial boards of the most authoritative Russian and international journals, such as "Geotectonics", "Nature", "Herald of MSU. Geology", "News of Universities. Geology and Research", etc. He was also the editor-in-chief of the journal "Geology".

In 1995 V.Y.Khain was awarded with the State Prize of Russian Federation for a number of fundamental scientific works.

Academician of AS of the USSR, Academician of RAS, Laureate of the State Prizes of the USSR and Russian Federation is the author of more than 1000 scientific works, including about 60 fundamental monographs.

V.E.Khain is the honorable doctor of Paris University named after Pier and Mary Curie, honorable member of European Academy of Sciences, full member of International Academy of Science H&E, member of New-York Academy, honorable member of French, London, Bulgarian and American geological societies, member of American geophysical union and American association of petroleum geologists, corresponding member of International Committee on history of geological sciences.

Academician V.Y. Khain was awarded with A.P.Karpinskiy's gold medal, P. Furmarye's gold medal of Royal Belgium Academy of Science, Steinman's medal of Germany geological society, Prestvich's medal of French geological society, Gold Medal and Diploma of the First Degree of the World Organization for Scientific Cooperation (WOSCO), the Nobel Prize Laureate Pavlov's gold pin of International Academy of Science Health and Ecology.

In 2007 the Academician Victor Khain was chosen as Honorable President of International Academy of Science H&E (Austria, Innsbruck).

In 2009 the Academician Victor Khain was chosen as Honorable President of World Organization for Scientific Cooperation (WOSCO, London).

The world-known famous scientist in the sphere of geotectonics and geodynamics, participant and organizer of more than 600 scientific international and national congresses, conferences and meetings, has been to more than 50 countries of the world.

During the last years Victor Yefimovich devoted the scientific researches for the most important problems of humanity: the research of the cyclicity of seismic and volcanic activity and their connection with other geological and cosmic factors. His researches in the sphere of global changes of geological environment allow us to have a look at the processes of climatic changes and geological life of the Earth from the new positions.

V.Y.Khain is the outstanding scientist. Over a period of his life he keeps on close cooperation with many scientists of the world, actively takes part in the joint scientific researches and international projects. With the scientific supporting of Academician Victor Khain was created the Global Network of Forecasting the Earthquakes.

MEDICINE AND BIOLOGY

◀AIR POLLUTION AND CARDIOVASCULAR HOSPITAL ADMISSIONS IN AUSTRIA – ENVIRONMENTAL DISASTERS AND AN EVOLUTIONARY VIEW ON CORONARY HEART DISEASE

Kofler Walter, Neuberger Manfred, Schnaiter David
International Academy of Science H&E

This paper is divided into three parts.

First I will present results of different epidemiological studies within IUAPPA-Programs presented in Australia on the 14th World Air Conference with significant relationships between the concentration of different air pollutants and the admission rate of coronary heart diseases in Austrian hospitals. A correlation we already observed after different environmental disasters, e.g. after the London smog catastrophe in 1952/53.

Then I will discuss chronic sub-acute and acute processes dealing with coronary heart disease from an evolutionary point of view.

And finally I will link these predictions with predictions on the basis of the "Extended View"(1-4), especially with two principles: The principle of the so called Matrixworld as a concept of interaction between the human brain and the human body and the so called causally unspecific health effects in consequence of a lack of adaptive capacities.

Part 1:

On the below presented graph you can see the situation of the three biggest cities of Austria which were the basis of the epidemiological studies. The Austrian capital Vienna (1,6 Mio. inhabitants), the highly industrialized town Linz and the university town Graz with many and permanent inversion layers during wintertime.

As you see, we could confirm significant correla-

Increase of **hospital admissions** of elderly (65+ years) in 2000/2001 for **cardiovascular** disease (ICD 410-438) with daily concentration of **particulate matter** and **NO2**
semiparametric Poisson GAMs (best fit selected from all models for lags 0 up to 14 days), significant associations for PM, NO2, SO2, H2S, time, mean temperature, rel. humidity

Mortality before, during and after Smog Episode, Greater London, Nov. 1952 - Jan. 1953

Bronchitis
CHD
Myocardial Degeneration
Vascular lesions of CNS
Pneumonie
Respiratory Tuberculosis
Influenca
Motor-vehicle accidents

Logan W., Lancet 1953

Dense fog (5th-incl. 9th Dec)

tions between e.g. nitrogen dioxide and different particles as well in Graz as in Linz, in elderly - both in men and in women. The increase of admission was 10 Microgram per cubic meter ambient air for particles smaller than one micrometer and for NO_2 about two percent. This data is independent of temperature, humidity, particle number, SO_2 and hydrogen sulphide, which shows modification effects in general. In both cities a higher increase could be confirmed in female than in men.

These data are in good correlation to the current level of knowledge. The centre of risk assessment of Harvard University sees the highest relevance of ambient air pollutants actually in the Western world, in the influence especially from finding particles on coronary heart disease (Schwarz 2007). There are experimental studies which demonstrate that the influence of air pollution can be reduced within three days by 30% if the person is shifting into a clean air ambience.

Hypothetical Modes of Action for Fine PM

The relevance of air pollution on coronary heart disease is in principle well known, at the latest since the disaster of London 1956, when after a smog episode the mortality rate increased for 3000 persons additionally to the mortality rate under normal circumstances. More than 40% of them died on heart related diseases. These facts are
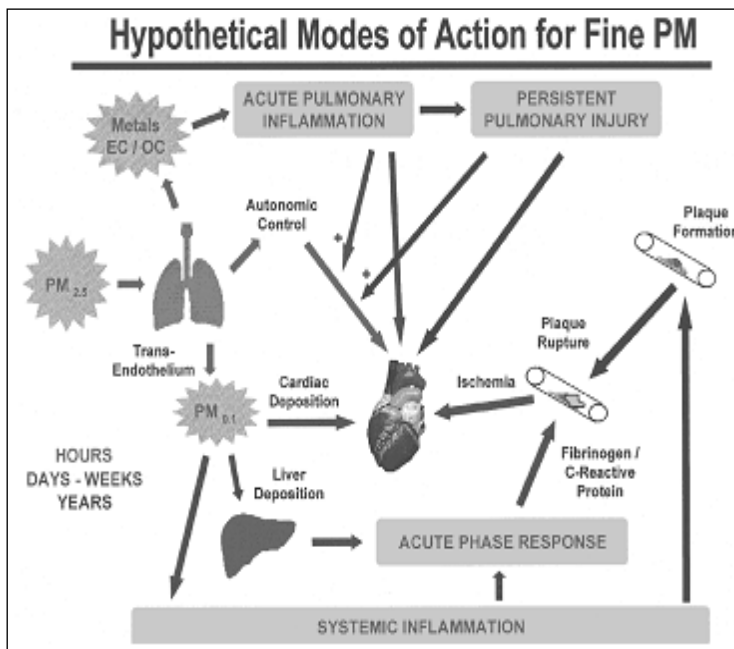
in good agreement with the actual accepted models about the influence of air pollutants on cardiovascular diseases as you can see on the graph to the left. But such models show only the qualitative links between the different components and bodily consequences. Errors do not demonstrate the quantitative effect. We know from the history of science that coronary heart disease has been a very rare mortality reason e.g. in Austria at the beginning of the 20th century but was increasing constantly until the end of the 20th century.

Part 2:

This reflects a shift in causality from a disease resulting nearly only from nutrition style to a multi-factorial aetiology. Coronary heart disease can be caused only by physical or chemical factors because of an overload of cholesterol and fat linked with a lack of physical activity. During the evolutionary selection procedure

Epidemiological Shift
Transit of the most relevant causes of death:
From infectious diseases to civilizational diseases

Austria, deceases caused by Tbc, cancer, CHD and acidents, 1921 - 90
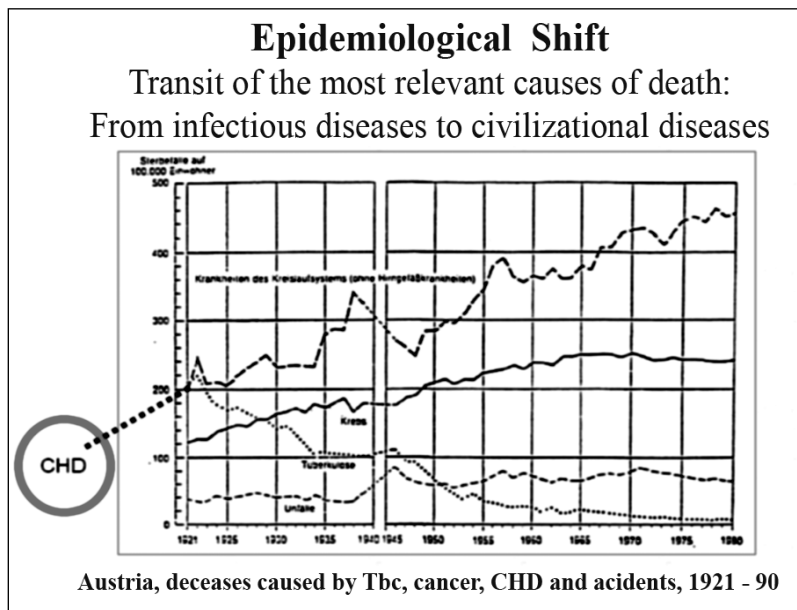
there never was a situation similar to now. All the time an insufficient supply of cholesterol and fat was given although there was an urgent need of both e.g. for a healthy growing and physical activities. Therefore it was from the evolutionary point of view conclusive to store it temporarily close to the vessels to keep it day and night ready for fight and flight and growing.

These are the aspects for chronic changings in relation with coronary heart disease. The actual view shows: Too much food, no sport. Why should we expect effective genetic protection against negative consequences of a process which was helpful for millions of years only because it is not helpful any more within the last 50 years? Acute influences are to be expected in connection with the process to store, to distribute and metabolise these components with regards to change other influences e.g. by smoking or by air particles etc.

Acute situations in coronary heart disease can be seen as a need for tuning the blood-flow according to the actual demand of the use of these components, but in competition to other actual demands which can result from existing permanent loads e.g. because of high age or adolescence or by actual demands like in the case of an environmental disaster like in London. All these influences have to be taken into consideration to understand the complex situation of coronary heart disease nowadays.

Matrix-World allows to understand:

Ancient messengers are used to stimulate......

Karajan conducting Beethoven:

Nonverbal Communication with the orchestra
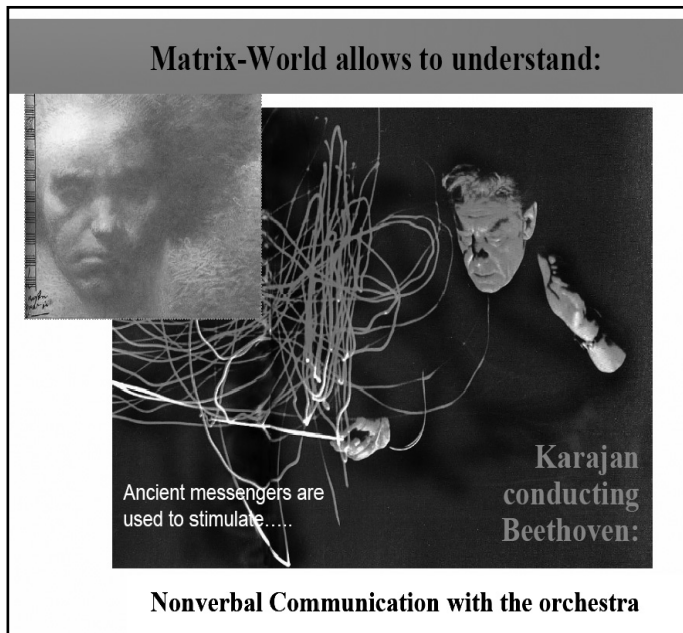
Part 3:

Using the "Applied Extended View of a person as a social being" (1, 5) we were able to point out different conclusions which are helpful to understand the situation in modern civilisations with respect to coronary heart disease.

First we start from the assumption, that adaptation is a process which can be caused by an ability which is restricted, a position which is in a good agreement to the position of Konstantin Sudakov. If we assume, that adaptation needs ability to organise, then we have to assume also, that this ability is restricted. Otherwise it would be in contradiction to conservational laws. Therefore we have to expect health effects in a situation in which an additional acute demand is given e.g. after an environmental disaster like in London or, within a smaller scale, an acute increase in demand for more information needed for reactions by the body. - This explains why PM1, which has more surfaces and offers therefore more information is more relevant than PM2.5 or PM10. So we have to expect in persons which are in bad physical conditions or elderly and children an increase of risk to get ill. This can cause earlier death which is often named harvesting effect. But with harvesting alone, the increasing numbers of deaths e.g. after the disaster of London can not be explained.

There are additional aspects to be considered. For this we can offer different mechanisms which can be deduced from the Extended View. Here I want to present just one: The consequence of the assumption that the human body can be used by the brain in such a way that the brain is creating a Matrixworld for the cells, tissues and organs of the body. These are covered by a skin which is extremely selective against the trespassing of information. Lacking other information the somatic cell systems have to believe all information which is coming from the brain. The brain though has learned to cheat the members of the co-operative. The cheated cell systems believe to work to solve their daily life problems and have no idea at all that they actually work to fulfil the brains individual and personal intentions.

With this model we can explain why e.g. Herbert Karajan could motivate with his conductor's baton the Vienna Philharmonic Orchestra to provide a gor-

geous performance of Beethoven's concert Nr. 9 just through neurotransmitters and chemical and electric impulses that are exactly the same as hundred thousands and millions of years ago.

If you accept the existence of a Matrixworld and if you accept, that the brain is only able to act via somatic cells, tissues and organs, but that the cells assume to be together with the brain cells within a co-operative to solve "just" cell problems and therefore the brain had to learn to cheat the cells which are covered by skin and therefore excluded from external information about the intention of the individual person, then you understand why ancient messages can be used for brand-new demands.

The Matrixworld is helpful to understand a wide range of phenomena concerning quite old animals e.g. all mammals. But not all mammals have reached the same level than e.g. chimpanzee or a human persons do and did. Therefore the Matrixworld was modified within the evolutionary process because the brain has been constantly, and therefore also during any evolutionary process, fully active. Hence the teacher of Konstantin Sudakov, MacLean (6, 7) proposed the triune brain, which is helpful to understand, that the Matrixworld has different levels and within cascades the principle of the brain to cheat the body cells - a process we call "overforming" - must be overformed again and the overformed must overform the overformed and so on. To understand a human person as a social being we have to attribute an additional level to the triune brain - the four-united brain. So the Matrixworld can be used for final and abstract intentions of the human person as a social being too. With this knowledge we have to comprehend that sub-acute influences can be modified by cultural and social influences and this allows us to understand the different relevance e.g. of cholesterol levels in Japan and in the United States. - So we should be able to give a better answer to these only apparent paradoxes.

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◄ TRANSFUSIONALLY-TRANSMITTED VIRAL INFECTIONS IN THE REPUBLIC OF AZERBAIJAN: EPIDEMIOLOGIC SITUATION AT THE FIRST DECADE OF XIX CENTURY

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A b s t r a c t

The paper contains brief basic information reflected distribution of most important transfusionally-transmitted viral infections (caused with hepatitis B and C viruses and human immunodeficiency virus) among population of the Azerbaijan Republic. The authors presented data about morbidity connected with above infections and frequencies of its infections specific markers detection among adult healthy inhabitants of the country.

The idea about existing of special group of viral infections separated of many other human viral infections with several substantial epidemiologic and pathogenic peculiarities appeared in medicine only to the beginning of last quarter of XX century.

The viruses cause these infections in the nature transmit from person to person with sexual, "vertical" (intrauteric) and galactogenic routes. In the same time these viruses in modern society with well-development health care system are able to transmit with artificial route realized during different invasive medical procedures, which accompanies of skin and mucosal membranes damaging and creating possibility for viruses to penetrate directly to the blood. That is why these infections were united under common name "blood-born infections" or "transfusion infections" (TI).

There are several infection can be included in TI group but most epidemiologically important TI are infections caused with hepatitis B virus (HBV), hepatitis C virus (HCV) and infection caused with human immunodeficiency virus

(HIV). These infections have global distribution and general number of person involved in epidemic processes connected with these TI in the world exceed 1 billion and annual economic damage is due to these TI and their complications and remote consequences achieves tens billion US dollars [10].

It is clear that HBV, HCV and HIV circulate among population of Azerbaijan Republic and its capital – Baku city. But till now general epidemiologic situation concerning these viral infections in our country is not presented in the literature in summarized form.

Therefore in the article we present brief summary information, reflected the modern situation with features of most important transfusion infections distribution among healthy population of Azerbaijan Republic and Baku.

HEPATOTROPIC VIRAL INFECTIONS. Infections caused by hepatitis B virus (HBV) and hepatitis C virus (HCV) have global spreading. Being based on the official data of WHO it is not difficult to count up, that in the world not less than 600 million persons (approximately 10% of the population of the Earth) are involved in the epidemic process, caused HBV and HCV [9].

As well as in many regions of the world these infections have distributed in the Azerbaijan Republic. At the same time, the data about features of them spreading are presented at some separated papers [4, 5, 7, 8].

First of all we presented official data of the Azerbaijan Republic Ministry of Public health reflected the frequency of acute hepatitis B and C cases among population of the country for last 10 years. These figures are exhibited on the table.

Table.

Amount of acute hepatitis B (AHB) and acute hepatitis C (AHC) registrated among population of the Azerbaijan Republic for last 8 years

years	2000	2001	2002	2003	2004	2005	2006	2007
HB	199	171	158	147	179	281	342	360
HC	-	16	19	48	63	118	138	201

It is clear that intensive index of morbidity (calculated for 100000 population) with acute hepatitis B and hepatitis C in 2007 were 4,1 and 2,3, correspondently (total population of the country at the end of 2007 was 8.700.000).

But taking into consideration these infections very often have subclinic course we suggested that above presented figures are not correctly reflect the intensivity of these viruses circulation among country population.

That is why we decided to present results of serological examination more that 40 thousands healthy population of the country done for virologic control of donor blood.

HBV-infection. Judging by results obtained in seroepidemiologic observations performed among citizens of Baku during last 8 years by several separated groups of researchers (total amount of tested healthy adult persons more that 45 thousand) mean frequency of HBsAg revealing was approximately 3,0%. In the same time mean frequency of anti-HBs revealing fluctuated from 15% up to 20% and mean frequency of anti-HBc isolated revealing fluctuated from 7% up to 11%. These data allow to attribute Baku to territories with moderate frequency of chronic HBV-carriership [1, 11, 14].

Examination of blood serums of HBsAg-positive healthy donors, patients staid in oncologic, phthysiatric and surgical hospitals for virological characterizing of these viruses demonstrated that population of HBV circulated at Azerbaijan was presented with wild type virus (approximately 80%) and mutant variants: in 15% - defective in synthesis of HBeAg and 5% - defective in synthesis of HBcAg. But all HBV isolates were belong to subtype "ay" (in 94% cases) and "ad" (in 6% cases) [15].

The data available today about spreading of this infection in various regions of the country are limited with results of researches had been done more 10 years ago researches. According these data mean frequencies of HBsAg revealing HBsAg among healthy population were: in Gandzha - 5,6%, in Sumgait - 4,7%. This parameter fluctuated from 6,0% up to 9,0% among population of Yevlakh, Kazakh, Beylagan, Zangelan and Ismiliy regions.

Only in 2002 serologic examination was performed among more than 2 thousands of inhabitants of the Nakhtchivan Autonomous Republic. It was demonstrated that mean frequencies of HBsAg revealing among healthy population in this region was about 4% [16].

HCV-infection. For determination of HCV-infection spreading degree in Baku we have taken into consideration data obtained in laboratories of National center of oncology, Research institute of hematology and transfusiology and Iranian Red Crescent clinic situated in Baku. In these laboratories totally more 45 thousands healthy person were serologically examined for detection antibodies to HCV (anti-HCV) in the blood [1, 11, 14].

According obtained results the frequency of anti-HCV revealing fluctuated from 3% up to 5% and mean frequency of anti-HCV detection is approximately 4%. Thus it was possible to conclude that Baku belong to territories with moderate degree of HCV-infection endemicity.

The data reflected frequency of anti-HCV detection among population of other different regions of the country while are not present, excluding the Nakhtchivan Autonomous Republic where seroepidemiologic researches were done only in 2002. Summarizing results of examination more than 2 thousands of

healthy inhabitants of this region demonstrated that above mentioned antibodies was detected at 5,5% persons [16].

Information concerned HCV genotypes spectrum among viruses identified at the Azebaijan Republic is remain rather small. In the same time it is cleared out that more than 70% seropositive persons were infected with HCV belonged to "1b" genotype, about 20% persons - with HCV belonged to "3a" genotype and only 10% - with HCV belonged to "2a" genotype [6].

Comparing results seroepidemiologic examinations have been performed for detection HBsAg and anti-HCV demonstrated that about 0,8% healthy inhabitants had HBsAg as like as anti-HCV.

Infections, caused with other hepatotropic viruses. About 15 years ago new hepatotropic and tranfusionally-transmitted virus was identified and named as "hepatitis G virus" (HGV). Finally at 1999 scientists described virus, directly named as "tranfusionally-transmitted virus" (TTV). Now information reflected distribution HGV-infection and TTV-infection among population of the Azerbaijan Republic is remain very short.

The first serologic research for detection antibodies to HGV (to peptides coded E2 zone of HGV genome) in the blood of 200 healthy inhabitants of Baku have been done in Baku at 1998. It was demonstrated that antibodies to HGV existed in 6,0% serums of tested healthy persons [12, 7].

The data on revealing DNA TTV among 200 healthy inhabitants of Baku have appeared only in 2003. According publish data this markers with the help of polymerase-chain reaction done on the base of standard commercial primers had been detected in 19,0% investigated blood serums [13].

Above presented data confirmed that territory of the Azerbaijan Republic is not free of 4 types of transfusionally-transmitted viral hepatotropic infections - hepatitis B, C, G and TTV.

HIV-INFECTION. Now HIV-infection widely spread in the world and is one of the important in not only epidemiology but in whole modern medicine. Only according the official data WHO in the world about 40 million persons are directly involved in the epidemic process, caused HIV and till now more than 25 millions HIV-infected persons are already died [18].

The first serological examinations for detection of antibodies to HIV (anti-HIV) among inhabitants of the Azerbaijan Republic have been performed at 1986. AIDS control center in Baku was established at 1989 and till now more than 4 millions persons had been examined for detection of HIV-infections.

In this communication we summarized our results obtained during serological examination of healthy population of the country for detection of anti-HIV. These examinations were carried out with the help of ELISA and immunoblotting [2, 3].

Up to the end of 2007 in Azerbaijan it is revealed 1379 HIV-infected persons including 1320 citizens of the country.

Among HIV-positive the country citizens 84,6% belonged to male and 15,4% belonged to female. All HIV-positive persons belong follow age groups: till 14 years - 0,8%, 15-18 years -0,4%, 19-24 years - 9,2%, 25-29 years – 20,8%, 30-39 years - 43,2%, 40-49 years - 17,9%, 50-59 years - 1,9% and more than 60 years - 0,3% the persons. Age of 5,5% HIV-positive anonymously tested persons has remained the unknown.

Among HIV-positive citizens 32,9% were inhabitants of Baku, 65,4% - inhabitants of other regions of Azerbaijan and at 1,7% infected persons the residence remained to unknown.

From the general number of the HIV-seropositive persons were infected with follow ways: in 59,8% cases - in time of parenteral narcotic drug using, in 21,3% cases - by mean of heterosexual contacts, in 0,9% - by mean of homosexual contacts. In 0,8% cases the infection was due to HIV transmited from mother to children, in 0,1% cases - by mean of blood transfusion. But in 17% cases the way of virus transmission has remained the unknown.

For the last 15 years up to the present in the country clinically manifested AIDS development has been registered at 294 persons, and the number of AIDS caused death was achieved 195.

HUMAN RETROVIRAL INFECTIONS. The last International classification of retroviruses united only two types of human lymphotropic viruses (HTLV-1 and HTLV-2), which are able to spread with sexual and "vertical" routes as like as transfusional route. Both types of HTLV are pathogenic for humans, but their role in human pathology is remain needs further investigations.

Till 2008 information about HTLV-1 and HTLV-2 circulation intensivity among population of the Azerbaijan was absent.

We have performed seroepidemiologic examination specimens of 207 healthy adult persons who live in Baku for detection of antibodies to HTLV-1/2 (anti-HTLV). Assays did with the help of ELISA on the base of commercial diagnostic kits.

Results of this examination demonstrated that anti-HTLV were existed at 0,97% tested blood specimens. This fact confirmed that mean frequency of anti-HTLV is approximately 1% and adequate rate of HTLV-seropositivety in major non-endemic regions of the world [17].

Thus it is clear that further studding of epidemiologic features these infections is important part of the struggle against these infections.

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◀ **GLOBAL HEALTH AND ECOLOGY:**
INDIVIDUALIZED INFERENTIAL STATISTICAL BLOOD PRESSURE
ASSESSMENT FOR HEALTH CARE AND LARGE-SCALE SPACE
WEATHER MONITORING

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Abstract. Health care and science dealing with blood pressure (BP) and heart rate (HR) have no choice. If reliance continues 1. on the homeostatic concept of sleep-wakefulness-related variations around a true BP, and hence 2. on the initial office visit as a first screen, 3. in special cases on the false gold standard of a 24-hour profile by ambulatory blood pressure monitoring (ABPM) and 4. on time-unqualified target values for an average BP as well as on day-night ratios, one must accept the facts that prehypertension may be missed and that a diagnosis and treatment, sometimes for a lifetime, based on fixed targets that ignore rhythmicity, may depend on whether a patient is seen in the morning or in the evening, an inevitable mathematical necessity. There is no alternative to variability assessment, as realized over 125 years ago by Zadek. In 2007, one can quantify the variability encountered longitudinally, now around the clock, for a week as a start and eventually for a lifetime, instrumentation permitting, as already feasible today in the laboratory. After a disorder is found, and as long as a cure for high BP and other disorders is not yet available, continuous monitoring is indicated.

Having monitored for decades, we find time structures chronomes in us and align them with chronomes around us. Thus, we seek associations of cycles of BP or HR vs. those in space weather and climate, while also using the longitudinal data from biological monitoring as a gauge of solar activity. As an important dividend or as the primary focus, BP and HR monitoring, analyzed individually with

inferential statistical methods serves self-help-based health care. These objectives are being implemented in a now-ongoing project on The BIOsphere and the COSmos, BIOCOS, aiming at a broad transdisciplinary science, based on a figurative microscopy and telescopy in time. BIOCOS is helped by the Phoenix Project, a Minnesota group of the Institute of Electrical and Electronics Engineers (www.phoenix.tc-ieee.org) building a website (www.sphygmochron.org/) for BIOCOS for largely automated analyses and their large-scale uses.

Objective. The paradox of more for less can be realized by computer-aided self-help in preventive health care, by prehabilitation, initially with focus on BP and HR, yet the approach is pertinent throughout health and ecology as a whole. This endeavor can start with the detection of variability disorders in the normal range that represent risks greater than hypertension. This can be done as early as possible, certainly with the captive audiences in late primary and early secondary education. For this purpose minimal data requirements in terms of density (of hourly measurements) and length (of 7 days) and minimal analytical steps (required by the short form of a computer summary of results, called a sphygmochron) have to be specified. Given such standards, BIOCOS can now provide a free service and achieve a second paradox, namely data collection on a broad basis for monitoring the effect of solar weather as a dividend from self-help in health care, eventually to be implemented as an automatic website by the IEEE. This project is the more important since evidence is available to show that in the case of BP the status quo has been untenable for over a century and that current shortcomings can be readily overcome by an international consensus which broadens the view of health and ecology (1, cf. 2) by the backing of an international academy, so that information on time structure in us and on the effects of space weather upon us become part and parcel of universal literacy in late primary, early secondary and adult education, eventually implemented by an international, multilingual website (http://www.sphygmochron.org).

Methods. The extended nonlinear cosinor (3) assessed the circadian period and its uncertainty on hundreds of 7-day around-the-clock BP and HR records from several towns on 3 continents. In the vast majority the circadian periods were 24-h synchronized with CIs (95% confidence intervals) overlapping 24 hours. This finding is in keeping with routinely fitting a two-component (24-h and 12-h) cosine model to at least 7 days of around-the-clock data for a first summary of parameters of variability, Figure 1a, including an improved average, the midline-estimating statistic of rhythms (MESOR, M), Figure 1b. As compared to an arithmetic mean, the M is more accurate when computed from unequidistant (e.g., self-) measurements or more precise in the case of equidistant data obtained with automatic monitors. Nonparametric endpoints derived from data stacked over an idealized 24-h day compared with time-specified reference limits qualified by gender, age, and
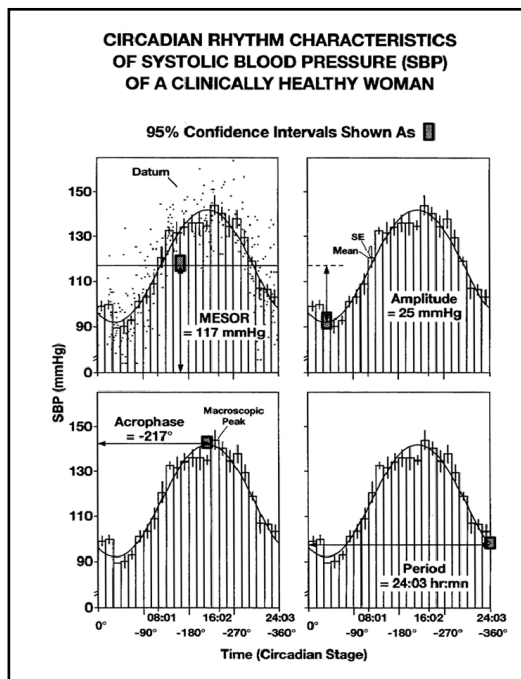
Figure 1a. Endpoints from parametric approach in sphygmochron. Circadian rhythm characteristics for systolic blood pressure monitored over several weeks by a clinically healthy woman. Data are shown as dots (top left), plotted after stacking over an idealized circadian cycle. The data are analyzed by linear-nonlinear rhythmometry, allowing the period to be estimated (bottom right), together with the MESOR (top left), amplitude (top right) and acrophase (bottom left), each with a measure of uncertainty, the 95% confidence interval (shown as a dark rectangle). Since the period is 24-h synchronized in the vast majority of cases, in the routine summaries a two- (24- and 12-hour) component model is fitted to the data.
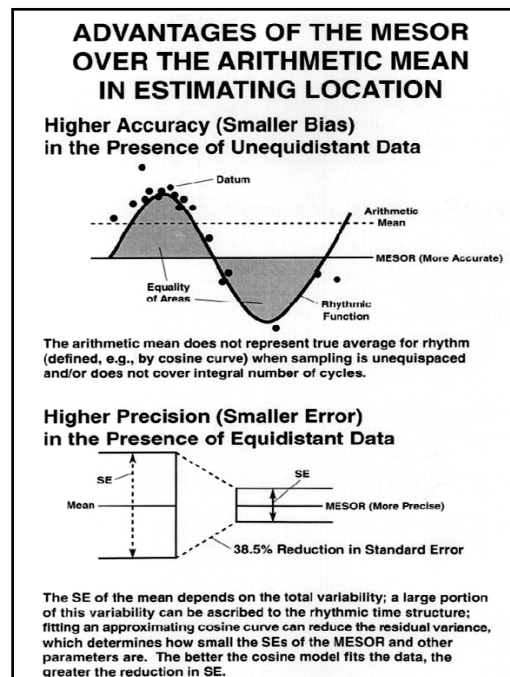
Figure 1b. As compared to the arithmetic mean, the MESOR usually provides a more accurate and more precise estimate of location.

ethnicity, Figures 2a and b, are also given in a sphygmochron, i.e., a computer-aided cardiovascular monitoring summary over time, Figure 3a (4).

An excessive circadian amplitude (A) of systolic (S) or diastolic (D) BP, Figure 3b, is defined as one exceeding the 95% upper confidence limit of A computed from data of peers matched by gender, age and ethnicity, and designated as a circadian overswing, CHAT (short for **c**ircadian **h**yper-**a**mplitude-**t**ension). CHAT may precede, coexist with or follow, as Figure 4 shows (5), spans with a
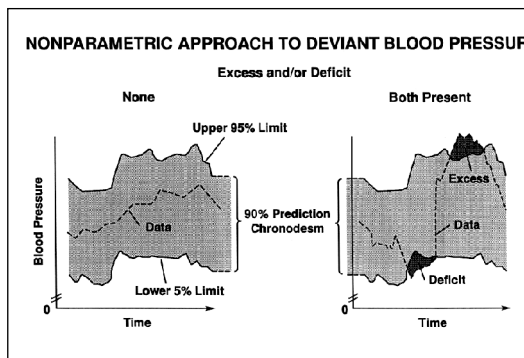
Figure 2a. Nonparametric complement of sphygmochron. The actual data are stacked over an idealized 24-hour day (dashed curve) for comparison with time-specified 90% prediction limits (solid curves) derived from clinically healthy subjects matched by gender and age (and whenever possible also by ethnicity, geographic/geomagnetic location and social class). Deviations are shown as darker areas below the lower 5% and above the upper 95% prediction limits, representing blood pressure deficit and excess, respectively. These abnormalities are assessed non-parametrically as the percent time deficit or elevation and as the area delineated by the profile when it is outside acceptable time-varying limits and the limit itself (hypobaric or hyperbaric index, respectively). An indication of the timing when most of the excess (or deficit) occurs is also provided as a guide for timing any needed intervention.
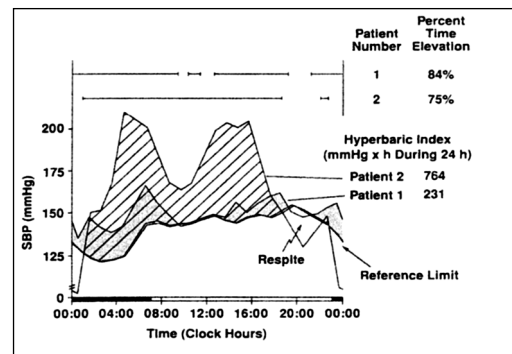
Figure 2b. The need to assess the hyperbaric index as a complement to the percent time elevation is illustrated by a comparison of profiles from two patients with a similar number of deviant readings. Patient 1 has a numerically slightly larger percent time elevation but a much smaller excess. The very large difference in hyperbaric index between the two patients likely reflects the difference in their prognosis.

high BP, MESOR-hypertension (MH), which is determined as a M above the upper 95% prediction limit of M computed from data of peers again matched by gender, age and ethnicity (4). Use of the term MH implies that the diagnosis is based on chronobiologically (C) interpreted, preferably 7-day ambulatory BP measurements (C-ABPM). Reference to MH thus serves to separate a chronobiologic diagnosis from reliance upon single office measurements of BP. MH, like CHAT, is best qualified by the number of days of monitoring upon which the diagnosis is based. Figures 5a-b show the discrepancy of two 24-hour ABPM profiles and Table 1 shows the different extent of day-to-day variability in two separate 7-day profiles obtained by C-ABPM. In a first 7-day span, daily systolic BP-Ms varied from 117 to 139 mmHg. In a second profile of the same subject they varied only between 124 and 130 mmHg. Much larger day-to-day and week-to-week variations are recorded (4).

Figure 3a. Sphygmochron: short form of a vascular monitoring profile over time, based on reference standards from peers matched by gender, age and, when possible, ethnicity. Results from parametric approach (Figure 1) are given in boxes with reference values specified in rectangles next to the boxes from peers of corresponding gender and age.
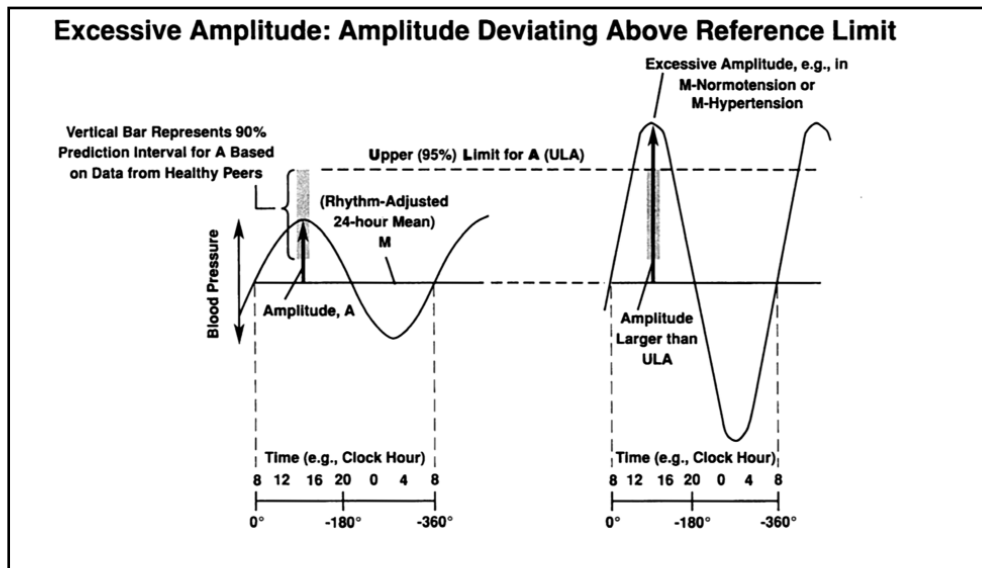
Figure 3b. Circadian amplitude of blood pressure assessed by cosinor as a diagnostic endpoint, subject to infradian modulations, notably at birth, enlarged in newborns exposed to betamimetics, larger in adolescents with a positive vs. negative family history of high BP and/or related vascular complications. In adulthood, a larger circadian A of BP is found in an intermediate group formed on the basis of cardiac left ventricular mass, in the absence of any elevation in BP MESOR, Figure 7c. An excessive circadian BP A carries a very large risk of ischemic stroke and nephropathy, Figures 7a-c, and can be pre-hypertension, Figure 7d.

* Values from non-overlapping with 1-day intervals serial sections on half-hourly around the clock data; GK (M, 72-78 y) on varying treatments.
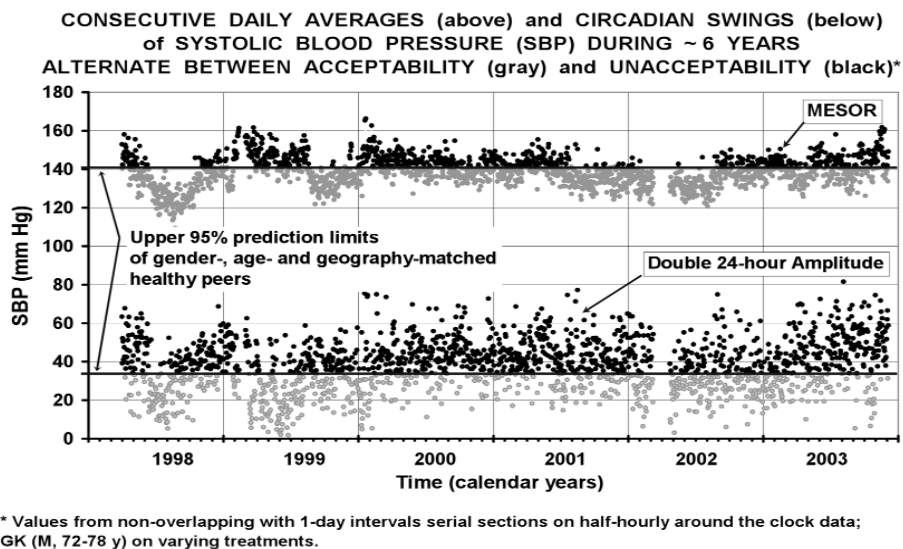
Figure 4. Time course of treated MESOR-hypertension, MH, top, and **c**ircadian **h**yper-**a**mplitude-**t**ension, bottom, in GSK, a man MESOR-hypertensive since his 30s, studied from the ages of 72-82 years on different treatments, with very few gaps (5).

Tabl 1.

Longitudinal 7-day/24-h monitoring of systolic (S) and diastolic (D) blood pressure (BP) and heart rate (HR) interpreted chronobiologically (C-ABPM) reveal not only day-to-day variability (I & II), but also week-to-week variability (I vs. II)*: FH, M, 88 y, C-ABPM

		SBP-M	DBP-M	HR-M	SBP-2A	DBP-2A	HR-2A	SBP-φ	DBP-φ	HR-φ
Ref Span 1: 05/07-13/2007		125.7	69.8	57.1	22.97	19.66	8.05	15:20	15:40	01:09
Ref Span 2: 05/22-28/2007		127.2	71.2	57.5	23.75	18.93	14.42	14:36	14:55	02:02

	Date May 07		SBP-mean	SBP-SD	SBP-DNR	DBP-mean	DBP-SD	DBP-DNR	HR-mean	HR-SD	HR-DNR
		Ref Span 1	125.59	21.46	15.68%	69.92	14.99	22.46%	57.15	10.28	-12.48%
I	07 Mon	Day 1	132.05	19.60	8.64	71.80	12.40	14.22	58.98	12.34	3.89
	08 Tue	2	123.74	21.43	17.93	70.76	14.82	25.62	57.30	10.24	-13.54
	09 Wed	3	139.39	27.79	35.85	78.72	18.44	41.45	62.72	12.64	-5.79
	10 Thu	4	117.46	16.99	4.17	65.46	12.28	6.95	55.20	7.51	-17.48
	11 Fri	5	124.91	18.37	17.42	68.75	15.23	27.09	54.33	8.56	-24.28
	12 Sat	6	123.47	18.16	12.60	65.87	13.12	14.83	55.79	9.72	-20.18
	13 Sun	7	117.09(1)	16.48	7.21	66.84 (1)	13.40	17.56	55.23	7.45	-11.80
		Ref Span 2	127.02	18.43	14.86%	71.18	14.17	21.21%	57.68	11.47	21.30%
II	22 Tue	Day 1	124.80	16.48	12.27	72.84	12.59	16.37	60.51	12.64	-33.41
	23 Wed	2	127.86	20.69	11.40	70.81	14.23	12.47	61.10	10.52	-9.68
	24 Thu	3	130.47	18.10	12.68	72.84	13.72	20.75	62.98	15.89	-39.61
	25 Fri	4	128.88	21.50	20.10	72.26	17.11	33.52	52.72	6.05	-19.88
	26 Sat	5	127.11	18.13	15.62	70.61	15.21	26.08	55.02	9.20	-11.26
	27 Sun	6	123.69	16.15	15.65	67.96 (2)	11.80	21.66	57.83	10.93	-14.66
	28 Mon	7	126.65	18.10	15.97	71.16	14.46	17.02	53.44	8.51	-18.92

*C: chronobiologically collected and interpreted BP and HR measurement; ABPM: ambulatory blood pressure (and heart rate) measurement

M: MESOR (midline-estimating statistic of rhythm), a rhythm-adjusted mean, that may differ slightly from arithmetic mean listed below

2A: double circadian amplitude: extent of predictable change within a day

φ: circadian acrophase: a measure of timing of overall high values occurring each day, expressed in hr:min

SD: standard deviation; DNR: day-night ratio

Underlining indicates Sunday: daily spans cover midnight to midnight

(1) Outside 90% prediction limits for Mon-Sat from Ref Span 1 and Ref Span 2 (pooled)

(2) Outside 90% prediction limits for Mon-Sat for Ref Span 2 and from Ref Span 1 and Ref Span 2 (pooled)
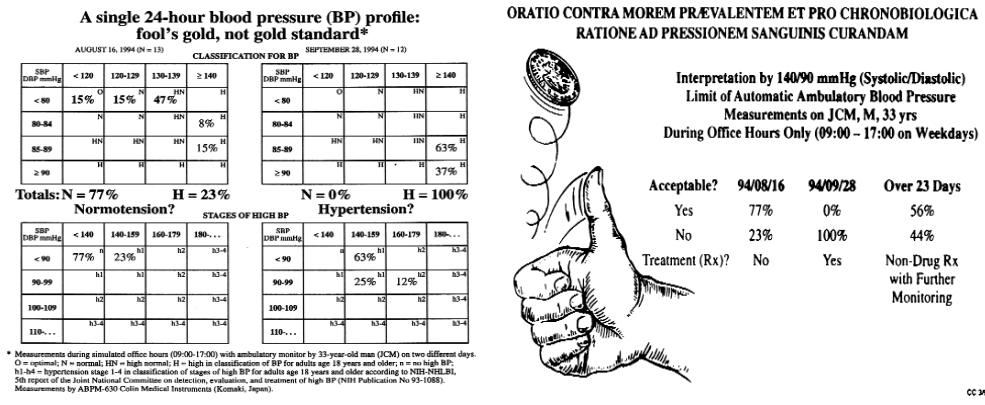
Figure 5. The U.S. NIH, the WHO and WHL consider that repeated, albeit single
SBP/DBP values < 140/90 mmHg are acceptable.
Based on this classification, BP readings during office hours from the ABPM of the same subject
over 23 days would be acceptable 56% of the time. On one day (August 16, 1994),
77% of office-hour measurements are acceptable, whereas on another day (September 28, 1994),
none of the measurements (0%) are acceptable. This is a factual illustration of the inference that a
single 24-hour profile can be equivalent to flipping a coin (4).

At several international consensus meetings, including one in 1995 (4), the clinical entities of MH and of CHAT, circadian overswing, were introduced to show first that CHAT constitutes a risk of ischemic stroke, Figure 6a, and of nephropathy, Figure 6b, higher than that of MH (4, 6). Second, even when the M was below 130 mmHg, a high relative risk of ischemic stroke (Figure 6c) and of nephropathy was associated with CHAT (4, 6; cf. 7). Third, CHAT is more frequent between BP Ms of 130 and 140 mmHg systolic BP and between 80 and 90 mmHg diastolic BP, findings suggesting that this condition could be a state of pre-hypertension, Figure 6d (8). An increase in A had been reported to precede MH in Okamoto's stroke-prone spontaneously hypertensive rat (SHR-SP) (9), Figures 7a and b. Increases in A and in the left ventricular mass index (LVMI) also precede an increase of M in humans, Figure 7c (10), as Kumagai's prehypertension (11).
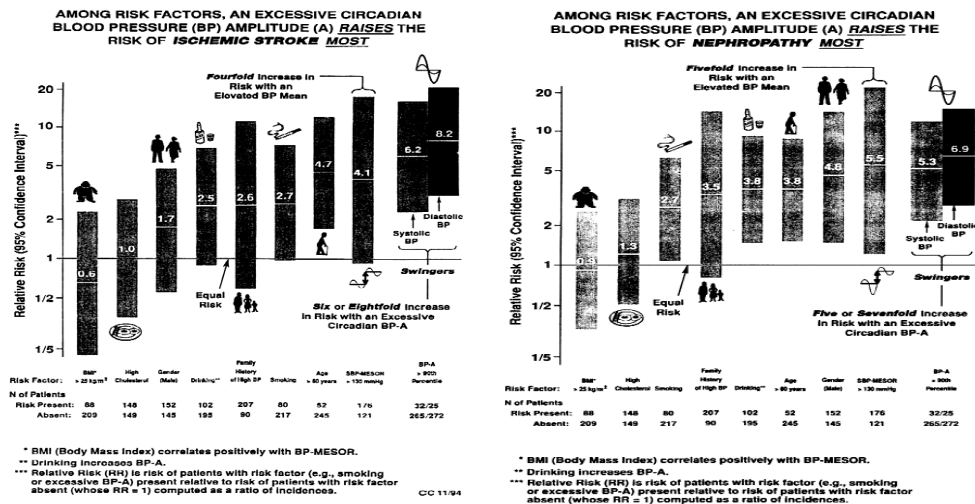
Figure 6a. An excessive circadian amplitude of diastolic blood pressure represents a 720% increase in risk of ischemic stroke (see last column on right).

Figure 6b. An excessive circadian amplitude of diastolic blood pressure represents a 590% increase in risk of nephropathy (see last column on right).

**AN EXCESSIVE CIRCADIAN BLOOD PRESSURE (BP) AMPLITUDE (A)* IS A RISK FACTOR
FOR ISCHEMIC STROKE INDEPENDENT FROM THE 24-HOUR MEAN (MESOR)****

SBP-MESOR: (mmHg)	< 130	130 - 140	140 - 150	150 - 160	> 160
N of Patients:	121	99	39	20	18
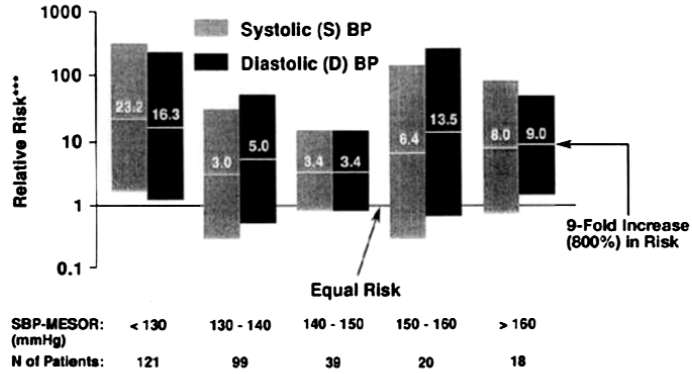
* Above 90th percentile of peers.
** Results of 6-year follow-up study of 297 patients.
*** Relative Risk (RR) is risk of patients with an excessive circadian BP-A relative to risk of patients with an acceptable circadian BP-A (whose RR = 1). Wide confidence ranges due to limited sample sizes.

Figure 6c. A high relative risk of ischemic stroke and of nephropathy (not shown) is also associated with an excessive circadian amplitude when the MESOR of SBP is below 130 mmHg (left).

**CIRCADIAN HYPER-AMPLITUDE TENSION (CHAT)
INCIDENCE AS A FUNCTION OF
BLOOD PRESSURE MESOR***

Systolic Blood Pressure (SBP)

Diastolic Blood Pressure (DBP)
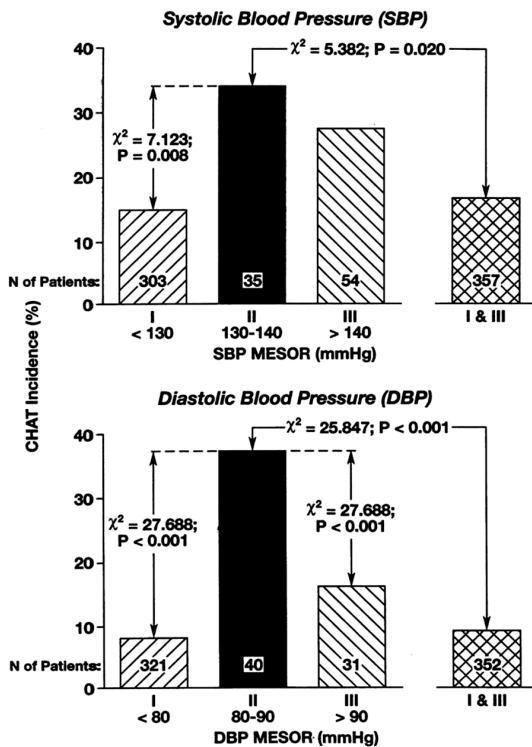
* MESOR = rhythm-adjusted mean.

CC 12/95

Figure 6d. Non-random pattern of incidence of systolic (S) (top) and diastolic (D) (bottom) CHAT with a blood pressure MESOR in groups (II) with SBP between 130-140 mmHg and DBP between 80-90 mmHg, findings suggesting that this condition could be a state of prehypertension.

22
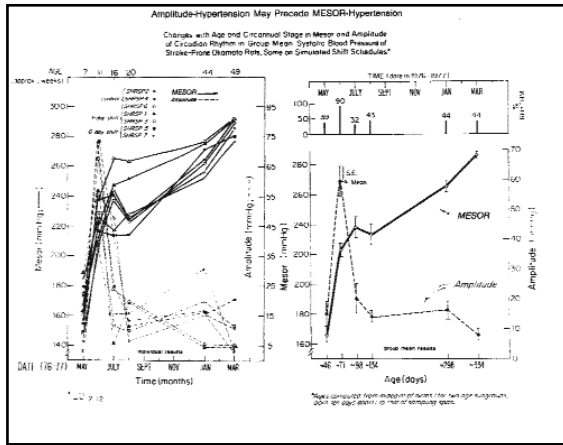
Figure 7a. An excessive circadian amplitude character-izes prehypertension in the SHR-SP rat.
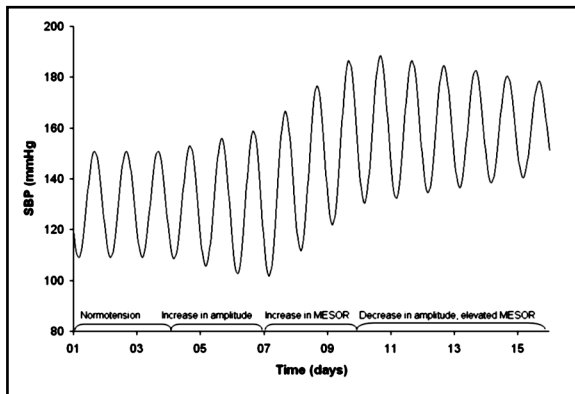
Figure 7b. Abstract modelling prehypertension as an intermediate stage between MESOR-normotension and MESOR-hypertension.
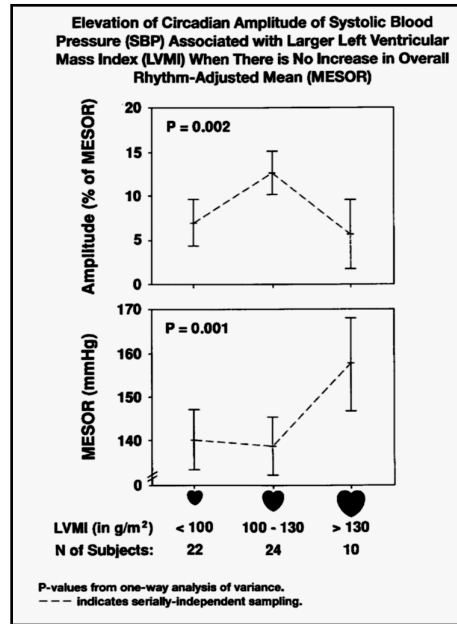
Figure 7c. An increasing left ventric-ular mass index (LVMI) underlies groups 1-3 shown on the abscissa, formed based on cut-offs in the literature. Along the scale of the LVMI increase, there is a transient increase in circadian BP amplitude (top) at an a priori cutoff for LVMI lower than that associated with an increase in MESOR (bot-tom). This sequence from normotension over circadian amplitude-hypertension to MESOR-hypertension may be reversed by insufficient treatment of the latter condition and may be telescoped into a scale of a few months in Figure 5.

In the studies (4) underlying Figures 6 and 7, however, the retina was not examined for hard-to-define minimal changes. This was accomplished by Pietro Cugini (12, 13), whose data, summarized in Figure 8 (top left), show that he found retinopathy with daytime systolic BP mean values of 129 ± 10 mmHg (left) while corresponding values from controls without retinopathy were statistically signifi-cantly lower. Nighttime means did not differ between his two groups with and without minimal retinopathy. His information on daytime vs. nighttime values allowed him to consider overall dipping vs. non-dipping. He remarks that in his putatively normotensive subjects with minimal retinopathy there was "no acrophase shift to cause the non-dipping phenomenon".
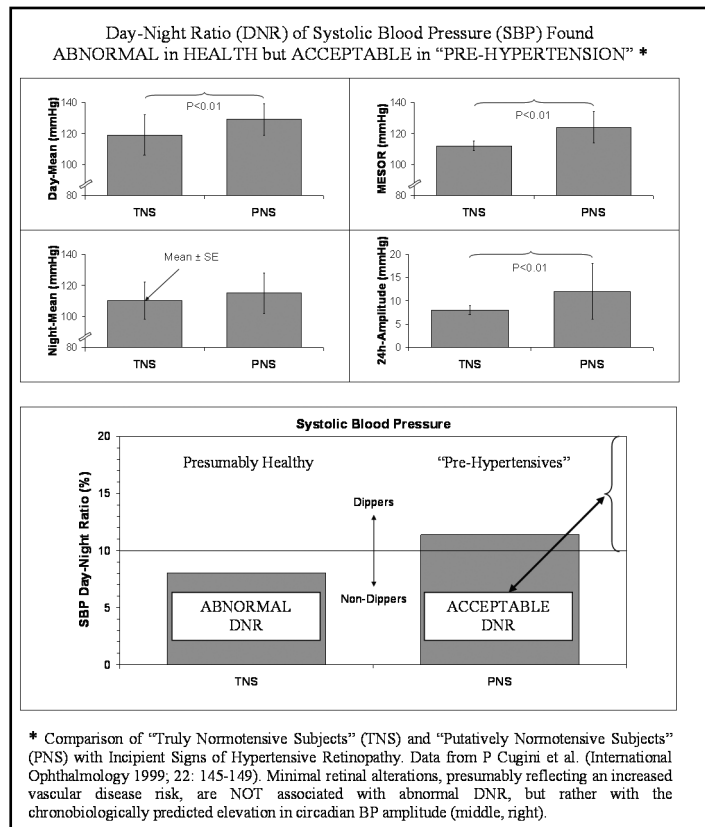
Figure 8. Subjects with minimal change retinopathy have daytime mean values of systolic blood pressure (SBP) higher than those without retinopathy by day (top left); a dipping classification not only fails to resolve prehypertension, being normal in the presence of a minimal-change retinopathy, yet abnormal in the absence of minimal change retinopathy (bottom). Chronobiology shows an increase in circadian amplitude as well as MESOR, in the presence (PNS) versus the absence (TNS) of minimal retinopathy, top right.

Cugini's important data, however, as summarized in Figure 8 (bottom), also reveal that, overall for systolic BP, those with retinopathy were dippers and the "truly normotensive" subjects were non-dippers, another case in which the chronobiologic approach (also used by Cugini) worked and the dipping classification not only failed to predict the outcome (in this case minimal change retinopathy), but actually was abnormal in those without retinopathy. Although chronobiology and dipping "may give overlapping results" (14), they also differ as reported earlier for the prediction of hard (4, 6) and proxy (LVMI-based) (7) outcomes and now in the context of prehypertension, Figure 8 (bottom).

A chronobiologic approach by Cugini in Figure 8 (top right) shows a statistically significant increase in both M and A of systolic BP, suggesting that one is dealing with a very early hypertension, a state referred to as Cugini's (systolic) pre-

hypertension (15), which awaits scrutiny of any sequence in which minimal change retinopathy vs. other target organ involvement, such as an increased left ventricular mass index (Kumagai's prehypertension) (10) or microalbuminuria appear in longitudinally monitored subjects. Kshirsagar's prehypertension (16) has to be noted, but cannot be assessed in its own right, since studies based on office measurements, even when they are repeated, are necessarily complicated by false diagnoses (48% "cures" by placebo) (17; cf. 4).

Recently, Thomas Pickering scholarly documented why "Exclusive reliance upon an office visit is not recommended" (18). The next step may be to recommend what Janeway (19) did

… *it is essential* that a record of the pressure be made at frequent intervals *at some time previous* [presumably to an examination], to establish the *normal level* and the *extent of the periodic variations.* When this is done, it may be possible to demonstrate changes of small extent, which, lacking this standard for comparison, would be considered within the limits of normal variation.

and Bartter (20) noted

By conventional standards, this patient is clearly normotensive every morning. But the blood pressure determined each day at 6 in the afternoon provides especially convincing evidence that this patient is a hypertensive. …

My plea today **[in 1974]** is that information contained in [data curves compiled under differing circumstances, such as 24 hours a day/7 days a week] become a *routine minimal amount* of information accepted for the description of a patient's blood pressure. *The analysis of this information by cosinor should become a routine.* It is essential that enough information be collected to allow objective characterization of a periodic phenomenon, to wit, an estimate of M [the time structure or chronome-adjusted mean, or MESOR] … an estimate of [the amplitude] A itself, and finally an estimate of acrophase, ϕ [a measure of timing]. In this way, a patient can be compared with himself at another time, or under another treatment, and the patient can be compared with a normal or with another patient.

A chronobiologic approach in 2007, with now-free analyses from corne001@umn.edu for those who volunteer their data to the BIOCOS (The Biosphere and the Cosmos) project to establish an international data base, is overdue, 127 years after Ignaz Zadek (21), who did not want to evaluate the blood pressure, but the variability of blood pressure in the given person. Janeway emphasized that he needed the assessment of "periodic variations" (note plural), and in 1880, in his thesis for a medical degree in Berlin, Zadek had the data to demonstrate about-half-weekly and weekly as well as circadian rhythms (22). Today, we have learned that there are many other variations with longer wobbly periods and small amplitudes. Figures 9a-d allow a glimpse of some cycles with rather long periods (2, 22-24) with hints of putative mechanisms (2, 25).
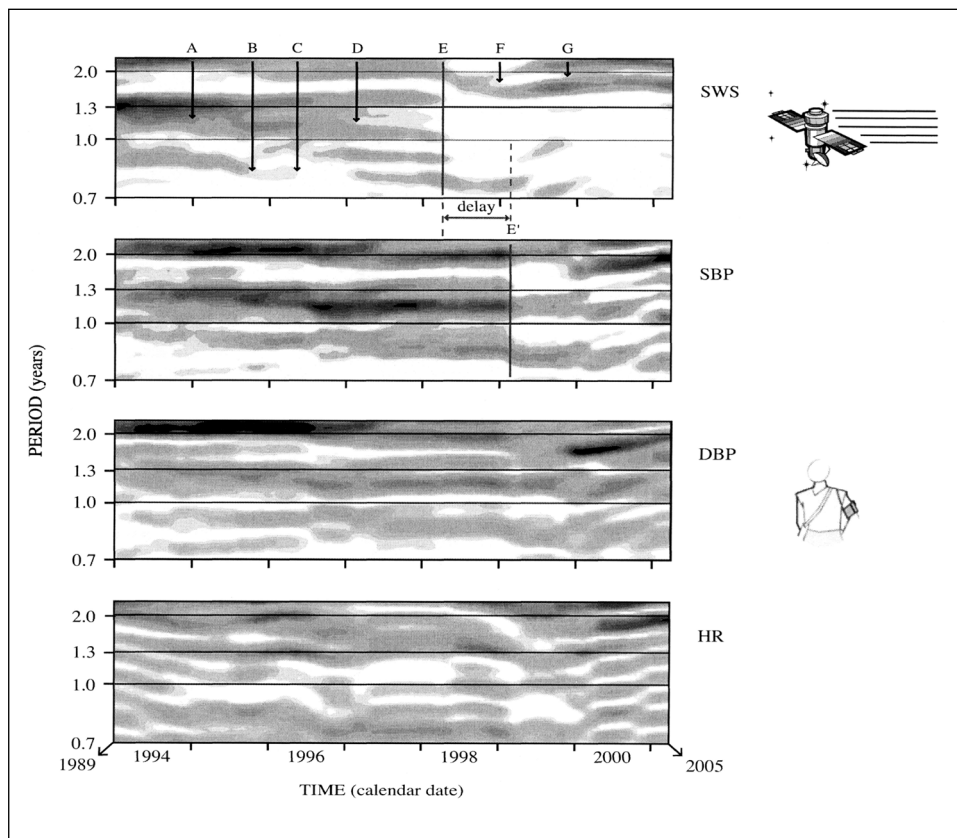
Figure 9a. Time courses of the frequency structures of the speed of the solar wind (SWS) (top) and of an elderly man's (FH) SBP, DBP and HR (rows 2-4, respectively), examined by gliding spectral windows. Human SBP selectively resonates with SWS (top 2 sections). No major resonance, only minor, albeit abrupt changes in DBP or HR (bottom 2 sections). Rhythms in gliding spectra of SWS and SBP drift or otherwise change in frequency (ceasing and reappearing smoothly [A] or abruptly [B, C, D]; bifurcating [D, F] and rejoining [G]); they also wax and wane in amplitude (B) (up to disappearing [C, E] and reappearing). During a nearly 16- year span there are no consistent components with a period averaging precisely 1 year in the 3 physiologic variables, possibly an effect of advancing age, as in Figure 10d. While post hoc ergo propter hoc reasoning can never be ruled out, an abrupt change in the top row in SWS is followed in the second row in SBP by the disappearance of some components, suggesting that as a first demonstration, some of FH's cis- and transyear components were driven by the SW [since they disappeared with a lag of about a transyear following the disappearance (subtraction) of the same components from the SWS spectrum at E]. The persistence of other spectral features in turn suggests endogenicity, i.e., an evolutionary acquisition of solar transyear oscillations that may reflect solar dynamics for the past billions of years, just as circadians may reflect exposure of life to the possibly more recent alternations of light and darkness. FH was 70 years of age at start of around-the-clock monitoring, mostly at 30-min intervals (with interruptions) for nearly 16 years (N=2418 daily averages, total ~ 55000). Gliding spectra computed with interval = 8 y, resolution low in time but high in frequency, increment = 1 month, trial periods from 2.5 to 0.4 y, with harmonic increment = 0.05. Darker shading corresponds to larger amplitude.

DECADAL, MULTI- & PARA-ANNUAL CONGRUENCE OR SIMILARITY
GAUGED BY OVERLAPPING OR OVERLYING VS CONTIGUOUS CIs[¶] OF PERIOD, τ,
IN SPECTRA OF SOLAR WIND SPEED (SWS)
AND SYSTOLIC BLOOD PRESSURE (SBP) MESOR (M) *
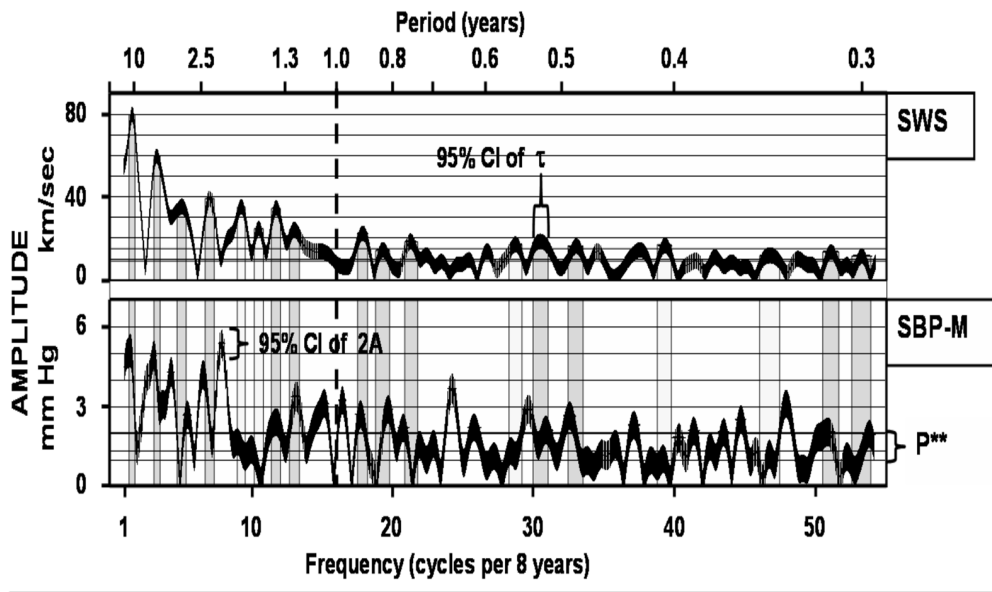
* SWS: daily data from ftp://nssdcftp.gsfc.nasa.gov/spacecraft_data/omni, N=5272. BP data: daily averages from Dec 1989 to Jul 2006 monitored ~ every 30 min (with gaps) by FH, a man of 70 y at start of records. N = 2684.

** Horizontal lines indicate ordering significance at the 0.001 and 0.05 levels only as a first approximation; until more robust methods become available, that are not dependent upon the assumptions of independence, normality and homogeneity of variance, a transdisciplinary congruence of periods and a "remove – replace" approach remain the criteria of importance. Congruence between components with amplitudes differing from zero with an ordering P betweein 0.001 and 0.05 are questionable.

[¶] CI = 95% confidence interval of τ (of each component fitted separately).

Figure 9b. Congruence by the criterion of overlapping, if not overlying 95% confidence intervals of periods, notably at the Schwabe cycle's circadecadal period between spectra of the solar wind's speed and the MESOR of systolic blood pressure of FH.

For everyday practice, however, decades-long records, like those in Figures 4 and 9a-d, serve to reinforce the recommendation, as a compromise with practicability, of a 7-day record with C-ABPM. A 24-h profile by ambulatory monitoring is subject to too many false positive and false negative diagnoses, Figure 5 (4), and dipping classifications while appearing to be simpler can actually be misleading in the context of prehypertension, Figure 8 bottom, and are limited by the assumption that the sleeping/waking difference accounts for the variability of BP (14).

While important ultradian variability should also be spectrally resolved, as reviewed by Parati et al. (26), there is a circadian and broad infradian modulation of BP and HR. In all these contexts, including ultradians, associations with the cos-

mos are documented on earth and in extraterrestrial space (27, 28). Cycles in the cis-half-yearly (~5 months), transyearly (2), decadal and multidecadal ranges that affect human pathology as well as physiology also await further scrutiny (29-31).

TRANSDISCIPLINARY MAPPING: ENVIRONMENTAL RECIPROCALS TO PHYSIOLOGICAL CYCLES; SOLAR SIGNATURES IN THE HUMAN CIRCULATION*

* BSC = Hale's Bipolarity Sunspot Cycle (odd cycles coded negative); WN = Schwabe's relative sunspot numbers (Wolf Numbers); Gaa = Geomagnetic aa-Index; SBP = Systolic Blood Pressure; DBP = Diastolic Blood Pressure; HR = Heart Rate. Cardiovascular data collected during 38 y by RBS, a MESOR-normotensive man, 20.5 y old at start of ongoing ~5 daily self-measurements. Width of horizontal bars = 95% confidence intervals (CIs) for all τs. All series in same span (May 11 1967 to Nov 07 2005). Thin connecting lines and shading indicate overlapping CIs. **Conclusion (tentative; based on limited data): CIs of τs of some cardiovascular spectral components overlap (when driven ▭ ?) or do not overlap (but are near) environmental reciprocal τs (when they are endogenous ▭ ?); alternatives, including <u>chance</u>, not ruled out.**

Figure 9c. Differential congruence of environmental and physiological peaks in RBS, a clinically healthy man who self-measured blood pressure and heart rate from the age of ~20 to about 60 years about 5 times a day. On top, Hale's **b**ipolarity **s**unspot **c**ycle (BSC) is congruent by the criterion of overlapping, if not overlying 95% confidence intervals of periods with systolic (S) and diastolic (D) blood pressure at some frequencies and with heart rate at a different frequency. Differential congruences are also seen between Schwabe's relative sunspot cycle or geomagnetics and the physiological variables and further among environmental or physiological variables themselves. Congruences are a first step for the study of associations by the subtraction and replacement of an environmental frequency with the possible partial loss and damping of the partially persisting physiological frequency when, because of natural changes, the environmental frequency is not detected (see Figure 9a).

The signatures in human disease of the earth, a neither flat nor fixed but a round and rotating heterogeneous magnet with hence important longitudinal and latitudinal differences in its response to a still larger magnet sun (32), await overdue international longitudinal terrestrial and extraterrestrial biological and other monitoring, Figure 9a, if we are interested in mechanisms underlying rhythms

longer or shorter than a year, that characterize in particular the very young and the very old. In the elderly (33), infradians may predominate and they modulate the circadians' signatures in the absence of a calendar-yearly component, Figure 9a (2). Infradians may be demonstrated only in certain circadian stages, Figure 9d (24).

TIME-VARYING SYSTOLIC BLOOD PRESSURE REVEALS
SOLAR ~1.84-, ~1.03- AND ~0.40-YEAR COMPONENTS &
IN THE EVENING, A MAJOR TELLURIC HALF-YEAR (↓) *
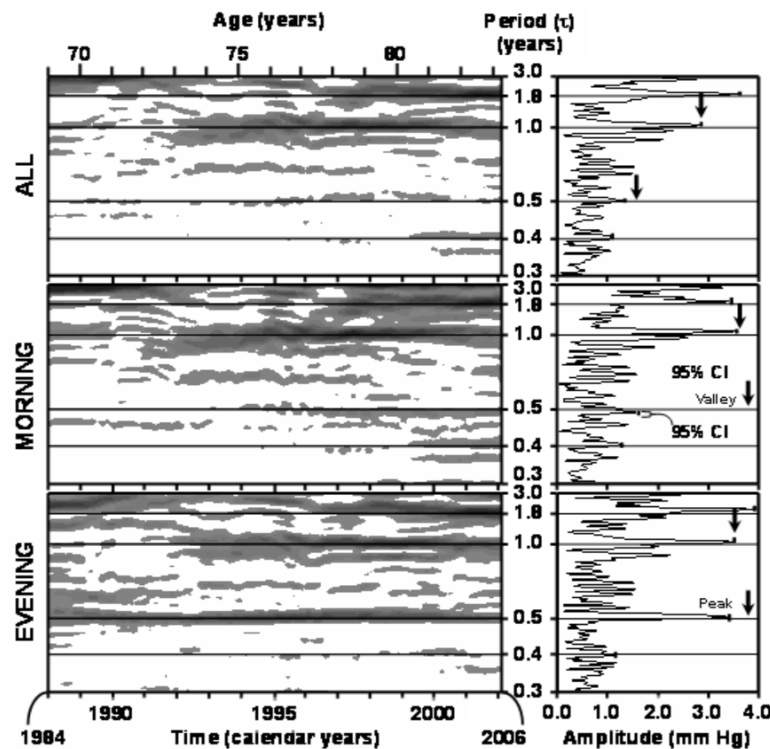
SBS, a man 65 years old in Feb 1984 at start of 22-year observations (twice / day, N ~ 12,759).
Left: gliding spectral windows, interval= 8 y, increment= 2 months, harmonic increment= 0.1. Darker shading corresponds to larger amplitude. Right: global spectral windows.
CI = 95% confidence interval. τs and CIs overall are 1.835 (1.824; 1.847), 1.034 (1.028;1.040), 0501 (0.498; 0.504) and 0.402 (0.394; 0.410); in the morning 1.814 (1.797; 1.831), 1.049 (1.042; 1.056), 0.488 (0.485; 0.490), 0.404 (0.402; 0.406) and in the evening 1.851 (1.836; 1.865), 1.018 (1.012; 1.025), and a geomagnetic 0.501 (0.495; 0.502), 0.397 (0.394; 0.401).

Figure 9d. Half-yearly component of systolic blood pressure found in evening measurements by an elderly man, but not in measurements made by the same person in the morning when the spectrum shows a valley (so labeled on the graph) rather than a peak. It seems pertinent that human circulating melatonin also exhibits a half-yearly cycle only by night in Florence at mid-latitude and that human urinary melatonin excretion is damped by a magnetic storm that also dampens the MESOR and amplitude of the circadian rhythm in pineal melatonin of the rat.

Unseen nonphotic components coexist and compete with both the photic day and year and dominate the yearly region of the spectra of BP and HR early and late

in life. At issue are risks greater than high BP, Figure 10, in health that should be detected and treated for prehabilitation (27), including suicide (34) and sudden cardiac death (2). There is the even more urgent task of preventing criminality and wars, that also undergo cycles influenced by the sun, and spreading infections of the mind as well as the body in populations (35). By monitoring and mapping such cycles in individuals, we might learn about mechanisms and institute measures against those environmental factors that are manipulable, just as heating and air conditioning were developed for the obvious photic and thermic cycles.

Decreased Heart Rate Variability (DHRV), Circadian Hyper-Amplitude-Tension (CHAT) and Elevated Pulse Pressure (EPP) are Separate Cardiovascular Disease Risks*

CHAT?	--	**NO**	------------------------------	
EPP?	NO	NO	YES	YES
DHRV?	NO	YES	NO	YES
	206 / 8	9 / 4	27 / 12	2 / 4

*Patients (N) with each risk combination without (▨) or with (■) morbid event

CHAT?	--	**YES**	------------------------------	
EPP?	NO	NO	YES	YES
DHRV?	NO	YES	NO	YES
	13 / 4	1 / 1	0 / 3	0 / 3
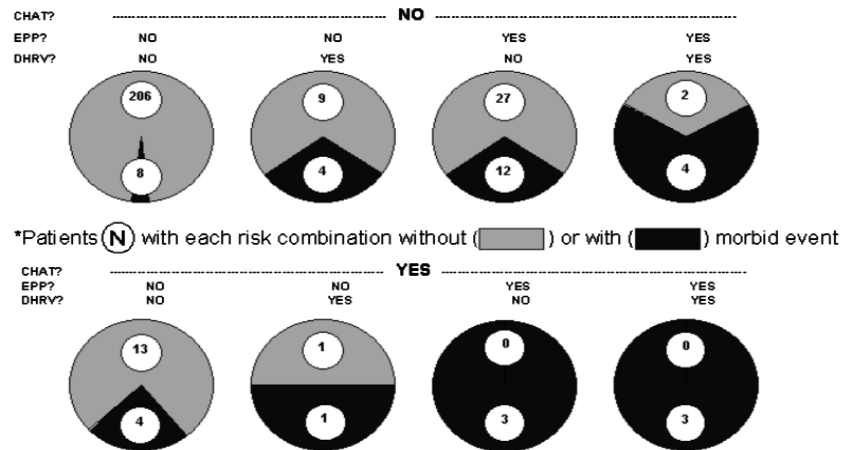
*Results from 6-year prospective study on 297 (adding all Ns) patients classified by 3 risks (8 circles), supported by findings on total of 2,807 subjects for total of over 160,769 sets of blood pressure and heart rate measurements.   Data from K Otsuka.

Figure 10. CHAT is one of several conditions related to the variability in BP and/or HR that is associated with an increase in vascular disease risk. The circadian (or preferably circaseptan profile) with too large a pulse pressure (the difference between SBP and DBP, i.e., between the heart's contraction or relaxation, or the extent of change in pressure during a cardiac cycle) and a decreased HR variability (gauged by the standard deviation of HR) in relation to a threshold, preferably eventually all in gender- and age-matched peers are two other risk conditions (as is an abnormal circadian timing of BP but not of HR, not shown). Vascular disease risk is elevated in the presence of any one of these risk factors, and is elevated further when more than a single risk factor is present, suggesting that these abnormalities in variability of BP and HR are mostly independent and additive. Abnormalities in the variability of BP and HR, impossible to find in a conventional office visit (the latter aiming at the fiction of a "true" BP), can raise cardiovascular disease risk (gauged by the occurrence of a morbid event like a stroke in the next six years) from 4% to 100%. By comparison to subjects with acceptable BP and HR variability, the relative cardiovascular disease risk associated with a **d**ecreased **h**eart **r**ate **v**ariability (DHRV), an **e**levated **p**ulse **p**ressure (EPP) and/or **c**ircadian **h**yper-**a**mplitude-**t**ension (CHAT) is greatly and statistically significantly increased. These risks, silent to the person involved and to the care provider, notably the risk of CHAT, can usually be reversed by chronobiologic self-help, also with a non-pharmacologic approach in the absence of MESOR-hypertension (4).

Epilogue. Focus upon BP and HR herein, and upon health and ecology, is a start to approach a global health problem. But the same methodology of assessing time structures and their alterations also seems applicable in looking for harbingers of earthquakes and other cataclysms, albeit the variables that may be most sensitive remain to be found experimentally against the background of accumulating evidence (36, 37). In laboratory experiments, Friedemann Freund has studied energy transfer processes yielding telluric current coupled to ionospheric current vortices. He writes:

The Earth's crust and upper mantle are electrically conductive. Ionospheric current vortices induce currents into the solid Earth. These telluric currents generate a horizontal torque. Model calculations show that the torque energy is comparable to that of tectonic deformation energy. Its contribution can reach the energy equivalent to that released during an M=3 earthquake. (38)

His proposition that "the coupling between the ionosphere and solid Earth … creates a positive feedback allowing Earth's crust to respond dynamically to the energy flow from the Sun" (38; see also 39-41) is in keeping with the finding of solar wind signatures in seismics. Transdisciplinary monitoring research is indicated.

Vladimir Ivanovich Vernadsky's mentor Vasily Vasilievich Dokuchaev (42) was not satisfied with Darwin's biology and Lavoisier's chemistry; outstanding separate disciplines though these were, they were not enough. We add that in the same sense, Einstein, Planck and Schrödinger (43) all sought a unified field theory, but again only in their disciplinary context. Roederer, who had asked whether magnetic storms are a hazard to health (44), advocated tearing down disciplinary barriers (45), all without any broad endeavor of mapping the cycles and broader time structures involved. The cartography of transdisciplinary cycles may well serve Kofler's advocacy of extending current views in health and ecology (1), in the sense of building a transdisciplinary science, with benefit from prehabilitation, Scheme 1, served by a website, Scheme 2.

In an immediate global context, within the USA alone, the number of hypertensives is estimated to be about 72 million. There may be at least equally as many prehypertensives, not only in the West but also in developing nations. Prehypertension and hypertension combined almost certainly affect more people than HIV/AIDS or any other illness. The vascular diseases with which vascular variability disorders are associated not only concern hundreds of millions of people; incapacitation after a massive stroke can also be second to none and the costs are great. There is an urgent need for prehabilitation by education in order to recognize our time-structural alterations by a microscopy in time. It seems possible that the methods of time series analyses developed for health and ecology, Schemes 1 and 2, can also serve for exploring the cosmos and how it affects our bodies and minds, and thus the biosphere and the noosphere in toto, far beyond cataclysms (46).

Scheme 1. Prehabilitation, preferably before as well as after or with rehabilitation (for further vascular disease prevention) and more generally for use of the same data in monitoring the variable sun's effects on the biosphere. By the early detection of disease risk syndromes in the individual subject, countermeasures for primary prevention can be instituted. Such prehabilitation in health can also complement rehabilitation and can be a major goal of a transdisciplinary science.

Preventive and curative health care can yield the dividend of biomedical monitoring of space weather by time-structural analyses of ambulatory blood pressure and heart rate series[1]

(1) by aligning longitudinal and linked cross-sectional biomedical with (whenever possible also local and global) physical environmental monitoring for transdisciplinary science -- while safeguarding anonymity, privacy and security with lifelong follow-up. Vision of Larry A. Beaty (www.sphygmochron.org) of the Phoenix Project (www.phoenix.tc-ieee.org/). • (2) If abnormal, participants are advised to allow data and analyses transfer to care providers for surveillance, diagnosis, optimization of treatment, if and as need be, and for ascertaining continued efficacy.

Modified from Figure 1 (Phoenix Architecture) in Adams C Privacy requirements for low-cost chronomedical systems. Int Conf on the Frontiers of Biomedical Science: Chronobiology, Chengdu, China, September 24-26, 2006, p. 64-69.

Scheme 2. The Phoenix Group of volunteering electrical and electronic engineers from the Twin Cities chapter of the Institute of Electrical and Electronics Engineers (www.phoenix.tc/ieee.org) is planning on developing an inexpensive, cuffless automatic monitor of blood pressure and on implementing the concept of an educational and automatically analyzing website (www.sphygmochron.org) in exchange for use of the data for monitoring biospheric effects of solar variability.

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◄ PROBLEMS OF TUBERCULOSIS IN AZERBAIJAN

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Approximately one-third of the world's population now carries the TB bacterium. As per the information provided by WHO, approximately 8 million new infectious tuberculosis cases and 3 million lethal outcomes of TB are registered each year. More people die of tuberculosis mycobacterium, than of any other infectious agent. In developing countries, death rate caused by tuberculosis accounts for approx. 25 % of all lethal outcomes that could be prevented. Developing countries account for 95 % of disease and 98 % of lethal outcomes due to this infection.

Main reasons of rising global importance of Tuberculosis problem are:

– Poverty and increased gap between rich and poor population

– Underestimation of the problem (incomplete disease case detection, wrong diagnostics, ineffective treatment)

– Demographic processes (increasing population of the Earth, increasing migration, changes in age structure)

– Impact of HIV-infection pandemic.

In 1993 the World Health Organization declared Tuberculosis a global health emergency requiring immediate intervention, and in 1994 set forth a Strategy for 'Directly Observed Therapy, Short-course' (DOTS). Later on, WHO published a 'Global Plan to Stop Tuberculosis', which covered technical, administrative, social and political aspects.

Global aim of fighting tuberculosis is to decrease disease cases, death rate and infection spread and also prevent emergence of drug resistance. In Eurasia, rate of tuberculosis incidence fluctuates in a very wide range: from 5 cases per 100 thousand population in Sweden, up to 181 cases per 100 thousand population in Kazakhstan (44 cases per 100 thousand population in Azerbaijan).

Level of need for tuberculosis control in European countries

Low	Medium	High
Italy France United Kingdom Austria Belgium Finland Germany Greece Holland Norway Slovenia Sweden Switzerland	Poland Portugal Spain Turkey Albania Bulgaria Republics of former Yugoslavia	Romania Republics of former USSR

As shown in the table above, Azerbaijan is among the countries with high level of need for tuberculosis control.

For the purpose of tuberculosis control, Azerbaijan, in line with other countries, developed a tuberculosis control strategy and in 2000 "Tuberculosis Control" Law came into effect. In August 2002, Ministry of Health of Azerbaijan Republic adopted DOTS – Directly Observed Treatmen Short-course programme. This strategy has been successfully implemented in many countries. The number of countries implementing DOTS strategy increased from 10 in 1990 up to 150 in 2002. Due to the fact that currently this programme is successfully implemented, certain positive results in tuberculosis control have been achieved. In Azerbaijan DOTS is being implemented in three phases:

1. Pilot project phase
2. Expansion phase
3. Implementation phase.

History of Tuberculosis Control Programme based on DOTS strategy

– Civilian sector – 1995 WHO 3 pilot regions – 1996 temporary termination – April 2001, "Law on Tuberculosis Control" – August 2002, Program on combat against tuberculosis commenced within the framework of "Caucasian Initiative" of German Federal Government – 2002, 19 pilot regions – 2003, 36 pilot regions – 2005, whole Republic 1. First line Antituberculosis Medication 2. X-ray Equipment 3. Laboratory and Diagnostic Equipment - 2005, Request to Global Fund for treatment of resistent Tuberculosis (DOTS+) - 2006, Approval of the request by Global Fund	Penitentiary sector – 1995 International Red Cross Committee and Ministry of Justice - pilot 300 people – 1998 moving from pilot level to full-scale level encompassing whole sector – 1998 opening of Special Treatment Institution of Ministry of Justive – 2001 construction of Special Bacteriological Laboratory able to perform comprehensive analysis – 2003 start of Strategy on Active Detection of convicts wih TB – 2004 request submitted to Green Light Committee (GLC) to gain access to resistent tuberculosis treatment (DOTS+) – 2005 decision made by GLC to issue a license for resistent tuberculosis treatment (DOTS+) – 2006 Agreement signed by Ministry of Justice and Global Fund

We carried out an analysis of main indicators of disease rate, mortality and treatment effectiveness during 2001-2006.

Dynamics of initial cases registered in 2001-2006 in civilian sector
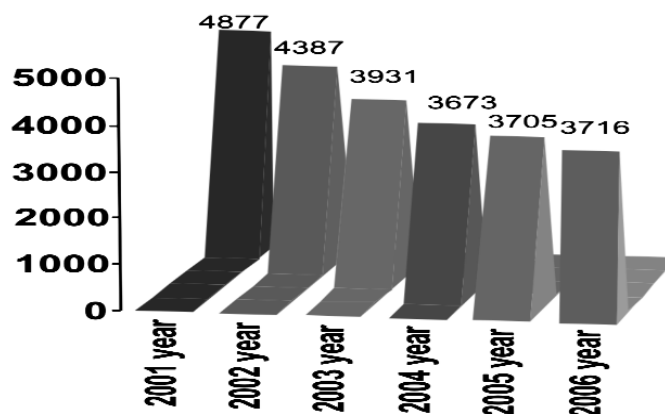
Tuberculous meningitis cases in 2001-2006 in civilian sector
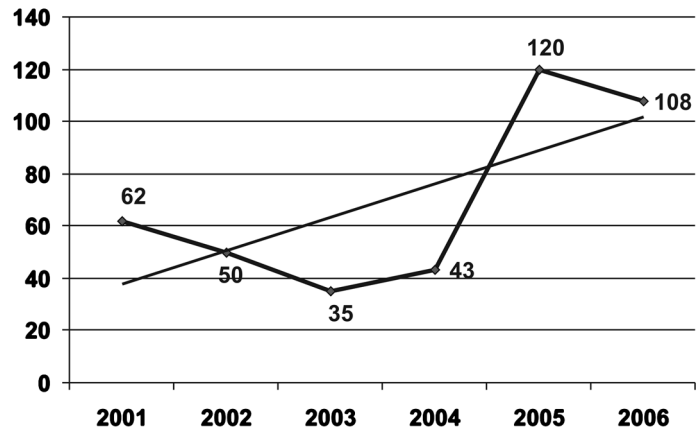
Death rate due to active tuberculosis in 2001-2006 in civilian sector
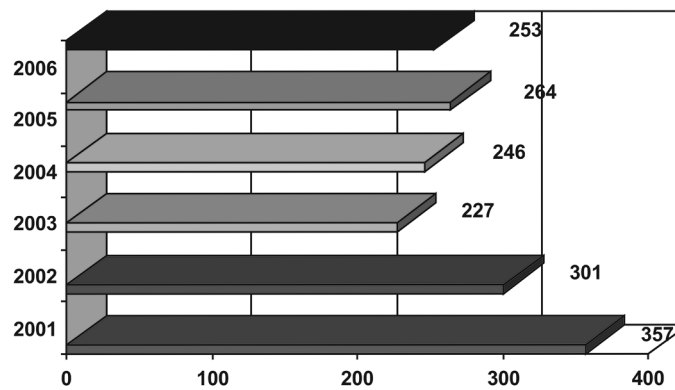
Effectiveness of patient treatment –non-bacilli in 2001-2006 in civilian sector

41
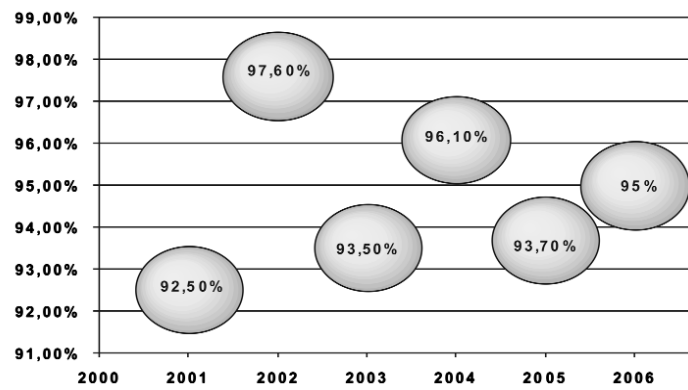
Analytical research showed that statistics tend to stabilize up to 2006. Nevertheless, situation related to tuberculosis epidemic in Azerbaijan remains tense.

Therefore, there is a need for development of new strategy and fundamental reforms. Currently national programme on tuberculosis control is in project and discussions phase.

Main objectives of national tuberculosis control programme are:
· Tuberculosis cases detection
· Treatment of tuberculosis in line with WHO recommendations
· Standardization of record keeping and reporting in line with WHO recommendations.

This programme also includes main directions in reorganization of antituberculosis service of the Republic. Taking the aforesaid into consideration, necessity and timeliness of these fundamental reforms in antituberculosis service system implemented in Azerbaijan need to be re-emphasized. These reforms include:
· Provision of regional laboratories with necessary equipment (69 labs fully provided, 7 more need to be equipped)
· Construction of national reference laboratory (completion planned in 2007)
· Establishment of regional TB prophylactic centres within the framework of DOTS programme (total of 12 centres planned)
· Establishment of regional hospitals for treatment of multiresistent tuberculosis (total of 5 hospitals planned)
· Provision of TB prophylactic centres with X-ray equipment (some centres already provided, planned for completion in 2012)
· Use of uniform reporting system by antituberculosis service (starting January 2008)

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ELABORATION OF A NATURAL MULTICOMPONENT MEDICAL COMPOSITION WITH IMMUNOSTIMULATIVE AND ANTIOXIDANT ACTIVITIES (GLYCYRRHIZIN ACID, KHITOZAN, ZEOLITE, AN AMBER ACID)

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The major direction of modern pharmacology development – is creation of new medical products with influencing to pathological process by activation of internal physiological reactions which the nature has awarded the person. The basic feature of that class of medical products – their high efficiency, stability of therapeutic influence, non-toxity and absence of side effects.

Elaboration of new medical products on the basis of natural raw sources and theirs metabolites is inextricably related with theoretical and experimentally clinical studying mechanisms of influence [1, 2].

The modern pharmacology is multicomponent on the structure, and in case of administration, each doctor first of all is guided by a direction of a pharmacodinamic vector of medicinal substances in order to achieve, at least, summarizing of pharmacological action, to avoid influence potential inductors which can be present in combination, and minimize side-effects of therapy as a whole [3].

Inflammation – is a response of a macro organism to damage, consisting in the certain changes of the struck fabric and directed to liquidation of injuring agent. In the center of inflammation there are complex dynamic processes which cannot proceed independently and are a signal for inclusion in inflammatory reaction of various systems of an organism as a whole, first of all immune system. At present it is known, that activators of infectious – inflammatory diseases possess by ability to influence on immune mechanisms directed on destruction and elimination of etiologic agent [4]. The data collected define immunopathogenesis of diseases and characteristics of immune response in different cases.

Therefore the purpose of the present work was elaboration and creation of the new multicomponent compositions from the known pharmacological means possessing by immunocorrective and antioxidant activities, being used in different diseases in individual kind, such as glycyrrhizin acid, zeolite, khitozan, an amber acid.

The history of creation and the based mechanisms of action of these substances sufficiently are known and checked up in clinical conditions, however their combination we prove position of Pharmaceutical Committee that we have a deal with a new class of medical means [5].

The components included in this composition are native, with natural origin: vegetative (glycyrrhizin acid), mineral (zeolite), an animal (khitozan), an amber acid – the basic natural endogen substratum of an organism cell.

In hypoxic conditions its action is realized in a cycle of tricarbol acids and oxidizing phosphorilization [4].

The amber acid accelerates a revolution of dicarbol parts (suksinat- furamat- malat) and decreases lactate concentration, that is very important with its combination with polysaccharides (glycyrrhizin acid, khitozan) and the zeolite, being powerful stimulators of immune system [3].

The amber acid raises a cycle of dicarbol parts, hence, increases volume of the energy necessary for synthesis Adinozid Trifosfat Acid and GÀÌ Ê that is important the combination of an amber acid and preparations.

A popular and widely being used herb – Licorice (Glycyrrhiza glabra F.) has received a general recognition in medical practice because of a wide spectrum of pharmacological action.

About 5000 years has been used in medicine and pharmacy. A root and rhizomes of licorice contain triterpen saponin: glycoside-glycyrrhizin, being splited on glycyrrhizin acid – $C_{42}H_{62}O_{16}$, flavonoids (likviritin, likviritozid), dioxystigmasteril, ß -sitosterin, cirrizinic bitterness, asparoginc, pectinic substances, starch, gum, exstragen substances, benzoic acid, ascorbinic acid, (up to 30 mq), calcium potassium , magnesium, radio oil.

Renders by lymphotropic, anti-inflammatory, immunotropic, mineralocorticotropic, antimicrobic, against fever, expectorative, broncholytic, enveloping, soothing, spasmolytic , laxative, diuretic, desinsibilization, desintoxication actions, normalizes function of adrenal glands, hormonal balance and a metabolism, apply at diseases of high part of respiratory ways, in stomach ulcer and duodenal ulcer, chronic locks, allergodermatosis, decreases immunologic reactivity of organism.

Zeolites – are natural minerals. Natural micro pore silicate minerals found in mountains of different countries are called zeolites. There are 106 different types of zeolites (Lelas 2000), but by that three categories are distinguished: phase, layered (scaly) and crystalline. The main skeleton of crystalline lattice of zeolite consists, first of all, of tetrahedron. This skeleton discovers cavities, where are located ions of, for example, sodium, potassium, calcium, which easily exchange to each other and surrounding substrate.

This specific crystalline mineral structure of zeolite is perfectly represented in organism, connecting to itself such toxic substances as ammonia and other compositions of nitrogen as well as heavy metals, and extracting them from intestine through

exchange processes. Removed toxic substances are replaced by minerals, which organism strongly needs. Thus, homeostasis of organism, especially mineral metabolism is maintained or restored. Thanks to this, most vulnerable systems of organs, such as brain, nervous, hormonal, immune systems, liver, not only obtain protection from toxins, but also increase their endurance to toxic pathogenic influences.

Analyses show that crystalline structure of zeolite is not destroyed during grinding i.e. crushing in a cross mill and during rubbing in agate friction cup, by that crystal preserves the properties of lattice.

Physiological mechanisms of zeolite influence are reflected in improvement of electrical conductivity, which promotes:

– More intensive ion exchange;

– Selective delay of processes of ion exchange;

– Stronger connection of ions;

– Increase of absolute number of replaced ions, if value of acid-alkali balance (pH/Lelas 2000) drops.

The result of influence of zeolite preparations on physiological functions at per-oral application can be observed in:

– Increase of adsorption surface of walls of intestine and tissue at the place of influence;

– Increase of values of acid-alkaline balance (pH) in cell and beyond cell matrix;

– Selective proliferation of amino acids, peptides and proteins;

– Activation and optimization of potassium and sodium feeding in cells and concerned loose radicals;

– Transportation (supply) of sugar from blood into cell without using insulin;

– Binding of toxic and harmful substances;

– Regulation of homeostasis of mineral metabolism.

Last years in world and domestic practice chitin and khitozan, received from armours of various shellfish (crabs, shrimps, squids, lobsters, spiny lobster) and another chitin contained raw material which find more and more wide application in structure of the medicinal compositions possessing by antimicrobic, adsorbtive, immunostimulated, antineoplastic hypoglycemic actions with antioxidant activity that allows to use it for creation of mono – or polycompositions in therapeutic practice of many diseases is widely applied.

Continuously there is an expansion of scopes of that polysacharide which already now is widely enough used as in medical, food, cosmetology, chemical and other industries. Also are investigated gelling properties of khitozan and its derivatives that can be used for creation of the medical means preserving mucous gastroenteric tract, from toxic substances resulting by accumulation of free radicals and development of gastroenterological pathologies.

Khitozan – is structural analogue of cellulose. It represents it self os natural liney.

In view of the aforesaid we resolved 2 problems:

1. Teoreticaly to prove compatibility above-named medical means of the given composition, for creation of multicomponent immunocorrectors with natural origin;

2. To carry out their laboratory – clinical studying in some diseases.

With the purpose of the solving of first problem by us it has been taken into account, that selection of medical products for correction of infringements of immune system is expedient for carrying out in view of a lot of factors: the age, an accompanying pathology, a stage of pathological process of diseases, character and duration of previous therapy, a condition of reproductive function and so on. Besides of it, one of the most major factors during pathogenetic method selection and means of therapy should be the result of complex diagnostic search of infringements in immune system. In table 1 the analysis of mechanisms of natural resistance and adaptive immunity which counteract various ethiotropic agents is submitted.

On the basis of character and such as revealed immunologic infringements in complex anti-inflammatory therapy it is expedient to include immunotropic preparations promoting stimulation of nonspecific resistance factors and allocated by immunocorrective properties [1, 2].

Table 1.

Protective mechanisms immunoreactivity at stages of formation of anti-infective immunity

Stage of response	Infection with extra cellular localization of etiologic pathogen	Infection with endocellular localization of etiologic pathogen	Viral infection
Invasion of the pathological agent and alteration	Phagocytosis. Activation of complement (by alternative way)	Activation of mononuclear phagocytes	Activation of NK-cells
Phase of induction of immunoreacti-vity (1-3 day)	Formation of the center of local inflammation. Allocation of monokins. Humoral immunogenesis.	Formation of the center of local inflammation. Ò-independent activation of monocites /macrophages. Allocation of monokins. Ò-cellular immunogenesis.	IFN-a and b and Century Activation IFN - of NK-cells. Immunogenesis of cytotoxic cells.
Phase of formatted of generated immunity (3-4 weeks).	Formation of antibodies of IgM, then IgG, IgA classes. Activation of complements (by classical way).	Immune inflammation. Production of IFN-y Th-1 cells. Activation of monocytes/ macrfags. Phagocytosis of activated macrophages.	Cytotoxic T-lymphocytes. Reinforced macrophages.
Phase of formation of immune memories.	The accelerated formation of high- affinity IgG, antibodies in case of reinfection.	Accelerated formation IFN-y. Activation of macrophages in case of reinfection.	The accelerated formation of cytotoxic T-lymphocytes in case of reinfection.

MATERIAL AND INVESTIGATION METHODS:

Investigation material were: Glycyrrhizin Acid, Khitozan, Zeolite, an Amber Acid preparations. Investigation methods: Laboratory and Biochemical

Investigation objects were 120 healthy sportsmen.

In the first stage of investigation participated 42 healthy sportsmen volunteers at the age of 18-22 years. All volunteers arbitrarily have been divided into 2 groups of 10 people each. The participants of the first group received in the dose of 1,56 per day during 10 days, 10 participants of the second group received in the dose of 1,56 per day and 10 person of control group received placebo. During the same period. It was proposed to participants driftly to increase the load of (at a speed of 33 watt/min) veloergometry up to magnitude in which the frequency of heartbeat reach 170 beating (stroke) minute. The received results showed the considerable raising of efficiency in receiving (table 2). So, the participants could fulfill the work, equal to 64,8 kilojoule. In receiving plasebo this index, as it was expected, practically did not change, while after receiving glycyrrhizin acid, khitozan, zeolite, an amber acid the volume of work, fulfilled by the volunteers, receiving placebo.

Table 2.

Effect of Glycyrrhizin Acid, Khitozan, Zeolite, An Amber Acid on exercise aerformance

Index	Unit	Plasebo	Glycyrrhizin acid, Khitozan, Zeolite, An Amber acid
Maximum capacity	watt	180 ± 14,0	366 ± 57,0
Volume of accomplished work	Kilojoule	64,9 ± 2,2	96,1 ± 5,1
Duration of accomplishing	second	668 ± 21,0	943 ± 25,0
PWC 170	watt	222 ± 5,0	315 ± 15,0

$P < 0,05$

Note: PWC 170-load capacity, at which the frequency of heartbeat reaches 170 stroke (beat)/minute

These results allow to come to a conclusion, that preparations ingreased the

fulfillment and duration of a B16 capacity loads and for 10% in average. At the next stages of in investigation the effect to the exercise performance of professional sportsmen of high level training have been evaluated. In the first test 15 masters of sports on cycle racing, who were examined twice a week in a veloergometer in regime of drifty increasing loads (33 watt/min) up to reaching of pulse frequency, which is equal to 170 strokes/min. One hour prior to testing the sportsmen received in the dose of 0,036 or plasebo only once. The testing was carried out in double touch system regime [1].

Table 3.

**Glycyrrhizin acid, khitozan, zeolite,
an amber acid effect on sportsmen exercise performance**

Index	Unit	Plasebo	Glycyrrhizin acid, Khitozan, Zeolite, An amber acid
Maximum capacity	Watt	220 ± 11	366 ± 9
Accomplished work volume	kilo joule	$89,8 \pm 4,1$	$150,7 \pm 4,0$
Duration of accomplishing	Second	562 ± 24	920 ± 33
PWC 170	Watt	241 ± 13	475 ± 11

Note: PWC_{170}-load capacity, in which the frequency of heartbeat reach strokes/min.

The received results, as a whole, confirmed the capacity of glycyrrhizin acid, khitozan, zeolite, an amber acid to in crease the physical efficiency (Table 3). The volume of a accomplished work after receiving glycyrrhizin acid, khitozan, zeolite, an amber acid in creased in average as much as 120%, but integral index of efficiency, intended for database, in creased in a verge of 10%, even on one time receiving of preparation. The efficiency of using of glycyrrhizin acid, khitozan, zeolite, an amber acid by sportsmen-slayers, who have high level of training and expressed motivation to the trainings, have been evaluated in the next test.

Trial and control groups have been formed as e equivalent of control run

results. The efficiency of using glycyrrhizin acid, khitozan, zeolite, an amber acid was determined based on running duration, heartbeat frequency, measured before start, right after and in 5 minutes after the finish, also the temperature, measured un auxiliary cavity.

The comparative analysis of received results showed a rather big frequency of heartbeat of runners, receiving plasebo before start, in 5 minutes of recover after running, pulse normalization degree was a big in a trial group, differences between groups were trustworthy. Duration of running by sportsmen, that received glycyrrhizin acid, khitozan, zeolite, an amber acid before round which was 1 minute lessin average was of special interest. In modern sport 1 minute is not a short time (table 4).

The glycyrrhizin acid, khitozan, zeolite, an amber acid effect the effect the efficiency of sportsmen-swimmers evaluated in the last series of test. The test carried out in a special stand training equipment, allowing quantitatively evaluation of exercise performance carried out by sportsmen during training. It is important to note that the training of sportsmen was carried out in hypobaric conditions at the height of 2230m above sea level. 10 persons of 18-20 years old participated in the test, having sport qualification from master of sports up to the master of sports of international class.

Table 4

Glycyrrhizin acid, khitozan, zeolite, an amber acid effect on efficiency in test of running of 6 km (M±T)

Index	Plasebo	Glycyrrhizin acid, khitozan, zeolite, an amber acid
Running time (min)	24,2 + 0,3	22,2 + 0,2*
Heartbeat frequency in peace (stroke/min)	82 + 14	98 + 16
Heartbeat frequency after running (stroke min)	184 + 23	150 ± 19
Hertbeat frequency in 5 minutes after recovery (stroke/min)	120 + 12	104 + 6*
Body temperature (ºC)	36,8 + 0,4	36,6 + 0,8

Note: The truthworthy differences with plasebo marked by the asterisk.

The initial indexes of sportsmen the physical efficiency was determined during the initial training. Before the next training the sportsmen received the preparation in average dose of 30mg/kg in 40-60 minutes before the loads. Under the effect of glycyrrhizin acid, khitozan, zeolite, an amber acid the volume of accomplished work in average increased up to 30% (from 87,8±4,1 kilojoule to 113,7±4,2 kilojoule), and maximum capacity of developing load for 20% (from 231±13watt to 275±11watt).

In conducting the tests during training in hypobaric condition it has been determined that being in moderate hypoxia during 7-10 day the main results of sportsmen in test rounds (swimming on back and free style on distance of 50m) became worse for 0,23±0,06 second with respect to results in plain. The usage of glycyrrhizin acid, khitozan, zeolite, an amber acid in dose of 0,056 three times a day during 7-10 days in test round reduces the time to 0,31±0,04 second, it secured not only recovery up to norms of reduced result, but also the growth of sport exercise.

Thus, the carried out researches convincingly showed that glycyrrhizin acid, khitozan, zeolite, an amber acid can be related with good reason to the means of exercise performance growth in heavy loads. The main effect in acceleration of recovery process and reducing the "Payment" of organizm work. It is important to note, that glycyrrhizin acid, khitozan, zeolite, an amber acid, in contrast to anabolic preparations, does not contain substances in its composition, related the dope groups. So long as not trained persons, as well as professional sportsmen of different specialty participated in the tests, this can confirm that glycyrrhizin acid, khitozan, zeolite, an amber acid are effective means of increasing of sports trainings results. It is important to note that glycyrrhizin acid, khitozan, zeolite, an amber acid essentially reduce the time postload recovery of exercise performance.

Effect of glycyrrhizin acid, khitozan, zeolite, an amber acid. Functional condition and efficiency of man in condition of hypoxia.

The results of glycyrrhizin acid, khitozan, zeolite, an amber acid tests presented in previous section have been received based on the test on sportsmen, worked in normbarical conditions and just only in one case they acted in a moderate hypoxia. It was shown, that as a result of weekly staying at the height of 2230m above sea level the personal indexes of sportsmen had became worse, however, as a result of receiving glycyrrhizin acid, khitozan, zeolite, an amber acid effect to the functional condition was observed. These results served as basis for a more wide studying of glycyrrhizin acid, khitozan, zeolite, an amber acid effect to the functional condition and efficiency of healthy persons in hypoxia condition.

30 healthy men-sportsmen at the age of 22-25 years old during 2 days were in pressure chamber in condition of vacuum corresponding to the 3000m above sea level in the first stage. All the volunteers have been divided into 3 groups consisting of 10 persons each. In the first group the examinees received of 16 before start

of hypoxia effect, in the second group the examinees received of 16 and then after each 8 hours during all the time of staying in a pressure chamber. The volunteers of control group received plasebo. Before test and immediately after the test completion the complex inspection of volunteers have been carried out staying in hypoxia condition was accompanied by the regular changes, of a number of physiological parameters (Table 5).

Table 5

**The glycyrrhizin acid, khitozan, zeolite, an amber acid effect
to some physiological indexes of organizm after 48 hours staying
at the height of 3000m above sea level**

Index	Unit	Normoxia back-ground	Hypoxia	
			Plasebo	Glycyrrhizin acid, khitozan, zeolite, an amber acid
Running time (min)	Stroke/min	63 ± 3	76 ± 5	74 + 14
Heartbeat frequency	MM.Mercury	72 ± 1	78 ± 1	72 + 11
Diastolic	MM.Mercury	117 ± 2	130 ± 1	116 ± 12
Consumption	Ml	273 ± 12	354 ± 8	280 + 15
Coefficient of using	%k	83 ± 4	71 ± 4	82 ± 16
Maximum consumption	ml/kg-min	47,8 ± 1,0	37,6 ± 0,6	46,3 ± 1,8
PWC170	Watt	172 ± 6	151 ± 2	170 ± 8

Note: PWC170-load capacity, in which the heartbeat frequency reaches 170 strokes/min.

In particular, the heartbeating frequency, systolic pressure had been increased. At the same time the oxygen consumption had been increased and coefficient of its using had been reduced, physiological shifts reflect hightened activa-

tion of sympathoadrenal system and reduction of organism 15 functional reserves level.

During receiving glycyrrhizin acid, khitozan, zeolite, an amber acid the changes of physiological indexes were either absent or statistically insign-nificat.

Thus, in model and field tests of glycyrrhizin acid, khitozan, zeolite, an amber acid it was determined, that the presence of expressed immunocorrective and antihypoxant influence to the sportsmen's exercise performance. This action was displayed in normobaric and high mountain conditions. In this connection gly-cyrrhizin acid, khitozan, zeolite, an amber acid can be successfully used by moun-taineers and also by the workers, who are engaged in Physical works in mountain or other hypobaric and hypoxia conditions. It can be supposed, that glycyrrhizin acid, khitozan, zeolite, an amber acid are also helpful for miners and mountain res-cuers, who often work in hypoxia conditions.

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DETECTION OF CADMIUM IN THE FOODSTUFFS AND ITS TOXIC INFLUENCE OF THEM TO HUMAN ORGANISM

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Cadmium – the most honorable rare metal of the periodic table.

The World Health Organization recognized cadmium the most dangerous from all elements of the periodic table as it is not practically deduced with that from a human organism and is accumulated there with the age.

During a day time from an organism it is deduced only 0,1 % of the received doze. Owing to soil pollution of soils cadmium gets into a vegetative organism.

The basic source of cadmic pollution of soils is application of fertilizers, in particular superphosphate, where cadmium enters as microadditives, (superphosphate contains 720,2 mkg of cadmium per 100 gr, potassium phosphate – 471 mkg, saltpeter – up to 66 mkg).

Cadmium ground pollution of ground by cadmium is kept for a long time and after is metal ceases to come again [3,7]. Cadmium gets into an organism of a person on an ecological food chain: ground – plant – animal – food – person (directly or through vegetative food). Cadmium possesses the feature to be collected in kidneys, liver, pancreas, and tubular bones, spleen; easily gets into an organism of a person through a gastro enteric path, through a mother's placenta to her fetus. Majority of the filters applied to water treating it are inefficient against. Therefore for cadmium is characteristic the lowest harmless concentration both in drinking waters-1 of mkg/l, and in foodstuff (0,02-0,03 mg/kg of dry substance). The disposable doze of 30-40 mg can be fatal for a man. The sources of cadmium in non polluted areas receipt food – 85-90 % serves, (a lot of this metal is kept in such seafoods, as flounder, oysters, crabs), water-5-10 % (especially when the water goes in pipes, made of cadmium containing materials), air – 3 %. The general cadmium food pollution makes 2 mg. About 40 % of this element falls on black bread. The quantity of cadmium getting into man's organism depends not only on its by

cadmium-containing foodstuff, but in a greater degree on the quality of his diet.

We have done much work on of heavy metals' salts detection in the foodstuffs coming to the territory of Azerbaijan.

For last three years have been checked up 3126 tests of various products cadmium salts' contain. From them:

1020 tests – meat, meat products,

518 tests – fish and canned fish,

510 tests – waters, juices, lemonades, fruit-berry drinks,

339 tests – fresh and fresh frozen vegetables (including plantation cultures, berries, a potato and mushrooms),

213 tests – cooked meats,

61 tests to seafoods (crayfishes, shrimps),

63 tests – children's feed (porridges, mixes, liquid sour-milk products)

37 tests – phytogenous and animal's oil,

26 tests – food concentrates,

22 tests – floury and pastry articles

37 tests – bioactive food additives (also farina) and other tests.

For of experiments we took a batch from 5 up to 40 grams of a product. Processing and a consecutive mineralization were carried out a temperature of 500°C in muffle furnace. Further the probe was transferred into solution and was later investigated by a method of atomic absorption analysis on device AAS 300, Perkin Ehmer, USA 2000. Then were carried out calculations and indications were compared to the norms of maximum concentration limit (GOSSANEPIDNADZOR, Moscow – 2002).

How researches showed, in the meat coming from India was revealed 3-4 times the raised cadmium salts' (pic.1). If in the samples investigated by us it varied from 0,15 up to 0,27 mg/kg (at norm of 0,05 mg/kg), and in canned meat, intinned stewed meat, coming from Stavropol region, the cadmium content exceeded maximum concentration limit in 2-3 times (at the norm of cadmium in canned food – 0,1 mg/kg) in the investigated samples from 0,208 mg/kg up to 0,436 mg/kg.

Detection of cadmium content in fish canned food – Astrakhan sprat (maximum concentration limit – 0,2 mg/kg) – varied from 0,276 up to 0,322 mg/kg. In lemonade bevarrage – "Mountain Day" 0,5l produced by the Baku Pepsi – Cola factory (maximum concentration limit = 0,03 mg/kg), the cadmium content has made 0,260 mg/kg. In the table salt sample of Ukrainian production cadmium content has made 0,188 mg/kg that exceeds maximum concentration limit approxi-

Cd
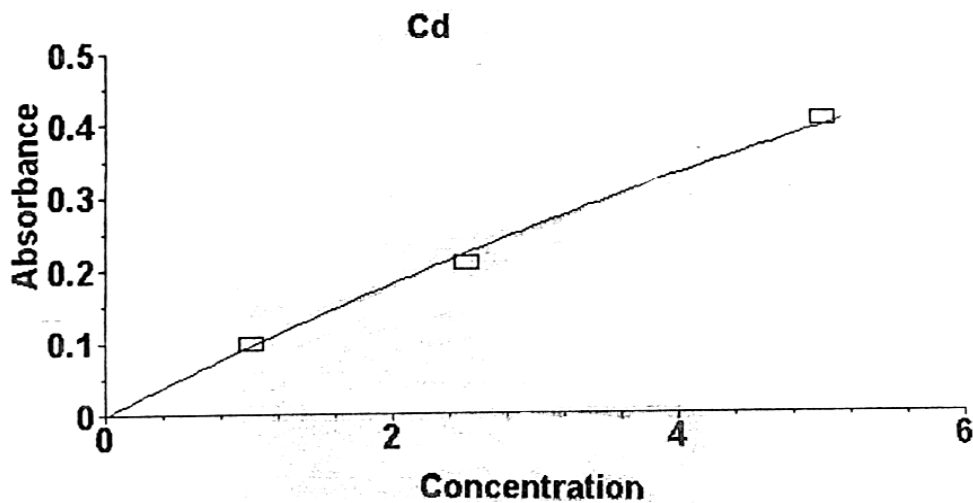
Calibration Type : Zero Intercept: Nonlinear
Slope : 0.10093
Correlation Coefficient: 0.99703

mately in 1,8 times.

Figure 1. Adsorption – concentration diagram of cadmium in the meat

Biologically admissible level of cadmium in children's and adult's hair is 2 mkg/gr of hair. An additional source of cadmium is smoking. One cigarette contains 1-2 mg of cadmium, and cigarette filters do not detain it.

The mechanism of metal toxic action of metal (pic.2) consists in replacement of biometals in metallic biocomplexes that causes the loss of biological activity by the latter. Lead, cobalt and cadmium ions are activated with enzyme haemocinaza, decomposing heme. Loss heme the leads to anemia development. The toxic effect of heavy metals is also connected with biodegradation of xenobiotics cytochrome P-450, synthesis infringement responsible for. Infringement of this system leads to organic toxicants' accumulation in fabrics and bodies. However cytochrome P-450 participates in a metabolism of not only xenobiotics, but also of endogenous biologically active substances: hormones, catecholamines, group D vitamins, and cholesterol. Therefore infringement of their synthesis or activities decrease can cause deep metabolism infringements. In case of lead, mercury, chrome, cadmium and other heavy metals' ions is noted the activation peroxid and free radical oxidations. As a result of it some fibers, nucleinic acids, lipids, and also biomembranes are damaged. The damaging effect is explained by inhibition of the metals'enzymes protecting an organism from H_2O_2 accumulation in it. Hydrogen peroxide in its turn, can give highly active in reactions of oxidation and there hydroxyl free radi-

cal possessing damaging effect. The mechanism of toxic cadmium influence on an organism is connected both with its direct influence on a fabric, albuminous exchange infringement, and with replacement of zinc, to a lesser degree copper, selenium, calcium from an organism.

These elements are antagonists to the cadmium, capable to protect an organism from its toxic influence.

After cadmium salts getting inside an organism of a person there appear nausea, salivation, vomiting, stomach pains, diarrhea, muscular pains, headache. Inhalation of cadmium fumes leads to occurrence of metal taste in an oral cavity, to superficial breath breast, pains. The patient is getting pneumonia. Urine research exposes hematuria, proteinuria.

The anemia and leukopenia, liver function deffects develops at the patient. During dissection after inhalative poisonings may be relevated a stomach, and intestine inflammation and also liver and kidneys. Damages in case of a chronic inhalative poisoning appear cough, short breath, weight loss, irritability, yellow colouring of a teeth, liver, kidneys and pancreas. [2,4]
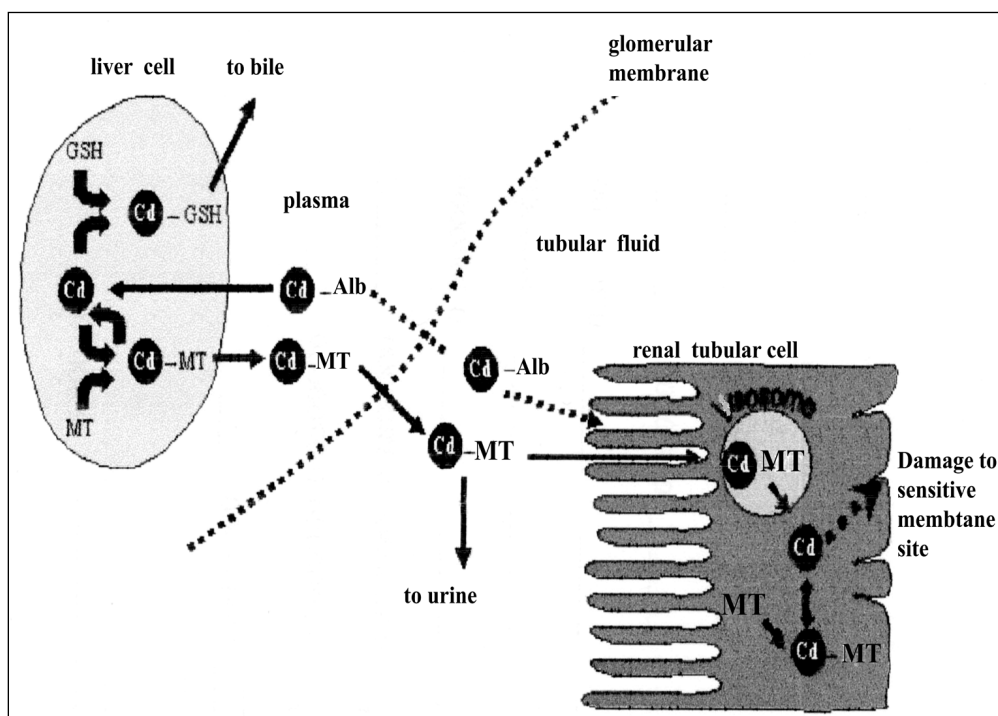
Figure 2. Mechanism of cadmium action in bioorganism
MT – metallothionein, *GSH* – glutathione, *ALB* – albumin

For a long time already it is known, that cadmium presence in the environment can cause in the person oncological diseases. Now a day American researchers in laboratory experiments on yeast cells have happened to find out carcinogenic cadmium effect.

Superfluous cadmium accumulation in an organism usually leads to suppression of immune system activity, functions' infringement of kidneys (nephropathy, glomerulonephritis), prostate gland, causes of hemorrhagic necrosis of testicles, anemia, skin diseases, increase of arterial pressure, promotes appetite decrease, negatively affects brain activity plays a significant role in occurrence and development of insults, negatively influences eye retina sticks reaction, possesses cancerogenic properties, raising all forms of display of malignant new growths.

The example of s "itai – itai" illness rather demonstrative. For the last time this disease was noted in Japan in 1940th and was characterized by strong pains, skeleton deformation, fractures, and kidneys damage. After 15-30 years more than 150 people died from a chronic cadmium poisoning. In the basis of this poisoning the irrigation lies of rice fields and soya plantations with the water from the Dzintsu river polluted by drains of zinc mine. Cadmium concentration in rice was much bigger, than usuall, and it was accumulated in the organism of local inhabitants.

Summary:

Fixing consequences, we come to the conclusion, that cadmium ability to a long – term accumulation in alive organisms, biochemical affinity with zinc, mercury and other elements put this element according its character of influence a person out of competition among metals – ecotoxicological substances.

For preventive measures, in conditions of environmental cadmium contamination special attention demands correctly organized feeding. Dietotherapy provides increase of antitoxic functions of an organism its resistance, and activation of xenobiotics allocation [1,6]. Besides at microelementhosis are used antioxidants (for example, a preparation "AOK – selenium"). Treatment in case of an inhalation poisoning consists in the following: it is necessary to stop poison influence and to treat hypostasis of lungs or pneumonia according the common standard rules. Ethiopathogenetic treatment in cases of t microelementhosis toxicopathia development should include medicines promoting deducing of heavy metals from fabric depots (chelators, entherosorbent agents). Those are "Polisorbovit", "Phytosorbovit". And also preparations in the form of a complex with bioligands (natural carriers of microcells – peat, yeast, seaweed) – a preparation "Clorefyl" can be applied.

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INFLUENCE OF GEOMAGNETIC STORMS ON THE HUMAN BRAIN FUNCTION

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Introduction

The geosphere is very sensitive to solar activity, to changes in this activity and their manifestations on the Earth. Conditions on the Sun and in the solar wind, magnetosphere, ionosphere, and thermosphere (i.e., so called Space Weather) can influence not only the performance and reliability of space-borne and ground-based technological systems, but can endanger human life and health (1,2). Therefore, it is very important to get more and better knowledge about solar and geomagnetic storms and their potential impacts, in order to decrease or minimize these disturbance factors (3).

The results of the detailed studies, which are published , show that during the periods of strong geomagnetic disturbances, the number of hospitalized patients with nervous diseases notably increases, the cases of myocardial infarcts and cerebral insults, different paroxysmal conditions, nervous disturbance disorders and suicidal attempts become more frequent, the psycho-neurological diseases become aggravated and so on. At the same time, some reports show comparatively positive influences of heliogeophysical conditions on the human health state. For the persons, suffering from epilepsy, a reduction of frequency of epileptic attacks and improvement of general health state were detected during increases the level of geomagnetic field disturbances. Researches, conducted simultaneously at different geographical regions of the globe, revealed that during geomagnetic storms some monotype changes in the health state of mentally ill patients take place. It is curious that with an increase of disturbance of geomagnetic field, the number of epileptic attacks decreases.

During high solar activity periods, the predominance of maniacal phases in

patients suffering from manic-depressive psychosis is of frequent and short-duration nature. When there is stabilization in the geomagnetic conditions, the maniacal phase is replaced by the depressive stage. Disturbances of the geomagnetic field, as any stress factor, influences first the central nervous system being the sensitive screen, and perceiving even weak disturbance fluctuations (oscillations) in the environment (4,5). Investigation of bioelectric activity of the human brain, which reflects a continuum of functional conditions, according to the paper (6), is an adequate method for research of a condition of cerebral cortex of the big hemispheres and cortico-subcortical interrelations.

Not only the central, but also vegetative nervous system of human being is very sensitive (responsive) to the geomagnetic disturbances (7). It is established that during weak and moderate magnetic storms, a tone strengthens in the field of sympathetic part (section) of a vegetative nervous system. Only in some cases and, most often for the men, the strengthening (amplification) of tone of the parasympathetic section of a vegetative nervous system is observed (8).

Based on EEG researches, it is established that the nervous system of patients responds on geomagnetic disturbances by a diphasic reaction (9). During days with geomagnetic storms, the generalized reduction of indexes of spatial synchronization of EEG is marked.

On the contrary, a general increase is registered on the next day in contrasted long-leaved quiet period.

In this original research paper we have studied possible influence of solar and geomagnetic storms of various strength and very intense (severe) geomagnetic storms caused by the violent Sun-Earth connection events (such as which had a place in October-November 2003) on the human brain activity and its functional state. Special attention was paid to the stormy days of July 2000, April 2001, October-November 2003, November 2004, January 2005 etc. Particularly, one of the major and severe geomagnetic super-storms current Solar Cycle 23 in October-November 2003 gave a unique chance to Azerbaijani researches to study in details an impact of extreme Space Weather events on the human brain functional state.

We have studied the influence of geomagnetic storms on the human brain functional state of healthy adult women patients (permanent group) in states of relaxation, during photo-stimulation and hyper-ventilation. Results of EEG investigation were used for reflecting functional state of the human brain. A parallel registration of the electrocardiogram (ECG) was conducted.

Comparison of data for October-November 2003 with other data obtained during a long-time period experiments for relatively geomagnetically quiet and moderately disturbed days as well as interpretation of the obtained results were carried out.

Methods

Data record of bioelectric activity of the human brain was made with the help of the computerized electroencephalograph, which is the multi-channel (16 channels) digital recorder intended for polygraph registration of the physiological characteristics. The digital data was recorded on the hard disk, which was subsequently subjected to reviewing and analyzing qualitatively. 27 healthy female persons (permanent group), aged between 20 and 40 years old, issued from the same geographical area, were chosen for a long-term investigation during geomagnetically quiet (favorable) days, at days with weekly-disturb and strongly disturb (unfavorable) geomagnetic conditions. All female patients were examined in the inter-menstrual period.

Registration of spontaneous EEG by a mono-polar way from 16 standard leads arranged pursuant to the international system of "10-20" and parrarel registration of the electrocardiogram (ECG) was conducted. The experiments were carried out in the standard system from forehead (frontal), central, parietal, occipital and temporal areas of both hemispheres of the human brain.

The native records of EEG, which were obtained at different functional conditions, as well as the relevant data and registered curves were stored on disks. Later on after removal of artifact segments, they were subjected to the analysis using the special software. Spectral and amplitude mapping, correlation and periodical-metric analyses were carried out. Frequency and amplitude cartograms, obtained for different functional conditions, reflect features of the human brain functioning at comparatively quiet and at days with strong geomagnetic storm.

Experiments were conducted taking the account solar and geomagnetic storms during above mentioned days. As the most widely used parameters of the geomagnetic activity for biomedical problems, the Ap-index and Dst-index, we used in our researches a longside other Space Weather parameters.

Results and Discussions

Results of our investigation have revealed that during severe geomagnetic storms the large majority of patients of under test expressed indisposition, weakness and/or presents of indistinct localized headaches. In most cases, bioelectric activity of the human brain was characterized by reduction of frequencies of a dominating rhythm, amplification (strengthening) of expressiveness of slow wave component (mainly, a thetarhythm) and increase in amplitude of activity. We have observed the forms of waves with pointed outlines and strengthening of process of synchronization of activity. Flashes of pointed and sharp alpha- and theta- waves having right cerebral hemisphere's accent (stress), were registered during experiments. Smoothing of inter-zonal distinctions was observed as well. For a part of examinees diffuse synchronization was traced on frequency ranges of alpha-1 and

alpha-2 rhythms. Reactivity of dominating activity was weakened, and reactions of adopting rhythm were observed lower frequencies of the alpha-ranges. During hyperventilation process observable flashes of both pointed and sharp alpha- and theta- rhythms were amplified, and their amplitudes were increased as well. Figure of correlation interrelations, inherent to various functional conditions, was broken. Inter-hemispheric asymmetry was revealed. The leading role in interrelations had temporal area of the right cerebral hemisphere. Activation of rostral-temporal and caudal-temporal connections (links) of the right hemisphere was marked.

The obtained results prove the significant changes in activity of the human brain during the days with severe geomagnetic storms, reflecting infringement of functions of both central integrative mechanisms and local processes of brain regulation.

It's well known that the most sensitive sections of the human brain, being influenced by negative factors of an environment, are hypothalamus and cerebral cortex of the big hemispheres of the human brain (10). The increase of representativity of theta- and alpha- rhythms, which carry flash-like character, testifies on dysfunction of mesodiencephalitic sections within the limits of which hypothalamic nucleus are located. Considering hypothalamus as leading part of nonspecific systems of the human brain (11) and as responsible for neuroendocrenal and vegetative regulation, it should noted that strong geomagnetic disturbances infringe normal activity of the structure, causing imbalance in ergo- and tropho- tropic interrelations.

The dysfunction, registered on EEG and reflecting ascending sendings, undoubtedly affects descending directions as well, causing complex vegetative complaints observed in the majority of examinees. At the same time it must be noted that, pointed and sharp flashes of waves of theta- and alpha- range which are observe on some tested persons in the days with severe geomagnetic storms, testify on the paroxysmal character of the infringements, specifying on reduction in a threshold of convulsive (spasmodic) readiness mesodiencephalitic formations we followed corresponding clinical-neuropsychological consequences.

Observed right cerebral hemisphere accent (stress) of changes testifies the greater "interest" of right hemisphere. According to the paper, activation of the right hemisphere is accompanied by negative tinge of emotional reactions. Outgoing from this fact, it is possible assume that during very strong disturbances of geomagnetic conditions the negative emotional background of the person is amplified. This assumption is also proven by results of the correlation analyses specified strengthening cortical connection in the right cortical hemisphere and their short circuit temporal sections, while, in geomagnetically quiet days, a profile of correlation interrelations has reflected weak internal- and inter- hemispheric connections.

Thus, results of our researches prove the negative influence of the very strong geomagnetic storms on the functional state of the human brain. Normal function-

ing of integrative non specific systems located within the limits of limbric-reticular complex and responsible for creation of the corresponding level of wakefulness, which directed on realization of optimal current activity of an organism is broken. In balance of activating and deactivating mechanisms arises including also dysfunctions of ergo- and tropho-tropic over-segmentary centers.

The threshold of convulsive (spasmodic) readiness of the human brain is reduced which is especially dangerous for the persons of high risk and, as a result, this fact should be taken into account for preventive measures and therapy of paroxysmal conditions.

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◄ FUNCTIONAL STATE OF THE KIDNEYS AND LOWER URINARY TRACTS IN CHILDREN SUFFERING FROM BLADDER NEUROGENIC DISFUNCTION

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The problem of the disorder of the uro-dynamic takes on of the central place in child urology. It regards with the big dispersion and variety of the reasons which cause evacuator insolvency of the urinary tract, as well as the occurrence of the direct proportionality, the dependence between the degree of the disorder of the uro-dynamic, activity of pyelonephritis and the terms of the arising of the functionality of the renal insufficiency (Lopatkin N.A., Pugachev A.G., 1979). The disorder of the uro-dynamics frequently arises at the lower level of the urinary tract and bears the functional character (neurogenic dysfunctions of the urinary bladder).

Under the neurogenic dysfunction of the urinary bladder (NDUB) we shall understand the disorder in various forms, its reservoir and evacuator functions which is developing at the result of the involvement of the nervous system at its different levels- from the cerebral cortex to the intramural apparatus (Djavadzade M.D., Derjavin V.M., 1989).

It arises clinically, at the first time with the dysfunction of the act of the urination in type of pollakiuria, the imperative tenesmus, the imperative incontinence, enuresis, NDUB accompanying with serious dysfunctions of the uro-dynamics on the functional obstructive type. According to the works of the authors this dysfunctions among the children with the disorders of the act of the urination and recurrent infection of the urinary tract fluctuates between 60 to 85% (Djavadzade M.D., Huseynov E.Y., 2000).

The diagnosis and treatment of the bladder neurogenic dysfunction (BND) is on of the most actual and challenging problems in urology. The introduction of the urodynamic methods of the study revealed a significant role of the bladder neuro-

genic dysfunction in pathogenesis of the vesicoureteral reflux (VUR). The patients with VUR develop disorders in renal artery blood flow without parenchymal defect and in isolated cases even noticeable damage of the renal parenchyma. With the development and introduction of the ultrasonic diagnosis techniques into medicine using Doppler effect, there appeared the ability of the noninvasive research of the state of the renal hemodynamics for various lesions in children including VUR.

335 children aged 3-14 years entered our study. Group I patients comprised 170 children with NBD, group II consisted of 165 children suffering from NBD and VUR.

All of the patients underwent complex examination, which included laboratory, ultrasonic, urodynamic, X-rays, radioisotopic methods of the examination.

Urodynamic methods of the examination showed the prevailing hyper-reflex nonadaptability forms of the bladder neurogenic dysfunction both in children of group I and group II suffering from BND and secondary VUR (42,9% and 51,5 % respectively). Renal hemodynamic values have been deteriorated with the increased VUR rate. 20-27% increased resistive index has been measured while pulse index increased by 18-23%. The renal static scintigraphy showed the presence of the scarred sclerotic changes both in patients suffering from VUD grades III-IV (in 100% of all cases) and in children with VUR grades I-II (50% and 75% respectively).

The renal dynamic scintigraphy revealed the reduced glomerular filtration velocities (GFV) as well as the increased accumulation time values of and T ½ drainage values of radiopharmaceutical from the kidney accordingly to the increased vesicoureteral reflux rate.

It should be noted that, the above stated pathology was approved with the results of the histological investigations.

The ureteronephroectomia was implemented to five patients of group II with BND and one-sided VUR of the 4th degree, reflux-nephropathic with shrinkage connection with the declining of the function of the kidneys. The operative removed material passed through the pathomorphlogical examination. The histological investigations (the method of the painting Van Gizon) defined the alterations in glomerulitis, dystrophy of the epithelia of canals, including the wide sclerosis; the thinning of the cortex of the kidney with chronic inflammation. In some cases the focal sclerosis of the parenchyma was stated, lymphgystiocytar infiltration of the stroma, periglomerulic and total sclerosis of the glomerulus, perivascular sclerosis of the multiple of the vessels and glomerule, nidus of atrophy.

The big volume alterations detected in brain layer around pelvis. At the background of the general inflammational infiltration in the apparent degree of the obstruction the small abscess was detected.

The treatment using oxybutin chydrochloride showed a high effectiveness as well.

The comparative analysis of the clinical results and data of retrograde cystometry in children suffering from BND before and after treatment showed the best results obtained in children with hyper-reflex form: on average increase of 55,3%, increased sensitivity threshold 51,5%, detrusor tension has been reduced by 40,3%.

RESUME

Thus, on the basis of the morphological, radioisotope, X-rays, urodynamic researches during the complex examination of 165 children with NDUB and BND was developed the pathogenetic methods of the therapy of BND in children with the various forms of NDUB.

Beside it, the main method of the treatment of NDUB is pathogenesis of its formation and the degree of the loss of the function of the kidneys.

The submitted methodology allow partial or complete reduction of the symptoms of the disease in 89% of the patients.

PROSPECT OF USE OF LICORICE PREPARATION IN PRACTICE OF EXTREME SITUATIONS

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Extreme situation, this infringement of normal conditions of a life and activity of people on object or the certain territory (water area), caused by failure, accident, spontaneous or ecological disaster. In view of the aforesaid the organism of military stuff and rescues is exposed to big stress both physical and mental. Therefore during salvage operations the help in management of physiological and biochemical reactions is necessary for an organism of the rescuer.

The nature of Azerbaijan differs the big variety and reflects not only influence of a complex modern is natural – historical conditions, but also the gone complex and long historical way of formation on a background of change of geological epoch.

The Azerbaijan Republic is located in east part of Transcaucasia, adjoining to Caspian Sea, and occupies the area about 87 thousand km 2, has the richest vegetative flora.

In structure of all natural vegetative communities composing a vegetative cover of republic, enters over 4200 kinds of the plants concerning to 930 sorts and 125 families. Alongside with the kinds of plants having a wide circulation across Caucasus and other countries, in flora of Azerbaijan there is a significant amount of kinds (more than 270, about 7%) peculiar only to Azerbaijan, or even its rather small areas.

Prevailing value is the role in flora of republic is played with long-term grasses (96,8%), on the second place are contemporary grasses (23,4%), other biological types make about 20%. Natural wood and shrubby the flora of Azerbaijan differs significant riches. Is submitted by 435 kinds of trees and bushes that makes 11% of all flora of the country.

The dentoflora Azerbaijan totals over 70 regional endemic kinds that makes 16% from the general number of kinds of trees and bushes of republic.

In structure of wild flora of Azerbaijan there is a set of the useful fruit and fodder plants being also valuable medicinal raw material. Public health care is the primary goal of medicine and pharmacy.

With the purpose of rendering effective medical aid, undoubtedly, the important role plays creation of new treatment-and-prophylactic medical products.

Now all over the world it is used over 200000 medical products: substances, preparations which assortment is daily updated, and $1/3$ from them it is developed from herbs. Advantage of herbs is their conventional salutary force and the richest experience of their application in national medicine of all countries of a planet.

Therefore rational use of local natural vegetative medicinal resources with creations domestic phytopharmaceutical manufactures of curative treatment-and-prophylactic means is represented interesting and useful.

Licorice is natural national riches of Azerbaijan it is distributed more than in 28 areas of republic and on the data student's in ours to the country there are sufficient stocks Licorice a root for the organization of uninterrupted industrial preparation of medicinal raw material.

Licorice – latin name Liquiriciae; Greek – Glycyrrhiza; Azerbaijan – Biyan; English – Licorice; Tibetan – Shing-mngar; German – Sussholr; Ukrainian – Lukrisia, Lokrica; Bulgarian – Likvirisia; Georgian – Dzir-tcibili, Tcbal-dzura; Indian – Atti madxu, Chinese – "Cansao", Korean – Glycyrrhizi, Sanskrit – "Maduca" – the most perspective herb known since ancient times. It about 5000 years is used in medicine and has not lost the popularity till today. In the world market it is appreciated level with a root of a life a ginseng, and on some pharmacological actions it surpasses. It is classical means of East medicine. Still ancient doctors Hypocrat, Feofrast, Diocorid described this surprising plants as panacea from various diseases. Licorice occupies in «a gold number» plants of the Ayurveda one of the first places as affects all systems of an organism. The Licorice root was widely applied shumers, Hindus, is the basic means of the Chinese, Tibetan, Korean medicine. This sweet root was chewed instead of food by the European immigrants who have arrived to America. It hal helped them to avoid many illnesses and has given force to adapt on new continent. «The Canon of a medical science» which was told by Avicenna and Licorice root has been presented in many gastric, laxative, chest, expectorate gathering.

The Licorice root was open long before our era as the reasonable person should notice rather characteristic sweet taste of this useful plant. Therefore this property was reflected and on the name it is plants, that in translation of various peoples means «a sweet root».

Medical syrups on a basis glycyrrhizae

Non-polluting treatment-and-prophylactic biologically active additives from local natural vegetative raw material which technology of preparation is based on scientific development of domestic scientists with application of the high quality "know-how" of medical syrups.

Medical syrups contain a complex active components, and are applied to

preventive maintenance, auxiliary therapy and support of an organism within the framework of physiological functional activity of its bodies and systems.

Syrups are made on a basis and contain extracts of the known herbs being sources and vitamins, minerals, amino acids, therefore are completely acquired by an organism, render soft influence, possess high efficiency and comprehensibility, have pleasant taste and a smell, are well transferred, is long keep the activity, are very useful to children, adults and older persons.

Bechica antitussis:

Sirupi antitussiva "TUS" of Licorice, Rozae, Thimi, Tussilagi, Jnulae

The syrup of Licorice, altheae, echinacea will consist of a dense extract Licorice, a dense extract of altheae, dense extract echinacea syrup of sugar, beer honey, a citric acid.

Is recommended as antitussiva, immunostimulative, anti-inflammatory, expectorant, antifebrile, laxative, diuretic and tonic.

Indications to application:

Profylaxis and treatments of respiratory tract diseases: tussis humida, tussis sicea bronchitis, pneumonias, dry cough, immunostimulative, anti-inflammatory;

Chronic diseases of lungs, catarrhal diseases of respiratory ways: nasopharynxes;

Acute and chronic diseases of urogenital tract;

Allergic diseases.

Direction of use: For 1-2 spoons early in the morning on an empty stomach then to accept mineral water.

Sirupi Glycyrrhizae, Hiperici, Rozae, Exinaceae

The unique combination of Licorice syrup, a dogrose, Echinacea create effective anti-inflammatory immunostimulative, tonic, antifebril, and expectorating, diuretic and laxative effects.

Therefore, the syrup is recommended with preventive purpose at firs attributes of cold and during epidemic of flu. The big efficiency of medical means is noted in a case of inflammatory diseases: rheumatism, arthritis, a prostatitis, gynecologic diseases and so on.

Curative properties of Licorice, polyvitaminic opportunities of a dogrose and powerful immunostimulative properties of echinacea promote increases of protective forces of an organism, mobilization of natural forces struggle against infectious and virus diseases. The preparation suppresses the growth of staphylococcus, streptococcus, an intestinal stick, viruses of flu and herpes. Possesses by hypoxic properties, tones up the central nervous system, raises specific resistency of an organism.

In structure of a syrup the dense extract of Licorice root, a concentrate and a powder of a dogrose, a dense extract of echinacea, an ascorbic acid, a citric acid, a syrup of sugar are included.

Indications to application:
Treatment and profylaxice of hypovitaminoses;
Treatment of anemias especially children and pregnant women;
Diseases of upper respiratory ways;
Diseases of digestive tract (a gastritis, entericolitis);
Chronic inflammatory diseases;
Postoperative complications;
Allergic diseases;
Acute and chronic diseases of urogenital tract;
Profylaxis and treatment of catarrhal diseases: such as flu;
Tumoral diseases;
Rheumatism, polyarthritises.

Direction of use: For adults and children more than 12 years 1-2 spoons 2-3 times per day during meal.

In this connection quite explained heightened interest to use of the means normalizing and accelerating regenerative processes, but not concerning to chemical. In this plan usage of adaptogens a vegetative and animal origin is perspective.

At present huge experience adaptogens usage is saved up under such conditions of extreme factors of various characters. One of first such preparations has been received from a Licorice – Glycyrrhiza. A little bit later high efficiency Licorice (Velieva M.N., etal. 1993-2008).

However the human organism and animals has property of ability to get used to many chemical substances and to not react to them as on stimulators. Thus, than the greater set of various substances in the arsenal will have the rescuer and change them more often, the effect will be higher and adaptation to physical loadings is better. Therefore searching of new adaptogens is actual. The arsenal of adaptogens could be filled up by Licorice, huge quantity growing in Republic of Azerbaijan. It takes the second place after a ginseng by the curative properties and widely used at treatment of such diseases, as quinsy, bronchitis, gastritis, stomach, ulcer, etc. At the same time the works connected to studying of Licorice extract as adaptogen is not enough, whereas the analysis of these pharmacotherapy properties of Licorice allows to bring it to "elite" group of adaptogens (Veliyeva M.N., 1998).

By our researches is proved, the extract of Licorice stimulates adaptation of an organism to hypoxic and possesses by antistress properties.

In view of results of preliminary researches quite proved the assumption of possible stimulating effect of Licorice represented at adaptation of an organism to muscular loadings.

A series of investigations which have been carried out on rats, has allowed noting, the extract of Licorice increases the general physical serviceability of animals both at single, and at course application. Most likely, stimulating properties of

an extract are related with its ability to strengthen haemopoietic function of an organism. Substantial increase of concentration erytocytes and hemoglobin in blood has been marked at experimental animals both at adaptation to hypoxic condition, and during a training micro cycle.

Table 1.

Serviceability in the group accepting an extract of Licorice

Group	loading, ml		Hemoglobin	
	In the beginning of a training micro cycle	In 20 days of trainings	In the beginning of a training micro cycle	In 20 days of trainings
Control (n-10)	30,88±1,6	25,7±1,4 P1 > 0,1	100,2±1,75	100,4±1,7 P1 > 0,1
Experimental (n - 10)	30,93±1,7 P2 > 0,1	40,02 ± 77 P1 < 0,02 P2 < 0,05	122,3±0,80 P2 < 0,05	122,3±0,70 P1 <0,01 P2 > 0,1

The note. **P1** – reliability of distinctions inside group, **P2** – reliability distinction among groups.

Essential property of Licorice extract is ability to strengthen the processes of glycolysis in an organism. Thus application of Licorice extract within 50-60 days was not accompanied by decrease of functionalities of own adaptive link of an organism of animals.

Results of experimental researches allow to suppose that the extract of Licorice can fill up an arsenal of adaptogens, used in practice.

Methods of research. 60 military persons of the Ministry of Extreme Situations of the Republic of Azerbaijan have taken part in experiment. Their voluntary consent to participation in inspections has preliminary been received. During research defined the exponentiation influence of Licorice extract on development of physical qualities (the general endurance, force), and also on a functional condition of nervous system and stability of reproduction of impellent skills. Preliminary definition of investigated parameters has not revealed authentic distinctions in a level of physical readiness of persons of control and experimental groups.

A degree of development of the general endurance supposed by results of definition of loading and concentration of hemoglobin (Definition of hemoglobin was noted in conditions of laboratory of medical service).

The parameter of force results of intensity of work of muscles is essential. At investigated also determined volume of a shoulder, a hip and a circle of a thorax.

The functional condition of nervous system was noted with the help of a special computer "the peace of 0, 5 M". This device of serial release is frequently used for the control of a condition of nervous system of air dispatchers, dispatchers of a railway transportation, programmers, etc. In the researches we used techniques «Moving object «and "Light irritant". Accuracy of reproduction of movements and muscular efforts registrated by a technique offered by V.V.Sermeyev (1973). Stability of reproduction of impellent skills was noted at performance of exercises with stereotyped not cyclic structure of movement (broad jumps and height).

Inspections of investigated carried out up to experiment that and in 20 days after its finishing. Military persons from experimental group accepted 2 times per day a water solution of Licorice extract in dosage of (0,05 gr/per 1 kg of weight of a body).

Results of research. Definition of loading in control and experimental groups has allowed to reveal authentic increase in the general serviceability in group of the persons accepted an extract of Licorice (tab. 2).

In same group the certainly increasing concentration of hemoglobin that confirms stimulating effect of an extract on haemopoiesis function of an organism has been revealed also. Most likely certain, but the low gain of hemoglobin is connected to short duration of reception of an extract. In researches on animals has been noted, that 60-day's application of an extract of Licorice during muscular training was accompanied by increasing of concentration of erythrocytes more than on 80%. Animals are taking place in similar conditions, but not using an extract, concentration erythrocytes has increased by 40%.

But reception of an extract of Licorice root influences not only development of such physical quality, as general endurance. Positive action renders an extract and on muscular force.

So, in our researches the gain of force during a 3-week training cycle has been marked only in group of the persons using an extract. At the persons using placebo, the gain of results in athletic multiathlon is not registered (tab. 2).

It is necessary to emphasize, that at relative stability of weight of a body in experimental group the increase in volume of a biceps and a circle of a thorax is revealed.

Probably, the extract possesses by fat mobilizing effect. Energy released at it goes on realization of anabolic processes in protein exchange.

It is possible also, that the positive effect from application of an extract of Licorice is related with presence of glycyrrhizin acid. The given chemical element is capable to optimize power maintenance of process of endocellular formation of amino acids and their transport from the outside, that creates favorable conditions for power and plastic processes in a phase of super compensation.

Table 2.

The comparative characteristic of the anthopometrical data and muscular force of the streets which were using and not using an extract of Licorice during 3-week salvage operations

Investi-gated para-meter	Outco-ming data	Control group			Out-coming data	Experimental group					
		Terms of supervision				Terms of supervision					
		7 days	14 days	21 day		7 days	Đ1	14 days	Đ2	21 day	ĐÇ
Weight, kg	76,5	76,6 ±2,8	76,5 ±2,8	76,5 ±2,8	77 ±2,1	76,6 ±2,9	◁0,1	76,96 ±2,91	◁0,1	76,9 ±2,92	◁0,1
Growth, sm	181,0	181,3 ±2,03	181,0 ±2,03	181,3 ±2,03	178,6 ±2,4	178,3 ±2,01	◁0,1	179,0 ±2,02	◁0,1	179,3 ±2,03	◁0,1
Volume of a thorax, sm	100,3	100,5 ±1,05	100,8 ±1,06	100,2 ±1,03	100,9 ±2,1	100,8 ±1,09	◁0,1	101,2 ±1,1	◁0,1	102,3 ±1,2	◁0,1
Arterial pressure	113/62	115±1,77 63±1,2	113±1,7 60±1,3	113±1,78 60±1,4	113±1,7 60±1,6	112±1,8 62±1,5	◁0,1 ◁0,1	113±1,9 62±1,5	◁0,1 ◁0,1	115±1,95 60±1,4	◁0,1 ◁0,1
Attach-ment draft	170	170,1 ±7,6	170 ±7,6	169 ±7,5	170 ±6,5	171,8 ±7,81	◁0,1	185 ±7,9	◁0,1	187 ±8,0	◁0,1
Grasp forearm	36/37	36,2±1,9 37±1,91	36,3±1,9 38±1,91	36,2±1,85 35 ±1,75	36,9±2,4 42,1 ±2,3	36,4±2,57 42±1,08	◁0,1 ◁0,002	36,9±2,6 43±1,09	◁0,1 ◁0,1	37±2,65 44±1,1	◁0,1 ◁0,001
Volume of a hip	56,2	56,5 ±2,8	57,5 ±2,9	57,2 ±2,9	56,9 ±3,4	56,8 ±2,8	◁0,1	57 ±2,85	◁0,1	58 ±2,9	◁0,1
Press of a bar	100,5	100,8 ±9,61	100,8 ±9,6	100,9 ±9,62	102 ±14,2	108,1 ±15,3	◁0,1	113,3 ±14,0	◁0,1	115 ±15,0	◁0,1
Curtsy	125,0	129 ±13,2	136,6 ±14	130,2 ±13,9	127 ±16,1	140 ±15,9	◁0,1	143 ±16,1	◁0,1	143 ±16,1	◁0,1

*The note. **P1** – reliability of distinctions in comparison with control group within 7 days; **P2** – reliability of distinctions within 14 days; **P3** – reliability of distinctions within 21 days.

The results confirming influence of an extract on intensity of course of nervous processes and formation of complex impellent reactions are most interesting and valuable.

Repeated inspection of rescuers with use of a computer «the peace 0,5 " in 20 days of experiment has allowed to establish reduction of time of impellent reaction in group of the persons using an extract (tab. 3, 4), and also reduction of quantity of mistakes and authentic improvement of results in the test " Moving object ". The obtained results will be coordinated to (Velieva M.N., 1998). marking reduction of time of response data, an aggravation of perception due to increase of functional activity of analyzers and improvement of a differentiation of nervous processes, integrative functions of a brain, and also to increase on force and time track reactions at the course adaptogens usage in vegetative origin. The positive effect, probably, is related with influence of an extract of Licorice on brain mediators.

Table 3.

The test "Moving object"

Group	Average number. Hits		Number. Advancing		Number. Delays	
	In the beginning of experiment	At the end of experiment	In the beginning of experiment	At the end of experiment	In the beginning of experiment	At the end of experiment
Control (n - 10)	4,5±0,54	3,6±0,76 P1 > 0,1	3,25±0,24	2,59±0,32 P1 > 0,1	1,7±0,1	1,9±0,13 P1 > 0,1
Experiment-tal (n - 10)	3,7±0,78 P2 > 0,1	4,0±0,6 P1 > 0,1 P2 > 0,1	3,24±0,63 P1 > 0,1	1,7±0,1 P1 < 0,01 P2 < 0,02	2,0±0,15 P1 > 0,1	1,4±0,1 P1 < 0,02 P2 < 0,001

Table 4.

Group	Time of deduction of balance, with		Accuracy of reproduction of movements, sm	
	In the beginning of experiment	At the end of experiment	In the beginning of experiment	At the end of experiment
Control (n - 10)	23,1±2,1	31,5±3,0 P1 < 0,02	3,9±0,8	2,2±0,4 P1 > 0,1
Experimental (n - 10)	27,6±3,1 P2 > 0,05	37,5±3,4 P1 < 0,02 P2 > 0,1	3,1 ±0,4 P2 > 0,1	1,1±0,3 P1 < 0,02 P2 > 0,001

Increase of efficiency of course of the above-stated nervous processes, undoubtedly, has affected quality of development of impellent skills where crucial importance has accuracy of reproduction of impellent actions (running jumps, in height and length).

The use of Licorice extract is conductive to increase of stability. In this group the average size of indications was authentically above in comparison with control group (P1 < 0,002). Productivity has increased due to decrease in quantity of spades (P1 < 0,01).

Thus, becomes obvious, that application of an extract of Licorice promotes integrative increasing of reserves of functioning of bodies and the systems determining physical and intellectual serviceability of an organism that opens ample opportunities for use of a preparation by preparation of rescuers at salvage operations.

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◄ANALYTICAL PICTURE OF DRUG PRODUCTION, TRAFFICKING AND DEALING IN AZERBAIJAN

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History and Recent Developments

Drug use in Azerbaijan has existed since Soviet Union times. Mostly used drugs at that time were medical drugs and opiates. After gaining the independence in 1991, a lot of social and economic problems, including unemployment, a large inflow of refugees from occupied territories, economic depression, poor protection of borders, etc. promoted sharp increase of drug use in the country for the period of last 12-15 years.

One of the main factors stimulating spread of drug use was social transformations caused by collapse of USSR. That was a period of social and economical instability and rapid political changes which resulted in worsening of drug use situation. First cases of HIV and AIDS among IDUs were registered during that period. At present, along with economic development of the country, drug use and HIV infection are also growing.

While describing illicit circulation of narcotic drugs, psychotropic substances and precursors, illicit import and transit of psychoactive substances should be specially emphasized. Virulent narcotic drugs, such as cocaine, heroin, opium, hashish, stimulants, and hallucinogen are not produced in the country. Marijuana which is illegally prepared from widely spread wild and cultivated poppy and small quantity of hashish are illegally produced in the territory of Azerbaijan. Virulent drugs are brought into Azerbaijan from neighboring countries, among which Islamic Republic of Iran takes up the leading position. Drugs are imported into the country for sale and transit purposes. Favorable geographical location and well developed communication system enables to use the territory of Azerbaijan as a transit country for illegally trafficking drugs from Asia to European countries. On the whole, there are several routes where the territory of Azerbaijan is used as a transit for illegal trafficking of psychoactive substances from Asia to Europe.

In order to have corresponding approach towards the existing situation, as an outcome of respective actions carried out by the state, several activities were done in legislation field. In 1992-2005, the Republic of Azerbaijan joined all international conventions regarding the control over narcotic drugs and psychotropic substances, several normative legal documents, as well as various legislative and normative acts regulating legal and social relations in terms of drugs were adopted and improved.

Several actions were taken towards formation of an institutional system for control over drugs and psychotropic substances.

"National Program on combating illicit trafficking of narcotic drugs, psychotropic substances and precursors and drug addiction" is another important document outlining national policy in terms of combating illicit circulation of drugs. This Program defines several actions and measures targeted at the implementation of provisions of the law on "Combating Illicit Trafficking of Narcotic Drugs, Psychotropic Substances and Precursors". The Program was approved with the Presidential Decree on June 28, 2007 and covers action plans for 2007-2012.

Countering Activities

The responsible agency for the implementation of "National Program on combating illicit trafficking of narcotic drugs, psychotropic substances and precursors and drug addiction" is State Drug Control Commission which is headed by Deputy Prime Minister. Working Group of State Drug Control Commission was established with the Presidential Decree # 488, dated August 26, 1996.

The main goal of the Working Group is to coordinate the activities of State Drug Control Commission, as well as "National Program on combating illicit trafficking of narcotic drugs, psychotropic substances and precursors and drug addiction", and provide implementation of Program. Permanent members State Drug Control Commission who are major state structures and non-governmental organizations, as well as other agencies, institutions and NGOs which are not Commission members bear responsibility for the implementation of provisions of National Program and Legislation.

Interagency cooperation at national level

Various organizations are responsible for the implementation of issues envisaged in drug related legislative acts and National Program. As is mentioned above, State Drug Control Commission and its Working Group coordinate and control the overall implementation of the National Program on drugs.

Demand reduction activities within National Program

National Program defines the precise duties for each organization, while at the same establishes legal base for their joint actions. Types of cooperation are defined through the decisions and decrees of the President of the Republic of Azerbaijan, normatives, treaties, projects, action mechanisms of Cabinet of Ministers, Ministries and agencies.

Regional Cooperation

International and local cooperation are basically targeted at prevention of drug transition. Reinforcement of border protection is aimed at prevention of drug transition to Russia and Georgia and later to Europe through the territory of the Republic of Azerbaijan.

For this purpose Export Control and Related Border Security Program (EXBS) of United States Government continued assistance to State Customs Committee and State Border Service of the Republic of Azerbaijan. Although EXBS trainings and support were targeted at non-spread of weapons of mass destruction, a lot was contributed to the improvement of methods for combating any type of smuggling, including drug smuggling.

EXBS funded several trainings for the representatives of Seaport Border Service Groups and Customs agencies. In August, 2005 US Government organized trainings for the officers of Ministry of Internal Affairs on identifying transportations carrying explosive substances and narcotic drugs.

Besides, within the joint Project of UNDP and the Government of Azerbaijan "Capacity Building and Data Transmission Network Implementation for the State Customs Committee of the Republic of Azerbaijan", a system for registration and control over the offences was created.

State Customs Committee of the Republic of Azerbaijan closely cooperates with the joint program of EU and UNDP "Southern Caucasus Anti-Drug Programme". Within the framework of this Program European experts carried out monitoring in the customs checkpoints at the borders and highly assessed the activities done in the Republic during the implementation of the Program.

Within the framework of this Program, different kinds of necessary technical equipment was provided to Seaport, Customs checkpoints at Borders, customs checkpoints, etc. Cooperation within this Program is being continued.

In order to reinforce combat against illicit circulation of drugs and smuggling, hand radios, night observation devices, photo and video cameras were provided within the technical assistance project "Strengthening Southern Borders of Azerbaijan" funded by AGFUND and implemented by UNDP.

Considering the internationally recognized effectiveness of using tracker and sniffer dogs in combating illicit circulation of drugs, Dogs Training Center (Kinological Center) were established under the State Customs Committee and therefore enlarging its activity scope, the Committee made significant achievements in customs checkpoints at borders.

Currently, 40 tracker and sniffer dogs are being used by customs agencies. These dogs were distributed among the customs checkpoints considering the nature of posts. For the purpose of ensuring promptness, effectiveness and future development of kinological service, Kinological Center that is in line with international standards was established. The Center was provided with the modern equipment, computers, video devices, as well as other necessary technical equipment that is important for the training of dogs, their veterinary examination, also kinological classes were arranged. Besides having professional staff, Kinological Center prepares and trains dogs for searching not only narcotic drugs but also arms and explosives, as well as for security services.

Prognosis

Situation concerning the illicit circulation of drugs in the Republic is expected to be stable in next 1-2 years. However, drug related crimes are expected to increase in the next few years. Considering the geographical location of Azerbaijan and it being situated on the transit and drug trafficking routes, state border service is expected to reinforce protection of state borders.

Increase of virulent drugs in black market will be observed. In the next 5 years, the share of heroin among opioids will increase. Demand for psychotropic substances (amphetamine, hallucinogen) will grow as well. Peroral absorption of psychotropic substances among youth is expected to grow. Drug injection might cover new social groups. Main target groups might be local communities, students, rural population. Moreover, the risk of AIDS spread also exists.

Prices of drug at black market are predicted to remain stable in next year. However, demand for the virulent drugs and psychotropic substances in future may lead for the rise in prices and low quality in drugs. Demand for treatment is predicted to increase due to the increase of drug addiction. Need for new narcological medical institutions, experienced experts will grow. Government would have to emphasize treatment in its drug policy during the next 5 years. New stationary and rehabilitation centers will be needed. Lack of rehabilitation and reintegration mechanisms might cause some crisis in the near future.

Coverage of substitution therapy is expected to expand. Methadone therapy will be enabled in regions.

Need for outreach project and thus for experts in this and harm reduction

field will grow. Necessity for improving awareness and preventive measures system and implementation of various projects will increase.

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List of Abbreviations used in the text

SCAD – Southern Caucasus Anti-drug Programme
UN – United Nations
HIV/AIDS – Human Immune Virus/Acquired Immune Deficiency Syndrome
NGO – Non-Governmental Organizations
IDUs – Injecting Drug Users
MSP – Methadone Substitution Programme
USSR – Union of Soviet Social Republics
EXBS – Export Control and Related Border Security Program

TO THE CHARACTERISTICS OF THE MIXED INFECTION (VIRUS-BACTERIOLOGICAL) IN CHILDREN

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Presently, on the pathology of the people all big amounts acquire the association of the microorganisms as the etiological factor.

For example, on the information of Synderling A.V. and so on (1) Starshov P.D. and others (2) associated with virus-bacteriological infections, especially, pneumonia detected frequently and have a course more severe than virus and bacteriological separately.

The acute pneumonia is the more frequently complication of the influenza infection. They registered in 2-17% of the influenza patients and 50-70% of the patients addressing to the stationary. In this, staphylococcus is the principal though it is not unique component caused the fatal outcome from the influenza infection during the outbreak or the epidemic process (2). The share of the pathogenic staphylococcus among the bacteria, provocating the acute pneumonia during the influenza, is always increasing.

Besides it, we should notice, that, in the analyzing pathology there is not only the layer of the bacterial infection, on virus infection; as well as we can have virus to virus infection. Therefore, the problem of the interinfluence of the virus and bacterial infection maintains actual.

The description of the course of the disease in the different periods of the development with the leveling of the virus infection to the bacterial was not stated in the literature. It is known the difference opinion on the pathogenesis of the clinical syndromes like catarrhal croup, angina, the intestinal disorders, arising in different times of the acute respiratory virus infections (ARVD) of the children: are these clinical syndromes the principal cause of the virus disease or they are its complications?

Regarding with it, the problems of the clinical and laboratory diagnostic mixed infection, caused with the different associations of the microorganisms presently is actual.

This regards with the tendency of their growth, especially in children of the early age, with the absence of the outlined clinical presentation of these diseases and the absence of the sole clinic-laboratorial diagnostic criteria in time of the diagnosis determination and the big amount of the associated forms of the disease of the virus-bacterial character. The observation of the latest years testify, that despite of the modern antibacterial therapy the infants are the very sensitiveness contingent to the bacterial infections.

In case of the joining to the pyogenic -septic infection of the virus infection severity and the course of the disease of infants increasing and the risk of the fatal outcome evaluating.

According to the above stated the complex works were done with the clinician of the Scientifically Research Institute of Pediatrics named after K.Farajova on research of the specification of the disease with the virus-bacterial character in infants.

The clinical observation with the virology and bacterial research were conducted on 146 children of the first age, in dynamics of the disease with the diagnosis of the pyogenic-septic disease with the adjoining of the acute respiratory-virus infection (ARVI). Among them in 115 cases the results of the laboratory virology and bacterial researches were positive (32.6%).

Nosologic forms of the pyogenic-septic diseases –the two sided bronchopneumonia in 35 cases, pneumonia +sepsis -2 cases, pneumonia -35 cases, ARVI in 22 cases, ARVI+bronchopneumonia-in 214 cases.

In the etiology of the above stated diseases in 69 cases detected the association of the microorganisms (60%).

The analysis of the history of the disease detected that, in all 115 patients the clinical diagnosis was mainly pneumonia. Although in the etiology of the disease was stated: the virus-bacterial infection-in 32 cases (st.aureus +B/Leningrad/369/75/) and st.aureus+ A/Khabarovsk/77/HIN1/), virus-virology infection-in 31 cases (B/Leningrad /369/75+B/Japan/23/73), bacterial in association-in 21 cases (Salm.tiphimurium+ st/aureus), bacterial infection-in 12 cases evoked Pseudomonas aeruginosa, virus infection–in 29 cases (B/Leningrad /369/75/).

Almost in all patients the background of the disease was identical: (according to the data of the epicrisis) the general severe condition, temperature, short breath, cyanosis, dry crepitation, the absence of the appetite. Although there is some distinctive peculiarities in clinics and in anamnesis of the patients, approving the detected etiology.

So that, with the ill infant age of 3 months (Hasanov.K) with the diagnosis of the pneumonia was determined the increasing of the titers of the antibodies in GADR to 4 times to the antigen of the influenza virus of B/Leningrad /369/75/. In anamnesis-the mother of the infant in the eighth month of pregnancy survived ARVI.

In other case, the infant Gurbanov S. with the diagnosis of ARVI+ bronchopneumonia detected the increasing of the titers antibodies to 4 times to the antigen of the influenza virus B/Leningrad /369/75/. In anamnesis- the mother of the infant survived ARVI at the first stage of the pregnancy. In the stated case it is possible the suggestion of the vertical transplacental transfer of the infection (according to the additional information Kovalyeva E.P. to the theory of Gromashvesk JMEI, No 1, 95, 103-106).

In case of Agayeva I. with the diagnosis of the two sided bronchopneumonia the virus-bacterial infection (st.aureus+ B/Leningrad/369/75/) was detected. In clinics–the apparent intoxication with the symptoms of the neurotoxicosis. The detected tendency to the increasing of the mixed infections provided the necessity of the further studying in the plan of the specification their course and treatment.

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PHYTOSIRUPS ELABORATION ON A BASIS OF LICORICE FOR TREATMENT OF CATARRHAL DISEASES IN PEDIATRIC PRACTICE

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The problem of creation an effective medicinal form on a vegetative basis in relation with features of children's organism and frequent allergic diseases related with application of medical products is actual.

It is known, that the medicinal forms being elaborated on the basis of extraction from herbs, are practically harmless and can be applied long time, without afraid of side effects that is especially important in pediatric field.

Due to especial frequently preparations with expectorate activity are used in pediatric practice, at present the opportunity of getting an anti-inflammatory corrected vegetative medicinal forms now is created.

Approximately 60% of medicinal forms with improved taste for children make up liquid medicinal forms, basically syrups.

Syrups (Sirupi) represent themselves the concentrated solutions of sugar in water (up to 64%) and medicinal substances (extracts, tinctures, juices). Syrups depending on structure subdivide on medicinal and flavouring [5].

Syrups depending on used raw material and purpose subdivide on: vegetative, fruitage-berry, aromatic, and special purpose.

Syrups should be made according to requirements of the standard (the general specifications on GOST 28499-90) on compounding and technological instructions with observance of sanitary norms and the rules authorized when due hereunder [5].

With the purpose of creation an effective anti-inflammatory phytosirups by cough -depressant effect had been investigated by us an opportunity of development of new compositions of phytosirups on the basis of Licorice syrup without application of preservatives.

Licorice – Glycyrrhiza- officinal-technical plant had been used in medical practice for above 5000 years. It is considered the most perspective medicinal vegetative raw material in the world market [3].

Licorice -Glycyrrhiza- is a natural national vegetative riches of Azerbaijan,

had been used in national and scientific medicine still ancient time, also being used special popularity among patients and doctors.

Firstly by Azerbaijanian scientists are proved a lymphtropic property of vegetative preparations of Licorice which contains saponins [2, 4-6].

On a basis of Licorice various medical products are successfully being used in pediatric practice as anti-inflammatory, wound healing, expectorate, cough depressant, diuretic, laxative, antiallergic means were elaborated and implemented into medical practice [7].

By us have been in details investigated and scientifically-grounded immunostimulated properties of Licorice preparations and are practically recommended their application at a number of pediatric diseases such as: thymomegalia, TLC, a bronchial asthma, sepses, allergodermia, meningitides, iron deficit anemia [3].

It is known the Licorice syrup – (Sirupi Glócórrhizae) from roots and rhizomes of Licorice or sweet, which contain, of a dense extract of Licorice root, of a sugar syrup then and ethanol [6].

Prepares by mixture of 4 parts of a dense extract Licorice root at weak heating with 86 parts of sugar syrup then add 10 parts of 90 % ethanol.

The syrup of Licorice is a liquid of yellow – brown color with an original smell, lusciously sweet taste with smack of bitterness. The syrup of Licorice possesses by anti-inflammatory, cough depressant, immunostimulative, and softener actions. That is being used in pediatric and adult practice for treatment of diseases of the upper respiratory ways as an effective immunomodulative mean [1, 4].

However, the presented medical product has an available a number of lacks, in particular, bitter smack (without pleasure acceptation by children) and presence in structure as a component of alcohol (ethanol of 90 %), that in the Muslim countries is not perceived, besides it the given syrup is prepared on the usual drinking water, containing the mechanical impurity, the oxidized iron, various turbidities, colloids, ion of chlorine, organic and biological pollution which reduce consumer and commercial properties of outputted medical syrups.

With the purpose of improvement the structure and improvement of flavouring qualities of Licorice syrup is being offered by us the nonalcoholic simplified technology of output process of Licorice syrup by cleared water.

The task in view is being achieved by the preparation of a dense extract of Licorice and a simple sugar syrup and usage of cleared water adopted with the help of special filters: clearing mechanically the chemical and biological impurity.

The essence of investigated consisted of the liquid medicinal form as a syrup, containing a dense extract of roots and rhizomes of Licorice and the simple sugar syrup, adopted by cleared water by special cleaned water through the plastic column filter with alum silicate sorbent with the purpose of clearing from mechanical, colloid particles, with the subsequent clearing through the column filled impregnat-

ed by activated coal (special coal from a coco, having a big adsorptive surface) for chemical and biological water treating from ions of chlorine, organic chemistry, biological pollution and the dissolved gases, further by usage of a cartridge filter, occurs clearing of micro particles in the size of 5 mm and is higher with efficiency of clearing by 99,99%.

As a result of usage of the offered Licorice syrup from the simple sugar syrup – Sirupi Simplicis, and the dense extract of roots and rhizomes growing in Azerbaijan of Licorice (Glycyrrhiza glabra) by cleared water the effective, harmless, not toxic medical product with the increased resistance and advanced, simplified technology of output has been created [7].

Having used cleared water, dense extract of roots of Licorice and the simple sugar syrup we can have the better and qualitative immunostimulative activity of a medical product.

It is known, the method of preparation offered by pharmacopoeia of a simple sugar syrup, should be taken 0,64 kg of sugar on 0,36 L of waters heat up at the beginning up to 60-70 C of degree during 35-40 minutes, and then up to 110 C of degree during 30 minutes outputted a sugar syrup. It should be filtered and used for any purpose [6].

The technology of outputting of the sugar syrup is advanced by us for more modern and qualitative technological way of output, applying at the rate of: 0,64 kg of refined sugar and 0,36L of cleared water heat up at continuous stirring within 25 minutes leading up temperature of boiling up to 100 C of degree.

With the purpose of choice of optimum conditions for output of a basis for phytosirups was carried out a biopharmaceutical estimation of the outputted Licorice syrup by the method of an equilibrium dialysis through semipermeable membrane. A degree of liberation of active substances was determined by triterpen saponin of Licorice – glycyrrhizin acid by the weight and spectrogasometric method.

It is established, that the greatest completeness of liberation of glycyrrhizin acid was observed at use as a basis of sugar (87,3 %-of triterpen saponin -glycyrrhizin for 90 minutes). Liberation of acting substances was descendent from solution sorbite on 12,5 more slowly, than from a solution of sugar. Refer to appointed above the conclusion about an opportunity of sorbite usage has been made as means of prolonged action for creation of syrups for diabetic children.

The process of elaborating is following by:

It's known the method of getting of the dense extract of Licorice root – (Extraktum Glycyrrhizae Spissum) with usage as a basis for extragent 0,5-1 % water solution of ammonia [6]. Into small particles cutted roots and rhizomes extract during 48 hours at temperature of 60C degree by water solution of ammonia.

Having repeated extraction process three times unites water extracts, filter

through a cotton fabric, and then subject to vacuum evaporation before output of the dense extract of Licorice. The quantitative maintenance of glycyrrhizin acid not less than 14 % refers to GPC (3).

The water solution of ammonia by irritating action on mucous membranes is unsuitable for industrial purposes, for that purpose in quality of extragent for output of the dense extract the cleared water is recommended by us.

Having taken small particles cutted roots and rhizomes (d = 3 mm) and cleared water in the ratio of 1:5, then extract them during 5-6 hours, at temperature of 60-65C degree, cool up to 20C, and then filter and condense up to 75 % and concentrate.

The technology process of Licorice preparation:

1 kg of small particles cutted roots and rhizomes of Licorice mix in 5 liters of cleared water and extract them during 6 hours at temperature of 69-65C degree, then filter in a cotton fabric, cool up to 20C of degree and condense the maintenance of glycyrrhizin acid not less than 14%. By cleared water at the rate of 640 g of sugar – lump sugar and 360ml of cleared water, prepare the simple sugar syrup by mixing 96 ml of sugar syrup and 4 g dense extract of Licorice and getting is 100 g of Licorice syrup. The maintenance of glycyrrhizin acid is 4% in syrup. An output is 99,99%, by satisfying of requirements of GPC during all validity [3].

Preparation of the offered medicinal form more simplified and modern: the structure is 96 g of the simple sugar syrup and 4 g the dense extract of Licorice.

Organoleptic parameters of Licorice syrup follow to requirements, specified in table1.

Table 1.

Organoleptic parameters of Licorice syrup

The name of parameters	The characteristic
Appearance	Dense syrupy liquid
Color	Yellow - brown
Smell	With an inherent specific smell
Taste	Sweet

Physical and chemical parameters should satisfy the following norms:

Table 2.

Physical and chemical parameters of Licorice syrup

The name of parameters Norm	
ðÍ a solution	5,0-6,0 (5 %-s' solution)
Density	d = 1,29-1,31
Parameter of refraction	1,36 = 1,37

Thus, the structure of Licorice syrup has been investigated in detail with appointed parameters on the basis of usage of various compositions from the dry and dense extracts most frequently used in pediatric practice of herbs, have been created the new effective antidepressant means with immunotropic activity and developed with an establishment of technological parameters.

It has been investigated by us the additional opportunity of influence of some auxiliary substances on organoleptic and microbiological parameters refers to phytosirops quality.

The following compositions of herbs are elaborated: the dense extract has been included in structure of the first composition (№1) with Licorice and dog rose; the second composition (№2) dense extract of Licorice and hawthorn; the third composition (№3) extract of Licorice, dog rose, Sea-buckthorn berries; the fifth (№5) extract of Licorice, Thyme, plantain; the sixth (№6) extract o Licorice , Eucalyptus, origami; the seventh (№7) extract o Licorice, Thyme, Eucalyptus, Elecampane; the eighth (№ 8) extracts of Licorice, dog rose, Colors of Calendula, Elder; ninth (№9) extracts of Licorice, Thyme, Elecampane, peel of a tangerine.

As a sugar basis used solutions of saccharose (64 %) and sorbite (60 %) (11).

Phytocompositions included into solutions of sugary substances as 10 % from weight of syrup at room temperature and mixed. Thus took into account also influence of auxiliary substances of organoleptic parameters of phytosirops.

As auxiliary substances were being used the following substances by us:

1. Corrects: a citric acid, glycerin, vanillin, sorbite.
2. Thickeners: sodium alginate.
3. Preservatives: benzoic acid, nipagin, nipazol.
4. Dyes: indigo, carmine.

For estimation of corrects influence on taste and appearance of phytosirops was being used the organoleptic method referred to the pharmacopoeia and Gosstandart on syrups (3, 4).

The most pleasant taste were phytosirups in case of syrup of a citric acid was being included into, however the majority of experts estimating taste have stopped the choice only on structure offered o phytoextracts.

The estimation of thickeners usage in phytosirups, preservatives and dyes was being carried out according to requirements of studying of parameters of technology of syrups in various modes of process of manufacturing. Thus paid attention to dissolution of sugary substances in water extraction of various compositions of medicinal vegetative raw material at temperature of 80, 85, 90,95 and 100Ñ degree; time of extracting 15; 20; 25; 30; 35; 40; 45; 50 minutes and ratio of water and phytocomposition at insisting.

It has been established, that peak efficiency of extracting process is achieved at a ratio of 1:10 of phytocomposition and waters cleared at temperature of 95-100Ñ degree, time extracting – 40 minutes.

In outputted extraction dissolve saccharose or a sorbent.

A choice of dosages of extracts of herbs carried out according to known recommendations.

During elaboration of phytosirups structures the nomenclatures of herbs with expectorate, anti-inflammatory, immunostimulative, antiallergic actions being used in pediatric practice has been in detail investigated (10). After the choice of structure of pharmacological and plants chemical compatibility has been analyzed and substantiated [2].

It have been investigated an application of preservatives additionally: benzoic acid, nipagin, nipazol in various concentration (from 0,1% up to 0,3%) on stability of a syrup.

As a result of research optimum concentration of preservative of benzoic acid in syrup (0,15%) has been picked up. The results of microbiological investigation of phytosirups have revealed that they possess antimicrobic activity concerning microorganisms without presence of preservatives.

Usage of dyes such as: indigo, karmin in phytosirups unequivocally have not led to positive results so obtained phytosirups quite satisfying consumer properties of the goods are painted in natural Colors.

The outputted syrups at the beginning have been investigated on presence of antimicrobic activity (table 3) which has been carried out at faculty of microbiology and immunology of Azerbaijan Medical University.

The microbiological activity of phytosirups was being studied by recommended ways the state pharmacopoeia of a new edition.

Table 3.

Antimicrobic activity of phytosirups on a basis of Licorice

¹	The name of syrups	Staphylococcus aureus		Escherichia coli
		Bacteiostatic effect	Bactericidal effect	Bacteiostatic effect
1	Syrup of Licorice	1:12	1:20	1:30
2	Syrup of Licorice with dog rose.	1:140	1:30	1:30
3	Syrup of Licorice with hawthorn.	1:140	1:40	1:40
4	Syrup of Licorice with Dogrose and Sea-buckthorn berries.	1:150	1:30	1:30
5	Syrup of Licorice, Thyme, and Sea-buckthorn berries.	1:160	1:40	1:40
6	Syrup of Licorice, Mother - and stepMothers, Thyme, plantain, Elecampane.	1:160	1:40	1:40
7	Syrup of licoice, Eucalyptus, origami.	1:160	1:40	1:40
8	Syrup of Licorice, Thyme, Eucalyptus Elecampane.	1:160	1:40	1:40
9	Syrup of Licorice and Dogrose.	1:160	1:40	1:40
10	Syrup of Licorice, origami, Thyme, Eucalyptus.	1:160	1:40	1:40

The obtained results of comparative microbiological investigation have displayed, that the elaborated syrups possess by the expressed antimicrobic properties under the relation of tests – cultures of microorganisms such as Staphylococcus aureus and Escherichia coli.

Table 4.

The obtained results of antimicrobic activity of phytosirups by the method of diffusion in agar "by shaft way"

₁	The Structure of a "shaft"	Diameter of a zone of a growth inhibition of test - culture of microorganisms, mm							
		St. aureus (209)	St. aureus	S t. Epi-dermi-dis (45	E-coli 675	Shigella Flex 266	Shigella gondi	Bact.	Bact.
1	Syrup of Licorice.	32	29	27	17	22	19	32	28
2	Syrup of Licorice with Dogrose.	30	25	27	17	22	20	22	20
3	Syrup of Licorice with hawthorn	22	25	24	20	20	19	28	26
4	Syrup of Licorice, Dogrose, Sea-buck-thorn berries	32	27	29	19	22	19	30	28
5	Syrup of Licorice, Sea-buckthorn berries, Thyme.	34	32	29	19	22	19	30	28
6	Syrup of Licorice, Thyme, Mother - and stepMother's Elecampane, plan-tain.	34	32	29	27	24	22	32	28
7	Syrup of Licorice, Eucalyptus, Origaum.	34	32	27	19	24	20	32	28
8	Syrup of Licorice, Thyme, Eucalyptus, Elecampane.	34	32	29	25	24	20	32	28
9	Syrup of Licorice, Dogrose, Colors of Calendula, Elder.	32	29	27	19	20	17	30	28
10	Syrup of Licorice, Thyme, Elecam-pane, a peel of tan-gerine.	34	30	27	19	24	21	32	

Further the definition of antimicobic activity was being carried out by us additionally of phytosirops by the method of diffusion in an agar (by shaft way). The method is based on an estimation of test oppression of microorganism's growth. An estimation of the results carried out on diameter of growth inhibition of tests – cultures around "shafts" switching and its diameter, the results are submitted in table 4.

As being displayed from the table2 the elaborated phytosirups on a basis Licorice, without preservatives possess by significant antimicrobic activity concerning the investigated tests – cultures of microorganisms.

The proved bactericidal effects of phytoisirups are the basis for their manufacturing without preservatives and industrial manufacture that opens wide opportunities of their application in pediatric practice.

Conclusions:

1. It was being elaborated the rational way of output of Licorice syrup without application of preservatives.

2. The new way of phytosirups from phytocompositions of herbs is picked up on the basis of Licorice syrup.

3. The influence of auxiliary substances by organoleptic parameters, microbiological stability of phytosirops on a basis of Licorice is investigated.

4. It is proved, that phytosirops on a basis of Licorice without application of auxiliary substances can be successfully used in pediatric practice.

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◄DIFFUSE VARIANT OF PROGRESSIVE SYSTEMIC SCLEROSIS

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Key words:
Progressive systemic sclerosis – (PSS)
Antinuclear antibodies – (ANA)
Rheumatoid factor – (RF)
Circulating immune complexes – (CIK)

Objectives: The goal of the present study was to investigate clinical and immunological peculiarities of diffuse version of progressive systemic sclerosis caused by autoimmune abnormalities.

Methods and results: 24 patients with true systemic sclerosis have been examined (according to the criteria of the American Rheumatologic Association (ARA) [980] [6].

Antinuclear antibodies (ANA), rheumatoid factors (RF), as well as circulating immune complexes (CIC) and levels of immunoglobulins (C, A, M) have been determined in the blood serum of the patients. Among the patients of diffuse version of systemic sclerosis a systemic character of lesion of the vital organs has been detected which was closely associated with antinuclear antibodies, while using rats' liver sections and monkeys' esophagus CIC has been detected at 87.5% and 91.6% of the patients (respectively). CIC was detected at 70.8% of the patients and rheumatoid factors were detected at 62.5 % of the patients.

Conclusions. Investigation results allow to assume that increase of the levels of immunoglobulin M & circulating immune complexes is found at the patients of diffuse version of systemic sclerosis with the lungs lesion, acroosteolysis on the background of evident antinuclear reactions. Thus enables us evaluate those factors as prognostically unfavorable.

Introduction: Expediency of clinical and immunological study of the progressive systemic sclerosis (PSS) is of great importance from the point of view of revealing complex pathologic processes and related to them clinical presentations of the disease [1, 4, 8, 9].

According to up to date concepts systemic sclerosis (SS; scleroderma) is related to diffuse diseases of the connective tissue and is characterized by progressive skin fibrosis, lesion of support-motor apparatus, of vital organs and autoimmune abnormalities [1, 2, 4, 7, 8, 9].

Presence at PSS of such autoantibodies as antinuclear antibodies (ANA), rheumatoid factors (RF) enables us to discuss the role of immunological disturbances in the development of pathologic processes at such kind of disease [2, 3, 4, 9].

Significant polymorphism of clinical presentation of PSS became a basis for distinguishing various versions: diffuse dermatosclerosis (sclerosis), CREST-syndrome (calcinosis, Raymond, esophagus dysfunction, sclerodactylia, teleangiectasia) and "OVERLAP" or crossed syndrome [1, 3, 4].

In recent years there appeared some works, where it was shown that at various versions of PPS is possible to reveal a particular spectrum of autoimmune abnormalities. Namely, at CREST syndrome unlike diffuse termatosclerosis, ANA are detected which react predominantly with centromere of chromosomes.

It should also be noted that clinical evaluation of ANA determination and its significance at diffuse systemic sclerosis has not been thoroughly studied.

Therefore, study of ANA clinic value, determination of sensibility of various techniques for detection of these antibodies and determination of their belonging to different classes of immunoglobulins are still actual problems both for evaluation of peculiarities of various versions of development of systemic dermatosclerosis and for evaluation of the character of organic pathology.

Goal of the work: Aim of the present study was to investigate clinical and immunological peculiarities of diffuse version of progressive systemic sclerosis in the relation to autoimmune abnormalities.

<u>**Literature and technique of the study:**</u> Twenty four patients with true diagnosis of diffuse version of systemic dermatosclerosis have been examined according to ANA criteria (1980), 21 of them being women and 3 of them being men; correlation between them comprised 7:1. Average age of the patients and average duration of the disease were 40.82.8 years and 7.61.2 years respectively.

Determination of antinuclear antibodies (ANA) in the serum was conducted by the method of indirect immunofluorescence by Kuns using rats' liver sections as substrata and monkeys' esophagus, antiserums against immunoglobulins of the human being, conjugated by fluoresceneinisotionate, as well as ANA belonging to separate classes of immunoglobulins (G, A, M, D, E) has been determined (antiserums of "Behringwerke" company (Germany).

Determination of circulating immune complexes (CIC) was accomplished by using 3% PEG-TEST, complement (S) content was determined by 50% hemolysis (H) that is quantity corresponding to one hemolytic unit of the complement (CH – 50% unit/ml) [5].

Table 1.

Clinical and laboratory characteristics of 24 patients with diffuse version PSS

Manifestation of the disease	Frequency of defection	
	absolute member	%
I. Clinical signs:		
Vascular syndrome		
Raymond's syndrome	22	91,7
Telangioectasis	12	50,0
Ulcerations	11	45,8
Skin lesion	24	100,0
Articular syndrome		
arthralgias	23	95,8
Flexion contracture	23	95,6
Arthritis	7	29,1
Osteolysis	9	37,5
Affection of internal organs		
Lungs	17	70,6
Heart	21	87,5
Esophagus	19	79,2
Kidneys	15	62,5
Polyserositis	15	62,5
Calcinosis	6	25,0
Myalgia	7	29,2
II. Laboratory rates		
Acceleration of erythrocyte sedimentation rate (ESR) (20 mm/hour and above)	10	41,7
Seromucoid (>0,165 gr/l)	20	83,3
Ceruloplasmin (>0,25 gr/l)	12	50,0
Fibrinogen (> 4 gr/l)	12	50,0
Aspartate aminotransferase (>0,45 mkm/l/1 hour)	8	33,3
Alanine aminotransferase (>0,68 mkm/l/1 hour)	6	25,0
Hyperalpha2 globulinemia (>12%)	10	41,7
Hypergamme globulinemia (>21%)	15	62,5

CRP has been detected in the area of micro precipitation by using commercial antiserum, but RF was determined by two techniques (Valler-Rose and Latex agglutination).

Mathematical processing of the investigation results was conducted by "Statistica 5,0 programme".

Results:

Frequency of major clinical and laboratory manifestations of diffuse version of systemic sclerosis at patients has shown that at a given version all the organs are practically involved with great frequency into the pathological process (Table 1).

Skin lesion in the form of sclerodermatous edema, indurations and atrophy was of diffuse character, more frequently on the body and was present actually in all patients of this group. For sclerodermatous skin lesion characteristic was lack of skin folds, loss of elasticity, atrophy, hyper and depigmentation of the skin, flexion contractures of the hands as a result of fibrotic changes of the skin.

Face skin lesion has been normally accompanied by characteristic changes in the form of "mask cover", mimics being absent.

Vascular changes in our patients have been manifested by vasomotor abnormalities known as Raymond's syndrome – observed in 91.7% of the cases. These abnormalities involved fingers, feet and sometimes face. Most serious vascular changes in the form of ulcerations on finger tips and rarely on the feet registered at 45,8% patients, and telangiectasia at 50 % of the patients. We have found presence of both ulcerations and telangiectasia at the same time at almost half of our patients. ANF has been detected at 9 patients out of all of them at rats' liver sections and in all of them at monkeys' esophagus sections. Most of the patients had ANF of speckled type of immunofluorescene and only 3 patients had homogeneous one. ANF titers ranged from 1:4 to 1:64. Increased titers of CIC and RF have been detected at 7 patients. Complement content was normal or slightly increased.

Hence, presence of vascular changes is associated with great frequency and evidence of immunologic as well as other laboratory factors reflecting disease activity.

Articular syndrome in the form of arthralgias and flexion contractures in detected at almost all the patients (95.8%) within this group.

Arthritis was registered at 29.1% of the patients. Roentgenlogic analyses show the following: constriction of joints space at 37,5% of the patients, osteoporosis at 54.1% of the patients and erosion at 16.6% of the patients.

Deposition of calcium salt in subcutaneous fat and in periarticular tissues of the fingers and localization in other parts of the body are detected in 25% of the patients.

It is worth-while to mention that in most of the osteolysis patients (7 people) increased levels of CIC by PEG – test have been detected and in 2 patents cryoproteins were detected that is in 8 patients out of 9 CIC was found.

Pulmonary symptoms in this group of the patients were characterized by dyspnea at physical activity as well as at rest – at late stages; auscultatively it was characterized by the presence of dry and moist rales at the base of lungs, diminished breath sounds and roentgenologic changes in the type of basal fibrosis and intensity of lung pattern, detected at 70.8% of the patients.

Characteristic to pulmonary symptomatology at this PSS version has become prevalence of basal pulmonary fibrosis. Most of those patients (12) had increased CIC levels and immunoglobulin M content in blood serum (at 15 patients).

Heart changes have been detected at 87.5% of the patients. Pericardium lesion, abnormalities of intraatrial and intraventricular condition, partial block of bundles of "His" and decrease of electrocardiogram ECG voltage have been detected at the most of the patients, cases of impaired cardial function have been detected at 20.0% of the patients.

79.2% of the patients had esophagus abnormalities, having apparent character (II and III stages).

Based on our observations kidney lesion was at 62.5% of the patients which was manifested by arterial hypertension at 9.0% of the patients and urinous syndrome: proteinuria, cylindruria and microhematuria. Those changes at most patients were of unfixed character and were developed at 5 of them on the background of rather decreased content of IgG in blood serum and at 10 patients on the contrary hypergammaglobulinemia was observed. Changes in kidneys had been progressing at there patients with the transition into real sclerodermic lesion of the kidneys resulting in fatal outcome. After cadaveric examination were detected many infarcts of the renal cortical layer, thrombovasculars, sharp disturbance of permeability, occlusion of canaliculus by fibrinoid masses. Most patients with renal pathology (10 people) CIC was detected. 1. Complement content was drastically decreased at one patient of this group, which corresponded to apparent antinuclear reactions, high titers of RF, hypergammaglobulinemia and high IgM content in blood serum. In clinical presentation the patient had kidney lesion signs in the form of fixed proteinuria, cylinderuria, erythrocyturia and arterial hypertension.

These changes urge us to assume that in this case nephropathy is developed as a result of immune complex pathology.

In most patients with renal pathology (10 people) CIC was detected.

Variation of individual laboratory factors (acceleration of ECR, increase of seromucoid, ceruplasmin and fibrinogen, etc.) testifies to apparent inflamed activity in this group of patients.

Summarizing the date on immunologic disturbances of diffuse scleroderma in the patients the following can be mentioned (Table 2).

ANF in patients with this version of PSS by using rats' liver-sections and monkeys' esophagus is detected at 87.5% and 91.6% of the patients respectively, positive

results at simultaneous use of above mentioned nuclear substrata being comprised 100% – antinuclear antibodies were found simultaneously by two or one method.

CIC has been detected at 70.8% of the patients. Cryoprecipitate immune complexes have been found only in two patients which comprised 8.3%. SRB is registered at 87.5% of the patients and rheumatoid factors at 62.5% of the patients mainly in low titers (1:20 – 1:40) and only at two patients were registered in high ones (1:320 – 1:640).

We have also established that diffuse scleroderma patients had higher concentrations of immunoglobulins of G, A and M classes in more than half of the cased (66.7%, 50.0% and 83.3% respectively).

Table 2

Immunological factors at 24 patients of PSS diffuse version

Signs	Frequency of detection	
	absolute member	%
ANF (positive) (rates' liver)	21	87,5
ANF (positive) (monkeys' esophagus)	22	91,6
Circulating immune complexes	17	70,8
Cryoprecipitate immune complexes	2	8,3
SRB (positive)	21	87,5
RF (positive)	15	62,5
G > 12	16	66,7
Ig (gr/l) A > 2,5	12	50,0
Ì > 1,4	20	83,3
ÑÍ 50% (unit/ml) (Ì ±m)	41,1 ± 1,86	

Hence above given changes of immunologic factors justify autoimmune nature of the given pathology.

While using various sources of nuclear material (monkeys' esophagus, rats' liver) percent of ANF detection in titers 1:32 was with monkeys' esophagus at 72.7% of the patients, whereas while using rats' liver sections with highest frequency were met more lower titers (1:4 – 1:6) at 61.9% of the patients.

In the next table III are presented types of immunefluorescence action were found by us using various substrates of tissues.

Types of immunefluorescence of ANF at patients of diffuse PSS version

Types of fluo-rescence	Tissue substrate			
	Monkeys' esophagus		Rats' liver	
	absolute	%	absolute	%
Sp	15	68,2	13	61,9
H	7	31,8	8	38,1
Total:	22	100,0	21	100,0

While using rats' esophagus at 68.2% of the patients speckled (Sp) type of fluorescence has been detected and at 31.8% of the patients' homogeneous (H) type of fluorescence was detected. Speckled type of fluorescence using rats' liver was registered at 61.9% of the patients and homogeneous at 38.1% of the patients. As those investigations show there is not particular difference among types of fluorescence while using various substrates of tissues for ANF detection.

During examination of ANF belonging to various classes of immunoglobulin at patients of diffuse PSS version (Table 4) we have found that most frequently IgG (86.4%) class of ANF is detected and IgM and IgD (72.7%), but ANF – IgA – significantly rarely (40.9%). ANF – IgE is detected at only one patient.

Frequency of ANF occurrence in various classes of immunoglobulins at 22 patients with diffuse PSS version

ANF types	Titers 1:8 - 1:18		Titers 1:32		Total	
	abs.	%	abs.	%	abs.	%
G	9	40,9	10	45,5	19	86,4
A	8	36,4	1	4,5	9	40,9
Ig M	14	63,6	2	9,1	16	72,7
D	14	63,6	2	9,1	16	72,7
E	1	4,5	-	-	1	4,5

Conclusion:

Therefore, in clinical pattern of patients of diffuse PSS prevailed apparent diffuse changes of the skin in all the patients, in half of them these changes were accompanied by trophic changes in the form of ulcerations of finger tips and telangiectasias; most patients had esophagus lesion, lesion of lungs, heart, kidneys and support motor apparatus.

Systemic character of organs lesion has been associated with positive antinuclear reactions, more than half of the patients had rheumatoid factors and increase of concentration in blood serum of major classes of immunoglobulins. Hemolytic activity of the complement at all the patients, with the exception of one case has been within standard ranges or slightly increased.

It was found that at PSS patients with developing signs of lungs lesion, acroosteolysis on the background of apparent antinuclear reactions increased levels of CIC and immunoglobulin M were detected that gives right to evaluate these factors as unfavorable in connection with the development of the indicated lesions.

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PROSPECTS OF MICROCONTROLLERS IN MEDICAL-BIOLOGICAL RESEARCHES

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The effective decision of the basic medical and biological problems, such as, identification (diagnostics), forecasting and management (correction, treatment) a condition of the person (patient) is not conceivable without application of modern information and electronical technologies [6]. The given message is devoted to use of microcontrollers at designing and synthesis of intellectual systems for the decision of these problems.

Microcontrollers in medical and biological problems are used in quality as:
– The intellectual gauge of interactive hybrid medical and biologic systems;
– Kernel of the portable device.

It is necessary to distribute intellectual functions between the interface or the gauge in hybrid systems. At the decision of such problems usually proceed from different platforms:

– Commercial, where the accent is done on profitability of designing of systems;

– Professional experience of the head of group and creative group;

– From the point of view of efficiency of decisions of the put medical and biological problems.

Efficiency and reliability of system of monitoring psychophysiological conditions (MPC) of the person as intellectual system, depends on optimization of information mutual relations of components which form single purposeful system.

At designing and synthesis of intellectual MPC to all, a number of restrictions and the requirements connected by five interconnected processes which characterize intellectual systems is showed to its components, including «intellectual gauges» (IG):

– Motivation of system – statement of a problem from an allowable class, the analysis of this problem;

– Self-organizing system – the next attempt of the decision of problems;

– Adaptation of system – correction of the next attempt of the decision and search of successful attempt of the decision of a problem;

– Self-training – fastening of experience of the decision of a problem;

– Development of system changing of an allowable class of the decision.

In the given report principles of use of microcontrollers of series PIC of firm Microchip in quality IG MPC are submitted.

As a demonstration sample intellectual gauges NP-D developed by us – are chosen systems "Np-monitoring" (interactive system of formation «Neurodynamic a portrait»), RR-D-systems "Monitoring-ECG" (Interactive system displaying macro-and the microorganization of an electrocardiogram of signals in real time).

Sample of the circuit of the portable device on base Ì C PIC16F877A
Пример схемы портативного устройства на базе МК PIC16F877A
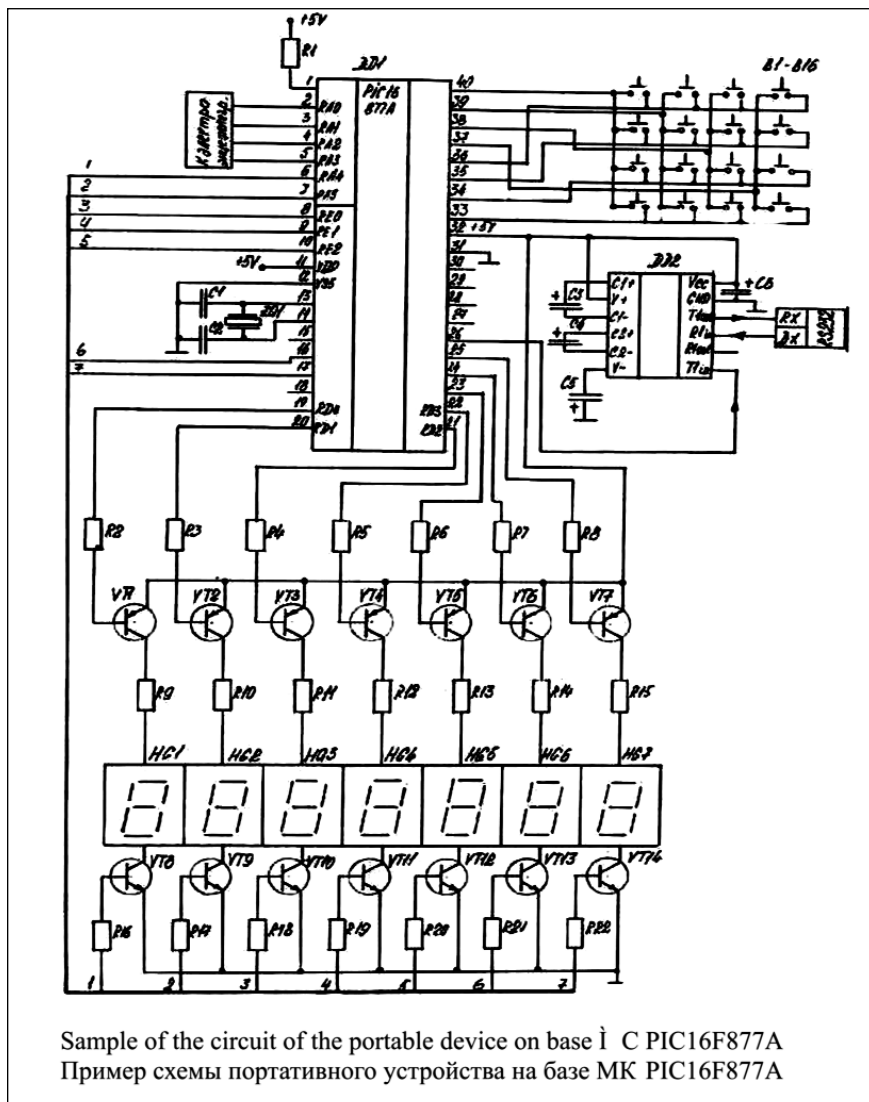
Intellectual gauges NP-D carry out function of a choice of the semantic and statistical information from basic set of a subject domain of interactive system "Np-monitoring" [1]. Basic set given IG is multichannel electroencephalogram (EEG) the process registered at the examinee in real time. At drawing up of software MC of the corresponding is used intellectual gauge the principle of an openness, multitasking, adaptabilities. As the semantic information is got out:

Local informative events of EEG-PROCESSES as the current dominating rhythm;

Events of corresponding alternations of 0-crossings conditional isolines;

Abrupt change of statistical characteristics of EEG-PROCESSES, as elements of the macro organization neurodynamical processes, etc.

Intellectual gauges RR-D carry out functions of a choice of the semantic and statistical information from basic set of a subject domain of interactive system "Monitoring-ECG". Multifunctional of the most interactive system puts before IG the following problems:

Problem of a choice probability structures of sequences of RR-circuits;

Problem of definition of sharp changes in dynamics of RR-circuits;

Definitions of a randomness.

As local database (LDB) is used of intellectual MPC flash-memory of that type in which both statistical, and the semantic information is kept allocated of a subject domain by means of IG (in this case NP-D and RR-D).

The powerful and flexible system the interface – microcontrollers (PICf877 22 contact I/O, the synchronous serial port functions as 3 hard-wired consecutive peripheral interface (SPI) or the two-wired (I2C), the universal synchronous – asynchronous transceiver (USART), the consecutive interface of connection (SCI), A/D the converter with 5 multiplexed entrance channels) allows to carry out bilateral communication IG with LDB, and also from the personal computer.

Use of networks of microcontrollers with the purpose of parallel processing a various sort of the data from a subject domain is perspective for formation of an integration image psycho physiological of the parameters reflecting in functional conditions of an organism.

Submitted IG NP-D and RR-D keep in itself a number of the requirements transmitted from the top level of the distributive information of hierarchical systems to which number of the coordination of time characteristics of subtasks of one level concerns, timeliness of transfer of results of primary processing by means of information function, etc [2,3].

Other scope MC is their use as a kernel of the portable device. In medical and biological researches portable devices are used as for identification conditions (monitoring), and managements of a functional condition. It is necessary to mention, that despite of autonomy of an operating mode of portable devices, it is usual that there is an opportunity of data exchange between the personal computer, and

if necessary in further more detailed analysis of the data. There is a computer variant of adjustment through a feedback except manual adjustment. The network interconnected IG due to which it would be possible to supervise and operate medical and biological processes.

Use Ì С in a control system as the intellectual executor (IE) is effective for correction of psychophysiological conditions a method biofeedback. Designing of network Ì С as base of the portable device for the given problem demands the creative approach, allowing to step over technological barriers and to create the specific functional organization of corresponding purposeful system.
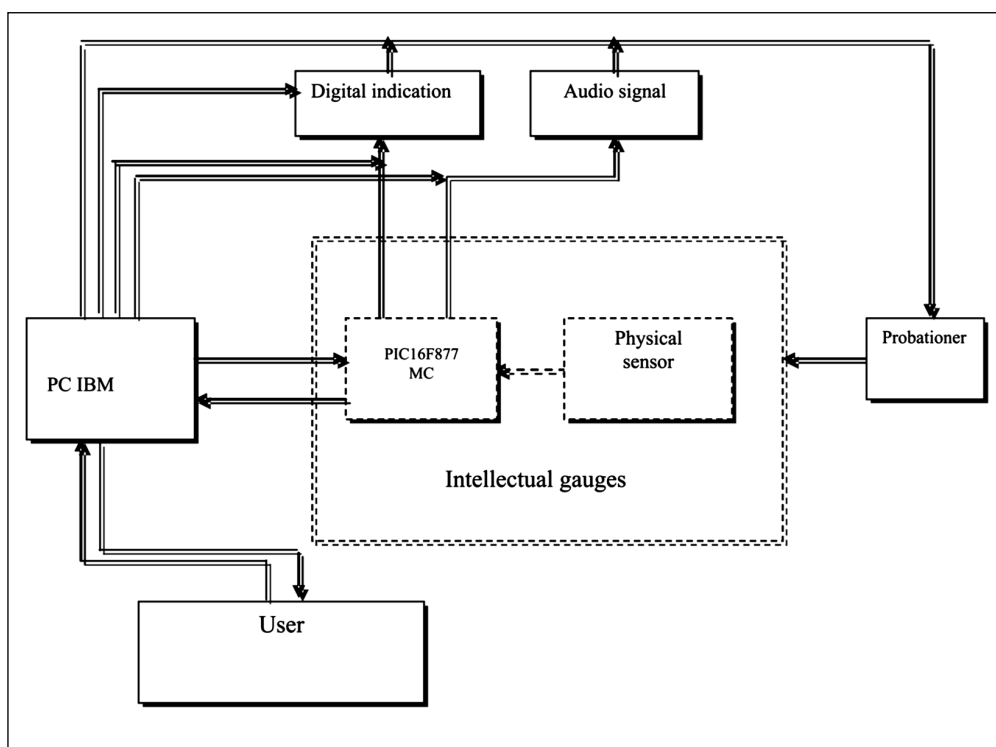
Structure-functional automatic system

Efficiency of application Ì С in medical and biological researches depends on motivational structure of the persons composed from creative collective.

Electronicians "programmers" are experts in the field of digital technologies, MC – is a substitute of the former circuit.

Mathematics "programmers" – for them MC – area where they can realize various optimum programs with the minimal resources for finding of heuristic decisions.

Efficiency of application MC still depends on ability of the head who is taking into account motivational structure of each listed experts in the creative group.

Prospects of application MC in medical and biological researches are caused with development as (in areas IG and AI [4,7]), also development and using software support.

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HURDLES TO ASEPSIS, UNIVERSAL LITERACY, AND CHRONOBIOLOGY – ALL TO BE OVERCOME

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Abstract

A joining of chronobiology and endocrinology was achieved in 1974 at a symposium focusing on the critical role of the hypothalamic-pituitary-adrenal network on the basic side and on the frst drug to carry timing in its name. The next step is a section on chronobiology in this neuroen-docrinology journal. An account of the problems encountered before both asepsis and universal literacy became the law of the profession and of the land serves here as background to endeavors in behalf of chronobiologic literacy. A step toward the latter goal is the use of systematically collected measurements of heart rate and blood pressure evaluated by computer against reference standards from peers of corresponding age, gender and ethnicity. Thereby, an illustrative, clinically relevant aspect of everyday physiology is resolved within the otherwise neglected normal range, and disease risk syndromes are detected so that preventive treatment can be instituted before catastrophic disease occurs. The scope of this chro-nobiology section of the Neuroendocrinology Letters is to map the time-qualifed feedsideward interactions within the neuroen-docrines, in the rest of an organism and in the environment. Thereby, we replace time-unqualifed feedbacks and feedforwards, along imaginary axes, by neuro-endocrine and cellular networks operating predictably insofar as rhythmically within the range of everyday physiology. Subtle effects are thus found that are otherwise covered by the curtain of ignorance drawn over the normal range. More important, feedsidewards account for opposite effects that recur rhythmically, and thus help clarify mechanisms that may underlie the difference between stimulating or inhibiting a malignancy and thus shortening or lengthening the lifespan.

Scrubbing[1]

In the twelfth century CE, in Cordova, Spain, Aver-ro¸s (1126-1198), the pantheistic Islamic scholar of law and philosophy, also learned in medicine, forced into hiding for a time on suspicion of heresy, apparently insisted on washing the hands before surgery. Other Arab physicians of Cordova followed the practice. When handwashing was transferred to surgery is unknown, but the merits of cleanliness as such had been recognized in priestly Jewish documents dating at least 500 and perhaps 1300 years before the Common Era (Exodus 30: 17-21; personal communication by Rabbi Leonard A. Schoolman). The washing of the hands before meals and before any ritual act may have eventually led to the requirement of cleanliness before surgery by the time of Averr?es if not earlier. To some extent, the atmosphere eventually recognizing the need for scrubbing was prepared for thousands of years before the resolution of bacteria by the microscope gave it a rational basis. Today, hygiene generally and scrubbing involve very many aspects of medicine.

It appears that the history of puerperal fever in the mid-19th century has several parallels in the status quo of the use of chronobiology in current health care. By 1843, the contagious nature of "childbed fever" had already been recognized by Oliver Wendell Holmes (1809-1894), the noted American author, teacher and practitioner of medicine. Yet a matter as cut-and-dried as antisepsis continued to be ignored by the medical establishment of that day.

In 1784 the Austrian Emperor Joseph II founded an obstetrical clinic at the General Hospital in Vienna, to reduce the suffering of unwed mothers and to stop the many infanticides that took place at the time. The mothers-to-be were cared for by physicians who taught medical students, the best the health science of the day could offer. Nonetheless, by the third decade of the nineteenth century, this refuge for women and girls in trouble had become a place of death. One epidemic of puerperal fever followed another; pregnant women lying next to each other in rows were suddenly stricken one by one.

In 1834, a second clinic was founded exclusively for the training of midwives. It soon became evident that while in the physicians' clinic at least 10% and sometimes as many as 31% of the women died, the corresponding mortality rate at the midwives' clinic was on the average 2%. Many possibilities were considered in the attempt to solve this puzzle. Concerns of overcrowding and bad ventilation in the wards of the hospital clinic and some ill-defned atmospheric-telluric infuences, a puerperal miasma or what was called the "genius epidemicus" were all considered.

There was even the notion that the women were dying of shame because examinations by male medical students offended their sense of propriety.

This was the thinking at the time when the difference in mortality at the two

clinics became a concern of Ignaz Semmelweis. He had been trained by the pathologist Rokitansky and had observed the ravages of puerperal fever on the organs of many pregnant women. The solution came to Semmelweis when his friend and teacher Jacob Kolecka died of sepsis; during an autopsy a student's scalpel had pricked Kolecka's fnger. When Semmelweis compared the autopsy report of Kolecka with his experience at autopsies of maternity cases, he made the connection: the student's knife, previously infected by use on a cadaver, had killed Kolecka. In the same way the fn-gers of students and physicians spread fatal infections to the maternity cases, since they had done autopsies just before they examined the women in the delivery room, and the usual soap-and-water washing of hands was not a suffcient precaution. Thus Sem-melweis solved the riddle of the difference in mortality between 1) the obstetrical clinic, where the mothers-to-be were examined by students who often went directly to the maternity wards from the morgue, and 2) the clinic staffed by traditional midwives, whose duties did not involve autopsies.

At the end of May 1847 Semmelweis introduced disinfection of the hands with chlorine into the frst obstetric clinic. By June, the mortality percentage had dropped sizably, and by November 1847 it was 2.55%. The truly great physicians of his time, Skoda and others, immediately recognized the impact of Semmelweis' discovery and supported him unreservedly. Semmelweis challenged his colleagues, who refused to scrub before surgery or before obstetrical examinations, with "The killing must stop! In order to stop the killing, I shall keep watch, and anybody who will dare to perpetuate dangerous errors about puerperal fever will fnd in me an active opponent!"

Unfortunately, the administrators of Semmel-weis' institution were not so supportive. Semmel-weis' position was discontinued in March 1849. He had diffculties thereafter as well. The French National Academy of Medicine in Paris rejected his claim. He then wrote his masterwork on "The etiology, concept and prophylaxis of puerperal fever" and began his lonely crusade[2]. Eventually, it fell to Sir Joseph Lister, who in 1867 published "On the antiseptic principle in the practice of surgery," to fnally infuence the medical profession to adopt thorough antiseptic practices.

But for a long time Holmes, Lister and Semmel-weis were ridiculed by surgeons in the English-speaking world who continued to operate in street clothes and refused to change their blood- and tissue-splattered clothes between procedures-an attitude equivalent to taking *the* (casual) blood pressure. According to the celebrated Victorian physician Sir Frederick Treves (cited by Gordon in [1]), it was considered to be as "fnicking and affected" for surgeons to be clean before procedures intended to save lives as it would have been for an executioner to trim his nails before beheading a condemned prisoner! "Only" puerperal fever was at stake (it

seems fnicky, by analogy, to insist on a weeklong blood pressure profle since "only" stroke is at stake.) Sutcliffe and Duin [2] in turn note that Holmes was criticized by eminent surgeons for having the temerity to suggest that the hands of them and their gentlemen colleagues were unclean; Holmes retorted that "Medical logic does not appear to be taught or practiced in our schools." Adams [3] adds with keen irony: "Doctors in the 1780s ... complained about *midwives with dirty hands* [emphasis ours] poking around in the mother's innards during labor. Truth is, as long as it was just midwives doing the poking, sterility wasn't that important. Only when doctors got involved did it become a matter of life and death."

Today, strokes and other cardio-, nephro- and vascular diseases are on the line, and it is mere common sense to exercise precaution. We must distinguish, as Jay Cohn put it, between risk contributors and risk markers, by operational quantitative assessments, and as we have separated risk and other markers in a glossary based on data [4, 5]. It was not evangelism to ask surgeons to scrub before they operate. In line with Janeway [6], it is neither fnicking nor far out to offer monitoring on a citywide basis to residents before they are seen as patients.

The ethics of doing a 24-hour or even a 6-hour measurement profle, as is done at the Mayo Clinic [7], vs. doing a surveillance for 7 days as a start and for longer and as long as is necessary in the given case, notably in the case of an abnormal blood pressure, is the issue [8]. As a minimum we must not presume to rule out a deviant blood pressure by a single measurement because we may thereby fail to recognize not only circadian **h**yper-**a**mplitude-**t**ension, or CHAT, but high blood pressure in itself. In support of that point is the fnding that when one measures dozens of people, each at 15-minute intervals for 7 days, one will hardly fnd any hypertensives who do not have normotensive values during offce hours, and hardly any normotensive who will not have hypertensive values during offce hours [9]. A patient of Bartter [10] had one diagnosis from another physician he saw in the morning and another diagnosis from a another physician he saw in the afternoon, hypertension vs. normotension, respectively, dependent only on the time of day. This point becomes obvious in an impeachment of current practices, showing, in an abstract way, how patients have to be necessarily hypertensive in the afternoon and normotensive in the morning, if they are rhythmic around certain common operating means-and who is not rhythmic [11]?

As far back as 1913, Percival Nicholson [12] was recommending that blood pressure should be taken at the same time each day. Nicholson thus forced recognition of chronobiological variations. This was a step in the right direction, better than taking **the** blood pressure at **any** convenient time, a precaution needed for single measurements but not suffcient. Janeway in 1904 [6] did this much better:

The diurnal variations, including the effects of eating and sleep, must be in mind. In following cases from day to day, especially with reference to the effects

of treatment on the blood pressure, determinations should be made at the same hours. …

Everyone admits the importance of this [variability along the 24-hour scale] in studying the course of the temperature in disease. With arterial pressure, it is not a whit less important. …

… *it is essential* that a record of the pressure be made at frequent intervals at some *time previous* [presumably to an examination], to establish the *normal level* and the *extent of the periodic variations.* When this is done, it may be possible to demonstrate changes of small extent, which, lacking this standard for comparison, would be considered within the limits of normal variation. (Italics ours.)

The fourth "R": rhythm (chronobiologic) literacy

The proposal to introduce the teaching of chrono-biology with that of the alphabet; to learn biology with one's own body as the laboratory; and to learn mathematics by the analysis of self-measurements has repeatedly been tested in Minnesota [13-19], Arkansas [20], Connecticut [21] and Italy [22]. In the U.S., the National Science Teachers Association has published a textbook on the topic [23] and educators have introduced the issue to legislators [24]. There is no battle analogous to that reviewed below for acceptance of universal literacy, but there is inertia and neglect rather than resistance to the proposition of encouraging self-help by active education and the provision of instrumentation as a public service [13]. We next review the battle that indeed occurred in the case of universal literacy. It may seem beyond our scope herein to describe the tribulations of those who sought to introduce the fourth "r" [17]. Instead, we turn to historical facts. Those in a hurry may proceed to the next section, "Urban healthwatch."

* * *

The need for universal literacy was recognized only slowly, and the same difficulty confronts chronobiologic literacy today. The Massachusetts Educational Law of 1642 decreed that "in euery towne the chosen men appointed for managing the prudential affajres … shall have power to take account from time to time of all parents and masters and of their children … especially of their ability to read …". The Massachusetts Educational Law of 1647 ordered "that every towneship in this iuris-diction, after the Lord hath increased them to the number of 50 housholders, shall then forthwith appoint one within their towne to teach all such children as shall resort to him to write and reade …" [25]. The Massachusetts Educational Law of 1648 goes further and imposes sanctions, as might be done to assure as yet not chronobiologic literacy:

Forasmuch as the good education of children is of singular behoof and beneft to any Common-wealth; and whereas many parents and masters are too indulgent

and negligent of their duty in that kinde [italics in original]. It is therefore ordered that the Select men of everie town, in the severall precincts and quarters where they dwell, shall have a vigilant eye over their brethren and neighbours, to see, frst that none of them shall suffer so much barbarism in any of their families as not to indeavour to teach by themselves or others, their children and apprentices so much learning as may inable them perfectly to read the english tongue, and knowledge of the Capital lawes; upon penaltie of twentie shillings for each neglect therin. [25]

On the other hand, a generation later, Sir William Berkeley, royal governor of the colony of Virginia, informed the Committee of Plantations in London: "I thank God, there are no free schools, nor printing; and, I hope, we shall not have, these hundred years. For learning has brought disobedience, and heresy, and sects into the world; and printing has divulged them and libels against the best government: God keep us from both!" [26].

Efforts by English humanitarians from early in the eighteenth century to teach the children of the poor to read by means of "charity schools" aroused strong opposition. Conservative opinion held, in general, that the ability to read would make workers discontented and thus foster social unrest [27]. The aristocratic position was set forth with great force and clarity by Bernard Mandeville, a physician of Dutch origin, in *The Fable of the Bees* [28]. F.B. Kaye, editor of the standard edition of the *Fable,* summarizes Mandeville's case against the charity schools:

Nobody will do unpleasant work unless he is compelled to by necessity. There is, however, "Abundance of hard and dirty Labour" to be done. Now, poverty is the only means of getting people to do this necessary work: men "have nothing to stir them up to be serviceable but their Wants, which it is Prudence to relieve, but Folly to cure." National wealth, indeed, consists not in money, but in "a Multitude of laborious Poor." Since, therefore, it would be ruinous to abolish poverty, and impossible to do away with unpleasant labour, the best thing to do is to recognize this fact, and help adapt the poor to the part they have to play. But charity-schools, by educating children above their station and thus leading them both to expect comforts they will not have and to loathe occupations they must engage in, are subversive of the future happiness and usefulness of the scholars:

… to divert … Children from useful Labour till they are fourteen or ffteen Years old, is a wrong Method to qualify them for it when they are grown up.

Finally, he attacked the schools on the ground that they interfered with the natural adjustment of society:

… proportion as to Numbers in every Trade fnds it self, and is never better kept than when no body meddles or interferes with it.

The gusto of Mandeville's assault on the charity-schools, and his incidental attack on what he termed the "Petty Reverence for the Poor," is apt to impress the modern reader as almost incredibly brutal. But that is because the *Essay* is judged

from a humanitarian point of view that hardly existed in Mandeville's time. Seen in historical perspective, there is nothing unusually harsh in Mandev-ille's position. The age was not interested in making the labourer comfortable, but in making his work cheap and plentiful. Sir William Petty was no friendlier than Mandeville to the poor when he termed them "the vile and brutish part of mankind"; even so ardent an upholder of the rights of man as Andrew Fletcher urged that labourers be returned to a condition of slavery; and Melon, too, advised slavery. The truth is that, although Mandev-ille's attack on the charity-schools caused great scandal at the time, his adversaries were really as little desirous as Mandeville to lessen the labourer's work or raise his wages.

Mandeville, indeed, was perhaps more considerate of the condition of the labourer than was the average citizen, for he felt at least the need of answering what could be urged on the other side:

I would not be thought Cruel, and am well assured if I know anything of myself, that I abhor Inhumanity; but to be compassionate to excess where Reason forbids it, and the general Interest of the Society requires steadiness of Thought and Resolution, is an unpardonable Weakness. I know it will be ever argued against me, that it is Barbarous the Children of the Poor should have no Opportunity of exerting themselves, as long as God has not debarr'd them from Natural Parts and Genius more than the Rich. But I cannot think this is harder, than it is that they should not have Money as long as they have the same Inclinations to spend as others.

It should be remembered, also, that Mandeville believed the lot of the hard-working poor need not be a sad one:

Was impartial Reason to be Judge between real Good and real Evil, ... I question whether the Condition of Kings would be at all preferable to that of Peasants, even as Ignorant and Laborious as I seem to require the latter to be. ... what I urge could be no injury or the least diminution of Happiness to the Poor ... by bringing them up in Ignorance you may inure them to real Hardships without being ever sensible themselves that they are such.

In view of this apology and the fact that his views rested on the current economic attitude, such complaint as was made against his brutality may be taken as due really to his having omitted the favouring of sentiment and moralizing with which his contemporaries sweetened their beliefs; they were scandalized at his downrightness of statement, which here, as elsewhere, was able to make a current creed obnoxious by the mere act of stating it with complete candour.

It is particularly regrettable that such views were offered by a physician. Similar opinions, often cloaked in various rationalizations, continued to be expressed for well over a century. The following quotations from Mandeville's "Essay on Charity, and Charity-schools" (an integral part of the rather curious structure of the *Fable)* are perhaps pertinent:

The Welfare and Felicity therefore of every State and Kingdom, require that the Knowledge of the Working Poor should be confn'd within the Verge of their Occupations, and never extended (as to things visible) beyond what relates to their Calling. The more a Shepherd, a Plowman or any other Peasant knows of the World, and the things that are Foreign to his Labour or Employment, the less ft he'll be to go through the Fatigues and Hardships of it with Chear-fulness and Content.

Reading, Writing and Arithmetick, are very necessary to those, whose Business require such Qualifcations, but where People's livelihood has no dependence on these Arts, they are very pernicious to the Poor, who are forc'd to get their Daily Bread by their Daily Labour. Few Children make any Progress at School, but at the | same time they are capable of being employ'd in some Business or other, so that every Hour those of poor People spend at their Book is so much time lost to the Society. Going to School in comparison to Working is Idleness, and the longer Boys continue in this easy sort of Life, the more unft they'll be when grown up for downright Labour, both as to Strength and Inclination. Men who are to remain and end their Days in a Laborious, Tiresome and Painful Station of Life, the sooner they are put upon it at frst, the more patiently they'll submit to it ever after (...).

No Body will do the dirty slavish Work, that can help it. I don't discommend them; but all these things shew that the People of the meanest Rank know too much to be serviceable to us. Servants require more than Masters | and Mistresses can afford, and what madness is it to encourage them in this, by industriously increasing at our Cost that Knowledge which they will be sure to make us pay for over again! And it is not only that those who are educated at our own Expence incroach upon us, but the raw ignorant Country Wenches and Boobily Fellows that can do, and are good for, nothing, impose upon us likewise. The scarcity of Servants occasion'd by the Education of the frst, gives a Handle to the latter of advancing their Price, and demanding what ought only to be given to Servants that understand their Business, and have most of the good Qualities that can be required in them. (...)

Abundance of hard and dirty Labour is to be done, and coarse Living is to be complied with: Where shall we fnd a better Nursery for these Necessities than the Children of the Poor? none certainly are nearer to it or ftter for it. Besides that the things I called Hardships, neither seem nor are such to those who have been brought up to 'em, and know no better. There is not a more contented People among us, than those who work the hardest and are the least acquainted with the Pomp and Delicacies of the World.

Although such infuential fgures as Addison and Steele supported the charity-school movement [29], opposition similar to Mandeville's lasted a long time. Soame Jenyns, for example, an infuential politician, declared in 1757 that igno-

rance is "the appointed lot of all born to poverty and the drudgeries of life … the only opiate capable of infusing that sensibility, which can enable them to endure the miseries of the one and the fatigues of the other … a cordial, administered by the gracious hand of providence, of which they ought never to be deprived by an ill-judged and improper education" [27].

In the United States, the New England attitude (but with political rather than religious motivation) spread rapidly throughout the North and Northwest after the Revolution, and by the 1830s a campaign for the establishment of universal free public education was gaining momentum in all the free states. Offcial American ideology held that the population at large must be educated in order to cast its ballots intelligently. The leading propagandist for free public schools, Horace Mann, added a broader conception of democracy to the merely political case for public schools. In his *Twelfth Annual Report … as Secretary of Massachusetts State Board of Education* (1848) Mann included a typical statement of his case:

According to the European theory, men are divided into classes,—some to toil and earn, others to seize and enjoy. According to the Massachusetts theory, all are to have an equal chance for earning, and equal security in the enjoyment of what they earn. The latter tends to equality of condition; the former, to the grossest inequalities. Tried by any Christian standard of morals, or even by any of the better sort of heathen standards, can any one hesitate, for a moment, in declaring which of the two will produce the greater amount of human welfare, and which, therefore, is more conformable to the divine will?..

Now surely nothing but universal education can counterwork this tendency to the domination of capital and the servility of labor. If one class possesses all the wealth and the education, while the residue of society is ignorant and poor, it matters not by what name the relation between them may be called: the latter, in fact and in truth, will be the servile dependents and subjects of the former. But, if education be equally diffused, it will draw property after it by the strongest of all attractions … Education then, beyond all other devices of human origin, is a great equalizer of the conditions of men, – the balance wheel of the social machinery. … It does better than to disarm the poor of their hostility toward the rich: it prevents being poor [30].

Although the need for at least rudimentary literacy in the populace at large was an evident corollary of universal manhood suffrage, support of free schools by tax revenues encountered some resistance in the United States. Various arguments were advanced in opposition, but the ultimate basis of opposition was for the most part similar to Mandeville's. Merle Curti summarizes opposition to tax support for public education in the mid-nineteenth century as follows:

Free school laws, it was argued, merely flled the bellies and covered the backs of the indigent at the expense of the taxpayer; what could be more patent than

the certainty that if free schools were granted, the concessions would not end short of socialism itself ? To provide free schooling for the less well-to-do would result in the loss of their self-respect and initiative; it would, in brief, pauperize them. Some argued that free public schools must be opposed on the ground that they would provide education to those "who were better suited to their station without it". Educated workmen, contrary to the arguments of the friends of the public school, were not, it was argued, a necessity. On the contrary, so the contention was, prosperity depended rather on an abundant supply of labor "comparatively uneducated" [31].

There was also a deep-seated anti-intellectualism among uneducated backwoodsmen that is expressed in brilliantly comic form by the monologue of Huck Finn's Pap. When he hears that Huck has been "adopted" by a well-disposed widow and sent to school for the frst time in his life, Pap says:

You've put on considerble many frills since I been away. I'll take you down a peg before I get done with you. You're educated, too, they say; can read and write. You think you're better'n your father, now, don't you, because he can't? *I*'ll take it out of you. Who told you you might meddle with such highfalut'n foolishness, hey? … you drop that school, you hear? I'll learn people to bring up a boy to put on airs over his own father and let on to be better'n what *he* is. … Your mother couldn't read, and she couldn't write, nuther, before she died. None of the family couldn't, before *they* died. *I* can't; and here you're a-swelling yourself up like this. … if I catch you about that school I'll tan you good [32].

Opponents of racial desegregation continued to oppose free public education for blacks into the later nineteenth century [33]. It was even argued at one point that "the negro who cannot read and write is more moral than one who can …" [34]. And covert attitudes of this sort only slowly fade beneath the surface of the debate over desegregation of American education in the twentieth century. The plan for the Roseville blood pressure and heart rate project, which touches on public health as well as education, is a step in the twenty-frst century toward a more ambitious goal.

Urban healthwatch?

Focus on alteration in pattern requires a change in attitude, as was needed for the case of universal literacy in some, but not all parts of the world. It frst appears to be hyperbole when we advocate seven-day around-the-clock blood pressure and heart rate monitoring, hoping that we fguratively seek to lead horses to water who are willing to drink.

Disease risk syndromes can be documented by monitoring blood pressure and heart rate at 1-hour or shorter intervals for 48 hours on groups in research [35–40], and on individuals for 7 days, or longer, if need be. Risk syndromes can be assessed by classical statistical endpoints such as a 24-hour (circadian) standard

deviation of blood pressure and heart rate and by cosine curve-ftting [41]. Thereby, the pattern of any multifrequency rhythms constituting an even broader time structure or chronome is resolved with as many components as the density and length of the data series permit. The endpoints from curve ftting or parameters include the MESOR (**m**idline-**e**stimating **s**tatistic **o**f **r**hythm), the amplitude and acrophase of any fundamental 24-hour component (measures of the extent and timing of reproducible variability, respectively), and the amplitude and acrophase of each harmonic of the circa-dian variation needed to describe the waveform. A dividend from curve-ftting is that the MESOR is a more precise and more accurate estimate of location than the arithmetic mean. Non-parametrically, excess pressure can be detected by replacing the conventional straight line for the upper limit of an acceptable blood pressure (and heart rate) by one that takes circadian variations into account. The area under the blood pressure data plotted as a curve, where this curve exceeds a time-varying limit and that limit itself, is the hyperbaric index [40–42].

By these procedures, a sphygmochron is obtained, as a summary of a monitoring profile, over time, involving computer-implemented comparisons with reference values from peer groups (available for analyses, carried out at the Chronobiology Center of the University of Minnesota; if interested contact by e-mail). Thereby, a change in the pattern of variability, indicating a very high risk of stroke, can be picked up [36, 38, 40, 41]. Sometimes, this risk occurs only within the range of everyday physiology. A very high risk of kidney disease as well as stroke is found in association with too large a circadian amplitude in the 24-hour pattern of blood pressure [36, 38], and/or with otherwise altered patterns such as a shift in the timing of variation. In this context, a change in the circadian amplitude of blood pressure is a more sensitive index than non-dipping [36, 43]. A decrease in the extent of heart rate variability below a threshold is also a marker of an elevated risk of stroke and other catastrophic vascular events [39, 44]. To avoid threshold-dependent conditions, surveillance of both the variability and average of blood pressure and heart rate is suggested

1. because a feature of variability, such as circadian blood pressure overswinging, called **c**ircadian **h**yper-**a**mplitude-**t**ension (CHAT), can be detected only by systematic focus on variability, preferably implemented by automatic instrumentation and analyses, which are both affordably available for research in actual practice;

2. because circadian blood pressure overswinging is associated with a greater risk of stroke than an elevated average blood pressure; and

3. because the average blood pressure, the proven etiopathogenetic factor of vascular catastrophic disease, can be more reliably estimated with a systematic account for variability than by a spot-check.

The association with catastrophic disease renders the assessment of variabili-

ty and of the improved average of blood pressure into a community concern. We all pay, indirectly if not directly, for the care of massive strokes, myocardial infarctions or nephropa-thy, apart from the immeasurable suffering and disability of those affected. In Minnesota, Dan Wall – an attorney, the immediate past mayor of Roseville, a suburban city of about 35,000 residents, and an author himself [45]— succeeded in acquiring for his constituents at frst ten automatic ambulatory instruments for 24-hour/7-day blood pressure and heart rate monitoring, as yet only slightly obtrusive tools. The incumbent mayor who succeeded him is in agreement with the plan and, despite his youth (28 years of age), intends to start monitoring himself and his wife. A project such as that planned originally by attorney Wall is a challenge second to none to the engineering profession and industry more generally to build new, further miniaturized instrumentation that will help to greatly improve the quality of care while further limiting its cost, which is already greatly reduced.

A public service task of physiological monitoring is, we trust, within the mandate of those not only in local but also in federal government agencies dispensing resources, and is just a frst step toward education in a much broader chronobiologic literacy. We append a handout to these lines for use in health care offces and in public spaces and a memorandum for those who wish to participate in this (research in) practice. Unquestionably, the investment into a very slight discomfort wearing the instrumentation is dwarfed by picking up the warning of a massive stroke.

Brochure proposed for the general public, originally produced for the city of Ros-eville, Minnesota, as a general informational handout

HEALTHWATCH

Why 7-Day/24-Hour Blood Pressure Monitoring? What you may want to know about blood pressure Prepared at the Chronobiology Center of the University of Minnesota, with help by Earl E. Bakken, Founder of Medtronic Inc., Fridley, Minnesota (now President, North Hawaii Community Hospital Inc., Kamuela, Hawaii) and Patrick Delmore, Head, Communications, Medtronic Inc., Fridley, Minnesota.

Summary

The usual way of measuring and interpreting blood pressure can be substantially improved. "Casual" blood pressure readings taken in a doctor's offce or drug store can be misleading. Measurements taken occasionally can be unusually high or low; false positive and false negative diagnoses can occur. False positive diagnoses can lead to unneeded treatment, unnecessary concern, expense and side effects from medications, such as cough, cardiac arrhythmia or impotence. People who actually need treatment can be lulled into a false sense of well-being by occa-

sional or mostly "good" blood pressure readings and may suffer a stroke or heart attack that could have been prevented. Moreover, the technically best single measurements will miss an altered pattern of variability that a computer detects, even when the inspection of the actual measurements reveals hardly any values that are too high or too low. The change in extent of variation, such as overswinging of blood pressure or underswinging of heart rate, tells us about the greatest risk of stroke, even when each value appears to be "good", insofar as it is neither too high nor too low.

The use of fully automatic ambulatory blood pressure monitors–programmed to take measurements at preset intervals for at least one week, or longer, when analyzed chronobiologically—can help to make a more reliable diagnosis. These blood pressure readings (with added heart rate measurements) are directly transferred into computers for analysis according to chronobiology, the science of rhythmic and otherwise patterned changes in variability, called time structures or chronomes, resolved by computer as a standard deviation, a cosine curve or another objectively testable pattern.

Variability as beneft

We're all born with natural variations in our circulation. Variations can also occur when we exercise physically and undergo excitement, anxiety or "stress". At the same time, we further respond to subtle factors in our environment, including the effect of storms in space (such as those causing the aurora borealis), an effect that can trickle down from extraterrestrial space to earth, to the poles and from there to lower latitudes. The development of borderline (and eventually of high) blood pressure is usually not accompanied by symptoms. The development of altered variability is much more often than not completely asymptomatic. Undesirable early changes in blood pressure variability pattern are diffcult or impossible to discover and reliably ascertain without the collection of around-the-clock blood pressure measurements for at least 7 days. It is true that monitoring for two days rather than one, notably with a diary, is the greatest gain toward a reliable diagnosis. Each additional day, however, adds further to approaching the aim of avoiding a false diagnosis.

Even when blood pressure is very high on average, it can be a "silent disease". There may not be any symptoms until complications become apparent. These complications can include a stroke, a heart attack and kidney disease. It seems more reasonable to prevent blood pressure from becoming elevated or otherwise outside norms than it is to treat conditions resulting from an abnormal blood pressure pattern. Once high or otherwise abnormal blood pressure has damaged the heart, brain, kidney or other organs, major handicapping and fatal diseases are more likely to occur.

In the doctor's offce, there's no way to obtain measurements around the clock. Yet modern instruments are available that collect readings while you sleep. And then they're analyzed by computer programs based on a data bank from thousands of individuals. The new hardware/ software/data base provides new opportunities to treat a faulty blood pressure pattern (without or with medication) and thus prevent serious illnesses.

Results of 24-hour/7-day (24/7) blood pressure monitoring are interpreted by using special computer methods, developed at the Halberg Chronobiology Center at the University of Minnesota (733 Mayo Building, 420 Delaware St. S.E., Minneapolis, MN 55455; Tel: [612] 624-6976, Fax: [612] 624-9989, E-mail:). Changes in blood pressure patterns can be detected as indicators of an elevated health risk, not apparent by using conventional methods.

Why monitoring?

The extent of suffering after a massive stroke is enormous and the healthcare costs related to high blood pressure are staggering – $30 billion in 1998 in the U.S. The ability to identify both those at risk and those with an already-elevated blood pressure reduces suffering and expense. It makes it possible to provide treatment early enough to prevent the actual development of an altered blood pressure pattern of variability as well as to lower a blood pressure that is already high or correct a blood pressure that is otherwise abnormal.

Your 24/7 blood pressure monitoring

The City of Roseville plans on offering–legalities permitting–24/7 blood pressure monitoring to all residents, from teenagers to seniors. If you decide to participate, you'll wear an only slightly obtrusive, and for those familiar with the load of self-measurement day and night, a reasonably comfortable, fully automatic, ambulatory blood pressure monitor for a week or more.

Why take blood pressure readings 24 hours a day?

Because in some people—possibly including you—rela-tively high blood pressures can occur at night rather than during the day. "Relatively" means that the pressures are high in relation to the range of acceptable pressures during rest and/or sleep. They may also be higher as compared to the range while you are awake and active. This altered timing of high and low pressures may happen spontaneously or in severe diabetes involving the autonomous nervous system, or because of long-acting blood pressure-lowering medications that cease acting sooner than anticipated. These high blood pressures will not be recognized in measurements taken only during the day.

Why take blood pressure readings 7 days a week?

Because abnormality can be there on some days but not on others. Fewer than 7 days of monitoring mean a greater chance of a false diagnosis.

Two features of the city's approach to blood pressure monitoring make it highly effective.
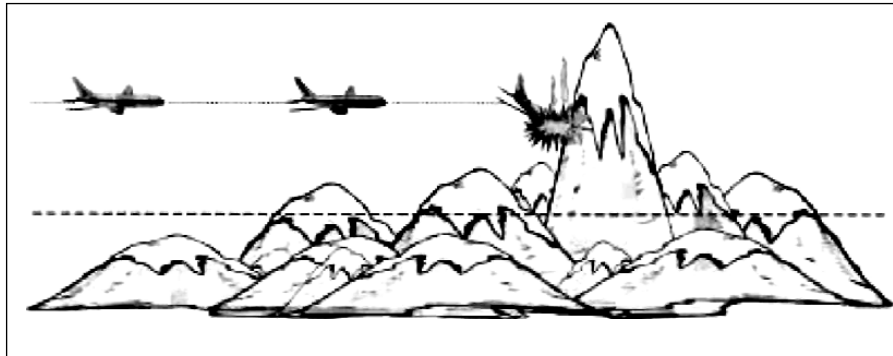
Cartoon illustrating the risk of CHAT (Circadian Hyper-Amplitude-Tension), a condition characterized by an excessive circadian blood pressure amplitude. Swings in blood pressure during rest and activity are healthy (left), but when they become too large, catastrophic events may ensue. © Halberg.

First, your blood pressure can be automatically monitored with little interruption of everyday life. Except that you have to stand still when the cuff infates and the monitor takes a measurement (you may be warned by a beep), you don't need to do anything special and you'll hardly know that the process is going on. This type of monitoring greatly reduces the likelihood of false readings and unnecessary treatment.

Second, your 24/7 blood pressure data will be analyzed by special computer methods in the light of an extensive data base. (Longer series of readings are possible as well, and you may be told that more monitoring is needed because 7 days were not enough, for instance if you are hypertensive and your physician changes your medication.) monitoring records, as compared to conventional ones, allow a less inaccurate evaluation of high-risk patterns of blood pressure and heart rate than do conventional approaches. For example, there could be an unacceptable degree of change within a day, as well as unusual times each day when blood pressures are high and/or low. A larger-than-usual change in blood pressure, called CHAT (circadian hyper-amplitude-tension) usually precedes an overall elevation in blood pressure and is an indication or predictor of a great risk of diseases. The data bank at the University of Minnesota has the reference values for the thresholds at which, for a given gender or age, for Asians or whites, the variability of blood pressure is

too high or that of heart rate too low. If you are of different ethnicity, the data base from whites will be used until the data base has been extended to your background.

Among other abnormalities, a blood pressure pattern peaking at odd hours also warrants further examination. The detection of unusual patterns in blood pressure change during a day or week can prompt a quicker follow-up and earlier preventive treatment, when needed.

Moreover, a blood pressure increase is more reliably evaluated with regard to when it occurs. And it can be more meaningfully treated in the light of information provided by expert analyses.

Rationale for offering chronobiologic blood pressure and heart rate monitoring and analysis.

Benefts to residents

Blood pressure monitoring on a 24/7 basis—according to chronobiology—can provide you with a number of benefts that a traditional blood pressure reading cannot:

– It gives you early warning signs of a heightened cardiovascular disease risk, which can prompt preventive action.

– It improves on the traditional diagnosis of acceptable vs. abnormal blood pressure.

– It helps you and your physician in making the decision to address your blood pressure problems.

– It can help your physician in the selection of the most appropriate treatment and dosages, if drug therapy is recommended.

– It provides a better assessment and validation of the treatment you receive, particularly when treatment results in an increase of the extent of daily changes in blood pressure.

When you get an erroneous diagnosis as a result of the traditional method, undesirable consequences can occur:

– If you're diagnosed with high blood pressure but do not have it, you may experience occupational discrimination or a diffculty in obtaining health insurance. Treatment with drugs may be accompanied by side effects, such as impotence, cardiac arrhythmia or cough. Drug therapy may strain your fnances.

– If you're incorrectly diagnosed as having normal blood pressure—when, in fact, you have high or otherwise abnormal blood pressure—the risk of stroke, kidney and heart disease increases, and with it the probability of organ damage. Minor symptoms such as easy fatigue and headache can gradually appear that may unnotice-ably impair your performance. Worst of all, painful and costly debilitating illness or death may occur, perhaps in 5% of the population with an altered variability pattern such as CHAT.

Why chronobiologic monitoring and analysis?

Chronobiologic monitoring and analysis can identify, under routine conditions, persons at risk of developing a high blood pressure or heart disease by assessing the daily pattern of change in blood pressure and heart rate. Several international meetings, including a special session of a National Academy of Medical Sciences, have reviewed the evidence and have endorsed the following points:

– Chronobiologic monitoring provides a more refned diagnosis of abnormal blood pressure by focusing not only on changes in the average, but also on altered daily patterns of blood pressure change. This approach may mostly beneft persons with borderline or unstable hypertension, assumed by others on the basis of spotchecks carried out on many patients to represent a large majority of the population with abnormal blood pressure.

– It should reduce the consequences of false positives and the misfortunes associated with false negatives, such as catastrophic diseases.

– It provides improved reference limits specifed in time and derived from extensive data on healthy individuals.

– It allows physicians to determine the duration, extent and timing of elevation in blood pressure or heart rate to gauge potential organ damage, as documented for the case of the weight of the left chamber of the heart as endpoint.

– It may help your physician decide whether to recommend drug or non-drug therapy (such as changing your consumption of salt and caloric intake, exercise or self-hypnosis). And it helps to determine the timing of your treatment.

– After treatment's been initiated, this diagnostic technique helps to establish an individual's response to treatment, if the 7-day or longer monitoring is repeated.

– And it can continue to monitor the success of therapy by a control chart so that prompt action can be taken when problems arise.

Recommendation for the Diagnosis of Abnormal Blood Pressure

The chronobiologic method of blood pressure diagnosis— which consists of systematic 7-day (and, if need be, longer) monitoring of every individual's blood pressure in all age groups and with or without disease of any kind—works best when an ambulatory monitor that is programmed to automatically infate the cuff at intervals is used, such as the monitor the city of Roseville is placing at your disposal. Moreover, the diagnosis by chronobiologic analyses—based upon the comparison of a given individual's data at a given time, with data obtained earlier on the same individual and/or with a large store of reference data from healthy peers—can pick up abnormality not otherwise detectable. When such abnormalities are found, there can be a 8.2-fold increase in the risk of stroke and a great likelihood of beneft since effective therapy has been found for this condition of an altered variability pattern [40].

Conclusion

Spontaneously, Michael Fossel, editor of the Journal of Anti-Aging Medicine, has written [40]:

– Talking about "blood pressure" as a single fgure is similar to knowing the average height of a mountain range: an interesting statistic, but completely useless to a pilot trying to make it through a mountain pass alive. Realistically, we need to consider not merely the mean [average] stress on an aging vascular endothelial cell, but the "peaks" that it has to "fy over" as well. Aging vessels are—to an extent— the end result of such stresses. Halberg et al. suggest that many patients may be apparently normotensive [with normal blood pressure], yet (because of circa-dian peaks in blood pressure) have the catastrophic risks of any other severely hyperten-sive patient. They recommend that [medical practitioners] avoid "fying blind" and begin to measure peak pressures more accurately if we are to avoid disaster.

All analogies serve only as hints, but hard data are available [35–47]. The foregoing analogy is used to indicate simply that blood pressure and the underly-ing stroke volume and compliance of the vessels are rhythmic and hence should be assessed by more than spotchecks. In this sense, a Citywide Blood Pressure Monitoring Project can be a frst step toward fying through the mountain range of blood pressure and heart rate variation patterns with open eyes. In so doing, we can learn about the prevalence of altered blood pressure patterns and the incidence of events associated with such altered patterns in our own back yard. Some may regard this aim as utopian, or at least as hyperbole. Scrubbing before surgery and antisepsis broadly were once ridiculed. There is nothing ridiculous in the fact that leaders in hypertension-medicine who were hypertensive have self-measured themselves for a lifetime several times each day, with analyses by desk computer [48, 49]. It is so much easier and more effcient today. The health watch aims as a frst step not only at clean and safe streets and clean air, but also at as clean and as safe a circulation of blood as one can make it by self-help with education and instrumentation available as a public service, with as few "accidents", such as strokes, heart attacks and kidney disease, as thus possible.

Epilogue

Taking *the* blood pressure in an emergency is a must, or at least taking *the* pulse; but by 1904, Janeway advocated that routinely multiple measurements should be taken before a patient is seen by the physician. This is now feasible and practical with the new hardware and software as well as with the reference values. The merits of scrubbing before surgery were once questioned but are universally recognized as essential today for preventing the spread of infection. Teaching chil-dren to read and write was once reserved only to a few privileged citizens, but is now available to everybody.

Monitoring of blood pressure and heart rate may also soon become routine once it is realized that, at a cost of Australian $60 million, a trial for mild hypertension showed that 48% of the "mild hypertensives" who entered the study and received a placebo ("sugar" pill) were "cured" after three years of such "treatment." Systematic measurements taken while following one's daily routine, analyzed chronobiologically, may detect what the naked eye cannot see in "good values." There are, of course, responders to placebo. But there are also an undetermined number of false positive and false negative diagnoses at the entry and at the end of such studies. The chrono-biologic approach may lead to the correct diagnosis and may help physicians select the appropriate treatment. The Citywide Blood Pressure Monitoring Project can be a step in that direction.
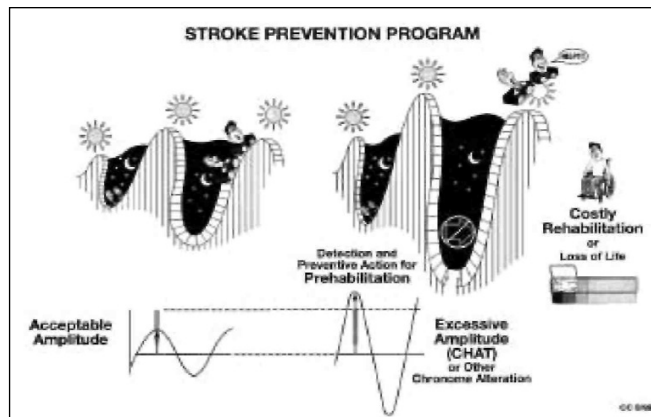
Graphic illustration of Editor's Note (40) conveying the desirability of assessing dynamic characteristics of change in blood pressure and in very many other variables. As a follow-up, the mayor of a city of about 34,000 wants to offer 7-day blood pressure and heart rate monitoring as a public service, comparable to safe streets and clean air and water. ©Halberg.

20th century scenario

Against this background, it may be understood why, a quarter-century ago, a keynote lecture at a Capri symposium, introducing the frst drug (Dutimelan 8 15) which carried timing (8 a.m. and 3 p.m.) in its name, was entitled "Protection by timing treatment according to bodily rhythms: an analogy to protection by scrubbing before surgery" [50]. Superfcially, scrubbing has nothing to do with chronobiology, except perhaps that the need for antisepsis, like that for acting, according to an interwoven time structure of rhythms, chaotic changes and trends (the chronome of each variable) was extremely slow to be recognized.

The present generation of patients and their physicians is beneftting from the availability of hygiene and antibiotics. For them, fortunately, the horror of wound infections in the pre-sulfonamide, pre-penicil-lin era is at best history. History, however, repeats itself, as it currently does in regions devoid of any antiseptic sup-

plies, with extreme, grimy destitution and famine. Such horrible contemporary mementos of a not-so-distant past notwithstanding, too many are apt to forget how long it took for asepsis and antisepsis to be accepted. Many amputations had to be done on limbs because of gangrene and on attitudes that had to be overcome: ignorance and, once this was overcome, inertia. The times are still diffcult for advocates, if not of the prevention of wound infections, then for those of chronobiology in the context of this chronobiologic scenario, even in the university where this science reportedly originated [51].

Entrenched attitudes are not easy to change. For too long, the suggestion to scrub was not heeded. Today it would be criminal negligence to fail to scrub before surgery. One of us (FH) along similar lines, many years ago, addressed the U.S. Food and Drug Administration (FDA) under the title "Ignorance, indolence; when will it become criminal negligence?" A commissioner of the FDA greeted the speaker as an apparent friend and assured our delegation of prompt action. His assistant commissioner, John Harter, appraised us that once the commissioner was alone with his staff, however, he decreed "business as usual," unaware that John, who had introduced alternate-day treatment with corticoids, was a chronobi-ologist *par excellence*! It was disappointing to learn of the actual failure of a seemingly successful mission.

Admonitions to take chronobiology into account and to exploit it much more often fall on deaf ears. Both the merit of antisepsis and of chronobiology were presented at prestigious meetings, including academies of medicine. Proponents of chronobiology have become academics. Nonetheless, this new discipline is taking a very long time to penetrate actual medical practice. The explanation may not be diffcult. Cleanliness before surgery, a much simpler concept, after Averroës had to wait eight centuries for Lister, before it became antisepsis. The quite conclusive and dramatic evidence of Semmelweis went unheeded for a long time. Sem-mel-weis stepped on many toes and did not live to see the full acceptance of antisepsis[2].

The resistance against chronobiology is also great. Chronobiologists cannot help but, by their mere presence, remind the establishments throughout medicine of *e pur si muove.* It matters little whether Galileo actually muttered "nevertheless it [the earth] does move" as he left the Inquisition. It matters greatly for a scientifc health care that we exploit the information within the physiologic range. We must do so before we become ill; we must overcome the inquisition of those teaching the "wisdom of the body" and the relative constancy of our internal milieu. Homeostasis sanctions limitation of our activities to offce hours 5 days a week. Chronobiology is much more demanding.

By 1933, Arthur Jores, subsequently co-founder of the Society for the Study of Biologic Rhythms (now the International Society for Chronobiology), eventually its president and also president of the German Societies of Internal Medicine and

Endocrinology, confronted with the suggestion to treat at meal times, referred to "this idiocy of *three times a day"* [52]. The merits of compliance by drug use at meal times notwithstanding, Gross in 1985 again preferred a time-targeted treatment [53]. He realized the need for a time-microscopic assessment of a variable such as blood pressure for a time-specifed diagnosis. Along the scale of 24 hours, systolic pressure changes on the average by over 60 mm Hg and diastolic by over 50 mm Hg each day. Gross also emphasized that it does not suffce to look at a curve on a graph or at a series of tabulated numbers in order to discuss the dynamics of blood pressure. The reactions to different stimuli have to be somehow separated from a basic statistically validated rhythm, gauged by some inferential statistical analyses for some reproducible features that characterize everybody.

To turn back to hygiene, eventually, attention to scrubbing has saved many lives in the delivery and operating rooms broadly. Many more lives, as well as horrendous suffering and enormous costs, may be saved if the mere risks of developing illness are detected early by an alteration of rhythm parameters, which may occur before the earliest signs of disease appear. A variable such as blood pressure can well show mean values within a "physiologic range", yet the dynamics of the variable are altered to an extent that they should and can be acted upon preventively. This is the more important since blood pressure deviations concern a large segment of the population and since blood pressure can be readily self-measured, although it is preferably automatically recorded.

In clinically healthy men and women, in the latter during pregnancy as well, "research in practice" has yielded invaluable new usual value ranges, chronodesms, specifed by clock-hour and, when pertinent, by gestational age. Chronodesms have already been mapped in Minnesota and can be used for the interpretation of single samples. Concurrently, reference intervals for a parameter pair, namely the amplitude and acrophase, measures of the extent and timing of predictable since rhythmic change are also available. On the basis of a statistically signif-cant alteration, warnings can be found and given for timely intervention whenever deviations from chro-nobiologic dynamic norms occur.

Acknowledgments

Footnotes
[1] **An original seminar** included in this paper was dedicated to the memory of Norberto Montalbetti, Professor and Head of the Department of Laboratories at Niguarda Hospital, Milan, Italy, and former President of the Section of Clinical Chemistry of the International Union of Pure and Applied Chemistry. Norberto was

an internationally active advocate of a human chronome (time structure) initiative, which he recognized as an endeavor required in its own right, and also visualized the complementarity of the human genome and chronome initiatives. The chronome, as the phenotypi-cal complement to the genome, adds to the latter a dimension of health; otherwise the genome initiative remains in its current home-ostatic straitjacket of focusing mainly upon the multitude of genetic diseases and upon clocks rather than also upon a time structure much broader than biological time measurement.

We also remembered several outstanding late medical administrators, chronobiologists themselves, and all former associates in research and/or friends.

Frederic C. Bartter (of Bartter syndrome), Head of the Hypertension-Endocrine Branch and thereafter Clinical Director of the Clinical Center at the National Institutes of Health (NIH), Bethesda, Maryland, USA;

Howard Levine, Director of Medical Education at New Britain (Connecticut, USA) General Hospital and Professor of Medicine at the University of Connecticut in Farmington. Both Fred and Howard were MESOR-hypertensive and, from the time FH frst had a chance to advise them, self-measured their blood pressure, not just for 7 days, as advocated only for people in apparent clinical health, but sever-al times each day until the ends of their lives;

Florian Delbarre, Professor of Medicine and President of the Université Rene Descartes in Paris, France;

Mortimer Lipsett, Director, National Institute for Child Health and Human Development, NIH;

Jacques Mirouze, Professor and Head, Department of Medicine, and President, University of Montpellier, Montpellier, France;

Kentaro Takagi, Head of the Department of Physiology and later Dean of Nagoya State University and a councillor in Japan's parliament, the Diet.

Among the living, three administrators helped make possible the start of a human chronome endeavor at the Chrono-biology Laboratories at the University of Minnesota:

Cherie Perlmutter, Acting Vice-President for the Health Sciences at the University of Minnesota during the span of the developments reported herein which underlie this position paper.

Duane Alexander, pediatrician and Director, National Institute for Child Health and Human Development, NIH, who, with Claude Lenfant, Director of the NIH's National Heart, Lung, and Blood Institute, overrode an insuffcient score for an application evaluated by colleagues who presumably take *the* (casual) blood pressure; and

Joseph Rigatuso, Associate Clinical Professor of Pediatrics at the University of Minnesota and Director of Research at Group Health Inc. (Minneapolis,

Minnesota), with whom we have presented a case which typifes the suffering and cost associated with the benign neglect of chronobiology.

In the intervening years, we also lost Jürgen Aschoff, Agostino Carandente, Rudolf Engel, Erna Halberg, Gunther Hildebrandt, Chris Künkel, Heinz von Mayersbach, Werner Menzel, Boris Nikityuk and Colin Pittendrigh, Betty Sullivan (Fig. 3), and Brunetto Tarquini. The feld reviewed herein owes all of them an indelible debt. Today's reductionist scien-tifc climate can hardly afford to ignore their integrative contributions and in particular the fact that, as a function of tim-ing, the same dose of the same molecule can inhibit or stimulate DNA synthesis [54]. We should know what time it is at all organization levels. On occasion, all of those named above must have felt as did Ignaz Semmelweis (1818–1865) as he completed his *magnum opus* on puerperal fever by writing: "If, God forbid, I should not reach the happy time when I can see with my own eyes, the acceptance of the prophylaxis of puerperal fever [read chronobiology], I shall be enjoying in the hour of my death the conviction that sooner or later this time will unquestion-ably come."

2 Semmelweis spent the fnal years of his life in an insane asylum. The sanity of one of us (FH) was also questioned in relation to the very studies that led him to coin "circadian" and eventually to the development of the new science, broader than biological time measurement, pertinent to any variable characterized by a ubiquitous circadian rhythm. In Minnesota in the early 1950s, the average period of the rectal temperature rhythm of blinded as compared to that of sham-operated mice in an around-the-clock record covering a few days deviated very slightly (by about half an hour) from precisely 24 hours. He interpreted this deviation as an index of the rhythm's built-in nature, as a new dimension of our make-up in time, now the chronome. He also realized that, apart from biological time measurement, he was at the threshold of resolving a terribly confusing, potentially ubiquitous source of vari-ation. If one of two groups being compared free-runs and the other was 24-hour syn-chronized, it can be seen in consecutive comparisons that for a while a given group is higher and thereafter the same group is lower than a control group at a given fxed time of day. These changes in the sign of an intergroup difference are unpredictable unless the free-run is recognized and the period assessed objectively by inferential statistical methods. Hence, FH decided to scrutinize this fnding further by continu-ing measurements around the clock for as many days or (as it proved to be) years as were necessary to establish the statistical signifcance and the degree of generality of the fnding. That decision to keep on measuring, based on an extremely small differ-ence, was originally labeled "paranoia" and caused the transient loss of his labora-tory. The "paranoia" was amply validated thereafter by studies continued for further years on end by many others as well as himself.

Semmelweis' superiors discontinued his position. Prior administrators at the

University of Minnesota never invested into a position for chronobiology and had nothing to discontinue. They accepted the support of the National Aeronautics and Space Administration (NASA), whose administrator, with his colleagues from the U.S. National Institutes of Health (NIH) and the U.S. National Science Foundation (NSF) brought about the Chronobiology Laboratories at the University of Minnesota that functioned as a *de facto* center fo r four decades. A few years before these laboratories' director reached retirement age, however, there was an attempt to block the continuance in support of chronobiologic activities of a lifetime career award from NIH (which NIH then spontaneously continued without any age limit). In 1987, a report on "Focus" suggested that chronobiology space be reassigned to clerical accounting staff. It is hoped that the parallel with Sem-melweis stops here.

Betty J. SULLIVAN, the frst lady of cereal chemistry and mentor of the time structure, the chronome, found in every variable in and around us, died in Bloom-ington, Minnesota on December 25, 1999, at 23:30. She had been in touch with her environment intellectually, was fully functional and well-cared for by family members and long-time friends including librarian emerita Alice Wilcox. Notwithstanding a progressive multifactorial lung disease with components of airway obstruction, a probable pulmonary embolism, following a hip fracture and a coexisting valvular heart disease, she continued to place her state on the map of cereal chemistry and beyond.

Betty Sullivan was born in Minnesota on May 31, 1902. As a budding chemist, Betty's undergraduate work for a bachelor's degree in chemistry set her professional course, starting with a thesis based on the polymerization of a bicyclic terpene hydrocarbon, prinene, found in turpentine oils and used as a solvent. Upon graduation, she was the frst woman to be employed as an assistant chemist at the Russell Miller Milling Company in Minneapolis. After two years of work, Betty pursued further education in biochemistry, receiving an international education scholarship from the University of Paris. She worked in the fermentation division of the Pasteur Institute, and also had the opportunity to learn from two-time Nobel laureate Marie Curie (1867-1934). After her return from Paris, as chief chemist at Russell Miller, Betty pursued further work in biochemistry, earning her Ph.D degree with a thesis on the lipids of the wheat embryo. She became expert in the development and marketing of products which use grains and/or seeds as raw materials. The determination of moisture and the organic constituents of wheat and four,

and their relation to gluten quality, were all within her interests, as was the isolation of glutathione from wheat germ and its effect on the oxidation and reduction of four. She became an authority on the chemistry of wheat proteins and the technology of baking.

In 1947, Betty became vice-president and director of research at the Russell Miller Milling Company, and when her frm merged with the Peavey Company in 1958, assumed the same position at Peavey, being responsible for development, market research and process engineering of new foods and chemical derivatives for proteins and sugars. When Betty reached the mandatory retirement age at Peavey of 65 years, she helped found a consulting frm, Experience, Incorporated, where she assembled corporate executives and retired university professors, consulting through the Agency for International Development and the World Bank for developing countries as well as for corporations in the feld of U.S. agribusiness. Many more details are available in a biography written by Marilyn McKinley Par-rish, who notes that Betty's greatest satisfaction came from discovering "something no one knew before, in my own case, the fnding of the presence and identifcation of glutathione in wheat germ, and its effect on four properties".

Erna Halberg, Franz's loving wife and former research associate in our laboratories, had worked with Betty and published in cereal chemistry. A lifelong friendship developed on this basis. Betty became a family member, and we learned of her many humane as well as scientifc qualities by her ongoing critiques of the new discipline of chronobiology. Sometimes, she did not see where new pieces of the jigsaw puzzle ftted. She was supportive nonetheless, when she found that our interests had "changed" to something else, and eventually saw the broader chronome picture.

If we seek to draw a parallel with Marie Curie, Betty wrote extensively in a new feld, as did Marie Curie. Betty and Mme. Curie lived in overlapping but greatly different times: While Mme. Curie declined to patent her processes or otherwise to proft from the commercial exploitation of radium, Betty held the patent on a four improver, on accelerated moisture conditioning and milling of grain, and on a method of obtaining protein-rich four. She did in her feld what Alexander Graham Bell and Guglielmo Marconi did in theirs. De gustibus ...

Betty was an honorary member of Iota Sigma Pi, the society of women chemists. She was on the front cover of Chemical and Engineering News in 1948 (report of award in June 14 issue; cover story July 12) when she received the Thomas Burr Osborne Medal of the American Association of Cereal Chemists. In 1953 she was the recipient of the Outstanding Achievement Award from the University of Minnesota. In 1954 she was awarded the Garvan Medal of the American Chemical Society, and was again featured on the cover of Chemical and Engineering News (March 22). Among her many other professional distinctions,

Betty was President of the American Society of Cereal Chemists in 1943-1944; chaired the Minnesota section of the American Chemical Society in 1950-1951, and served on the boards of the Journal of Agricultural and Food Chemistry, of Cereal Chemistry, and of Biological Abstracts.

With the undersigned, she participated in the demonstration that a calorie is differently handled at breakfast as it is at dinner. Although she did not accept co-authorship, Betty contributed substantially in design, analysis and critique as well as by arranging for the funding of this work. From 1988 through the end of 1999, Betty's generosity helped bring to fruition 976 published titles (and more still in preparation), many of which specifcally acknowledge the support of the Dr. Betty Sullivan Fund. Betty

was the center of attention when visitors from around the world learned from her, whatever their topic of specialization may have been. She commented on their work mostly in English, but was also fuent in French and understood German and Spanish.

Those like Betty who enable and foster the work of many and guide international developments, aiming for a better world with food for everyone as well as clothing, housing and health, are few and invaluable. Albeit they are scientists in their own right, they bat for much more than hard science. Betty Sullivan's sincere, deep interest and ever-willing helping hand touched on many topics. In particular, she advocated a budding chronobiology and chronomedicine, that splits and enters the range of everyday physiology, in which earliest

disease risk elevation can be detected and acted upon before catastrophic disease occurs. One of her legacies is the chronobiology center at the University of Minnesota, which she helped to bring into being. Chronobiol-ogists can only express gratitude which Betty, upon accepting the Osborne Medal, described as "the memory of the heart", wherein, far beyond being the board member of the Chronobiology Center, she was a friend and adviser to all. When Erna died in 1993, Betty wrote that "the world is a better place because of Erna". The same can be said of Betty. A laudatio in 1948 concluded: "What is going to happen to Betty Sullivan couldn't happen to a nicer (or a more worthy) person" (in the context of the Osborne Medal). The ffty-one intervening years by far extended this statement. As stated on the cover of Chemical and Engineering News on July 12, 1948, "She Analyzed the Wheat and Improved the Flour", and in the interim did much more in human relations as well as in science for a less hungry world.

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◀ INFLUENCE OF UV RADIATION ON OXIDATION – REDUCTION TRANSFORMATIONS OF SYTOKHROME b-559 AND OUTPUT H$_2$O$_2$ IN PHOTOSYSTEM 2

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In connection with environmental problems, with anthropogenous of an ozone cloud, etc.last years UV radiation draws attention of many researchers. From this point of view studying of influence UV radiation on plants, on their photosynthetic device is of great importance. As the photosystem 2 (PS 2) is the most sensitive macrocomplex of the photosynthetic device, we have considered influences of this factor on PS 2 and its separate components. Studied influences of UV radiation on sytokhrome b-559 in PS 2. It is known, that this fiber has two functions. The first function consists that on PS 2 or at weak functioning akseptor parts PS 2 sytokhrome b-559 transfers to action of light electron on donor part. Other function of this fiber consists that it can participate in reactions of allocation of oxygen in donor parts.

We conducted experiments by G.M. Ananjeva's method [1]. Allocated subchloroplast particles of PS 2 10 minutes adapt for darkness, then in ditches put in a special place in phosphoroskope. Measuring light (λ = 559 nm) falls on object through monochromator MDP-2. Photoelectronic multiplier (PEM) marks a signal of sytokhrome. Then we subject PS 2 on action of working white light. It is necessary to note, that intensity of white light in 100 times more intensity of λ = 559. We consider a kinetics of sytokhrome (fig. 1). Right after submissions of working white light sytokhrome it is restored through 20 sec. Action of light we stop and we include light through 60 sec.

At this time we notice oxidation of sytokhrome. Experiments show, that sytokhrome b-559 is rather steady to UV to an irradiation. As, even at 30 minutes an irradiation there are oxidation-reduction transformations. However, oxidation-reduction transformations depend on a doze of an irradiation and a dark – light mode. It is proved with experiments which are shown on fig. 1 and 2. On figure 1 oxidation-reduction transformations sytokhrome b-559 the ambassador dark irradi-

ations are shown. Apparently on figure here it is considered kinetic control object and objects irradiated by lamp PRK-2 accordingly 1min, 5min, 10 min, 20 min and 30 min (through filter UFS 2).
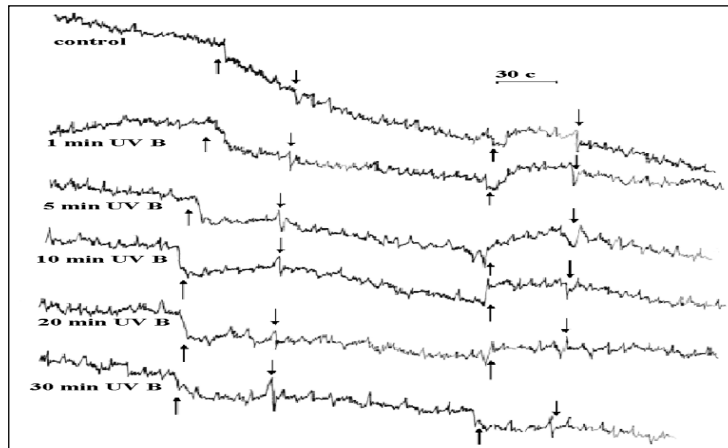
Figure 1. Reduction – oxidation transformations of sytochrome b-559 after an irradiation different dozes of UV in darkness. ↑ and ↓ shows inclusion and deenergizing of working white light accordingly.

Apparently 1 minutes accelerates an irradiation kinetic restoration in comparison with the control. At increase of a doze of an irradiation in kinetic restoration of sytokhrome increase and lowering is observed. In figure 2 are shown oxidation-reduction transformations of sytokhrome after an irradiation on light. Here too, apparently the irradiation accelerates speed kinetic restoration and increase of speed here more than in darkness.
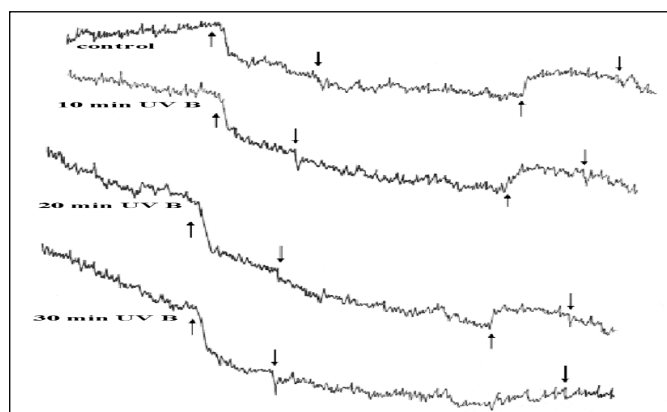
Figure 2. Reduction – oxidation transformations of sytochrome b-559 after an irradiation different dozes of UV on light. ↑ and ↓ shows inclusion and deenergizing of working white light accordingly

On R.I. Khalilov's works [2,3] for ecological UV beams (290-330 nm) the role of a chromophor- sensitizer is played with molecules of quinone, is especial it semiquinone the form. At illumination of the photosynthetic deviceby white light as a result of functioning the elektron-transport circuit concentration the semi-quinone forms of molecules quinone grows. There are reactive oxygen species (ROS). And it accelerates the destruction processes. After investment electrons with the help of sytokhrome b-559 are spent in donor part FS 2 (fig. 3).

Except for it we studied definition of one of forms ROS – peroxides of hydrogen (Í $_2$Î $_2$) in FS 2 and dependence of its exit from subchloroplast particles from doze UV of an irradiation.

For this purpose the reactionary system of luminole-peroxidase has been used.
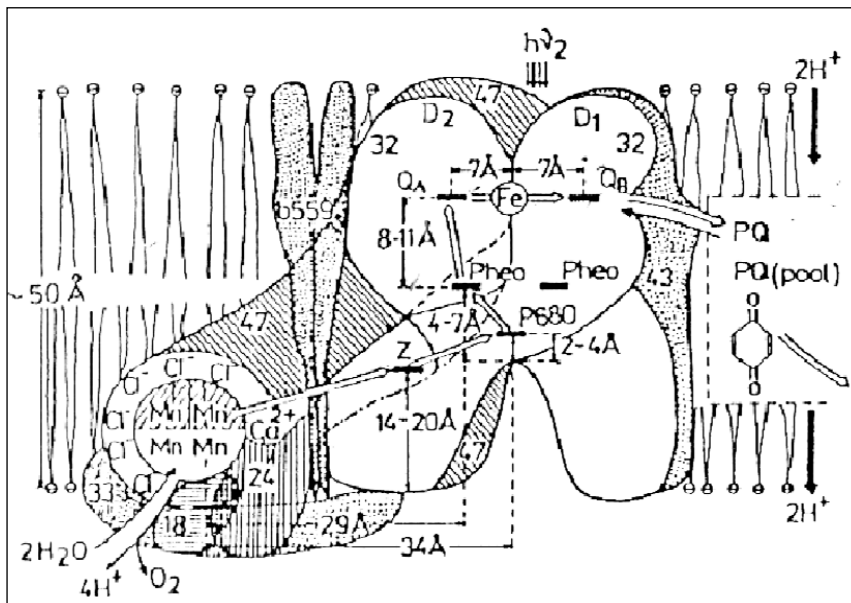
Figure 3. Suggested localizanion of the PS 2 components in the thylakoid membrane

Hemilunisensy of luminole with λ_{makc} = 450 nanometers registered with the help of high-sensitivity installation with photo multiplier FEU-128 in horizontal a ditch in volume of 1 ml [4,5]. The reactionary environment contained 15 mkl luminol and 10 mg peroxides in 30 mm the Hepes bufer, pH 8. In experiments objects have been irradiated in darkness and on light (fig. 4). Curves hemiluminise-tion compared to control curves. Apparently on figure at an irradiation on light amplitude of a signal higher. And also with the help of system luminole-peroxides

in irradiated UV light subchloroplasts particles PS 2 observes increase of signal strength hemiluminisetion. During an irradiation in a light mode at increase of doze of UV radiation exit H_2O_2 from particles PS 2 becomes more intensively.

By results of our experiments it is visible, that ecological UV beams (290-330 nm) operating on quinine molecules Q_A and Q_B on acceptor parts PS 2 subject them on different changes. At interaction with molecular oxygen in the excited condition are generated ROS and it causes the following processes of destruction. It is probable, that destruction occurs in donor parts, functioning water-oxidizing systems decreases. And it causes once again generation ROS. In result concentration of one of steady ROS – peroxides of hydrogen grows also we it we notice on our experiments (fig. 4). At action of white light by the photosynthetic device semiquinone forms of quinine molecules grows and as a result UV irradiations ROS become more. It is caused by increase of a signal hemiluminisetion of luminole (fig. 4).

On the basis of the literary data [6,7] and results of our experiments it is possible to generate such idea, that PS 2 is more sensitive to factors much stress, including to UV to an irradiation.
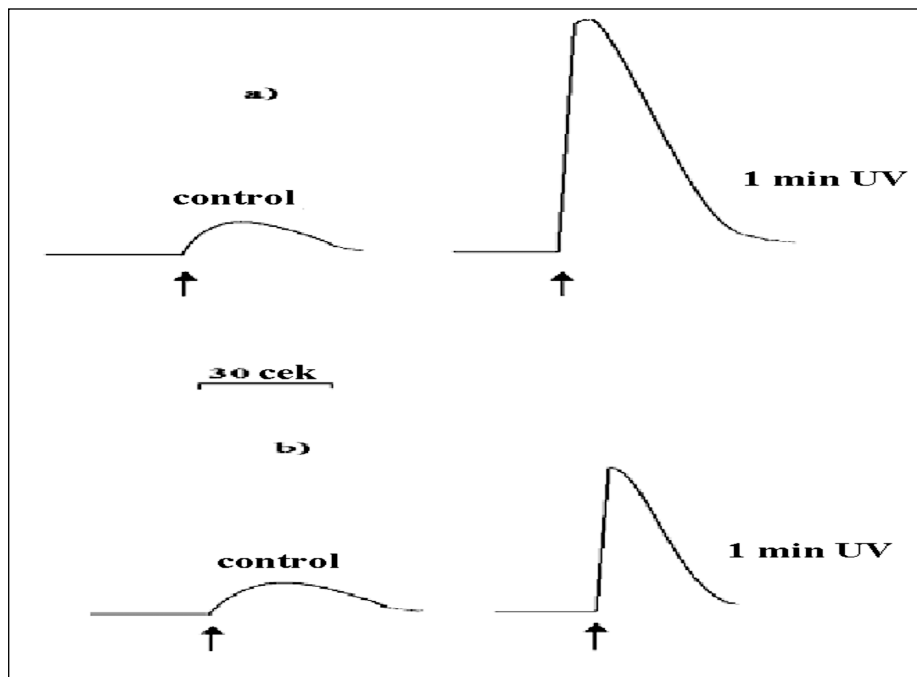
Figure 4. Experimental curves of hemiluminesseysy of luminole and peroxides;
a) particles PS 2 irradiated UV on light, b) particles PS irradiated UVin darkness

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◄ THE THEORY OF FUNCTIONAL SYSTEMS AS A BASIS OF SCIENTIFIC WAYS TO COPE WITH EMOTIONAL STRESS

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The systemic approach has become widely used not only in biology, but also in other fields of science, such as mathematics, philosophy, sociology, economics, psychology and others.

In the 1960's a Canadian biologist L. von Bertalanffy formulated a theory of biological systems, describing them as an "arrayed multitude of inter-linked elements" [2].

At the same time, the very notion of "system" introduced by L.Bertalanffy and his followers, as well as the general theory of systems developed by them, did not give the answer to the question of what caused individual elements to form systemic entities.

Being an "arrayed multitude of elements", the above mentioned systems do not actively function and present just only a multitude of inter-connected phenomena.

Thus, the very concept of a system needed a more profound specification of its properties, operational architectonics, and, primarily, its system-forming factor that would transfer an arrayed multitude of actively functioning elements on the level of a functioning system.

The concept of "a functional system" formulated by P.K.Anokhin (1935) perfectly complied with the requirements [3].

Functional systems are dynamic, self-organizing and autoregulatory central-peripheral organizations the activity of which is aimed at achieving adaptive results useful for the system and the organism as a whole.

A multitude of useful adaptive results that form different functional systems are present on metabolic, homeostatic and behavioral levels defining optimal for vital activity metabolism and adaptation of the organism to the environment [4].

There are two principally important features that make the Anokhin theory of functional systems essentially different from the general theory of systems developed by L.Bertalanffy and his disciples. They are the following:

1. Useful adaptive results, which are system-forming factors in functional systems and play a crucial role in the process of multi-component association into functional systems providing various manifestations of the organism's adaptive activity.

2. Dynamic, operational architectonics with compulsory reverse afferentation signaling into the central nervous system from the result of its activity.

Functional systems of any organizational level have a similar structural design and include the following common and shared by different systems peripheral and central principal mechanisms: 1. Useful adaptive result as a main functional system component; 2. The result's receptors; 3. Reverse afferentation coming from the result's receptors into the central units of the functional system; 4. Center representing nervous elements of different level selectively associated by the functional system into special system mechanisms; 5. Executive somatic, autonomic, immunologic and endocrine components including organized goal-directed behavior (Fig. 1). Since in principle different functional systems of the body are uniformly designed, they are rightly considered to be isomorphic [4].
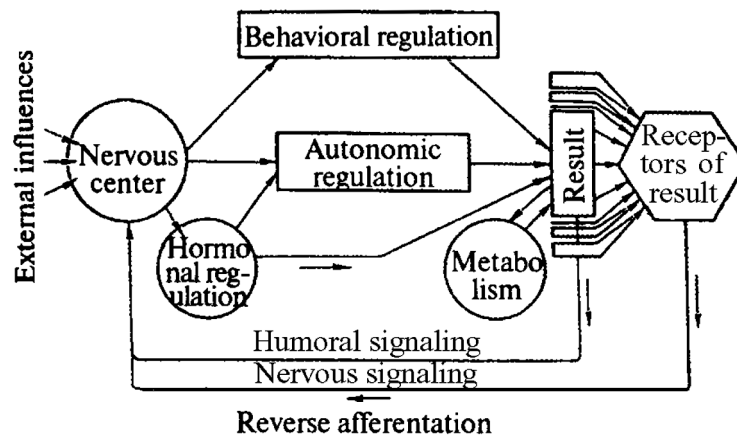
Figure 1. General scheme of Anokhin functional system.

In functional systems of behavioral and psychic levels of organization, the external link of autoregulation is dynamic environment-oriented behavioral activity of living beings aimed at the environment adaptation in accordance with body needs and at the achievement of behavioral results able to satisfy corresponding body needs and eventually to secure its survival. Therefore, the environment naturally participates in the activity of many functional systems of the organism. Only through body interaction with the environment these functional system acquire the results beneficial for the organism.

In a functional system, every shift of result as well as its optimal for the metabolism level is continuously perceived by corresponding receptors. Signals

("reverse afferentation" according to P.K.Anokhin) born in receptors come to the corresponding centers and selectively involve various level elements into the given functional system in order to give rise to its executive activity and thus restore the result needed for metabolism.

Reverse afferentation is the background of autoregulatory processes in any functional system.

Excitation of nervous centers occurs in a functional system of behavioral and psychic levels of organization on the basis of reverse afferentation presented by nervous impulses and humoral effects from the result.

The concept "reverse afferentation" was introduced into physiology by P.K.Anokhin 12 years before N.Winner, who as is well known has formulated the notion about "feedback".

Through formulating the notion of "reverse afferentation" P.K.Anokhin established a recognized priority in the field of living beings' cybernetics.

Independent of its structural complexity, any functional system has similar central architectonics. Central architectonics of the functional systems includes the following principal stages consecutively replacing each other: afferent synthesis, decision making, acceptor of action's result, efferent synthesis, and, finally, assessment of the achieved result [1] (Fig. 2).

The structure of behavioral level in functional systems is similar. The initial stage in the structure of behavioral level of a functional system is **afferent synthesis**. At this stage, the central nervous system experiences the synthesis of excitations caused by inner metabolic need, by environmental and trigger afferentation, with constant utilization of genetic and individually acquired memory mechanisms. The afferent synthesis stage terminates with a **decision making stage**, which physiologically restricts the functional system activity freedom rate and selects the only effector action line able to satisfy the leading organism's requirement formed at the afferent synthesis stage.

The next stage in the dynamics of consecutive central architectonics development taking place simultaneously with effector action formation is the stage of predicting the required result of the functional system activity, i.e. the **acceptor of action's result**. At this stage of the functional system central organization, the programming of the principal parameters of the required result and their constant assessment based on reverse afferentation of the achieved result parameters takes place. When a significant result satisfying the initial organism need is achieved the activity of the functional system decreases. And vice versa, if the achieved result parameters do not correspond to the parameters of the acceptor of action's result, there occurs a mismatch, i.e. orientating searching reaction; afferent synthesis is restructured, a new decision is made, and the functional system follows in a new direction required for the initial need satisfaction.
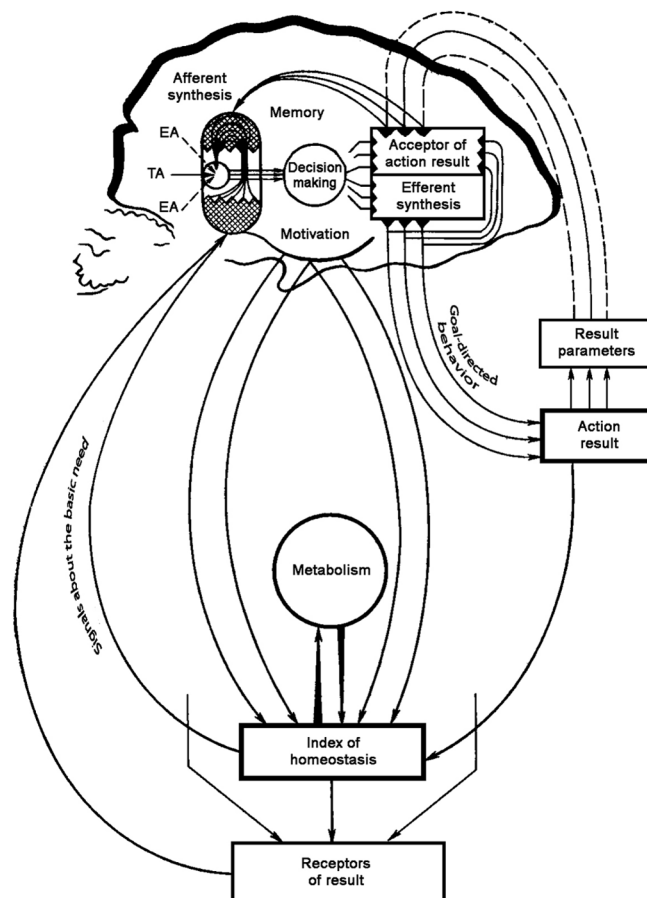
Figure 2. The central architectonic of functional system.
EA - environmental afferentation; TA - trigger afferentation.

Effector action is preceded by the efferent synthesis stage, when an executive act is center-formed as a certain central excitation complex and is not accomplished peripherally as particular actions.

All stages of achievement of organism-beneficial results and their various states are continuously assessed through reverse afferentation. Reverse afferentation arises when respective receptors are stimulated by result parameters and via respective afferent nerves and humoral factors arrives in structures forming the acceptor of action's result. If reverse afferentation bears no valuable information concerning the optimal result level, the nervous cells of the acceptor of action's result are excited, a new afferent synthesis takes place and a new action occurs.

The number of functional systems reflecting various aspects of the whole organism vital activity is extremely high. The activity of some functional systems

affects different characteristics of the organism's internal milieu – homeostasis, and the processes of homeokinesis leading to it. Other functional systems through their activity modify living beings' behavior, their interaction with the environmental and social factors to pursue different forms of social activity, for instance, to start a family, to organize household and place of work. Finally arises the need to build the society in the best possible way, and so on. Organism's functional systems of different levels are shown in their hierarchic relations [5].

Each functional system presents a dynamic autoregulatory organization. The central point of functional systems found at different organizational levels is an organism-beneficial adaptive result. Any deviation of the result from the level ensuring normal life of the body is immediately perceived by receptor mechanisms and by way of nervous and humoral reverse afferentation special central mechanisms are selectively engaged. By these executive means, including behavior, the latter mechanisms once again bring the useful adaptive result to the level necessary for normal metabolism. All these processes go on continuously while the functional system center is permanently informed of the successful achievement of the useful adaptive result, i.e. in compliance with the autoregulatory principle.

Dynamics of the work of functional systems of different levels of organization: metabolic, homeostatic, behavioral and psychic is built by discrete "system quanta". Every system quanta is formed by the initial need and aimed at satisfaction of that need [8] (Fig. 3).

Figure 3. The system quantum of behavior.
R_1-R_6 – *interim behavioral results, satisfying (+) and unsatisfying (-) the initial need.*

System quanta are disclosed externally by the results of satisfaction of organisms needs.

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System quanta may be recognized at different levels of life activity. These levels extend in their hierarchy from genes and functional systems of autonomic regulations to zoo-social populations of animals and societies of people.

System quanta of a human behavior and mental activities are organized through interaction of a dominating motivation and other components of central system architecture: acceptor of action results, goal-directed behavior, intermediate and final results satisfying or, on the contrary, not satisfying initial needs of the organism. Every result of a system quanta is valued by acceptor of action results with the help of return afferentation which leads to dynamic reorganization of central architectonics of the respective functional system (Fig. 4).

Figure 4. Dynamics of evaluation by acceptor of action results of intermediate and final behavioral results.

A conflict situation when the subjects can not satisfy their basic needs in order to achieve the essential results generates a psychoemotional stress which leads to disorders in the most debilitated functional systems of a human. At first the intersystem connections and then the mechanisms of selfregulation of the most debilitated functional system are violated. As a result emotional stress leads to different psychosomatic disorders [5].

Our long lasting experiments on animals showed that psychoemotional stress brings about primary changes in neurochemical properties of brain and only then, as a secondary, in particular, peripheral axis – hypophysis – adrenals, discovered by H.Selye, comes into action.

Scientific-technical progress, social, ecological and military conflicts for sure lay the foundation for psychoemotional stress in humans.

Most of their lives people spend at work, where a person is often exposed to stress loads. Some factors may cause emotional stress, among them: excessive technological demands to workers, poor control of the technological situation, in particular, impossibility to improve or change production process, low level of

social support and, finally, the limited psychological and physiological abilities of workers.

Daily psycho-emotional stress at work leads to dysfunction i.e. to violation of physiological rhythms, impermeability of tissue barrier and mechanisms of self-regulation of physiological functions. Under sustained stress loads these dysfunctions summing up transfer into various psychosomatic diseases. Therefore an early diagnostics of dysfunctions caused by stress is important for prevention of psychosomatic diseases in humans.

Production rhythm set by technological process is most significant.

In case a technological rhythm corresponds to the biological rhythms of different functional systems when physiological abilities of workers are adequate to production requirements the workers demonstrate good production results. When physiological functions of people at work do not correspond to the rhythm of the productive activity (set by technological process), when there is no harmony between the rhythm of a productive activity and that of physiological parameters the workers experience psychoemotional strain. In this case, as a result of conflict between production requirements and human physiological capacity, psychoemotional stress arises, which develops into a steady form at certain stages. At first, the links between separate functional systems are violated, temporary impairment of individual functional systems appear and then these dysfunctions transform into pathological cases and various psychosomatic diseases: different kinds of neurosis and psychosis, immunodeficiency, hormonal dysfunction, cardiovascular disorders, ulceration of the gastrointestinal tract, and others (Fig. 5). Production injury rate also increases. The theory of functional systems, oriented to the useful for the organism and, in particular, socially significant results, opens new perspectives for early diagnostics of stress.
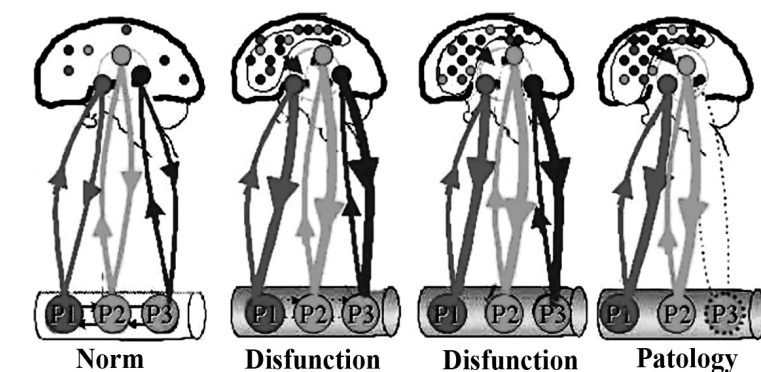
Figure 5. Dissociation of functional systems links under stress.

In order to achieve social results the functional systems of workers of metabolic and homeostatic levels unite into complex hierarchic, multi-parametric and

successive interactions. Their coordinated activity determines the optimal psychological state of a subject at work and thus allows the subject to achieve socially significant productive results.

The theory of functional systems shows new approaches to estimation of emotional stress in humans at work.

According to this theory any production activity of a person can be divided into separate resultant "system-quanta", at that, every system-quantum is determined by a cumulative activity of functional systems of behavioral and homeostatic levels. Every system-quantum includes: the origin of this or that biological and social need, formation on its base a dominant motivation and due to achievement of intermediate and final results terminates in satisfaction of that need (Fig. 6).
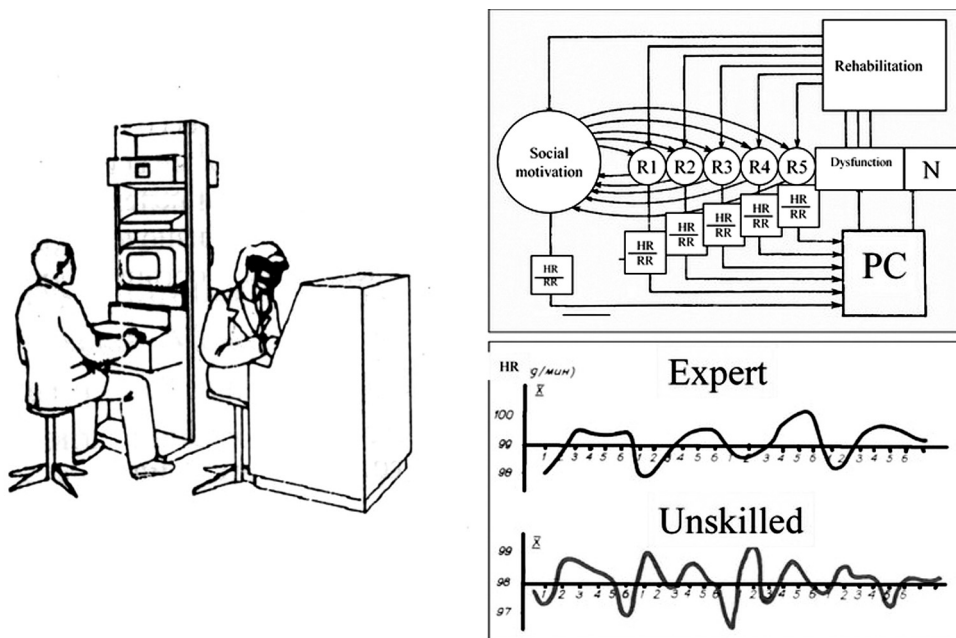
Figure 6. Automatic system of physiological functions assessment on the working place.

The estimation of system physiological parameters at work in accordance with the results of the workers' activities is performed by contact or telemetric method according to intermediate and end results of system-quanta in production activity.

The so-called "physiological price" of system-quanta of the production activity of some workers is defined by the changes of respiration and heart rates, muscle activity, skin-galvanic reactions and other parameters, registered during the work. Our observations showed that the coefficient of correlation of heart and respiration rates in this case reliably reflected the state of psycho-emotional stress in workers [6].

The investigations showed pronounced individual variations in the physiological parameters which are responsible for the fulfillment of typical production system quanta in different workers. The most vividly the individual variations of somatic providing of system-quanta of workers' productive activity manifest themselves as changes of regularity in respiration and heart rhythms and their synchronization. It made possible to single out two groups of workers. The first group exhibited close cross-correlation of heart and respiration rhythms with production results. The second group showed asynchronism in heart and respiration rhythms and the lack of their connection to the results of the productive activity. The workers of the 1st group comprised 20% and those of the second group – 80% of the tested population.

As a rule the 1st group consisted of high skilled workers and system-quanta of their productive activity on the whole corresponded to the technological rhythm. The workers whose heart and respiration rates were well correlated and corresponded to intermediate and final results of "system-quanta" did not manifest any psycho-emotional stress or fatigue and showed good productive results. The workers whose heart rate and respiration rate were not synchronized and did not correspond to the intermediate and final results of system-quanta of productive activity complain of psycho-emotional stress and fatigue. Many days' ECG monitoring registered arrhythmia and extrasystoles in that group of workers. They showed low productivity, higher morbidity rate and often retired prematurely despite their high motivation for work.

The test data indicate that the theory of functional systems opens up new prospects for determining the "physiological price" of resultant system quanta at workplace and for identifying emotional stress at workplace on the basis of correlation between rhythmic cardiac activity in agreement with the rhythm of production process.

Our observations testify that psycho-emotional stress appears at work in all those cases when physiological functions of a worker do not correspond to the rhythm of production activity set by technological process, when there is no harmony between the rhythms of the main physiological parameters and the rhythms of the productive activity and synchronization of heart rate and respiration rate is disturbed.

These data show that badly trained workers having a low value of correlation coefficient of heart and respiration rates in accordance with the results of their production activity showed a psycho-emotional stress. To the workers who vividly manifested psychoemotional stress at work we successfully practiced some methods of non-medicamental rehabilitation [6, 8].

The estimation of physiological parameters in workers at a work place and the corresponding procedures of rehabilitation serve as an additional link in selfregulation of functional systems (Fig. 7).
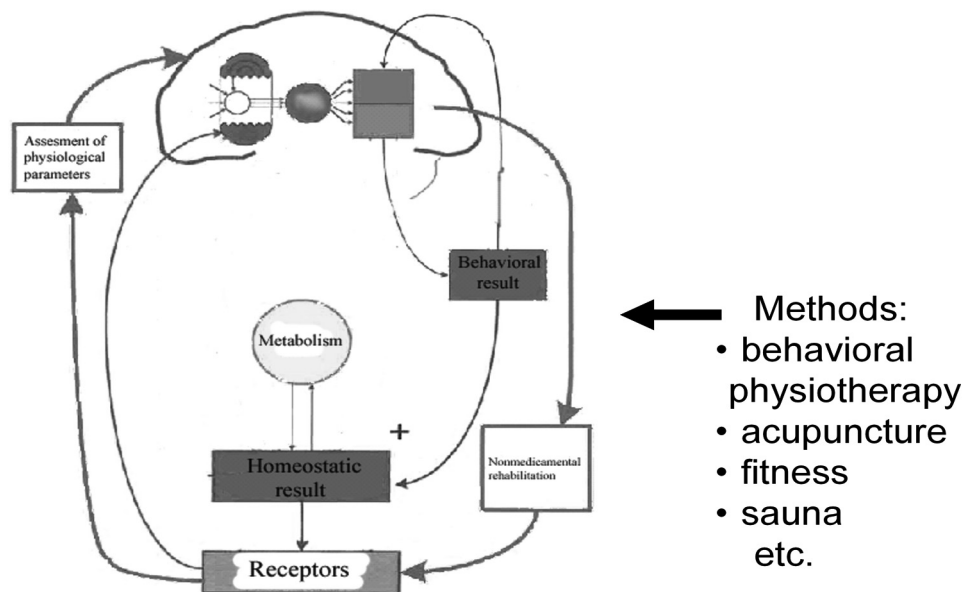
Figure 7. Additional link of selfregulation of functional system.

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ECOLOGY AND ENVIRONMENTAL PROTECTION

◀ THE NATURE-CULTURE-HEALTH INTERPLAY: FROM ENVIRONMENT QUALITY TO QUALITY OF LIFE

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Abstract

Introduction. Recent research points at significant impact of social and physical environment on the public´s health and quality of life. Sickness absence and disability pensions are indicative of defects in lifestyle and community interaction. Nature-Culture-Health, an organization started by G. Tellnes in 1994, has developed a community-based initiative in Asker, Norway, where participants, many of whom are long-term certified sick, are offered participation in a programme of health promoting (salutogenic) activities.

Aims. To evaluate health, quality of life and function among participants` included in a programme of community-based Nature-Culture-Health activities.

Methods. A qualitative evaluation study in 2003 included 30 men and 16 women aged 30-79 years old participating in 12 different health promoting activities at the 'Nature-Culture-Health Centre' (NaCuHeal – activities).

Results and comments. Around 2/3 of the informants reported to have improved their health status, quality of life and function, particularly when given

opportunity to utilise their own abilities and creativity. Belonging to a themed group seems to play a significant role in increasing their self-efficacy and self-esteem. A majority of the participants reported improved health, quality of life and function to return- to-work due to their experiences in the NaCuHeal-groups. Increasing the population's participation in health promoting outdoor and cultural activities seem to be a useful method to enhance complete rehabilitation, environment quality and quality of life.

Conclusion. The results of this article indicate that the Nature-Culture-Health approach to salutogenesis in Norwegian municipalities can improve the population´s health, quality of life and function.

Introduction

Public health research and practice should focus not only on factors causing disease and injuries (pathogenesis), but also factors promoting health (salutogenesis) in the perspective of health promotion and prevention in different settings. Already a half-century ago the great hygiene researcher Werner Kollath observed that civilization- or lifestyle-diseases, which have already in his time taken the lead, require a new approach to healthcare (Kollath, 1982). As Robert Putnam has observed, many of our new health hazards are found in disintegrating 'social capital' with all its implications (Putnam, 2000). Tomorrow's society will probably focus more on that which strengthens health, namely the salutogenic (health causing) factors (Antonovsky, 1987).

The shaping of health promoting settings at work, in hospitals, in schools and in local communities, therefore has been significantly supported by the World Health Organisation. Health promotion requires partnerships for health and social development between the different sectors at all levels of the community. New health challenges mean that new and diverse networks need to be created to achieve intersectoral collaboration in order to improve social and physical environment and the population´s quality of life.

Health promotion is carried out *by* and *with* people, not *on* or *to* people (WHO, 1997). It improves both the ability of individuals to take action, and the capacity of groups, organisations or communities to influence the determinants of health. "Settings for health" represent the organisational base of the infrastructure required for health promotion. New health challenges mean that new and diverse networks need to be created to achieve intersectoral collaboration. Such networks should provide mutual assistance within and between countries and facilitate exchange of information on which strategies are effective in which settings.

Partnerships for health promotion and new and diverse networks have been created to achieve intersectoral collaboration in a local community in Norway (Tellnes, 2003). The aim was to create a common arena and forum for wholeness

thinking and creativity, in order to improve environment, quality of life and health among people in the local community (Tellnes, 1996). The challenge was to get various interest groups, i.e. public agencies, private businesses, voluntary organisations and pioneers to co-operate in order to develop the idea to be realised in health promoting settings. The center described below is now one of the official partners of public health at the county level as well as the municipality level.

Lately, current public health debate has focused upon a new understanding of concepts such as 'health' and 'quality of life' (Batt-Rawden and Tellnes, 2005). Increasingly more emphasis has been put on lifestyle and cultural activities for maintaining health and 'quality of life' (Konlaan, *et al.,* 2000). In contrast to much clinical oriented research, whose main preoccupation is 'pathogenesis', i.e. why we become ill, Antonovsky seeks to trace our general resources of resistance against disease. We may mobilize these resources against disease, as they are present in all of us, possibly in various degrees. In conceptualising these resources Antonovsky suggests three main components: When life is felt comprehensible, manageable or meaningful, people feel coherence and continuity in life. To put it simply, this sense of felt coherence and continuity seems to favour resistance to disease. A salutogenetic perspective means to emphasis factors contributing to health and well-being or what predicts to a good outcome (Antonovsky, 1987, 1996).

Nature-Culture-Health Activities (NaCuHeal)

Every individual will through different group activities experience that e.g. dance, music, physical activity, painting, nature walks, hiking, gardening or contact with pets give an indirect effect with feelings of zest for life, inspiration and desire for rehabilitation. The participants can choose themselves which activity they want to engage in, and individuals do sometimes participate in several activities during a week, for example painting, nature walks and choir practice. There are usually about 12 ongoing health promoting group activities each week, which are scheduled for about two hours each. The activity groups are led by professionals e.g. musicians, artists, teachers or health workers according to the themed group or the group leaders may have been recruited from participating in one or several groups themselves for a longer period of time. The NaCuHeal centre has about 400 people participating in different activities during one week. For persons long- term certified sick for more than eight weeks, this may be a method for rehabilitation and return-to-work (Tellnes, 1996, Pauswang, 1999).

The direct route through vocational rehabilitation may be of help to some people. For others, however, it may be necessary to take a more indirect and creative route to succeed in their rehabilitation, i.e. to practice and participate in NaCuHeal activities for later to achieve a more useful and active existence.

The purpose of NaCuHeal-activities as a method of rehabilitation

At the National Centre for Nature-Culture-Health in Asker, a municipality west of Oslo, there have since 1994 been several experiments where people long-term certified sick, in rehabilitation or other social security clients have been helped to find their own talents and capacity for work to maintain function and pleasure in work. The physicians, psychiatrist or health professionals often refer the long-term certified sick to the centre, though this is a voluntary referral. Some people take their own initiative or are recommended by friends to contact the centre. The most typical diagnoses are muscular diseases, closely followed by psychosocial problems, i.e. anxiety, depression, chronic fatigue or stress-symptoms from a severe burn-out. A general picture though is that diagnoses, illnesses and diseases are not a recurrent theme in discussions, and are only introduced as a theme if participants themselves initiate such topics. At the Nature-Culture-Health centre it is desirable with participation and positive interactions between persons of all ages, health status, philosophies and social positions. The idea is that such a meeting place between practitioners and theorists between the presently well and the presently not so well, will be stimulating and enlightening to most people. Through participation in Nature-Culture-Health groups the individual will find the opportunity to bring to life his or her own ideas and by emphasizing positive and creative activities outside one self. Persons with different health problems may forget their health related and social problems for a while. The NaCuHeal activities may nourish other sides of one's personality that may also need development, attention and strengthening, to prepare for community and new social networks (Tellnes, 2003).

The concept of Nature-Culture-Health is based on the idea of stimulating to wholeness thinking and creativity within the Nature-Culture-Health interplay by emphasizing (Tellnes, 1996, 2004, Karaberg *et al.,* 2004):

· Nature, out-door life, and environmental activities.
· Culture, art and physical activity and diet.
· Health promotion, prevention and rehabilitation.

The intention is to:

· Increase participant's own empowerment and participation in activities in relation to strengthening their own health, quality of life and function.
· Create a growth in social networks that are encouraging and stimulating.
· Motivate to work ability and to explore ways of coping in day-to-day activities.

Aims of this evaluation study

There are two aims of the present paper:

· To evaluate health, quality of life, and function among participant's of Nature-Culture-Health activities in the local community.

· To investigate if, how and why participation in such activities effects folk's own subjective perception of health and well – being.

Method

The Nature-Culture-Health Centre (NaCuHeal) in Asker in the county of Akershus conducted in collaboration with Akershus University College in Southern Norway, a qualitative evaluation study in 2002, analysing the benefits of health and wellbeing of participants in different group activities. A total of 30 men and 16 women aged 30 – 79 years old participated voluntarily and were interviewed about an hour each by using a semi-structured interview guide. All informants were analysed according to group attendance, duration, regularity and social background, subjective opinions and beliefs. Patterns, tendencies and main characteristics have been explored and main results are presented through typical quotations from the informants, apart from general background variables being quantified. Several informants had been participating in more than one activity group.

This qualitative study had an explorative approach to a field where there seems to be very little data. In this case, it was of great importance to work with the research targets through the whole research process. This research aims to include the participants' own subjective opinions, life experiences and life-worlds. Quality of life is a subjective concept (Bue-Bjorner *et al.,* 1996). It is of very little help if professionals inform and confirm that their goal has been reached, if the persons involved have a different opinion (Harter,1999, Laverack, 2004). The word qualitative implies an emphasis on processes and meanings that are not rigorously examined or measured in terms of quantification, amount, intensity or frequency. In this way, data from this study might provide important insights and knowledge. Though it is vital to bear in mind that qualitative research methods are still in a developing phase, they give flexibility, empathy and sense of wholeness to the field setting. They can also give a deeper and hopefully clearer understanding of the participants' subjective opinions, actions and behaviours in the everyday social world (Schensul *et al.,* 1999, Spradley, 1979).

The Regional Committee on Medical Ethics Research, Southern Norway approved the project in January 2003.

Results

General background and characteristics

78 % of the 46 informants were between 40 – 69 years old. 43% had higher education. 73% had participated or been attached to The NaCuHeal Centre for at least two years. 27 persons were certified sick during the study.

Symptoms and problems

82% reported problems like stress-symptoms, psychosocial problems, anxi-

ety-depression, muscular-symptoms, tiredness/lack of energy and sleep-disturbances. Some of these problems were related to work or home situations. If the participants had experienced a negative home situation, they used to bring these experiences and their difficult life situation with them to work and vice versa. Some of the participants mention relational problems and divorce as a major hindrance to a positive life situation. Many participants explained that if they had problems coping in everyday life, their quality of life decreased and so did their health. Several had expressions like '*burn-out*', '*the last straw*', '*batteries had gone flat*', '*deflated*' or they had '*hit the wall*'. Several were particular occupied with the notion as to why people become so ill and how they then can maintain health, obtain a better lifestyle or change health behaviour.

Health and quality of life

Around 2/3 of the informants reported to have improved their health status, quality of life and work ability, particularly when given opportunity to utilise their own abilities and creativity. The experiences gained through belonging to a themed group played a significant role increasing their self-efficacy and self-esteem. Several described that the NaCuHeal centre probably had contributed to their increase in health and quality of life in many ways, e.g. a rewarding social network, the building of trust and confidence in small groups, the laughter and joy that seemed to be a part of the warm atmosphere of the centre. Some typical quotations from the participants illustrate this: 'A prescription for the soul…'. 'I have gained a better quality of life and more happiness in my everyday life by being here…'. 'Being here at NaCuHeal has definitely contributed to my health and well-being…'.

Coping and self – confidence

Many participants have expressed that they through NaCuHeal have found a place where they have been stimulated to bring forth hidden resources, creative talents and a lot of energy that had been covered in deep layers of problems and worries in daily life. 23 participants (50%) explained that it had been difficult to understand that so much unrealised potential had been stored in their minds and bodies. NaCuHeal had contributed to comprehend ways of coping to master the burdens, crises and challenges of everyday life. Doors into their inner selves have daringly been opened. Many participants had now learned to put down important limits for themselves, e.g. say no when they previously had agreed and take more care of themselves.

Typical quotations illustrate this; '*In many social situations I have had an anxiety for not being good enough or be capable, of doing something…it is not like this here…I feel I get personal strength and self-confidence…getting positive feed-*

back for what I am doing is absolutely great…in this way I dare to venture into new areas, as well…'.

Three main categories

Due to different coping strategies, background and resources, the informants seemed to be divided into three typical categories. These categories are analysed according to different variables, like educational background, age, period of participation in group activities, function and present life situation, problems and symptoms. These variables have also been analyses in relation to the main focus of the project and the different themes that appeared through the interviews.

Category 1. ***The role model:*** 11 persons (23%) seemed to fall into this category. They had fairly strong beliefs in which factors they assumed maintained or developed their own health and quality of life. They thought that they knew what 'a good life is'. Arguing along these lines, one could say that participation in activity groups could maintain or enhance their health and quality of life. These people were resourceful and energetic and had a lot to give to others. In addition, they believed that the interaction between nature and culture had a strong effect on health by giving a new enrichment and spirit to life. The participants seemed to function as ambassadors, role models and human agencies for other participants in their process of improving their health and quality of life. Quotes:

'I am happy and satisfied with my life and if I can bring to other people some light and joy, this is a place I would like to support…'.

Category 2. ***Lacking coping strategies:*** 21 persons (45%) represent this category in certain ways. They believe that the NaCuHeal – centre have influenced, inspired and developed their creative abilities particular in relation to painting and musicking. (Small, 1998). The participants are resourceful persons, but due to a huge workload, stress and lack of coping strategies they have been very ill. Terms like 'deflated', 'the last straw' etc…described earlier, is very particular for this group. Life has been too hectic for a long period of time without any possibility to relax and regain their energy level to prevent illnesses like chronic fatigue, muscular diseases, anxiety and depression. Through participation in group activities their self-efficacy and sense of coherence have increased considerably and sometimes to such an extent that willingness and motivation to go back to work is imminent; *'Now I feel ready to return to work. I think the society could have saved a lot of money if only people could be given opportunities like this, being at NaCuHeal…'.*

Category 3. *Huge benefits from participating in group activities*:

14 persons (30 %) seemed to belong in this category. Life had been full of minor or major crises, their health had declined and all-in-all one could describe

their life situation as problematic and complex. Several had limited educational background and were at risk of developing severe and chronic illnesses. Participation in the group activities at NaCuHeal gave many a valuable experience together with good, stable relationships. In addition, the group activities had helped them out of isolation and loneliness. A lot of them did not have any social network or they had been deprived of social contact due to their life situation, e.g. divorce, illnesses, moving etc…Typical quotes;

'NaCuHeal has meant so much for me. You could say that it has saved my life…". "I don't believe that one can push pills into ones body endlessly. This is much better than all the pills in the whole world. Talk with someone, share knowledge and experience and opinions…'. Good humour and mutual understanding were of importance. Walking, small talk, encouraging small talk in a trustworthy and caring environment, mingled with vast opportunities to use their own abilities and creativity, were in focus. The knowledge and experiences gained through belonging to a certain group now played a significant role to increase their self-efficacy and self-esteem, (Laverack, 2004, Sorensen et al., 1990, Dalgaard et al., 1996, Bracht, 1999).

Social well being

Social interaction, small talk about trivial events and naive things in everyday life, is what they now realize makes life meaningful and comprehensible to them. Further '*what makes life worth living*' for a great many of them is the possibility to communicate their experiences about significant life events. It seemed to be of vital importance to have somebody to talk to and even become a trustworthy listener for others (Dalgard *et al.,* 1996, Rosenstock *et al.,* 1988). Many had been deprived of such social interaction e.g. developing warm friendships. Close social networks have been well documented to have a huge impact on our health and quality of life. Close friends and partners are an important part of our mental and social well being. Current research also shows a link between the number of people experiencing a bad mental health and lack of social support. A close social network is also vital for our identity, self-image and social integration. The quality and amount of positive feedback from other people play a substantial part in our self-perception. Time to stop and listen, be present for somebody who need to talk, show support in a caring environment, seemed to be of great significance to the majority of the participants independent of social status, educational background, position, work ability and coping strategies.

Discussion
Methodological limitations
A disadvantage with qualitative methods dealing with personal opinions and

experiences is sometimes the difficulty of recruiting informants. In this respect, criteria of selection has been to choose a strategic convenience sample, i.e. that are both willing and motivated to spend time talking to you and represent characteristics that are relevant tour research focus (Bertaux, 1988, Schensul *et al.*, (1999). Neither do we have any data on persons who did not participate in the project that who also are attached to the NaCuHeal centre. On the other hand, if one compares these results from earlier studies, this sample seem to be fairly representative for people who are attached to the centre in different ways (Pauswang, 1999).

Another methodological implication is that we do not know how the participants health and quality of life would have been if they had not been attached to the group activities at the centre. Also we do not know how their zest of life would have been if they had partaken in similar activities in the local communities or other voluntary organizations elsewhere. The interviews were also conducted once and we do not either have any data on processes or changes over a longer period. Such problems ought to be followed up later. The positive results might also be interpreted as the participants own interest to create optimal results, for example 'this is a really lovely place, I hope this evaluation can contribute to an increase in such centres'. From another point of view, we have an impression that the participant's beliefs and opinions are genuine and real. The observer effect might also have been a factor. They all knew that the evaluation was going on and this might have influenced their positive opinions and behaviour and ought to be taken into account (Schensul *et al.*, 1999, Spradley, 1979).

Important elements in coping

A person has to believe that when starting a task one has to complete it with success. There is no other way apart from saying: *'I am capable of doing this'*. Through participation in group activities and the feeling of belonging to this specific culture, hidden resources and creativity are awakened. Participants feel good about themselves and what they do is appreciated. In this way one can strengthen the salutogenetic factors in a person's life (Antonovsky, 1987, 1996). In other words by focusing on promoting health factors one might actually promote health *in the process of doing so* (Johnson, 1997, Laverack, 2004, Tones and Green, 2004). There also seem to be a connection between the amount of time spent at the centre, the reasons for making contact, the intentions behind participating in group activities and the outcome on health and quality of life (DeNora, 2000, Trevarthen, 2000). The longer they had been at the centre, the better they thought their health was and the more energy, motivation and capabilities to cope and tackle life they possessed, especially those who had muscular disease, chronic fatigue, anxiety, depression, tiredness and a feeling of being burned-out (Austern, 2000, Brage, 1998).

Those who had a shorter association with the centre had a tendency to wait and see, almost sitting on the fence waiting for something to happen by observing

their companions in progress. In this way one could say that participation creates expectations both for themselves and to the centre. There are definitely reasons behind a wish to participate in group activities (Ansdell, 1997, Shepard & Wicke, 1997, Small, 1998). Pluralism – a Melting Pot of life worlds and subcultures might be the key to success for the NaCuHeal concept (Tellnes, 1996, 2003, Laverack, 2004, Tones and Green, 2004).

Nature Culture Health – Information Design

Already Werner Kollath observed (by giving his book "Civilization-Conditioned Diseases and Death Causes" the subtitle "A medical and political problem") that the present increase in lifestyle-caused diseases is closely related to various sources of power, of consumer industry among others (Kollath, 1982). The goal of our Nature Culture Health – Information Design project is to apply the power of modern communication technology, and more generally of suitably designed communication, to support salutogenic community developments (Karabeg et al., 2004). The idea of this project is to build upon the achieved results in the Asker community project to support salutogenic lifestyle developments in Norwegian municipalities, and also globally.

The Kommune Wiki project, initiated by Tor Næss, Oyvind Sorbroden and Dino Karabeg within recently started Nature Culture Health International organization, combines in situ dialogs with Internet dialog using a wiki, similar to Wikipedia (www.wikipedia.org). The goal of this project is to empower grass-roots salutogenic value and lifestyle change in Norwegian municipalities. The dialogs is envisioned in two phases. In the first phase, the participants develop an understanding of subtle disease and salutogenesis factors and create a collective vision of the direction of change they want to pursue. In the second phase, the participants develop concrete plans for implementing this vision in all aspects of community life (daycare centers, schools, city planning, work place, elderly policy etc.).

The Key Point Dialog is a similar project whose goal is to spread the salutogenic thinking globally (Karabeg, 2007).

Final Comments

This qualitative evaluation study has evaluated health, quality of life and function among participants` included in a programme of local community-based Nature-Culture-Health activities. The NaCuHeal centre seems to be a unique arena and functions as a substitute for the participant's lack of closely-knit networks that can support positive health behaviour. A majority of the participants reported improved health and quality of life due to their experiences in the NaCuHeal-groups. Increasing the population's participation in health promoting outdoor and cultural activities seem to be a useful method to enhance complete rehabilitation. There seemed to be three main factors contributing to this;

1. The NaCuHeal centre is an inclusive place where everybody can develop their personalities, coping strategies, rethink and reassess their life situation at their own pace and rhythm.

2. There is pluralism in group activities suitable for most people, which contribute to developing relationships and meaning.

3. There is also pluralism in the participants' educational background, age, and life situation and coping strategies.

Further research though is needed into certain categories e.g. for long termed certified sick and the outcome of participation and activity itself on health, function and well being in specific groups. This knowledge will perhaps stimulate the refinement, the focus and implementation of future health education and rehabilitation programs (Laverack 2004, Sorensen *et al.*, 1996, Tones and Green, 2004, Tellnes, 2004).

There is reason to believe that there is an untapped potential for improving public health by employing health-promoting nature and cultural activities. This is also a great challenge to our environment as well as the many multicultural and urban societies. The goal is increased ability to cope, productivity and prosperity to *all* people, i.e. not only the affluent members of society, but also the ones who are in danger of becoming permanently incapable of working. We need both environment quality and quality of life in order to develop a future global community based on *Sustainable Nature-Culture-Health Interplay.*

New health challenges mean that new and diverse networks need to be created to achieve intersectoral collaboration, and new methods of public health research have to be developed. Synthetic research methods, probably have to be applied in order to evaluate this community approach to public health.

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◄ GLOBAL PROBLEM OF THE MODERN CIVILIZATION – MINIMIZATION OF ENVIRONMENTAL IMPACT FROM BATTERIES SCRAP WASTES

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Abstract: *The paper outlines anti-crystallization charging-discharging impulse converter which helps to get significantly prolongation accumulator's active life (to raise number of recharging cycles) and therefore to minimize environmental impact from contaminated by old batteries rubbish. The studies showed that the use of this simple and cheap technology allowed to stop distribution of microscopic crystals over the surface area of the battery plates and even to unload the crystals. These surface areas changes greatly and improves a battery's ability to accept and store energy. By storing more energy, it provides more power to they loads. It also prevents sulfate-induced corrosion that is the primary cause of shedding of active material. By helping to prevent shedding, it is possible to get three or more times as many life cycles from the batteries.*

Keywords: environment protection, anti-crystallization measures, battery charger-discharger.

1. Introduction

Every day the concern for the welfare of the environment continues to increase world wide. Traumatic and irreparable damage is being caused by rampant waste and pollution. Among this waste is the damage inflicted by lead and sulfuric acids leaking from batteries that have been disposed incorrectly. This leakage is seeping into waterways, soil and even the air we breathe. Even small amounts of lead can cause severe damage to animals and humans who ingest it, especially children.

The increase in number of mobile energy consuming equipment, such as mobile phones, computers, handheld lights and other communications equipment

represents a new challenge to environment conservation. Large numbers of practically non-recyclable and old recyclable, disposable batteries handled together with communal waste create a contamination hazard. The most important sources of hazard are as follows: manganese dioxide, mercury oxide and zinc, cadmium, lead and nickel content of rechargeable batteries. Released into groundwater, these substances may dissolve in an acidic medium, causing poisoning.

The main aspects to solve of the above-mentioned environmental problem [2, 3, 4]:

1. Replacing not rechargeable batteries by domestic rechargeable batteries which may be used several times over. It is obvious that one rechargeable battery with a lifetime of 500-1500 cycles can replace equal number of the disposable batteries, thereby decreasing the contamination of the environment.

2. Use of rechargeable batteries containing different electrodes instead of poisonous ones. The rechargeable batteries may not contain any substances being marked as highly poisonous, but which may be characterized by the following statements: may cause cancer effect, may have a mutagenic effect, damage fertility, etc.

The battery disposal problem has become so severe that certain governments are passing strict laws to try and control it. Many are literally banning battery disposal all together. Others are mandating recycling programs, but it is estimated that only about 75% of all dead batteries are actually recycled. That means the remaining 25% are still being left in landfills or even more sensitive areas. As newer and more effective recycling programs are initiated, the number of recycled batteries should increase. But, in the meantime other measures need to be taken. The most effective and obvious measure of reducing the number of discarded batteries is to keep them in service longer. And the most effective way of achieving that goal is to use the modern battery maintenance systems. The most of old batteries are actually still usable.

The problem is that the plates have become so coated by these sulfate (crystals) deposits they can no longer release or accept energy. In the past, nothing could be done to solve this major problem. But now pulse technology can eliminate sulfaion buildup and even clean the battery plates. As a result, the 80% of all batteries that die every year due to sulfaion buildup, will be last longer, which means they will not have to be discarded.

The pulse technology utilized by these chargers extends battery life dramatically by maintaining it in good conditions for long time. Some technologies are unique because it is the first and only method available [2, 3, 8] for completely removing salvation buildup (lead sulfate) from battery plates. And according to one survey, salvation buildup and related problems are the main reason over 80% of all batteries fails every year.

The cause why do so many SLA batteries can no longer accept or release

energy is a hundred years old problem which is called sulfaion or crystallization buildup. For example, as an SLA accumulator battery gets older or sits unused for long periods of time, lead sulfates on the battery plates and enlarge the area where is created an insulation barrier. Before long they build up and become so dense the battery can no longer accept or release its stored energy. This is the main reason over 80% of all lead-acid batteries die. Similar problems arise in different forms of crystallizations on electrodes surface of NiCd, NiMH, Li-ion, Li-Polymer and even for the modern ones. The plate's corrosion (crystallization) is the main cause and effect behind decreased accumulator battery performance by age. This effect is almost linear. For instance, if a battery specification states that the battery loses 15% of its operational life by the end of its 3-5 years calendar life. So, every month the battery will lose 0.25% of its cycle-life and its capacity. Thus, design of the new controlled charging-discharging devices to keep an accumulator battery life as long as possible, are very important studies.

2. The Simple Pulse Charger-Dischargers

There are several approaches to charging processes and chargers construction. The main of them are: Slow Charger, Quick Charger, Fast Charger and Pulse Charger-Discharger. The last one helps in batteries de-sulfaion (decrystallization) process and therefore is under rapt attention in the paper.

With regular charging-discharging service of an accumulator the number of working cycles can reach as high as 4000 instead of 1500 cycles guaranteed by manufacturer. Without the service cycles being made, the number of working cycles is reduced more than three times [1, 2, 3 and 6]. So, it is not recommended to reject even old accumulator beforehand: there is a treatment, based on pulse charge-discharge devices, which can help to recover the battery.
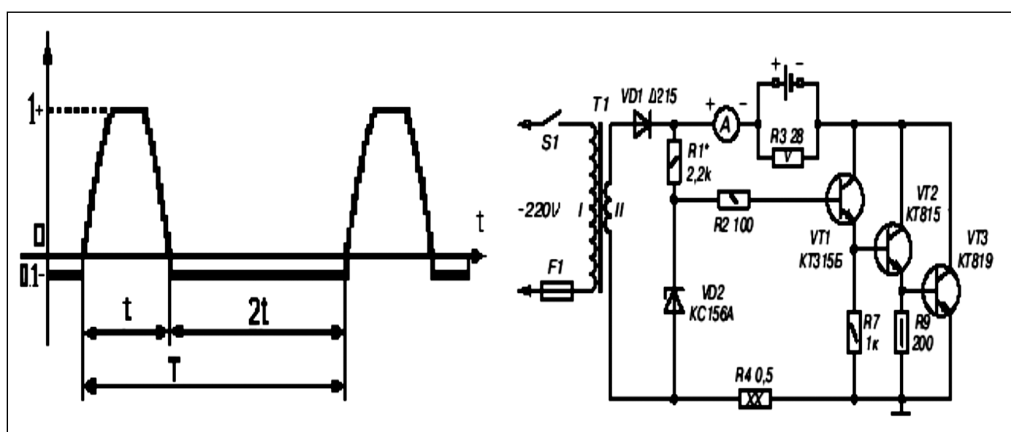
Figure 1. Recommended [8] asymmetrical charge-discharge diagram and current oscillogram.

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The recommended in [8] well known asymmetrical charge-discharge devices and current oscillogram are presented on Fig. 1. The device provides 100% required charging current I_{ch} and controls discharging (on R_3) current $I_D \approx 0.1\ I_{CH}$.

On Fig. 2 are shown two simple one pulse asymmetrical charge-discharge device diagrams just effective as diagram on Fig. 1. The Fig. 2 diagram is 7-10 times cheaper than the diagram on Fig. 1, but equally effective. Similar to Fig. 2 the discharge process happens on resistor R_{20} and can be controlled or fixed manually in the same rate. Currents and voltages behaviors of this two pulses charge-discharge device under load are presented on the Fig. 2. Extra power losses in these two diagrams are almost the same.
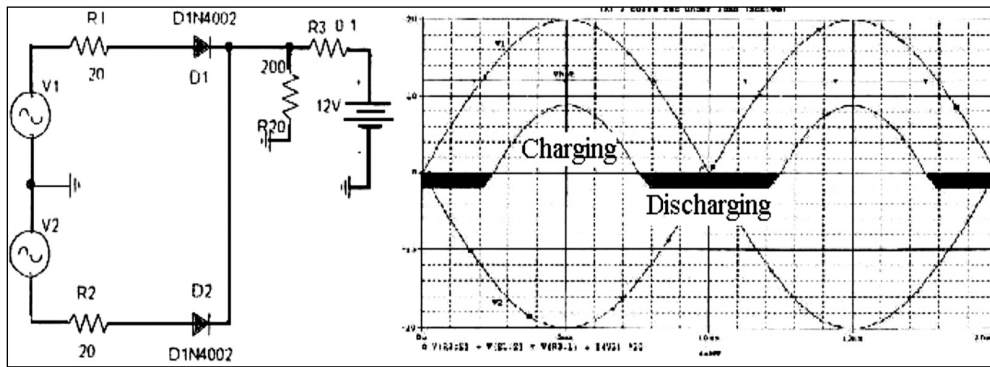
Figure 2. Simple two pulses asymmetrical charge-discharge device diagram and
its currents and voltages behaviors.

The main point of the paper is to present for people of low income countries the simplest and cheapest approaches and electronic diagrams of the charging-discharging devices, which can be assembled even in any school workshop from elements of electronic wastes.
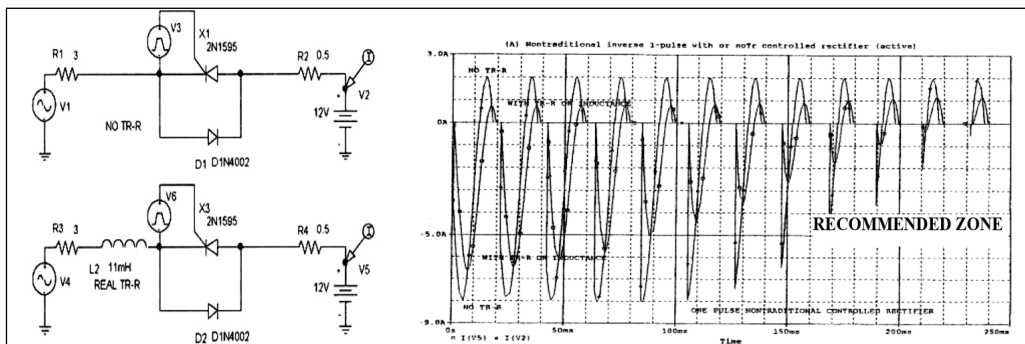
Figure 3. Pulse rectifiers with and without step-down transformer and their oscillograms.

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Each of the next two suggested pulses asymmetrical charge-discharge devices diagrams on Fig. 3 has got discharging thyristor rated for 10-15% of charging current, but there are no extra discharge resistors and much less power losses. The right zone of the oscillogram of Fig. 3 is the recommended working charge-discharge region [5].

The simplest and cheapest pulse charge-discharge device diagram is shown on Fig. 4. Adding a capacitor (an electrolytic or normal one) parallel to the diode helps to get charge-discharge current which has shown on Fig. 4. During the positive half wave of the transformer's secondary voltage through the diode (see Fig. 4) takes place in the battery charging process. Consequently during the negative half wave the secondary voltage takes place in the battery discharging procedure due to the capacitor charging process from battery V_{bat} and the negative half wave of the transformer secondary maximum voltage V_{2max} to the almost double battery voltage. The procedure repeats every period.
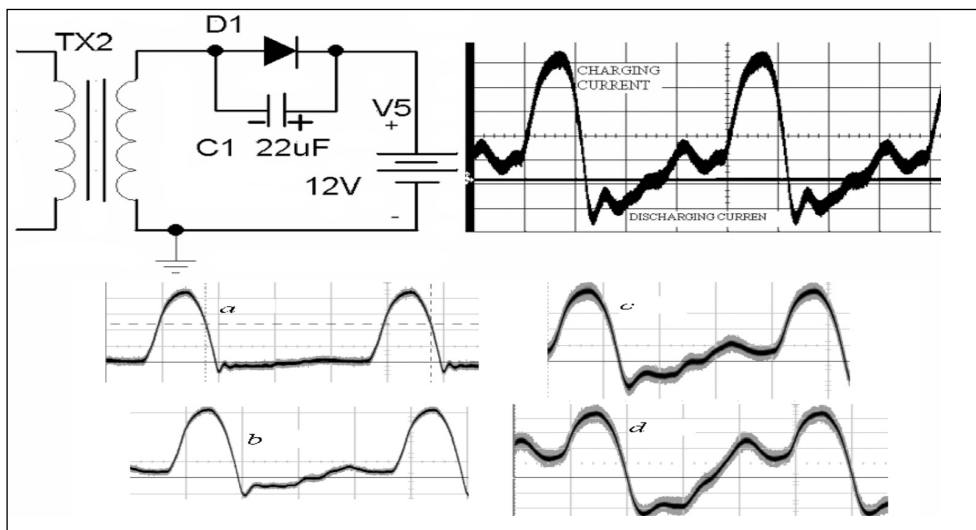
Figure 4. Pulse charge-discharge device with four different (4.7, 14,7, 22 and 47μF) capacitors parallel to diode and real oscillograms.

Due to the transformer inductance here are some small fading periodical processes, which are even helpful for the desulfaion (decrystallization) processes [3, 5]. This cheapest pulse charge-discharge device PSpice model was also carefully analyzed and optimized during the study and has shown results (Fig.5) similar to Fig.4 experimental oscillograms.
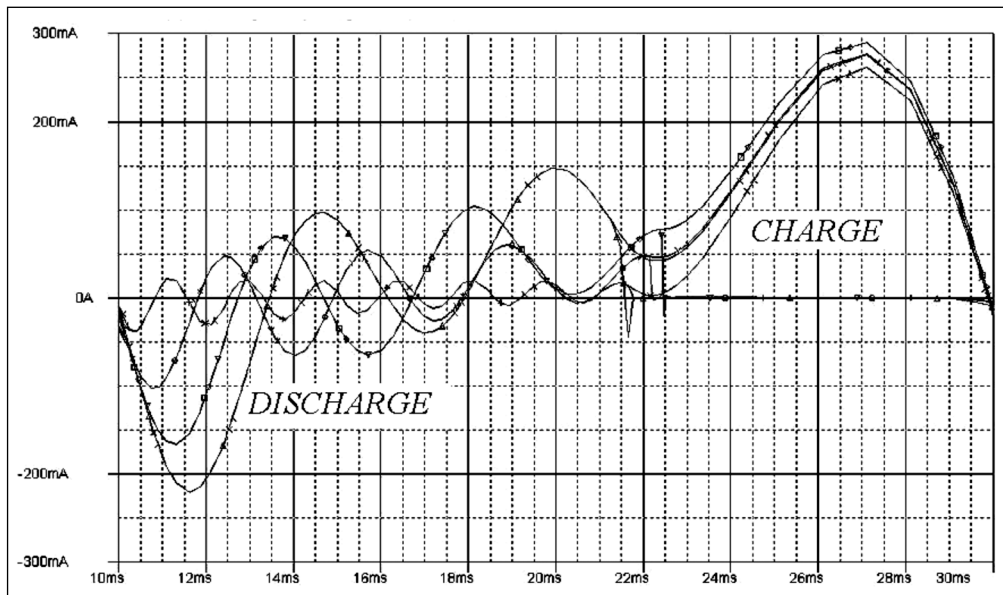
Figure 5. Pulse charge-discharge device PSpice model multi variant study
results

It should be stressed here, that the amount of energy stored in the capacitance during the discharging period is returning to the battery during the charging period practically without any power losses (except those in connection wires). The main parameters of the condensator should be chosen carefully:

1. Nominal voltage $V_{CAP} \geq 3V_{BAT}$;

2. It capacitance suppose to provide inverse (discharge) current around 10-15% of the battery nominal charging current.

The pulse charge-discharge device with the parallel capacitor to diode (Fig. 4) was tested on SLA for desulfaion process (PSH-1280 F2 12V, 8,5Amp Hr) and for Ni-Cd (P-100AASJ) accumulator for decrystallization process and has shown good results which similar to [3, 5] efficiency.

3. Conclusion

As newer and more effective recycling programs are initiated, the number of recycled batteries should increase. But, in the meantime other measures need to be taken. The most effective and obvious measure of reducing the number of discarded batteries is to keep them in service longer. And one of the cheap and effective ways of achieving that goal is to use for people of low income countries the mentioned in the paper battery pulse charge-discharge device maintenance systems.

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◂ THE BUBBLES OR THE BOILING POT?
AN ECOSYSTEMIC APPROACH TO CULTURE, ENVIRONMENT AND QUALITY OF LIFE

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For the diagnosis and prognosis of the problems of quality of life, a multidisciplinary ecosystemic approach encompasses four dimensions of being-in-the-world, as donors and recipients: intimate, interactive, social and biophysical. Social, cultural and environmental vulnerabilities are understood and dealt with, in different circumstances of space and time, as the conjugated effect of all dimensions of being-in-the-world, as they induce the events (deficits and assets), cope with consequences (desired or undesired) and contribute for change. Instead of fragmented and reduced representations of reality, diagnosis and prognosis of cultural, educational, environmental and health problems considers the connections (assets) and ruptures (deficits) between the different dimensions, providing a planning model to develop and evaluate research, teaching programmes, public policies and field projects. The methodology is participatory, experiential and reflexive; heuristic-hermeneutic processes unveil cultural and epistemic paradigms that orient subject-object relationships; giving people the opportunity to reflect on their own realities, engage in new experiences and find new ways to live better in a better world. The proposal is a creative model for thought and practice, providing many opportunities for discussion, debate and development of holistic projects integrating different scientific domains (social sciences, psychology, education, philosophy, etc.).

Key-words: education, culture, politics, society, health, environment.

The Salary of God and the Work of Man

In the beginning, God created the Heavens and the Earth. Confiding in the excellence of his work, he expected that his divine investment, in the ions of time, would bring forth heavenly dividends; for this, he relied on his own creation. expecting that sentient beings, like man, would, in due time, acknowledge the prominence of his undertaking.

Since then the universe has been continuously unfolding: galaxies gave birth to stars, stars diligently assembled the elements to build an infinity of planets, some planets harboured life; in the Earth, animals spread over the planet, birds excelled with their songs, plants garnished the land with flowers and replenished it with fruits.

As a conscious and animate partner of God, mankind should honour his expectations, bestowing a significant contribution to his endeavour. Respect for life, law-abiding and ethical behaviour, care for others, equity and justice would be God's payment in recognisance for His undertaking.

Would God be satisfied with mankind's partnership in the contemporary world?

All over the world quality of life, natural and man-made environments, physical, social and mental well-being are eroded by all sorts of hazards and injuries; political, economical and social disarray normalise atrocious behaviours and violence, in a context of dehumanisation, depersonalisation and reification.

Natural and built environments are impaired, human values that took centuries to develop are annihilated by the overspread violence and criminality, problems accumulate, reality is distorted by segmented public policies, academic formats, mass-media headlines, common sense prejudices and overwhelming marketplace's interests.

The future of creation, "a new Earth and new Heavens", depend on the quality of the relationships between men and men and men and nature. Processes and products, principles and actions should walk together, duties and rights, deeds and beliefs should be the faces of the same coin; inside and outside should reflect each another.

Although it is clear that there is a strong linkage between individuals, groups, society and environment; this does not exclude that many problems may not be internally soluble within the human community, which is not self-enclosed; we have a relationship to the sky, to the gods, to the nature, to strange forces that we cannot control (47).

The application of ecological systems theory to human development shows that the myth of power and the resulting conflicts (man versus environment, nations versus nations, classes versus classes, man versus God) ignores the fact that in cybernetic systems the parts can not take unilateral control over the whole or any other part (5).

The polymeric structure of space-time pervades the entire universe, thousands of historical events closely interrelate in the genesis of all events (phenomena, processes, actions); the higher is the numbers of levels in the system under research, the more complicated is the polymeric structure of the actual part of the time's metabolic space (30).

The world is not classifiable in different kinds of objects, but in different

kinds of connections (19; 10); it can be thought as a kind of a giant hologram, in which, in some implicit sense, a total order is contained in each region of space and time (42). Inwardness and outwardness are complementary aspects of reality.

The micro, meso and macrosystems are complex "layers" of the environment structure, each having an effect on the human development (9). Selfhood, embodiment and environment are extensions of each other, microcosmic "bodies" are continuous with and permeated by the macrocosmic "environment", complex thought has an ethical dimension (33).

According to Binswanger's phenomenological approach (6), being-in-the-world (*Lebenswelt)*, encompasses the "inner world" (*Eingenwelt*), the "interactive world" (*Mitwelt*), the "world of men" (*Menschenwelt*) and the "environment" (*Umwelt*). Existence should be understood as the focal point of these overlapping "worlds".

Gardiner's model (17) consists of three overlapping spheres, described as the *ecosphere*, relating to a person's (or groups') physical environment and surroundings, the *sociosphere*, relating to an individual's net interactions with all other people in an environment and the *technosphere*, encompassing all the person-made things in the world.

A mysterious tissue or matrix underlies and gives rise to both the perceiver and the perceived. Our environment presupposes our perceptions and vital processes, it pre-exists and co-exists (*Wirklichkeit*), it integrates our experience in the daily life (*Lebenswelt*), it is also a concept, a result of a conscious process, a domain of "scientific knowledge" (*Realität*) (45).

Knowledge cannot be identified with the ontological reality, it serves the organisation of the experiential world and should be actively built up (2). The relationship between sustainable development and economic growth has been overemphasised; social justice, solidarity and respect for ecological limits have been neglected (44).

It is not the efficient exploitation of knowledge that matters, but the learning process by which it is created. Due to non-linear relationships, small inputs in systems that are far from equilibrium can trigger massive consequences, as posited by evolutionary thermodynamics, in terms of self-organising systems and sustainable development (37).

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[1] In this sense, "strategic communication" (40) implies moving away from people as the objects for change... to people as the essential component of the change; from designing, testing and delivering messages. . to supporting dialogue and debate; from the didactic conveying of information from technical experts... to sensitively placing that information into the dialogue and debate; from a focus on individual behaviours... to social norms, policies, culture and a supportive environment; from persuading people to do something... to negotiating the best way forward in a partnership process; from technical experts in 'outside' agencies dominating and guiding the process... to the people most affected by the issues of concern playing a central role.

Kofler (24), views the unfolding cosmos as an autopoietic process and proposes a *general extended view* as a real world's theory connected to the different states of knowledge of the different scientific disciplines, from which *special extended views* could be deduced in view of the different sustainability problems. Questions of power, status and control are linked to environmental and cultural degradation, climate warming, pollution and looming populations (46). A shared way of apprehending the world, the capacity to respond adequately to the experiences, encounters, engagements and interactions, depend on the alternation of challenge and support[1].
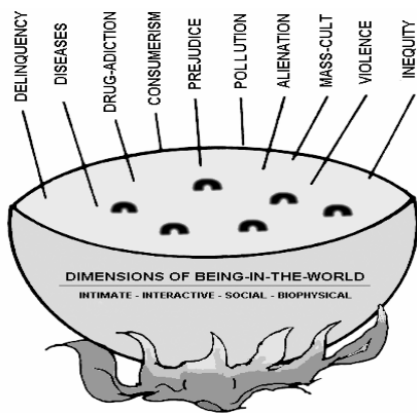
Figure 1. Problems should be looked for deep inside the boiling pot, not in the bubbles of its surface.

Figure 2. Microcosmic "bodies" are continuous with and permeated by the macrocosmic "environment"

A New Policy for New Ways for Being-in-the-World

Public policies should not be ready-made "patches" put on bad situations to make them "straight", Instead of "mending" individual or social "defects", by focusing on needs, deficiencies and problems, they should be asset-based, internally focused and relationship driven, centered on inner resources and capacities' development (22)

Instead of taking for granted the "bubbles" of the surface (segmented issues), subverting or ignoring what is inside the "boiling pot" (the real problems) (fig. s 1 and 2), public policies should pay attention to the relevant factors that are generating the evils of our times, encompassing ethics, governance, justice, equity and social responsibility.

Growth, power, wealth, work and freedom should acquire new meanings (34). Foreign policy, education, politics, economics, health and social welfare must

change their current paradigms and practices, building a culture of peace, environment sustainability, non-violence, justice and cooperation as organising principles.

Ethical questions, the conceptual direction and the moral legitimacy of development strategies should be examined, specially by the leaders of academic sectors, which, in the name of a "high status knowledge", have surrendered to specialisation and fragmentation, in a milieu of ethical indifference, moral objectivity and neutralism (8).

Sweeping market-oriented reforms, privatisations, deregulations, resulted in relinquishing state's duties to the private sector (security, health, education); public services barely survive, the "philosophical" problems of ethical, moral and civic education are left aside, in the name of information and communication technologies, presented as a panacea.

In societies which acquiesce to injustice or benefit mostly those in power, inevitably the new technologies exacerbate the gap between the possessed and the marginalised, who will think that, in order to be respected as full-fledged citizens, they should have access to all the products continuously advertised by media propaganda.

In this context, new technological waves will not rescue a devastated environment nor relieve the excluded (32). When political, economical and cultural disarray normalises all sorts of unethical procedures and transgressions, inequities, violence and atrocious behaviour are looked by people as part of their daily life.

Figure 3. Man as a supportive species (primitive societies)
versus man as a dominant species (civilised societies).

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[1] Increasing urban sprawl and related environmental degradation; car-dependent communities, longer commutes to work; traffic gridlock, poor air quality and loss of green space, a suburban mono-culture that lacks diversity; increased air pollution and sedentary lifestyles ask for a revolution that demands a long-term commitment (11).

To restore safety and security we need to restore faith and trust, core beliefs and values ("social capital"). Historic evidence indicates that significant community development takes place only when local community people are committed to investing themselves and their resources in the effort for community involvement and education (20).

To understand and resolve our present crisis, the concept of man as a "dominant" species should be reversed by man as a supportive one (fig.3); the identification of "progress" with individual or corporate self-interest and the way human beings deal with each other must be changed (7), in view of a new political vision to govern the world.

Life should acquire a new kind of normality, not by repairing humans, but by enhancing them (31). In a cultural, social and environmental degenerated condition, "repairing" means the tentative to restate a former "normal" level of functioning, "enhancing" creates new physical, social and mental environments, which are essential to live better in a better world.

Current development strategies tend to ignore, underestimate and undermine cultural values and environments essential to a healthy human development. An ethical and spiritual world view, security, sustainability and stability, mutually dependent, respectful and enriching values depend on systems built along the time and actively sustained within a specific society (41).

A culture grounded on market economics tends to produce human beings who have trouble being moral and developing coherent selves (39). Most of the megacities of the world are deeply troubled places: economies sputter, social ties weaken, political power fades. Crime and violence, joblessness, homelessness, gangs and drugs proliferate (22).

Many cities of the so-called emergent world are recognised as problem-ridden, economically unequal and intrinsically violent[1]. While the elite enjoy life in fortified enclaves, most of the city dwellers live in makeshift slum housing, often without access to the basic social services (health, education) and dependent on criminality for survival.

The link between environmental stress and violence has been verified in different studies (21), with severe consequences. It is not a surprise that social unrest has been increasing exponentially, specially among those that immigrated to the large cities in search of a better life and are hampered by multiple obstacles.

The social vulnerabilities, that affect the poorest people in many cities of the world, has a cascade effect on the entire population. Chronic deficiencies in educa-

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[1] Indicators like age, income, employment, household, health status, gender, ethnic origin, perception of risks and education are the counterpart of the degree of government preparedness and capabilities to face the impact of social and natural hazards (13).

tion, security, sanitation, dwelling, transport sway over all the inhabitants[1]; due to the outspread violence, most people become, by and large, uninvolved in civic life (4).

"Social inclusion" policies only accommodate people to the prevailing order, they do not empower them (26); once "included", a new wave of "egocentric producers and consumers" (12) will reproduce the very system responsible for their former exclusion, abusing cultural values and nature in the name of "progress" (43).

Progressive social change groups must incorporate a deeper spiritual understanding into their work (27). Contrary to the *adversary paradigm*, the *mutuality paradigm* is based on the assumption that the other is a friend, a colleague and an ally (14). Protecting relationships is often overlooked, when learning is abstract and decontextualised (25).

Besides economical and political equity, human rights include cultural and spiritual values, the preservation of rich natural and man-made environments, the engendering of beauty, creativity, conviviality, privacy, tranquillity and peace. Social and economical advancement should not be a private question, but a collective one.

Peace building, acceptance of ethical norms requires a multitude of ethically interpreted and ordered social experiences, a capacity for having morally relevant interests as the bases of rights-bearing, an empathy with people, including those regarded as alien, or even hostile, a broad, universally rationalised cultural knowledge (48).

Freedom and responsibility are sides of the same coin: being accountable for one another (even for other's faults, if one fails to intervene), doing or abstaining from something in view of others, are essential to authentic freedom (28). In a society with any organising principle at all, individual rights suppose the assumption of collective responsibilities.

Freedom *for* is not the same as freedom *from* (15): authentic freedom or freedom for presupposes existential control, a capacity to make adequate choices; the latter merely indicates the absence of exterior constraints, the former requires an ethical ground, preparedness (there is no "freedom" to play a piano when one does not know how).

Facade democracies usually try to repair "bad" situations to make them "straight", ignoring that "duties" and "rights" can not be prescribed in adverse political, economical, social and cultural conditions: it is a non sense to prescribe that everybody has a "right to play a piano" when the piano is not available and nobody knows how.

The emergence of private authority has eroded state's power and the utopia of global governance in the benefit of multinational corporations, financial institutions and organised crime (18). Neoliberalism atomises society and breaks all

bonds save contractual ones, smashing actual and potential networks of solidarity in the name of the so-called progress (38).

Globalisation has brought violence, uprootings, displacements, discordances, war, genocide, hunger, inequities, ecological vulnerability and deep social division (3). More and more it becomes difficult to distinguish between "legal" and "illegal" strategies and methods, which become very much alike in the assemblage of political and economical interests.

The world generalised problems can not be sorted out by segmented projects, which ignores micro, meso and macro relationships. Foreign policy, education, politics, economics, should change their current paradigms and practices, in view of a culture of peace, environmental sustainability, justice and cooperation as organising principles (35).

A profound change in the present ways of being-in-the-world is imperative. In a cultural, social and environmental degenerated condition, distinction between self-interest and mankind survival is crucial, social vulnerabilities can not be disassociated from environmental, economical, political, cultural and ethical considerations.

	INTIMATE	**INTERACTIVE**	**SOCIAL**	**BIOPHYSICAL**
DIAGNOSIS OF THE EVENTS	SUBJECTS' COGNITIVE AND AFFECTIVE ACTUAL STATUS	GROUPS ' AND COMMUNITIES' DYNAMICS AND COHESION	PUBLIC POLICIES LAW ENACTMENT CITIZENSHIP PARTICIPATION	NATURAL AND MAN-MADE ENVIRONMENTS BEINGS, THINGS
ELICITING NEW EVENTS	DEVELOPMENT OF SUBJECTS' EXISTENTIAL SELF-CONTROL	DEVELOPMENT OF GROUPS AND PRO-ACTIVE COMMUNITIES	DEVELOPMENT OF PUBLIC POLICIES AND CITIZENSHIP	PROMOTION OF NATURAL AND MAN-MADE ENVIRONMENTS
IMPACT ON EACH DIMENSION	ENHANCEMENT OF SUBJECTS' WELL-BEING	ENHANCEMENT OF GROUPS AND COMMUNITIES	ENHANCEMENT OF POLICIES AND CITIZENSHIP	ENHANCEMENT OF OVERALL ENVIRONMENT

Figure 4. Imbrication of the four dimensions of the world in the genesis and treatment of the problems

The Ecosystemic Approach to Quality of Life

A process of change is not a matter of throwing out "old things", nor acquiring "new things", but the development of a new way for being-in-the-world, that asks for both design and action; it is useless to change the furniture in a room, with-

out a new concept for living in it, an architect has a project for a house before building it.

Notwithstanding the pervasiveness of marketing in society (1), we should not take current prospects for granted and project into the future the trends of today (*exploratory forecast*), but define new goals and explore new paths to reach them (*normative forecast*) (23), in view of new forms of being-in-the-world.

Instead of "repairing" "bad" situations to make them "straight", problems of difficult settlement or solution should be assessed in different contexts and settings, as expressions of the interplay of the dynamic configurations encompassing the different dimensions of being-in-the-world: intimate, interactive, social and biophysical (36).

The four dimensions must be dealt with simultaneously, as mutually entangled donors and recipients, considering their connections and ruptures and how actual and potential deficits and defaults affect each other, as they *induce the events* (deficits and assets), *cope with effects* (desired or undesired) and *contribute for change* (expected outcomes):

• *intimate dimension*: core beliefs and values, coping abilities (cognitive, affective and cultural), self-esteem, resilience, civic profile, capabilities, expectations, desires, existential control;

• *interactive dimension*: networks, communities, groups' cohesion and mutual support (family, neighbourhood, workplace, religious and political affiliations), friendship ties;

• *social dimension*: public policies, educational, cultural, public health and socio-economic status, local, national and global citizenship, partnerships and resources; civic engagement;

• *biophysical dimension*: biological endowment, matter and energy, fauna, flora, land, water, air, natural and man-made environments, scenarios, landscapes, buildings, artifacts.

Analysis implies the assessment of the actual and potential role of each dimension in view of the configurations formed by the imbrication of the different dimensions in the space-time continuum (fig.4); in this sense, overall policies and projects, in different domains (well fare, education, health, environment, etc.) should:

• define the problems within the "boiling pot" instead of reducing them to the bubbles of the surface (fragmented, taken for granted problems);

• deal with the events as products of a dynamic field, intertwining the four dimensions of being-in-the-world: intimate, interactive, social and biophysical;

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Table 1.

Dimensions' enhancement in the ecosystemic model of culture

	Donors			
Recipients	*INTIMATE*	*INTERACTIVE*	*SOCIAL*	*BIOPHYSICAL*
INTIMATE	Creativeness	Support	Services:	Vitality
INTERACTIVE	Cooperation	Cohesiveness	Diversity:	Niches
SOCIAL	Citizenship	Partnerships	Organisation	Spaces
BIOPHYSICAL	Care:	Preservation	Sustainment	Equilibrium

Table 2.

Dimensions' disruption in the non-ecosystemic model of culture

	Inflictors			
Victims	INTIMATE	INTERACTIVE	SOCIAL	BIOPHYSICAL
INTIMATE	*Solypsism*	*Abdication*	*Domination*	*Agression*
INTERACTIVE	*Heteronomy*	*Fanaticism*	*Cooptation*	*Dispersion*
SOCIAL	*Subjection*	*Corporativism*	*Totalitarian*	*Extinction*
BIOPHYSICAL	*Predatory*	*Exploitation*	*Spoliation*	*Savageness*

• verify the deficits and assets of the dimensions as donors and recipients, in view of their relationships, in a mutually entangled web (configurations);

• revive the singularity (identity, proper characteristics) of and solidarity (reciprocity, mutual support) between all dimensions, strengthening connections and sealing ruptures.

• consider the development of an ecosystemic model of culture, in terms of the balance between all the dimensions of the world (opposite to the current non-ecosystemic model).

In an ecosystemic model of culture, there is a dynamic equilibrium, interconnection, interaction and reciprocity between the different dimensions of the world

[table 1]. In a non-ecosystemic model, they drift apart or seek a hegemony (individuals, groups, societies and environment are in conflict); disruption, isolation, unbalances, catastrophes, disease, famine and violence follow soon [table 2].

The Work in the Socio-Cultural Learning Niches

The objective is not to solve taken for granted problems (the "bubbles" in the surface), but to unveil and work with the dynamic and complex configurations in the "boiling pot", encompassing the mutual role of individuals, groups, society and environment to understand how problems arise and how to deal with them, at micro, meso and macro level.

Experiential, collaborative, innovative and socially beneficial projects in the socio-cultural learning niches should develop a network of hope, dignity and self-reliance: individuals who think critically, communicate effectively, value diversity, act ethically and show an empathy with people, including those regarded as alien, or even hostile.

Different fronts and actors should be involved, encompassing research and teaching programmes, development of public policies, mass-media communication,. governmental and non-governmental organisations, lay and religious leaderships, community building advocacy. .How the experience is defined and dealt with is a crucial aspect in the process of change

Working with phenomena (how reality appears in a specific space-time horizon of understanding, feeling and action), requires an adequate learning environment, which is essential to moral and democratic education (29). The methodology in the socio-cultural learning niches should be participatory, experiential and reflexive, giving the opportunity to engage in new experiences.

To develop awareness and capabilities beyond the traditional schemes of thought, feeling and action, subjective and objective realities should be entangled, encompassing the alien that we strive to understand and the familiar that we take for granted (16); this creates an "excess of meaning", in view of new paradigms of knowledge and action.

Heuristic-hermeneutic experiences unveil cultural and epistemic back-

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[1] Subject-object relationships can be analyzed in terms of different categories:

Appropriation: Construction of new forms of being-in-the-world, alteration of cognitive, affective and conative paradigms.

Common-sense: Conformity to established, commonplace, stereotyped ways of seeing things, without further questioning.

Academic: Reduction to logical categories and frozen schemes of thought to achieve closure, classifying and describing.

Dependency: Trust on exterior authority to describe and qualify own experience, alienation, bewilderment, confusion.

Resistance: Resistance to being involved, failure to see any meaning in the experience.

Dogmatism: Adherence to fixed paradigms and strict forms of being-in-the-world.

grounds and subject-object relationships in a specific space-time horizon of understanding, feeling and action (table 3). Judgements and contentions of the different discourses provide the basis for analysis, debates, agreements and disagreements in view of old and new assumptions

Innovative projects to develop the ecosystemic conditions to live better in a better world (fig. 4), depend on collaborative experiential learning and communicating processes within the socio-cultural learning niches, of a network of hope, dignity and self-reliance, consisting of individuals who think critically, communicate effectively, value diversity and act ethically.

The objective is not to solve taken for granted problems (the "bubbles" of the surface), but to unveil and work with the dynamic and complex configurations in the "boiling pot", considering individuals, groups, society and environments as components and active parts of the different issues of difficult settlement or solution in the world (table 3 is an application to health-related problems).

Table 3.

DIMENSIONS OF BEING-IN-THE-WORLD

	INTIMATE	INTERACTIVE	SOCIAL	BIOPHYSICAL
HEALTH PROBLEMS	*SUBJECTIVE WELL-BEING*	*GROUP DEVELOPMENT*	*COLLECTIVE WELL-FARE*	*ENVIRONMENTAL BALANCE*
DEPRESSION (EXOGENOUS)	PROJECT OF LIFE	GROUP SUPPORT	SOCIAL OPPORTUNITIES	ENVIRONMENTS' CONDITIONS SETTLEMENTS
SEXUALLY TRANSMITTED DISEASES	EXISTENTIAL CONTROL	PEERS' VALUES (FIDELITY) (DEFIDENCE)	SOCIAL MOVEMENTS PUBLIC POLICIES	PHYSICAL PROTECTION
ADOLESCENT PREGNANCY	EMOTIONAL MATURITY (SELF-ESTEEM	FAMILY COHESION "FAIRE ACCUEIL"	COMMUNITY SERVICES	LIFE SPACES
VIOLENCE DRUG-ADDICTION	EMOTIONAL BALANCE (RESILIENCY)	LEADERSHIP SUB-CULTURES VALUES, BELIEFS	SOCIAL INSERTION CULTURAL MODELS	DWELLINGS SURROUNDINGS

The heuristic-hermeneutic processes in the socio-cultural learning niches could take different forms, as subsequently described:

Unveiling subject-object relationships and contents (intimate dimension): Subject-object relationships and the range of experiences in the four dimensions of being-in-the-world can be unveiled by asking the participants to write down in a piece of paper (not identified) whatever comes to their minds in connection with circumstantial images or objects (previously selected to catch their eyes, like bottle caps linked by a string), which are passed along in the group.

Sharing perceptions in the group (interactive dimension): The written statements are subsequently distributed out of sort to the participants, who share their perceptions by reading aloud their narratives to the group, as a form to uncover the

different subject-object relationships[1] and contents retained by the participants (table 4); the experience goes beyond individual initial perceptions and is enriched by the perceptions of the group.
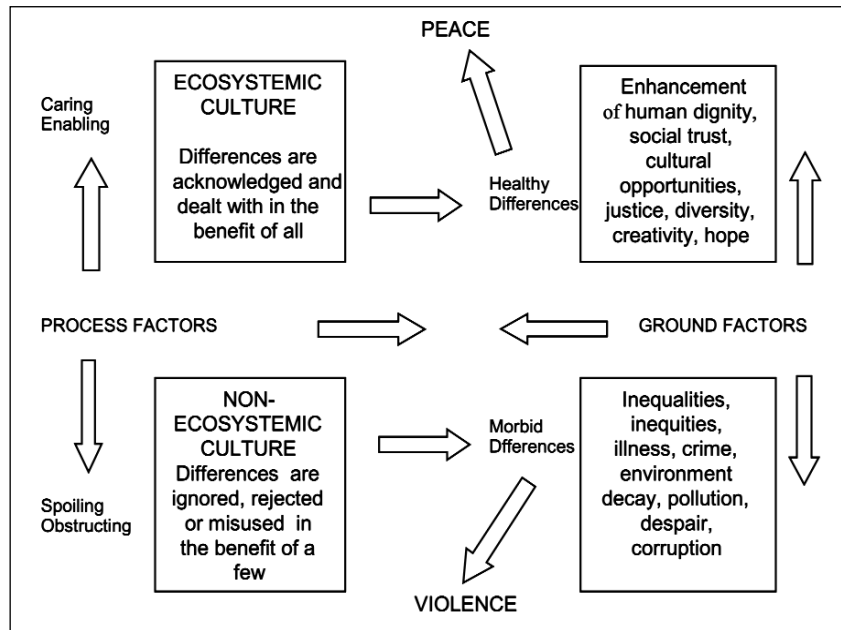
Figure 5. Violence and peace in the ecosystemic and non-ecosystemic models of culture.

Acting on the cultural and natural milieu (social and biophysical dimensions): Old and new forms of being-in-the-world are connected with traditional and alternative configurations, alternative forms are developed by the new experiences in the group, cultural, social, political, economical and environmental issues are analysed in view of different systems of culture (ecosystemic or non-ecosystemic).

Developing a new project of life: As a result of a participatory, experiential and reflexive process, the participants have the opportunity to reflect on their own realities and elaborate new forms to deal with the world, developing the capabilities to analyse and act upon present and future events, in a new horizon of understanding, feeling and action, in view of configurations formed by the interplay of the different dimensions of being-in-the-world.

Conclusions
Research Findings:
• How to deal with the enclosure of the cultural and environmental commons by the current fragmented public policies and reduced conceptual models, in view of an integrated multidisciplinary ecosystemic approach.

Table 4.

Statements offered by the participants after exposure to selected objects

Group A
1) Half shell; organic/inorganic; nature/human made; solid/flexible.
2) Found objects; shell/stones; artefacts; a collection of diverse objects not belonging to any category.
3) Objects of nature are more beautiful and interesting in form than are manufactured articles - but the metal caps may suggest that nature provides in many ways - even when unaesthetic.
4) Sharp and smooth texture; manipulate.
5) Contents: world, rocks from ocean, trash caps, city from modern society, black stones, forest plant; the contents represent global communities: rural, urban, forest, islands.
6) Three black seeds, three elastically connected bottle caps, three white river stones and a heart shaped, dried, open seed pot lay in a white rectangular open top plastic container; remains of living plants, time worn rocks and man-made metal objects represent earth materials.
7) Different shapes, sharp objects, smooth, multi-national corporations, dry.
8) Natural food and junk food; moderation - nature's way and mass consumption; voluntary simplicity, consumerism. sustainability, extinction/destruction.
9) I wonder what type of music these items make; was/is the heart-shaped thing good to eat; what are the little "black beans", how were the holes drilled in the pop tops? what kind of soda are the 2 unfamiliar?
Group B
1) Box having within: 3 bottle caps tied up by an elastic string (it may suggest interaction, integration, inter-personal communication, horizontality); a seashell, 3 pink stones (it may suggest compartment, non integration between parts); a ribbon of paper with the inscription: how many parts have a grain? (it may suggest the type of information discussed interaction).
2) This box (and maybe others) remembers me of my childhood and a beloved aunt, who kept photos and others belongings in it. I feel the smell of sea in the stones and in the alga. I don't know how many parts there in a seed., but nevertheless it would contain the production of life. The link between the objects means the link with other people and the basis of social relations. "Keeping" in the box means to keep people, to keep carefulness, preserving relations that became intense.
3) The box deceived me, I expected much for so little. I thought it cold, it is not; heavy, but no. I don"t like it, it is smooth, opening it I thought of a jewel-case; new sensations: white little stones, similar to those in the river where I work; united bottle caps, but for children.
4) Curiosity, boredom, impatience, beach, sea, chilled water, patience, questions and answers, sand, anxiety, to solve, "Maria Chiquinha", children songs, China, Japan, grains, quantity, immensity, plenitude, rest, tiredness.
5) Feeling of anguish in view of the time; inside each of us there are simple and complex things; their development will help us to grow as people.

Table 5.

Dimensions of being-in-the-world in the ecosystemic model of culture

	Benefits from the Intimate Area
To Intimate Area	**Creativeness**: subjects receive from their inner selves the necessary conditions for creation, both in the cognitive and affective domains.
To Interactive Area	**Cooperation:** groups and networks receive from their members enabling conditions to perform collective tasks (participants help each other, offer advice, listen to others, feel others needs)
To Social Area	**Citizenship:** societies benefit from active and interested individuals, who perform their social roles with a public regard and responsibility.
To Biophysical Area	**Care:** environment receive the attention of sensitive individuals, ecosystems are respected by concerned people.

	Benefits from the Interactive Area
To Intimate Area	**Support:** individuals receive support from groups and networks in order to develop their inner selves (self-esteem, identity, cognitive and affective clues to develop as mature human beings).
To Interactive Area:	**Cohesiveness:** groups and networks develop within themselves the very ground for mutual support and respect that qualifies human settlings as democratic.
To Social Area	**Partnerships:** societies benefit of networks and organised groups that sustain the social tissue, including families, peers (primary groups) and every other organised association (secondary groups).
To Biophysical Area	**Preservation:** environment benefits from the care of groups and networks, who actively preserve ecosystems (directly as specialised groups or indirectly as concerned organisations.

	Benefits from the Social Area
To Intimate Area	**Services:** individuals are promoted as citizens by societies which care for education, health, employment, leisure, transport, shelter, security, etc (citizenship results from enhanced human beings).
To Interactive Area:	**Diversity:** groups and networks benefit from democratic societies who permit diversity of association on cultural, political and economical grounds

To Social Area	**Organisation:** Social development and proper organisation entitle societies to provide the necessary services to promote citizens and quality of life at all levels.
To Biophysical Area	**Sustainment:** environments are sustained by societies concerned with policies and services aimed at the equilibrium of ecosystems, securing biodiversity

Benefits from the Biophysical Area	
To all Areas	**Vitality:** niches sustainment, variety; biodiversity; adequate natural and man-made environments provide to individuals, groups and societies the necessary conditions to develop physical, social and mental health, enhancing the quality of life

• How to work with the dynamic configurations intertwining the four dimensions of being-in-the-world and develop their singularity and reciprocity, enhancing the connections and sealing the ruptures between them.

• How to develop ethics, education, culture, natural and man-made environments, physical, social and mental well-being, as by-products of an ecosystemic model of culture, in view of acceptance, consistency, effectiveness, evidence and endurance.

*Policy Lessons***:**

• Assessment, planning, development and evaluation of public policies, teaching and research projects and community programmes should encompass the four dimensions of being-in-the-world.

• The circumstances that affect individuals, groups, society, natural and man-made environments depend on each other and must be supported simultaneously in view of their singularities and mutual balance.

• Ethics, education, culture, human rights, public policies, physical, social and mental well-being, citizenship, natural and man-made environments and quality of life are strongly affected by the different models of culture (ecosystemic or non-ecosystemic – fig. 5).

• New paradigms of growth, power, wealth, work and freedom should be developed to face the current economic, social, political, cultural, educational and environmental turmoil.

The final tables are presented to compare how the four dimensions of the world are mutually affected by the ecosystemic and the non-ecosystemic models

of culture (tables 5 and 6), to show how to develop the ecosystemic approach in different research and teaching programmes and field projects (table 7): and finally as a summing up of the entire proposal (table 8).

Table 6.

Dimensions of being-in-the-world in the non-ecosystemic model of culture

Harms from the Intimate Area	
To Intimate Area	**Solipsism:** self-existence is the only certainty; subject disregard others; absolute egoism hinders own development due to the lack of exchange with others
To Interactive Area	**Heteronomy:** groups lose their identity, are manipulated and attach their affairs and interests to another's law or rule.
To Social Area	**Subjection:** societies become rigid, totalitarian, obeisance to arbitrary rules is enforced by discretionary power of whimsical individuals.
To Biophysical Area	**Predatoriness:** environments are used arbitrarily, as a "primitive" source for unlimited wealth or pleasure of a few.

Harms from the Interactive Area	
To Intimate Area	**Abdication:** individuals abdicate of their own identities as human beings, in prejudice of original ideas, feelings and action; self is reduced and impoverished
To Interactive Area	**Fanaticism:** wild and excessive enthusiasm for ideas accepted without discussion, hinders feedback; groups cannot be creative, restricted forms of thinking degenerate into fanaticism.
To Social Area	**Corporativism:** societies are controlled by vested interests; groups lose their public dimension, ignoring society's overall interests and looking only for own immediate interests and advantages
To Biophysical Area	**Exploitation:** environments are considered as a stock of resources to be used whenever there is an advantage to the group, with no concern for others' needs and preservation of the biophysical area.

Harms from the Social Area	
To Intimate Area	**Domination:** individual feelings and thoughts cannot be expressed; overall "social rule" prevails and blind obeisance is commanded for subjects; there is no possibility of dissent.
To Interactive Area	**Cooptation:** groups degenerate and are used as instruments for dominant interests; family, peers, associations, networks are coopted by vested interests to promote acts or ideas; there is no informed consent, but a strong pressure, more or less overt or subtle.
To Social Area	**Totalitarianism:** societies dwindle with the suppression of interlocutors able to present new ideas and to discuss enforced policies, issues are decided in the benefit of the dominant rulers.
To Biophysical Area	**Spoliation:** environments are abused to the point of no regeneration; deserts, drought, pollution result from brutish policies and practices in connection with production and consuming processes.

Harms from the Biophysical Area	
To All Areas	**Aggression, dispersion, extinction, savageness:** In the absence of the anthropic principle (inclusion of mankind as part of the natural world) environments grow increasing hostile to humans, catastrophes could destroy entire populations.

Table 7.

Building quality of life in the ecosystemic model of culture

Dimensions as Recipients				
	Intimate	**Interactive**	**Social**	**Biophysical**
Dimensions as Donors	*Subjective Well-Being*	*Group Support and Integration*	*Political and Civic Life*	*Healthy Environments*
Intimate (personal roles)	*Subjects care for own development and well-being*	*Subjects care for significant others*	*Subjects care for the society's well-fare*	*Subjects care for natural and man-made environments*
What individuals can do for the dimensions of the world	Coping abilities, cognitive, affective and cultural predicaments, core beliefs and inner values, existential control	Bonding, bridging, shows affection, solidarity, support own group, family, peers and other social groups	Civic engagement, assumption of local, national and global responsibilities in public affairs, citizenship	Caring for environments, fauna, flora and own body; caring for works of art, architecture, landscapes

Interactive (groups' roles) *What groups can do for the dimensions of the world*	*Groups care for individuals and support participation in different instances* Accepting and supporting people; caring for inclusion and development	*Groups care for development of own and other groups* Promoting mutual understanding, participation, reciprocity and cohesion.	*Groups develop collective organised societal action* Developing partnerships, alliances, advocacy and public action (civil organisation, community building, citizenship)	*Groups care for environments and bodies* Sustaining organisations and civic action for the promotion of healthy bodies and environments
Social (public roles) *What society can do for the dimensions of the world*	*Society cares for individuals* Securing the rights to health, work, education, culture, security, justice, shelter, leisure, nutrition, sports, transportation	*Society cares for groups* Establishing public policies and facilities for the development of associative tasks and solidarity within the social tissue	*Society cares for society* Developing social, political, economical and cultural institutions; facilities, equity, accessibility and accountability	*Society cares for environment and physical bodies* Sustaining public policies for health, sanitation, natural and man-made environments, scenarios
Biophysical (environment roles) *What natural and man-made milieu can do for the dimensions of the world*	*Environment benefits subjects* Provision of resources and spaces for life (air, land, water, food, natural and man-made landscapes and artefacts, architecture	*Environment benefits groups* Provision of resources and spaces for the organisation and settlement of groups and group activities.	*Environment benefits society* Provision of resources and spaces for physical, social, cultural, political and economical life	*Environment benefits environment* Balance of matter and energy, diversity and equilibrium: land, water, air, fauna, flora, landscapes

Table 8.

The Ecosystemic Approach to Quality of Life, a Summing up

PROBLEMS: Quality of life, natural and man-made environments, physical, social and mental well-being are currently undermined by all sorts of hazards and injuries; political, economical, social and cultural disarray normalise atrocious behaviours and violence throughout the world; in a context of dehumanisation, depersonalisation and reification. Democracy, ethics, justice, social equity, education, culture, healthy environments do not prosper, the more powerful impose their own rule over the weaker and destitute, human values that took centuries to develop are progressively annihilated while public policies, legal procedures, academic formats, mass-media headlines and market-place's interests deal with the "bubbles" of the surface (the consequences of the problems), misrepresenting or ignoring what is inside the "boiling pot" (the real problems).

PROPOSED APPROACH: A theoretical and practical multidimensional ecosystemic approach and planning model is posited, intertwining, as donors and recipients, four dimensions of being-in-the-world: intimate, interactive, social and biophysical. Events are not reduced to fragmented representations of reality, but considered as configurations, resulting from a dynamic field, expressing the connections and ruptures between the different dimensions of being-in-the-world.

OBJECTIVE The objectives are the development of culture, education, environment, health and quality of life, of public policies and projects, in view of a holistic ecosystemic approach, intertwining, as donors and recipients, the four dimensions of being-in-the-world; intimate (subject's cognitive and affective processes), interactive (groups' mutual support and values), social (political, economical and cultural policies) and biophysical (biological endowment, environmental conditions, beings and things).

METHODOLOGY: Events are assessed in different contexts and settings (micro, meso and macro) considering connections and ruptures in the four dimensions of being-in-the-world, as they induce the events (deficits and assets), cope with consequences (desired or undesired) and contribute for change (diagnosis and prognosis). Heuristic-hermeneutic processes in the socio-cultural learning niches unveil the different forms of being-in-world, working with cultural and epistemic backgrounds, encompassing the intimate dimension (subject-object relationships, cognition and affect), the interactive dimension (group dynamics), the social dimension (cultural and political) and the biophysical dimension (environmental factors) in view of the development of the necessary capabilities to understand and work with new configurations conducive to a better quality of life.

RESULTS: Instead of being directed to the bubbles of the surface (reduced, taken for granted problems), projects of change contemplate the dynamic configurations "inside the boiling pot" formed by the imbrication of the different dimensions of being-in-the-world, strengthening the connections and sealing the ruptures between them. Enhancing their singularity (own characteristics) and reciprocity (mutual support) as donors and recipients, development projects articulate communication, culture, education, development, communication, citizenship, environment, health and quality of life as by-products of an ecosystemic model of culture, in terms of acceptance, consistency, effectiveness, evidence and endurance, in a context of proactive and purposeful action, co-operation, flexibility, commonality, responsibility and solidarity.

CONCLUSIONS: Public policies, ethics, education, culture, citizenship, health, healthy environments and quality of life are understood and developed as by-products of an ecosystemic model of culture, promoting the singularity of each dimension and the balance between them. Individuals, groups, society, natural and man-made environments are developed simultaneously and enhanced by the wholesome integration and development of the four dimensions of being-in-the-world; new paradigms of growth, power, wealth, work and freedom are associated with economic, social, political, cultural and educational changes as consequences of this ecosystemic approach.

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◄PLANTS MORPHOLOGICAL AND FUNCTIONAL INSTABILITY AND ENVIRONMENTAL QUALITY MANAGEMENT

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The consequences of the environmental contamination and degradation have different manifestations. The most visible negative consequences can be observed on the ecosystem level with involvement its biotic component and physical environment. Endangered species of the wild animals and plants, as well as conservation of the traditional agricultural plants varieties and breed of animals are the other level of ecological disorders which also display themselves immediately. The disorders induced with contamination and destruction of the natural environment on the tissues, cellular and molecular levels of living beings have dual effect: immediately manifestations and consequences which can be displayed through the years, sometimes in future generations (1). The long term and effective environmental management and ecological security can be achieved through nature conservation which involves the molecular and cell levels (2). The living beings' cells and molecules are the most sensitive to the influence of any environmental xenobiotic. Due to this fact the ecological security provided on these levels in most cases should guarantee the security for all other levels of ecosystem (3).

The environmental planning and management policy as well as environmental quality assessment systems are a complex and dynamic process. Environmental management policy, all activities planned for ecological assessment and security should be informative and provide with data about ongoing processes and future potential consequences for human and other living beings. At the same the environmental management system should be cost-effective and should not be in conflict with the global, national or corporative economical, ecological and social policy (4). Therefore the societal commitments in the field of the environmental quality assessment and management constantly updated. According to the most updated commitments the requirement of safety on the cellular and molecular levels are most important issue. Such a requirement historically proved (5) and have been introduced in different countries, became the subject of the international ecological convention in response to increased knowledge about possible long-term mutagenic, carcinogenic

and teratogenic properties of the environmental factors which have no immediately manifested eco-toxic effects on living beings including representatives of the wild flora and fauna (6). Such legislative initiatives as well as national and international law and regulation in this field are very important for safe and productive sustainable development of both current and future generations (7).

The cell and molecular studies also give a chance to provide the quantitative assessment of the degree of the environmental degradation. Quantitative assessment of the environmental degradation can be undertaken with involvement such indicators as gene pool losing, gene pool concentration decreasing, structural and functional disorders of the cells and DNA (7). The studies with involvement of the different species of the plants and animals have shown the important role of the structural and functional disorders of the cells in the manifestation of the effects of the environmental xenobiotics (8).

Table 1.

Ecological disorders and their quantitative assessment (7, 8)

The levels of influence	Manifestation	Indicator
Ecosystem	Degradation ecosystem's biotic and abiotic components	The extent of the environmental degradation
Species	Endangered species of animals ana plants	Endangered species number
Plants and animals population	Decreasing the number of animals and plants inhabiting on limited area	Percent of endangered gene pool
Tissue	Shortening of life span, different ontogeny pathologies	Mutations and modifications level
Cells and molecule	Different phylogenic pathologies, cancer	Chromosomes instability, DNA damages

Environmental planning and management includes assessing the quality of the natural or industrial environment, the level of environmental contamination by xenobiotics and the extent and character of the environmental contamination or change. One such group of environmental contaminants that are managed and monitored is xenobiotics that may be present in biosphere but are not found in the natural environment. Xenobiotics may have an impact on flora and fauna, human health and, thus, are assessed and reported in units of maximum allowable concentration (MAC) for chemicals and maximum allowable doses (MAD) for physical factors, such as radiation, temperature and others. These data are used in formula-

tion and development of environmental standards for regulatory purpose to protect flora fauna and human health. The threshold levels of potential contaminants in the environment, which are permissible from the environmental regulatory perspective, are assessed on the basis of MAC and MAD (6).

The MAC and MAD approach is good and provide for environmental security. But regulatory implementation of this approach is applicable in the situation in which living beings are exposed to the impact of only one environmental factor or chemical. In majority of cases, plants, animals and human in many given environment is exposed to several factors, which may combine to form such a phenomena as synergism, antagonism and metabolic activation. Synergism in ecology manifestation is characterized as process, in which different xenobiotics (chemical compounds or/and physical factors), which are separately non-toxic, neutral or low toxic in the allowed concentrations (MAC) or doses (MAD), acquire high toxicity in a mixture or in combination and influence of the certain physical factors. Chemical or physical factor in allowed concentration or doses in the environment do not guarantee the ecological security for environment and inhabiting living beings. Initially non-toxic chemical xenobiotics may interact with other substances existing not only in environment, but also in organisms and became toxic as result of metabolic activation.

Metabolic activation is a process when compounds, that are initially non-toxic from ecology point of view or have low toxicity, acquire toxic properties or higher toxicity while undergoing internal transformation in living organisms. Metabolic activation is similar to synergism. The most distinct difference between these two processes is that the process of metabolic activation takes place not in external environment (as in the case with the process of synergism), but it takes place in internal environment (in the bodies of plants, animals, human). Some of heavy metals for example or other compounds which exist in the polluted environment have the potential to acquire toxic properties due to the metabolic activation (6, 8).

The MAC and MAD concept is acceptable for environmental regulation. However, such environmental management practice can not guarantee ecological security due to the fact that in natural environments, where is always the potential for synergetic interactions of individual elements of multi-component environments as well as for the interference of toxicants with metabolic processes in living beings organism. In this situation the most relevant method for environmental quality assessment is biomonitoring. Biomonitoring is a method which allows full assessment of the environmental contamination on the basis of objective data generated through monitoring living organisms inhabiting the targeted region or ecosystem. The species which serve as a basis for environmental quality monitoring are identified as indicators species or bio-indicators. Plant morphology the

most widely used methods of environmental quality assessment. Along with the traditional morphological indicator such kind of characteristic as fluctuating asymmetry (8, 9) of plant leafs and chromosomes instability have been suggested for biomonitoring of the environmental factors influence on the tissue and cell levels.

In practice, as a suggested method of natural indication, biomonitoring may be passive or active. Passive biomonitoring is based on application of principles of assessment of plants, animals and other living beings which are naturally characteristic of or exist in a given environment. Passive biomonitoring is carried out on the basis of existing species-indicators and does not involve the introduction of other species into the study environment. In cases of active biomonitoring special selected plants species deliberately introduced into the area (10). Our experiments shown that the fluctuating asymmetry test ia applicable both in the process of active and passive biomonitoring (Table 2, 3).

Table 2.

Bilateral asymmetry the leafs of the Tritiym aectiym cultivated in contaminated environment (8)

Ecological characteristics	Number of plants	Number of leafs	Bilateral asymmetry $M \pm м$	Dyspepsia σ^2_d
Ecological optimum	100	360	$0,14 \pm 0,007$	0,013
Ecological risk	100	360	$0,23 \pm 0,011$	0,019
High ecological risk	100	320	$0,41 \pm 0,015$	0,21

Table 3.

Bilateral asymmetry the leafs of the *Ligustrum japonicum Thunb.* growing in contaminated environment (8)

Ecological characteristics	Number of leafs	Bilateral asymmetry $M \pm м$	Dyspepsia σ^2_d
Ecological optimum	180	$0,41 \pm 0,02$	0,11
Ecological risk	178	$0,59 \pm 0,02$	0,17
High ecological risk	250	$0,88 \pm 0,03$	0,28

The results of experiment shown that bilateral asymmetry is effective for passive and active biomonitoring of the environmental quality. These results demonstrates that wild and cultivated plants is effective for environmental quality assessment and environmentally quality management (Figure 1).
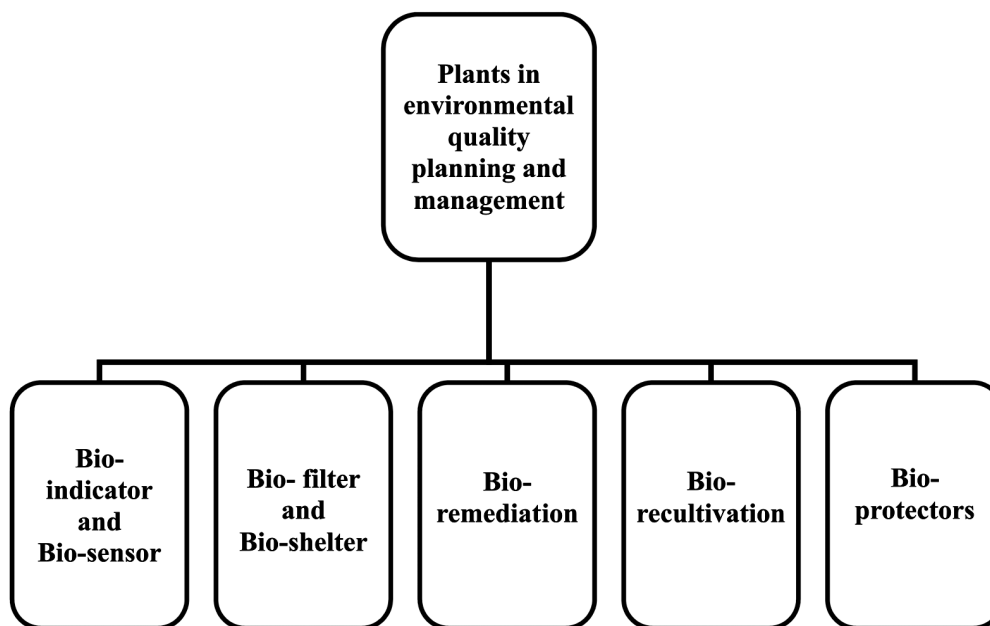
Figure 1. Plants in ecological planning and management (8, 11-14)

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ANALYSIS OF MOVEMENT SAFETY IN THE CASE OF EXTRAORDINARY BREAKING OF A CAR

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This article examines the variants of the traffic safety by the extraordinary braking of a car in the case when a driver finds out suddenly an impediment in the carriage-ways. It offers to implement the braking without separating a clutch coupling from transmission and during the determination of a critical distance from the car to the obstacle, to take into account the influence of a technical condition of an engine on the braking of a car with the help of the correction factors.

The traffic intensity in the motor roads and the streets of cities is expanding each year. It is occurred in consequence of increase of the stock of cars and owing to increase of demands in transportations. The considerable growth of the stock of cars and speed enhancing resulted in the complication of traffic. If we don't take any appropriate action on improvement of the traffic conditions, it will be resulted in a growth of the traffic accident. (TA).

According to the statistics, about 40% of TA takes place through the drivers' fault because of discrepancy of the start speed chosen by the driver and the traffic conditions. To avoid the accident, the driver has to stop a car timely. The speed of traffic has a decisive role for the movement safety, so as the energy of the car, to be reduced while braking is increased in proportion to the square of the speed. Therefore, in case of a sudden revealing of an obstacle by the driver in the roadway, he has to be capable either to stop a car before detection of the obstacle or to reduce the speed manoeuvring by the steering wheel to go round the obstacle.

However there may be cases, when at the moment of revealing of the obstacle, the car is at such a distance, its timely emergency stoppage may be embarrassed on account of several reasons. The specified circumstances are borne out by the numerous experimental investigations [1, 2, 3, and 4]. There was determined that there is a regularity between the percentage of drivers (in % of the total number of drivers), who could stop a car before reaching the obstacle, advancing with a determined speed and a distance from the obstacle contained in the schedule 1.

Table 1

Motor car speed, m/c (km/hour)	Distance, on which a driver has observed an obstacle, m								
	19,8	27,5	38,5	53,5	76,5	99	129	145	167,5
10,29 (48)	0,0	29,9	82,3	100,0	-	-	-	-	-
17,73 (64)	-	0,0	9,3	63,3	100,0	-	-	-	-
22,16 (80)	-	-	0,0	7,0	60,0	100,0	-	-	-
26,59 (96)	-	-	-	0,0	2,5	40,4	87,0	100,0	-
28,25 (102)	-	-	-	-	-	0,0	33,3	-	100,0

Now, we can determine the possible distances from the car up to the moment of sudden revealing of an obstacle at the road-way of streets with the purpose of preventing TA via the extraordinary stoppage of a car.

$$l - Vt_{\text{RPU}} \leq \frac{V^2}{2j_{\varsigma}} ,$$

If we accept that $\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ (1)

where l – is a distance from the obstacle up to the car; V – is a speed of movement of a car at the beginning of break; t_{RPU} – is a total time, allowing for the reaction of a driver, the time of delay of actuation of the brake gear and the time of gradual growth of a delay of a car from zero to the maximal value; $\dot{j}_{\varsigma}$ – is a delay of a car.

In this case, the driver, using the extraordinary braking will be obliged to stop a car before reaching the obstacle.

At this moment, the time of reaction of a driver will be a time embraces a time that the driver, from the moment of revealing of an obstacle takes a decision on braking and transfers a foot from a pedal of transmission of a fuel to the pedal of break. The lag of operation of the break gear is occurred within a time, in which there is chosen the free move of a pedal up to the forcing down of the brake shoes against the drum and revealing of the braking torque or a delay. Within a time, when the delay is gradually increased from zero to the maximal value, the effective breaking is taken place and the road passed during this time, may be called as a road of effective breaking. Then, in the cars, in which there were not mounted any anti-skid mechanisms in the breaking devices the wheels are blocked up. In case of blocking (sliding) of wheels of a car, the movement rules will be different than in movements with braked, but rotating wheels. When the blocked wheels of the car slide on road, the rubbing in the brake assembly will be lacking and the force of friction between tires and road will be less, rather than in a case when wheels do not slide, but rotate. Thus, the asphalt cuts off a thin layer of rubber from a tire

cover and its braked wheels slide on the smallest reels as if on bearing parts. As a result force of rubbing between tires and road decreases and it is required the greater way for absorption of kinetic energy of the moving car. Therefore, during the blocking of wheels the efficiency of braking became worsen.

Solving the equation (1) concerning delay of the car j_3, we shall receive:

$$j_3 = \frac{V_2}{2\,(1 - Vt_{RPU})} \tag{1}$$

It is obvious that the size j_3 becomes uncertain, if $l = Vt_{RPU}$. But even, if $l > Vt_{RPU}$, the delay from the point of view of comfortable conditions can be too greater and even dangerous from the point of view of traffic safety. In the case of the emergency braking of the car, the delay reaches the maximal value j_{3max} the critical distance l_{kp} from the car up to an obstacle will be equal:

$$_{kp} = Vt_{RPU} + \frac{V_2}{2\,j_{3max}} \tag{2}$$

It is clear that the value l_{kp} depends on the characteristics of the complex «car – driver» (A-B).

The value of maximal delay is determined as a rule by the below mentioned formula [5]:

$$j_{\text{Ç max}} = \frac{g\varphi_x}{k_{\acute{y}}}\ , \tag{3}$$

where φ_x – is a factor of longitudinal coupling of tires with road; g – acceleration of a gravity; $ê_{\acute{y}}$ – an effectiveness ratio of the braking, considering the operational conditions and technical conditions of the brake system.

We have to determine the maximal possible distance l_{max} from the obstacle, when the car cannot come to a stop in the case of approach with emergency braking:

$$l_{max} = Vt_{ñ} - (B + L)\ , \tag{4}$$

where $t_{ñ}$ – is an operating time of steering mechanism; B – is a width of carriageway of streets; L – a length of a road.

In this case, the car driver will be obliged to accomplish a maneuver of steering together with braking.

If $l_{\hat{e}\delta} > l_{\max}$ – the driver shall stop a car before reaching the obstacle via emergency braking.

If $l_{\hat{e}\delta} \leq l_{\max}$, the driver, being at the distance of $l_{\max} \leq l \leq l_{\hat{e}\delta}$, is not capable to stop a car by an emergency braking. In this case, the driver will manoeuvre inroad or a collision with an obstacle in order to prevent TC in case of decreasing of heaviness.

It is to be noted that in the emergency cases (in extreme situations) during the urgent evacuation of people and wounded men for maintenance of a traffic safety, it will be important to adhere to the critical distance between the transport means.

During such emergency and complicated situations for maintenance of stability of the car and decrease of dispersal of attention of the driver after detection of obstacles, maneuvering by the steering management, he will be obliged to accomplish the emergency braking without isolating the clutch couplings from transmission.

It was proved by the investigations of the other authors as well [3,4]. Therefore, in such cases, during determination of a critical distance from the car to the obstacle when there is applied an emergency brake without separating the engine from the transmission, the formula (2) has to take into account the technical condition of a car through factors $k_{\ddot{a}1}, k_{\ddot{a}2}, k'_{\ddot{a}2}$. apart from the value $j_{\varsigma\max}$. In this case, the critical distance of a car up to the obstacle depending on the mark of the engine, which are determined for this car may be found out as follows [6]:

For the cars with carburettor engine

$$l^{k}{}_{\hat{e}\delta} = V t_{\text{ĦÓ}} + \frac{V^2 k_{\ddot{a}1}}{\dot{j}_{\varsigma\max}} \quad ; (5)$$

For the cars with diesel engine with the free intake

$$l^{\ddot{a}}{}_{\hat{e}\delta} = V t_{\text{ĦÓ}} + \frac{V^2 k_{\ddot{a}2}}{\dot{j}_{\varsigma\max}} \quad ; (6)$$

For the cars with a diesel engine with the gas-turbine supercharge (GTS) and with inflating air cooling

$$l^{\tilde{A}\grave{\partial}\acute{t}}{}_{\hat{e}\delta} = V t_{\text{ĦÓ}} + \frac{V^2 k'_{\ddot{a}2}}{\dot{j}_{\varsigma\max}} \quad : (7)$$

Where $k_{\ddot{a}1}, k_{\ddot{a}2}, k'_{\ddot{a}2}$ – are correction factors, characterizing the technical condition of engines specified under the conditions of exploiting

The correction factors $k_{\ddot{a}1}, k_{\ddot{a}2}, k'_{\ddot{a}2}$ are determined as per the nomogram or the formula:

$$k_{\ddot{a}1} = a_1 \exp\left(b_1 \frac{Ne_{\max}}{Ne_{\max\,\acute{y}\hat{e}\tilde{n}}} \right); \qquad (8)$$

$$k_{\ddot{a}2} = a_2 \exp\left(b_2 \frac{Ne_{\max}}{Ne_{\max\,\acute{y}\hat{e}\,\tilde{n}}} \right); \qquad (9)$$

$$k'_{\ddot{a}2} = a'_2 \exp\left(b'_2 \frac{Ne_{\max}}{Ne_{\max\,\acute{y}\hat{e}\tilde{n}}} \right), \qquad (10)$$

where a_1, a_2, a'_2 è b_1, b_2, b'_2 - are factors, depending on the technical condition of an engine; $Ne_{\max}$ – is a power determined by the factory – producer; $Ne_{\max\,\acute{y}\hat{e}\tilde{n}}$ – maximal power of the engine being exploited.

The maximal power of the engine may be determined as per the formula under the conditions of exploiting [6]:

$$Ne_{\max\,\acute{y}\hat{e}\tilde{n}} = \left(\frac{G_{T_N} - G_{T_X}}{V} \right)^{1/\alpha} \qquad (11)$$

where G_{T_N} - is a fuel consumption, conforming to the maximal power in the exploitation; G_{T_X} - is a fuel consumption under the condition of exploitation when the engine operates according to the conditions of exploitation; V and α - are stable factors, depending on the constructive features of the engine;

The values of factors a_1, a_2, a'_2 and b_1, b_2, b'_2 are determined experimentally, they may be received through analytical modeling as well. To determine their importance for the single-line engine there is carried out a complex experiment in case of various combinations of faultinesses arisen under the conditions of ordinary exploitation of cars. As per the results of the carried out experiments we can build up a dependence:

$$k_{\ddot{a}1} = f'_1 \left(Ne_{\max} / Ne_{\max\,\acute{y}\hat{e}\tilde{n}} \right)$$
$$k_{\ddot{a}2} = f''_1 \left(Ne_{\max} / Ne_{\max\,\acute{y}\hat{e}\tilde{n}} \right)$$
$$k'_{\ddot{a}2} = f'''_1 \left(Ne_{\max} / Ne_{\max\,\acute{y}\hat{e}\tilde{n}} \right)$$

or the various values of $Ne_{\max \acute{y}\hat{e}\tilde{n}}$, which are approximated by the empiric function of the experimental type.

As the investigations specify, the purpose determined within the limits of the specified values of empiric coefficients, i.e. the increase of the evaluation precision l_{kp}, is not secured. As to the buildup of evaluation precision l_{kp} enables to give an opportunity in this case to ascertain more exactly the above mentioned criterion of the traffic safety.

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◄ SOME ASPECTS OF A PROBLEM OF HYDROGEN CHLORIDE UTILIZATION

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Environmental pollution is bringing in ecosystem uncharacteristic lively or lifeless components or the structural changes interrupting circulation of substances owing to what this system collapses or decreases its efficiency. The pollutions can be natural and anthropogenic character. The natural pollutions arise up as a result of the natural phenomena (catastrophes), for example, flood, eruption of volcanoes. The anthropogenic character pollutions are caused by activity of the human being, which alters the lively and lifeless nature. Changes, brought by the human being in the nature, often have negative character. As a pollutant may be any physical agent, chemical substance or the biological kind, getting in an environment or arising in it in the amounts which are beyond the usual concentration.

The main sources of emissions in an atmosphere are the industrial enterprises and transportation. In gas emissions of transportation prevail nitrogen oxides, polycyclic aromatic hydrocarbons, also soot and sulphuric oxide. In an industry the following fields are in the leading position on emission of the main polluting substances: an oil refining, petrochemical, chemical industry, mechanical engineering, metal working and ferrous metallurgy. The composition of pollution from the industrial enterprises depends on type of production.

The petrochemical and chemical industry is most various on polluting substances. Emissions of the enterprises of the chemical industry are characterized by presence in them solid, liquid and gaseous substances, and also by the wide list of specific hazardous substances, such as toluene, benzene, phenol, ammonia, hydrogen sulphide, hydrogen chloride, chlorine, etc. The enterprises of chemical branch determine the high contents of toxic substances in an environment, which include dioxines and similar to them substances. Sources of their emissions in an environment are the enterprises on production of the chemical fertilizers, polychlorinated biphenyls and chloric production, and also the enterprise of the pulp-and-paper and metallurgical industries.

Chemical pollutants can cause acute poisonings, chronic illnesses, and also have carcinogenic and mutagenic effect. Growth of incidence rate directly depends on a condition of an environment in the territories polluted by chemical industry. For this reason, the question of providing environmental safety of a chemical industry is closely connected with a question of environmental protection and maintenance of health of population.

The question of protection of the environment especially sharply stands for chloroorganic sector of the chemical industry. High-capacity technological processes of deriving chloroorganic products having greater consumer value, as a rule, are accompanied by formation of significant amounts of practically unutilized wastes. One of the important problems in production chloroorganic products are the greater capital and power expenses directed on treatment sewage and gas emissions, processing of by-products formed in appreciable amounts, recycling of the liquid and solid waste polluting an environment. From this point of view, today the problem of recycling hydrogen chloride which is a waste of processes of deriving various chloroorganic products, is highly actual. Not finding the qualified application of such hydrogen chloride is neutralized and dumped in water pools or turns into a hydrochloric acid with its subsequent recycling. However, this polluted by chloroorganic impurity a hydrochloric acid not always finds selling and its clearing highly labour-consuming. Despite of the large number developed and at different times the realized methods of utilization of hydrogen chloride, the main direction of its decision are processes of hydrochlorination and oxychlorination. Association of stages of chlorination and hydrochlorination or oxychlorination allows to create the balanced on chlorine processes of deriving practically all chlorhydrocarbons in which all given chlorine is spent only for main products.

In a context of decision of a problem of utilization of hydrogen chloride we consider the process of oxychlorination of propylene with deriving of allyl chloride. Allyl chloride is initial raw material for the production of such important products of petrochemistry as allyl alcohol, epichlorohydrin, glycerine, and also some ethers, medical preparations, some kinds of plastic materials, etc. In a world practice the main industrial method of deriving allyl chloride is high-temperature chlorination of propylene which has some of disadvantages. Oxychlorination, despite of the advantages, has not found yet an industrial embodiment. The reason consists in absence accessible and selective catalytic systems providing flow of process with high technical and economic parameters. So far as, the basic requirement produced to processes of oxychlorination, is their balanced on a chlorine, the conversion of hydrogen chloride plays determining role. For the best known in a world practice copper consist samples of catalysts this parameter is low and does not exceed 30-50 %. However there are highly active catalysts, allowing to reach 70 % conversion of hydrogen chloride, but they contain in the composition expensive

rare earth elements. The purpose of our work was search of effective catalysts for process of oxychlorination of the propylene, adequating to optimal characteristics – stability, selectivity in a combination to high activity, studying of the conditions influencing on composition of products of reaction and research of secondary transformations chlorohydrocarbons. As carriers for catalysts aluminium oxide, silica gel, aluminosilicates, faience carriers and natural clays, exposed to high-temperature incineration have been tested. On the basis of the carried out researches it has been established, that the best results are reached at use copper consist catalyst on the basis of hydromicaceous-kaolin clay incinerated at 980°C. On this catalyst under optimal conditions of carrying out of process – temperature 490°C, contact time 0,5 s and molar ratio $\tilde{N}_3\acute{I}_6$: Í Ñl: air ($\hat{I}_2$) = 1-1,2 : 1 : 2,4 (0,5) is reached 75% conversion of hydrogen chloride at selectivity on allyl chloride, equal 85-86%.

It is established, that among the secondary transformations influencing on composition of products of reaction, the basic role is play steam conversion (hydrolysis) of chlorohydrocarbons. It leads to formation of additional amounts of hydrogen chloride. As a result of it there is a decrease in conversion of hydrogen chloride, and also yield of allyl chloride. Kinetic laws of steam conversion formed chlorohydrocarbons are studied and the kinetic equations are deduced.

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◂ INNOVATIVE ACTIONS THAT CONTRIBUTED TOWARD PROTECTING THE ENVIRONMENT IN BRAZIL

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Introduction

The solution for an environmental problem arises sometimes from an action that aims at other purposes – in most cases the original motivation for acting is economical, social or legal. Leaving environment as a hidden or minor motivation in the order of precedence does not diminish however the merit of the action taken: usually in a short time the priorities are reversed and the environmental merit tops the list of the project's justifications.

This paper recounts some actions taken that contributed toward solving environmental problems by opening new paths for improving living conditions and stimulating sustainable development patterns. The examples given are projects and solutions conceived in Brazil, but their equivalent in other parts of the world can certainly be identified.

The examples described were selected to show the importance of using non-conventional approaches to reach an objective, but their outcomes point to a very interesting conclusion: the innovative approaches also originated several spin-offs that presented, in due time, new solutions for other environmental problems. In this regard a very relevant aspect of such innovative attitudes is the opportunity to transform eventual spin-offs of the solution found into new solutions for other related problems.

Innovation, breakthrough technologies, shift of paradigms, spin-offs and extended view are some keywords to have in mind when time is short for conventional and gradual solutions, and some environmental problems accelerate faster than human actions can correct them.

First example: Substitution of Petroleum Derivatives

Program start: 1970's

Original motivation:
High cost and shortage of petroleum and its derivatives, due to successive world oil crises

Conventional approach abandoned (infertile for generating new opportunities and spin-offs):
The rationing of petroleum derivatives and restrictions on the mobility of vehicles, to save fuel

Reasons for success of the innovative approach:
Extant local experience in sugar-cane cultivation and industrial ethanol production; local competence for automotive engine adaptation

Environmental benefits:
Promotion of the renewable energy concept; demonstration (in large scale) of a petroleum-free solution for moving people and goods; development and production of bio fuels and biodegradable materials

Program's spin-offs:
Ethanol production in large scale (higher efficiency); bio diesel production extracted from several tropical crops and palm trees; energy co-generation from sugar cane bagass; carbon credits (CDM projects inserted in Kyoto Protocol); multi-fuel engines (Flexfuel cars); development of bio polymers; genetic improvement of plants used as raw-materials for bio fuels production

Project rationale and results:
The need to save or even to entirely replace fossil fuels used in vehicles during recent oil crises gave origin to a massive bio-energy production program that now covers the whole country. The first petroleum world crisis that erupted in 1973 was to some extent beneficial to Brazil because important steps have been taken since then to replace fossil fuels with renewable sources of energy. The successive increases in petroleum prices since the year 1973 in addition to Brazil's severe dependence on imported petroleum at that time, has vigorously encouraged the development of substitutive fuels based on biomass. The most successful of these efforts was Proalcool, a program that in few years led to a drastic change in the conception of vehicles manufactured locally. During the1980's more than 95% of the

new automobiles were running on hydrated ethanol, displacing the use of petroleum by practically 100%. Even the older cars, originally designed for the use of gasoline, run with a 25% addition of ethanol in the fuel they use.

The development of engines that can run with various fuels and their mixtures is also an important breakthrough of this shift to the biomass fuels. More than 80% of the cars produced and sold in Brazil in 2006 are powered by engines based on the Flexfuel concept that automatically accepts the use of ethanol or gasoline at any ratio of mixture.

A new program proposed in 2004 by the federal government envisages the substitution of the diesel oil (mostly used by truck and locomotive engines) for vegetable oil – the so called bio diesel – produced from biomass that can be extracted from various tropical palms, as well as from soybeans, cotton, sunflowers, peanuts, castor beans and several other vegetables which yield excellent results in the tropics. In addition, the processing of all this biomass at the plantations sites can enhance the use of local manpower easing the problem of labour migration to large cities and represents a true eco-social approach to the energy problem.

The absence of sulphur and other pollutants in the bio fuels, and the complete elimination of lead addition to the gasoline (condemned practice abolished in Brazil since 1974) augmented the environmental merit of these projects and programs.

This growth in the use of fuels based on biomass can gradually lead to a complete transition from fossil fuels to renewable sources of energy, both in private and public transportation. In spite of a steady increase in the local petroleum production – that brings Brazil now to the enviable condition of a self-sufficient country and even a net exporter of oil – the increase in the use of biomass for electric power generation can also be noticed. Cogeneration projects using bagasse (the crushed sugar cane waste resulting from the sugar or ethanol production) as a subsidiary fuel reduce the environmental impact caused by the industrial production units, and are fully eligible for the Clean Development Mechanism established by the Kyoto Protocol on climate change: an additional fact that increases the competitiveness of the projects. The replacement of fossil fuels with biomass renewable fuels is clearly identified as a trend that will permanently influence the use of energy, consisting in a relevant shift in paradigm.

Second example: Recycling of Packaging Materials

Program start: 1980's

Original motivation:
Recovery of aluminium value in beverage cans

Conventional approach abandoned (infertile for generating new opportunities and spin-offs):

Forbidding the use of aluminium cans or imposing surcharges to reduce their use and consumption

Reasons for success of the innovative approach:

Already existing tradition in scrap collection and metals recovery; availability of low-cost man power to quickly multiplying into a collector's network

Environmental benefits:

Energy saving and preservation of non-renewable natural resources (bauxite mainly); cleaning the urban environment

Program's spin-offs:

Motivation to set up equivalent recycling programs for other packaging materials (plastics, glass, steel cans, cardboard containers, etc); stimulus for developing a breakthrough technology for recycling composite packaging materials, with the use of a thermal plasma process; new jobs for large contingents of independent garbage collectors, mostly unskilled or momentarily unemployed persons

Project rationale and results:

A long time Brazilian tradition in scrap collection and raw materials recycling, based originally on plain economical motivation has led to a fast adoption of the new "recycling-for-environment" approach with very successful results regarding paper, metals, glass, plastics and other recyclables. The already existent sorting areas and processing facilities, conceived originally for handling miscellaneous scrapped materials, together with the low cost of labour could sustain for many years some nationwide recycling programs even before the stimulus added by the new environment protection policies. Glass bottles and galvanized steel packaging have a long time tradition as recyclables and have had their collecting networks well established for many years. As can be noticed, these traditional recycling networks started on a purely economic rationale, but their merit as an effort to clean the environment and reduce the amount of garbage to be disposed of was soon realized. Such are interesting examples of environmental solutions that resulted after the economic equation was solved.

A program worthy of special reference is the recycling of aluminium beverage cans. This countrywide program of aluminium recycling sustains around 160 000 workers in Brazil, most of whom are unskilled or momentarily unemployed. It has also become a model for other recyclables. The cans are voluntarily collected and in 2005 they added up to the exceptionally high figure of 97,5% of all cans produced

in the country. Since its start in the 1980's a comprehensive system was set in place, including collector teams, locals for delivery (where the collectors are paid in cash for their "production"), metal smelting facilities and, last but not least important, the assurance of a stable market to absorb all the recycled metal. Saving in energy reaches 95% when we compare the secondary aluminium recovered from the cans, with the production of primary aluminium. In addition, the need for mineral ore (bauxite) and other non-renewable production inputs is entirely eliminated.

Lately this program has helped to conceive other extensive recycling initiatives. The processing of composite cardboard packaging (with layers of aluminium and LDPE) now uses thermal plasma technology. This is a recent development that to some extent uses the experience of the aluminium cans collecting network to amass large amounts of composite packages. The collecting and processing of other plastic packaging materials also grows steadily, particularly that of the PET (polyethylene terephtalate) beverage bottles.

On the other hand and contrary to these examples it is important to note that a type of packaging which by law obliges recycling is not economical to process – the agro-toxic containers discarded in farms. These are materials that require particular care after their use and transportation due to their toxicity, and their final destination must be in approved facilities. In this particular case, the environment is the mandatory reason for the processing.

Third example: Restoration of the original environment in Tijuca Forest area

Program start: 1840's-1860's

Original motivation:
Protection of water sources used for supplying urban population in Rio de Janeiro

Conventional approach abandoned (infertile for generating new opportunities and spin-offs):
Obtaining the water supply from more distant sources or drilling wells within the city

Reasons for success of the innovative approach:
Clairvoyance of the imperial ruler (a scientist and humanist himself) and political will to implement the restoration project

Environmental benefits:

Climate and water conservation; formation of a permanent public leisure area

Program's spin-offs:

Development of the concept of riparian forest protection (preservation of forested areas adjacent to bodies of water); introduction of the concept of nature parks; protection and dissemination of native trees species; growing experience in forest stewardship and reforestation;

Project rationale and results:

Contrary to the two other examples already mentioned, several environmental concepts (although not yet clearly exposed and understood at that time), were identified at the origin of this project decision and implementation. This is due to the clairvoyance of the project's mentor, the Emperor himself.

The young Brazilian emperor Dom Pedro II was crowned at only 15 years of age in 1840, and ruled until 1889 when Brazil became a republic like all other countries in the Americas. The concerns with the preservation of nature, present in the minds of eminent scientists who visited the new country, soon captivated the young ruler who took important steps to protect the luxuriant nature around the imperial capital city of Rio de Janeiro. Large depleted areas, once covered by the tropical forest within the limits of the city were showing at that time the importance of preserving the local sources of water and the canopy of the forest in order to control the climate in the region.

The tropical forest that surrounded the city had been severely cut down to set free areas for sugar cane and coffee plantations. Coffee farming had already climbed to the summit of the hills and almost to the peak of the high mountain where today the Christ's monument stands and is well known to the tourists. Fresh water to supply the country's capital city was becoming scarce whilst the tropical climate became harsher after the forest removal. A prolonged drought in 1824 had already lead to the decision to protect the areas around the water springs in anticipation of the modern practices of protecting water's edge vegetation (riparian areas), and in line with the current concepts of water management. A most serious draught in the year 1844 with the worst consequences on water supply to the population led the imperial government to expropriate the land in order to reforest these areas – the lesson of cause-effect provoked by wrong farming practices was being learnt.

In 1861, under the Emperor's personal instructions, a new law was issued turning all this land into a forest park, "to conserve the climate and protect the natural springs that supply water to the city". The whole area was then replanted with the same native species that covered it before deforestation. The use of exotic (or

imported) species was not accepted in the text of the new law, pioneering the protection of the local biodiversity. During the following 12 years, more than seventy thousand saplings were planted under the Emperor's personal supervision giving origin to the world's largest urban forest that stands until today.

The concept of protecting the water sources, together with a better understanding of the direct relationship between the local climate and the existence of forests can be easily traced in this project as conceived at the very early stages of the ecological science. Tijuca Forest, as it is called, with its 32 km^2 has officially been a National Park since 1967, and was listed as a Unesco Biosphere Reserve in 1991. Its revival as a forest amidst a large city can be considered a milestone in the human fight against the exhaustion of nature.

All this happened around 150 years ago setting up some new concepts of nature conservation now universally adopted.

Conclusions

The concept of paradigms shift, exposed by Thomas Kuhn in his book "The Structure of Scientific Revolutions" published almost fifty years ago, is clearly recognizable in all three examples described. Conventional solutions were put aside in benefit of innovative approaches, leading to new proposals and eventually to new technologies. With the help of lateral thinking and brainstorming techniques, innovative solutions can be conceived for many problems, leading sometimes to breakthrough technologies based on entirely new paradigms.

The examples given also illustrate the benefits to the environment that can be rescued from the innovative posture of the entrepreneurs, when they adopt an "extended view of our world", as proposed by Walter Kofler.

Looking for spin-off opportunities while exploring innovative solutions for a problem can also embrace other areas – promoting eco-social sustainability and public health, stimulating competitiveness, conserving natural resources, designing "green" products, developing "green" processes, creating new jobs and, most important, disseminating environmental education at the different levels of the society.

In his writings two hundred years ago Jose Bonifacio, scientist and mentor of the Brazilian political independence, prophesied facts that became truths – he foresaw how important it is to conserve the natural habitat and preserve the wooded areas, and he went even further when he proposed the protection of whales against indiscriminate killing. He was ahead of his time in the 19th century, and several decades before the word "ecology" was used by Haeckel for the first time. He did not live to see the petroleum era that dominated the 20th century, but he would certainly be an advocate of the biomass renewable energy era that will probably replace the fossil fuels in a few more decades.

In the early years of the 21st century, society is changing the focus of its environmental concerns, moving from the solution of specific and already identified impacts to the rather global concepts of sustainability and survival. A global approach to alleviate environmental stresses should not ignore however the importance of developing innovative technologies aligned with the local social conditions and economic requirements, preferably with the employment of local manpower and the use of local resources.

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CREATION OF RADIATION AND HYDROCHEMICAL MONITORING SYSTEM OF KURA, ARAKS, SAMUR RIVERS BASIN IN AZERBAIJAN

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INTRODUCTION

One of the main points of conception of the Stable development is the environment protection as an integral component of the development process and it can't be considered separately. It is necessary to emphasize that the environment functions on the base of its own rules the study of which is late, but the mankind will have to obey to them during the its development process. The provision of the natural-ecological stability is impossible without the presence of exact information about the environment state.

Various and intensive, poorly controlled economical and industrial activities as well as geological, geochemical and hydrological peculiarities of the whole region of the Caspian Sea Basin had its significant pollution. Ecological state became worse after the USSR collapse; establishment of independent states and at present there is a necessity to create a system of the ecological monitoring in the region. It will provide a fulfillment of regulations accepted in 1995 the Global program of actions on marine environment protection against the pollution as a result of onshore activity. This international mechanism called to supplement with itself the U.N.O Convention on maritime law (1982) in that part which deals with realization of regulations on marine environment pollution from onshore sources. The important stage of such monitoring is the study of degree and nature of pollution with radionuclides, toxic and chemical hazardous elements of Kura, Araks, Samur rivers, running on territories of Georgia and Armenia, and then on Azerbaijan territory and flowing into the Caspian Sea, to coast of which four states – Russia, Kazakhstan, Iran and Turkmenistan join.

The aim of the present Project is the study and characterization of pollution with radionuclides, toxic and chemical hazardous elements of the Caspian Sea

Basin rivers – Kura, Araks, Samur on Azerbaijan territory, creation of the substantiated system and scheme of the radiation and hydrochemical monitoring. During the project fulfillment it is proposed to verify the present experimental data and carrying out of extra studies on the selected plots with the purpose of provision of comparability and conjugation of data, improvement of method of the initial information gathering and improving used while developing the program of source information gathering and processing. The basic water objects of Azerbaijan are expressed by transboundary streams – Kura, Araks, Samur rivers.

Basins of these rivers cover vast territories of the South Caucasus and they are their basic life-support waterways. It is necessary to mention that over a half of territory of the South Caucasus states have the country inclination towards the Caspian Sea. Thus all the negative anthropogenic influences upon the river basin in neighbor states reflect on the Azerbaijan and on the Caspian Sea further. Azerbaijan water resources make 30,9 km^3, from them 20,6 km^3 arrive with transit rivers from the neighbor states. From year to year the water quantity in transit rivers reduces gradually and the quality gets worse. So, there is a necessity to carry out the works on revealing the sources – pollutants and detail study of these sources peculiarities as well as mechanisms of incoming of all kinds of pollutants into the basic rivers flowing into the Caspian Sea, including Kura, Araks, Samur rivers.

Proceeding from the mentioned above it follows that the success solution of the ecological problem is impossible to provide in separate state, so the joint and coordinated efforts are necessary.

Ecologic state of rivers at Azerbaijan territory.

Kura river is the largest water-way not only in Azerbaijan but of the whole South Caucasus (1). Within the republic it has the length of about 900 km with total length over 1500 km. The river heads located in Turkey, in Gel depression near the northern foot of Chaldir watershed, 2741 m above sea level, the entry is in Azerbaijan – 27 m below sea level. River basin covers the vast territory of the central and eastern Transcaucasia, parts of Iran and Turkey and the area is 188042 km^2. It is subdivided in the following way: Azerbaijan – 52,9 thousand km^2, Iran – 40 thousand km^2, Georgia – 36,4 thousand km^2, Armenia – 29,8 thousand km^2 and Turkey – 28,9 thousand km^2. The basic part of the source is formed in Georgia (37,7 %), Armenia (23,4 %) and Azerbaijan (21,5 %) as well as 13,6 % in Turkey and 3,8 % in Iran. Basin of Kura river covers 64 % of territory of the South Caucasus states. Over 65 % of Kura river territory (122,2 thousand km^2) is located on height over 500 m above sea level and presents area of feed and drainage transit; 35 % is the area of its re-forming and losses. According to physical-geographical conditions Kura river is usually divided into three parts: upper – from

river heads till Borjomi gorge inclusive (Georgia), middle – from the gorge till the Alazan river mouth and the lower – from the Alazan river mouth (or rather from Mingachevir mouth) till the entry. The general river inclination is 2,03 %.

Basin of Kura river is corresponded to regions of ancient irrigated agriculture. At present the area of irrigated lands exceeds 1700 thousand ha. Other factors of economical activity such as drainage melioration, channel storage, etc. that influence greatly upon the hydrological regime of the river had obtained a development. Kura river run-off is formed in highland regions, but mainly use in plains and lowlands. Thus, the amount of natural water resources is estimated according to summary run-off of rivers from zone of its forming. Kura river enters into the Azerbaijan Republic near Kharami river entry.

Average water resources of Kura river to Mingachevir are estimated as 15,4 km^3 per year; before confluence of Araks river – 18,6 km^3 per year and for the whole basin – 28,4 km^3 per year including on Araks river – 10,0 km^3 per year (2).

Over 74 % of Kura river balance is formed beyond Azerbaijan, and the river's ecological state significantly depends upon the ecological state of Georgia and Armenia. Concentration of oil products exceeding maximum permissible concentration in 5-220 times and phenols – in 2-30 times are observed in Kura river waters, on Georgia and Azerbaijan boundary. Water is so polluted that expresses a hazard for the republic people health, 75 % of them uses this water (3).

About 20 million people live in Kura river basin. The total volume of water consumption in the states is over a half of annual average run-off, i.e. water resources are used for population and economics needs. Such water withdrawal leads to desiccation of basin rivers and reduction of run-off in its lower parts. Bed of some small rivers is dry in warm (vegetation) season, in that way the limits of ecological run-off are disturbed.

The structure of water consumption in the South Caucasian states located in basin of Kura river is as follows: irrigation – 68%, heat-and-power engineering – 11,0%, industry – 6,9%, municipal consumption – 6,3%, agricultural water supply – 5,2%, fish industry – 2,6%. The water consumption increase for the last 30 years is observed in Azerbaijan – 7%, East Georgia – 7%, Armenia – 8,5%, Iran – 4,1% (4).

Creation of water reservoirs on Kura river (Varvara, water volume 60 million m^3, Mingachevir – 16070 million m^3, Shamkhor – 2677 million m^3, Enikend – 158 million m^3) and on its tributaries allows regulating the river run-off and rationally use the water resources for various economical needs. But the construction of water reservoir had brought significant changes in the environmental nature regime (5).

The second large waterway of the republic is Araks river, the right tributary of Kura river. It begins in Turkey, on slope of Bingel-dagh ridge, on the height of 2600 m. Its length is 1072 km, basin area is 101937 km^2, that makes 54,2% of Kura

river basin area. Water resources of Araks river before the boundary between Armenia and Azerbaijan (Nakhchivan Autonomous Republic) are 5,21 km^3 with river run-off 165 m^3 per second. Natural water resources of Araks river before flowing into Kura river are 10 km^3 with river-off in 307 m^3 per second, from them 4,4 km^3 are formed in Turkey and Iran (2). At present in Araks river basin the area of irrigated lands in Armenian and Azerbaijan is about 600 thousand ha. From them about 300 thousand ha fall to Azerbaijan share. According to official data for 1990 annually 2,6 million m^3 of wastes are thrown down Araks river basin (Kura river main tributary) on Armenia territory; 4,6 million m^3 – into Kura river basin in Georgia. In these waters the enumeration of hazardous pollutants, matters and chemical elements exceeds 150 items (3). The average annual concentration of water pollution exceeds maximum permissible concentration in some times, in emergency – in hundred times (6).

According to turbidity Araks river takes one of the first places among the rivers over the world: on average it brings 2,5 g/l of suspended substances, exceeding even Nil river (5). Along with Kura river Araks river is also distinguished by value of "solid" discharge among the world river: the river brings nearly 18 million tons of suspended substances per year; totally with Kura river this number reaches to 44-46 million tons. Besides it the presence of solute salts in water is also very typical for Araks river; it is explained by climatic conditions of the region, presence of soluble rocks in Araks river basin and technogenic factor. The largest water reservoir on Araks river is "Araz Hydrosheme" near Nakhchivan city. The water volume is 1350 million m^3. Araks river is one of the most polluted transit rivers of Azerbaijan.

The third large river forming beyond the republic is Samur (2). It begins from ridge of Main Caucasian ridge, from slopes of Guton mountain and falls into the Caspian Sea as two branches: Samur and Lesser Samur forming a vast delta on last 20 kilometers. The river length is 213 km, basin area is 3900 km^2. It is a border between Dagestan and Azerbaijan on its whole length. The river run-off forming is completed near the trunk of head water intake joint of Samur-Absheron canal. The average long-term annual river flow here is 2366 million m^3 with river run-off 75 m^3 per second. A portion of this water is transferred to Azerbaijan by Samur-Absheron canal. To date the detailed ecological monitoring of Samur had not been performed. One of the probabilistic reasons of it is that the boundary between Russia and Azerbaijan runs along Samur river directly.

It is necessary to mention that both in Georgia and Azerbaijan over 35% of settlements have no sewage disposal plants, the present facilities are mechanical, old and morally outmoded (7). The cities of Gazakh. Agstafa, Dashkesan, Shamkir, Tauz, Ganja, Mingachevir, etc are located in Ganja-Gazakh zone; their sewage disposal plants don't meet the modern requirements. Among them the cities of Ganja

and Mingachevir being the largest industrial centers are the most pollutants. Only 50 % of ~2,5-2,7 thousand m^3 per hour of Ganja city drainages passes the mechanical purification. Only 0,75 thousand m^3 per hour of ~2 thousand m^3 per hour of Mingachevir drainage are purified. The rest ones are throw down Kura river tributaries without purification. Paragachai river (Nakhchivan Autonomous Republic) is polluted by various wastes near molybdenum mines, Gashgarchai river – polluted by the iron-ore mines near Dashkesan city. The right tributary of Kura river – Agstafachai river, the basin upper part of which locates in Armenia – is strongly polluted by chemical colorants, oil products, phenols, ammonium nitrogen and other toxic and chemical hazardous substances, coming here as sewage (over 1 million m^3 per year) from Armenia cities (Ijevan, Dilijan, etc.) (6). Alazan and Iori rivers being the left tributaries of Kura river are polluted in Georgia and come to the republic with nitrogen and nitrates content exceeding sanitary norms in 4 times, oil products – in 2-6 times, copper and phenol – in 20 times (3). In low-flow period these numbers increase in some times. Waters of Araks river are polluted more strongly. Its left tributaries – Razdan, Arpachai, Ohchuchai rivers, etc. bring oil, phenols, ammonium and nitrite nitrogen, heavy metals from Armenia in concentrations exceeding sanitary norms in tens and hundreds times. Waters of Okhchuchai river are especially strongly polluted, here the sewage of Armenian Kajar ore mining and processing enterprise and Kafan copper-ore enterprises are throw down, the waste discharge is over 150 million m^3 per year. In the period of volley discharges the water in river turns into the nearly black muddy stream with objectionable odor. The impact of the radioactive pollutants is corresponded to that as well. So, the discharges of the used water from Armenian nuclear power-station into Araks river contributes to the summary discharge of the radioactive water fall into the Caspian Sea. It is necessary to mention that Kura river basin is subjected to all kinds and types of pollution – physical, chemical, biological, radiation, etc. On territory of Georgia and Armenia the tributaries of Kura river are polluted till the "dead" state, for some settlements these tributaries are the places of disposal tips and sewage. The constant pollution of Kura river waters with pesticides, detergents, especially organic substrate, heavy metals salts, and other pollutants had significantly changed the physical-chemical properties and sanitary-hygienic state of waters in reservoirs (6). Kura river swallowing had occurred, its flood-plain became to depredate and sharply reduce in sizes. The degree of waters mineralization in entry zone reaches to 1,5-2,0 gr/l. The process of water "flowering" became stronger.

The industry makes the significant influence upon the atmospheric air. The main industrial centers are located on the zone periphery on line Gazakh – Ganja – Mingachevir. The summary of the pollutants emanated by industrial enterprises of these cities is about 5,7 % of the summary emission into the atmosphere on the republic. The maximal ejection is made by the republic water power plant in

Mingachevir – about 20 thousand ton per year. Moreover, about 25-30 thousand ton per year comes from the Georgia and Armenia. Taking into account the above mentioned the degree of the atmospheric air pollution in flat and low land areas of the region is above the average, and covers nearly 50 % of the republic territory (3).

We still don't know in details the economical consequences of the rivers pollution with the organic substrates together with metals. At the same time it is known that in the presence of organics and heavy metals salts the synergism forms in the hydrosphere. Fauna and flora organisms accumulate the pesticides in concentrations hazardous for use, etc. The disturbance of some physiological functions, change of behavior, decrease of growth rate, increase of death-rate due to direct poisoning or decrease of steadiness to stress states of the environment are observed on the organism level. The injury of the genetic apparatus and transformation of the initial gene pool of individuals also have great significance. As a result the degradation of ecosystem takes place – it's worsening as an element of human being environment and decrease of positive role in biosphere forming.

Thus, the ecological state of water river environment significantly depends with technogenic pollution the basic components of which are: heavy metals, oil products, radioactive elements, chemical substances, etc. Distribution and behavior of these components as most important parameters of the anthropogenic impact is determined as their sources localization and totality of the geochemical factors such as composition of material suspended in water mass, oxidation-reduction environment in sediments, their mineral and grain-size composition, water hydrochemical parameters and waters circulation under the regional streams effect.

So, the comprehensive and objective notion on the ecological state can be obtained only at combination of the technogenic pollution monitoring with the basin geochemistry study.

Conclusions

At present there are some data on pollution of water environment of Kura, Araks, Samur rivers. At the same time there is an absolutely obvious necessity to perform the further wide-ranging investigations on revealing the basic sources of pollutants, more detailed study of these sources properties, study the mechanism of incoming and pollutants migration in the main life-support fresh-water ways of the Caspian Sea basin such as Kura, Araks, Samur rivers. For this purpose it is necessary:
- Large-scale investigation (chemical, elemental and radionuclid composition of water and bottom sediments) of Kura, Araks, Samur rivers;
- Revealing of the most polluted areas with detailed study of situation on the base of obtained data;
- Study of mechanisms and migration peculiarities of pollutants;

• Creation of scheme of system of the radiation and hydrochemical monitoring of Kura, Araks, Samur rivers on Azerbaijan territory;

• Creation of database including information of water quality and quantity as well as on degree and character of pollution of more ecologically hazardous areas and objects nearby;

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PHOTOINHIBITON OF PHOTOSYSTEM 2 UNDER UV – IRRADIATION

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Plants frequently are exposed to influence of adverse natural factors, such as high and low temperatures, strong salinity ground, light of high intensity and UV – radiation /1, 5, 8, 12 /. UV – radiation is one of the ecological factors, attention-getting researchers last years, in particular, in connection with anthropogenous infringements of an ozone cloud.

In the given work influence of UV-B radiation on plants, on their photosynthetic device is considered. As the photosystem 2 (PS 2) is the most sensitive macrocomplex of the photosynthetic device, we studied structural functional changes FS 2 at UV irradiation. In fig. 1 is shown scheme of PS 2.
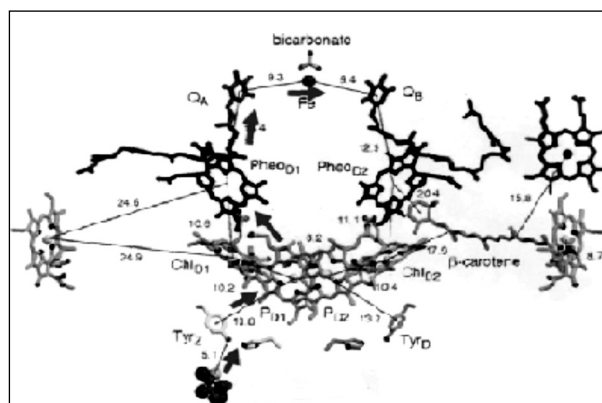
Figure 1. Scheme of PS 2.

Found out influence of UV light on allocation of oxygen, phototransport of electron and structural charac.teristics PS 2 in fragments PS 2. A series of experiments have been conducted for revealing primary site of UV inhibition. The major

parameter of electronic transport condition of in PS 2 is variable fluorescence (ΔF). Irradiation of UV light subchloroplasts particles PS 2 is resulted in sharp reduction of size photoinduced ΔF, connected with photorestoration Q and to suppression of reaction by Hill registered on photorestoration DCHF IF. Thus size Fî caused by fluorescence of chlorophyll, under action UV of an irradiation does not change, that shows stability of a pigment to UV-B to an irradiation.

There is no restoration of parameters of these photoreactions at the following addition Mn^{2+} to irradiated particles of PS 2. Replacement of Mn^{2+} on DFK at measurement of photorestoration DCHF IF results to some reactivation (60 %). It is necessary to note, that addition of ditionite to UV irradiated particles PS 2 results in increase F up to a level equal to sum Fî and ΔF of these particles, but not up to level Fmaks equal to sum Fî + ΔF of initial preparations. For exception of a role of oxygen radicals at UV-B inactivation preparations were irradiated in anaerobic conditions. Anaerobic conditions were reached by blowing off densely closed ditches by argon. The following results have been received: the irradiation of preparations PS 2 in anaerobic conditions slowed down Fmaks. If in an aerobic conditions as a result of irradiation UV light Fmaks decreased on 50% concerning the control over 9 min. (10^7erq/sm^2), in anaerobic conditions Fmaks ($4·10^7$erq/sm^2), reached this level through 30 min. For 30 min. There is reduction Fmaks only by 40% concerning control of an irradiation of particles PS 2 in anaerobic conditions.

To check up experimentally influence of UV-B light on the donor part PS 2. Experiments were carried out at the presence of artificial acceptors electrons ferrosionide and dechlorbenzoquinone. It has been found out dependence between doze UV irradiation and reduction of speed of allocation of oxygen (fig. 2).
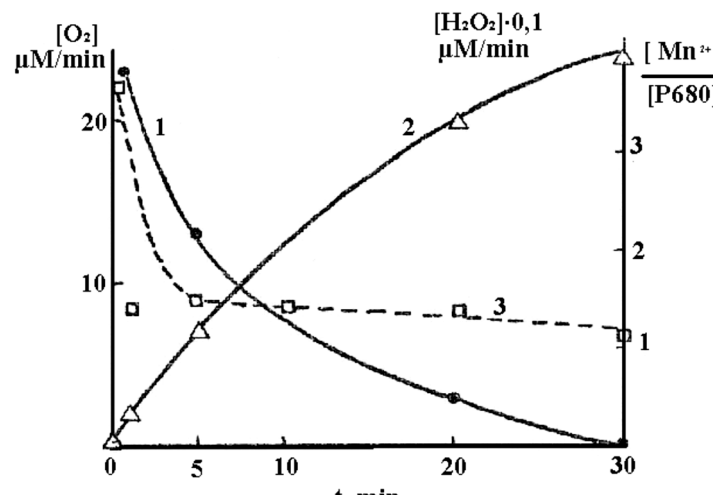
Figure 2. Influence of UV-B irradiation on allocation of oxygen (1), appearance of peroxide of hydrogen (2) and concentration of the connected manganese (3) in fragments PS2.

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For 6-7 minutes of an irradiation (a doze ~ 10^7erq/sm^2) speed of allocation of oxygen decreased for – 50 %. Research of action UV light on particles PS 2 has been carried out at temperature 10°C in anaerobic conditions. In result it has turned out, that in anaerobic conditions speed of allocation of oxygen falls much more slowly, than in aerobic conditions. On the basis of it we can assume, that damaging UV light action is connected with the foundation in aerobic conditions highly

reactive oxygen species (ROS) like H_2O_2 , $\hat{I}\,_2^{\,-}, \hat{I}\hat{I}$. Abating of influence of UV light on preparations PS 2 in anaerobic conditions can be connected with an absence of ROS.

For definition ROS used khemiluminessensy of luminol with λ_{maks} = 450 nanometers. Activation of khemiluminessensy is observed under action UV-B light in fragments PS 2. On fig.2 resulted dependence of allocation of peroxide of hydrogen in subchloroplasts particles PS 2 from duration of time of irradiation by UV light in aerobic conditions. It is visible from fig. 2 with increase of doze UV light appearance of peroxide of hydrogen also increases. Question has been raised about a role peroxide oxidations lipids of membranes and antioxidizing systems during an irradiation of cell cage UV light. Our experiments which have been carried out by methods of spin probes have shown, that in thylakoid membranes even big dozes UV-B of an irradiation (10^8erq/sm^2) do not result in any essential changes in lipid a part of membranes.

In the further experiments it was expedient to study action of UV-B light on protein components PS 2. It is established by the electrophoretic analysis of polypeptid structure (fig. 3), that the basic apoprotein fragments PS2 are polypeptide with molecular weight 47, 40, 33, 32, 30, 10 and 4,8 kDa. At a preparation of particles PS 2 there is also protein strip in the field of 28-29 kDa (fig. 3), corresponding apoprotein light harvesting of a pigment – protein-lipid complex. Experiments show , that under action of UV light in subchloroplasts particles PS 2 there is a linear decrease in a strip 33 kDa and its disappearance at 30 minute UV-B irradiation ($5\cdot10^7$erq/sm^2).
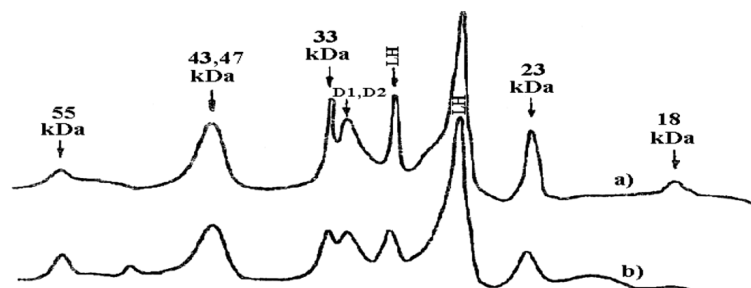
Figure 3. Dencitogramme of protein spectrum of subchloroplasts particles PS2;
à) control; b) irradiated ($4\cdot10^7$erq/sm^2).

Polypeptide with molecular weight 33 kDa enters into the structure of oxygen – evolving complex (OEC). In works /3, 5, 6, 10/ it has been shown, that this polypeptid plays a leading role in preservation of functionally connected manganese and in maintenance oxygen evolving function of nucleus PS2.

If occurs a degradation of 33 kDa protein, that possible the output of manganese on environment. As a result of the eksperiment we have obtained the following: as a result of influence of UV light there is an output of manganese on environment; the first minutes of an irradiation of particles PS2 result in loss on everyone reaktion center (RC) PS2 two atoms Mn^{2+} (fig. 2). The further irradiation does not change this ratio.

After 10 minutes of UV irradiations in dencitogramme is observed reduction of strips 32 and 30 kDa. Proteins with molecular weight 30 and 32 kDa make an albuminous basis of reactionary center PS2. Reduction of strips D1 and D2 under action UV of light is accompanied by increase protein with molecular weight in the field of 55-58 kDa. The irradiation of fragments PS2 with UV light in aerobic conditions with the big dozes results in insignificant reduction proteins with molecular weight 47 and 43 kDa.

Carried out a series of experiments for revealing a primary target of photodamage /7, 8, 9, 12/. Such scientists as N. Murata et al. came to such conclusion, that a primary target of photodamage is OEC, first of all, manganese containing claster. That is they prove, that UV irradiation is action directly on OEC. In result appear ROS and it results in degradation of D1 protein. And to a secondary target concerns photochemical RC. Besides a target for ROS is not RC, and the system of restoration PS2 /1, 2, 4, 11/.
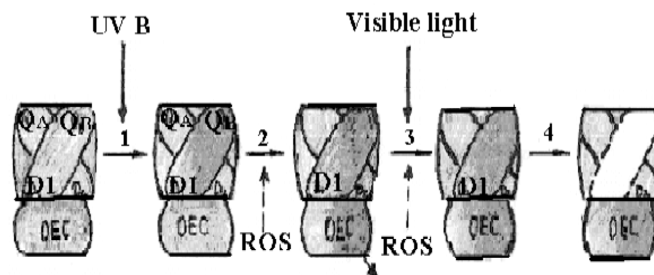
Figure 4. New model of the mechanism of photodamage PS2.

We agree with them completely. But results of the series of experiments carried out by us small dozes of an irradiation have allowed us to come to more exact conclusion. We irradiated chloroplasts 30 seconds, 1min, 5min and 10 min. At an irradiation of plants with small dozes of UV irradiation it became clear, that chromofores are quinine. That is UV irradiation first of all operates not on OEC,

and on acceptor part, is more exact on quinone. Further they transfer energy to oxygen. Thus appear ROS. And after that occurs inactivated OEC, appear ROS, and then there is a degradation of D1 protein. On fig. 4 we gave a new model for the mechanism which represents the of photodamage PS2.

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◄ COMMUNITY BASED INJURY PREVENTION

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Abstract

Aim: A multifactorial injury prevention programme started in 1981 and ran for about 10 years in an island community in Norway with a population of about 1000. A study was undertaken to evaluate effects of the programme over a period of 20 years. *Methods:*

Injuries were recorded by the one medical doctor on the island several years during the period 1970-2001. The programme was carried out with high intensity from 1981 to 1987. The intensity gradually decreased to a medium level that lasted until about 1994, when it was further reduced to a low level. *Results:* The injury incidence rate was reduced from 17.7% in 1980 (N=188) to 9.7% in 1987 (N=97) with relative risk reduced to 0.55 (95% CI: 0.44-0.70, p<0.0001). In 2001, an incidence rate of 9.6% was observed (N=91). An even higher reduction was observed for serious injuries. The age groups 15-24 and 65+ showed the most distinct reductions from 1980-2001 while minor reduction was observed in children (0-14 years). The incidence rate of traffic injuries was reduced by 77% in spite of an increase in the number of motor vehicles. Occupational, home and other injuries were reduced by 38%, 35%, and 49% respectively. The incidence rates were 2.6-3.0 times higher for men than for women through the 20 years observation period. *Conclusion:* This study indicates that a long-lasting multifactorial community-based intervention in a small community with defined aims may lead to a considerable and long-lasting reduction in injuries.

Background

Injuries are one of the most serious public health problems facing both high-income and low-income countries. Throughout the world, injuries are now a leading cause of death during the first half of the human life span and have grown in

relative importance as many diseases have been controlled [1]. In 1990, they were responsible for 10% of world mortality, predicted to increase to 12% by 2020 [2]. Various preventive measures have been used to reduce this part of the global burden of disease. Community based intervention is a promising concept for injury prevention. Some studies have reported significant reductions between 69 to 14% in targeted injury types [3-5]. Other studies have reported significant reductions of overall injury rates [6-8]. However, an Australian study reported no injury rate reductions, even after years of community based interventions [9].

The preventive strategies employed in community-based interventions are described in the literature [10-11]. Lund and Aarø have provided a model for injury prevention programmes which includes three main categories: attitude, behaviour and structural modifications [12]. A community is defined as a limited geographical area or in a certain social system with common goals and interests, e.g. a work place, large company, school or ethnic group. The interventions are directed towards the whole population, not only high-risk groups or individuals. Primary health care, hospitals, local authorities, media and organisations (voluntary, private and public) are involved in the interventions. In addition, many different interventions are implemented, and all types of accidents may be targeted. These multifactorial programmes normally last from one to five years.

Reports on community based injury prevention generally fail to identify, through careful analysis, the dominant workable influencing factor(s) or process(es). The following, however, seem to be important for succeeding with interventions: a) long duration – most of the programmes last several years, b) use of many communication channels simultaneously, c) a combination of preventive measures are utilised simultaneously, such as information, training, environmental changes, regulation and enforcement, and price incentives [13].

During 1970-73, a community diagnosis of Værø y and the similar neighbouring island community of Rø st, located in Lofoten, Norway was elaborated by the only physician, being responsible for both general practice and public health on the two islands. Rural primary health care in Norway has for more than 100 years been organised in such combined positions. The community diagnosis showed a large burden of injury, defined as one serious enough to be treated by the physician. Inspired by this diagnosis and interested in prevention activities, one of the authors (GT) initiated a community based injury prevention programme. This programme lasted with high and moderate intensity during the 1980-ies, while more reduced in the 1990-ies. After a prevention period of two years (1981-83), the incidence rate of injuries was reduced by 19% [6]. During the 1980-ies this study on injury prevention and safety promotion at Værø y inspired many other municipalities to start similar community-based interventions.

Aim

The aim of this study is to evaluate the effects of community based injury prevention 20 years after the initiation of the programme.

Methods

The island of Værø y had a population of 1060 inhabitants in 1980, reduced to 778 in 2001. This is a typical reduction of population from rural to central areas in most countries in the world [14]. The island is located just north of the Arctic Circle in the Lofoten archipelago, approximately 80 kilometres from the Norwegian mainland. In 1980, about 50 % of the adult men were fishermen or worked in fish processing plants, activities with high accident risks.

A registration of Værø y injuries was conducted during a 12-month period in 1979-80. Analysis of the collected data provided a basis for finding high risk groups and injury aetiology in order to make the prevention programme as effective as possible. A follow up registration was conducted in 1982 and 1983. After 1984 different physicians worked on the island. These were, however, instructed and supervised by their predecessor in order to make reliable, representative and valid registrations. More details of the material and methods are described elsewhere (15).

Results

The first year before the campaign started, 188 injuries among the residents at Værø y were recorded by the local physician. This gives an incidence rate of 177 injuries per 1,000 inhabitants per year. After the prevention campaign started in 1981, there was no reduction in incidence rate for the inhabitants of Værø y until the second year of the programme (1983). The incidence rate was then reduced to 144, a reduction by 19 % from 1980-level. By the year of 1987, the incidence rate had been reduced to 97 (reduced by 45%). The relative risk of injuries in 1987 compared with 1980 was 0.56 (95% CI: 0.44-0.70, $p < 0.0001$). In 2001, an incidence rate of 96 injuries per 1000 inhabitants was observed (See figure).

The incidence rate of the serious injuries was reduced considerably and more than the minor injuries, from 57 in 1980 to 28 in 2001, a reduction by 51% (95% CI: 18%-71%). All types of injuries among the residents of Værø y treated by the physician were reduced. Traffic accidents were reduced by 77% in 2001, occupational accidents by 38%, home accident by 35% and other accidents by 49%.

The incidence rates are 2.6-3.0 times higher for men than for women. The incidence rate for injuries in men was reduced by 42% and in women by 50% from 1980 to 2001. The reductions were highest in the age groups 65+ and 15-24 years with 65% and 54% respectively, while for children 0-14 years the reduction was 17%.

Discussion

It has been shown that the injury incidence rate in 1980 for the population at Værøy was similar to the rate found in 1970-73 for the population in Værøy and Røst. A marked reduction in injury incidence rates at Værøy appeared from 1983 to 1987, while in 2001, the incidence rate was similar to the rate in 1987.

The possibility of underreporting of injuries can not be excluded. However, for the years 1979/80, 1982-83, 1985-87 and 2001 the registration is assumed to have a high level of completeness and validity. This is supported by the higher decrease of serious injuries, less likely to be underreported than the minor injuries.

Exposure changes in terms of person years in the denominator could bias the findings e.g. if an increasing number of Værøy inhabitants travelled away from the island for long periods during the study period. While the number of fishermen fishing in other areas was assumed to be constant, there may have been increase in the number of persons travelling from Værøy for recreational purposes, particularly during the 1990-ies. This travel may have accounted for a small part of the recorded injury rate reduction during the 90-ies. However, it is not considered plausible that this mechanism contributed much to the 45% reduction observed in the 1980-ies.

The decrease in injury incidence rate in the age group 15-24 years from 282 in 1980 to 183 per 1000 inhabitants in 1985 can not be explained by the relative number of students away from home in this period, which was constant. In 2001 however, this proportion was increased and might explain some of the low incidence rate.

The observed injury rate reductions are similar for both genders. This may be an argument for the rate reduction being real, as women are considered to be more stationary on the island than their fishing husbands.

Reductions in injury rates might be explained by changes in the age distribution. Although the population was reduced by 27% during these 20 years, the age distribution was rather constant.

Because of the potential for kinetic energy release at high sea with heavy machinery involved, injuries at sea have higher degree of severity than all other occupational injuries in terms of places of occurrence. Thus, it could be that this fishing community had a very large injury burden in terms of both rate and severity and hence a high potential for prevention which was released when the injury prevention campaign started in 1981. In 1987, the Vriy community attained the same level as other communities in Norway at about 10% [16].

The reduction in traffic injury rates can not be explained by changes in motor vehicle ownership rates on the island. On the contrary, while the number of vehicles increased by 55%, the rate of traffic injuries decreased by 77%.

Occupational injury rates among the population of Værøy were compared

with the following exposure confounders: a) the amount of fish landed, b) the number of fishermen registered, and b) the man-labour-years in the fish processing plants at the island. The trends in these three exposure factors are not unequivocal. The downward trend in occupational accidents seemed to follow a steeper slope than the less pronounced downward trend of these three exposure factors.

The relation between the incidence rates for men compared to women are in an average community between 1.5 and 2.0 [16]. In Værø y, this proportion was 2.6 in 1980, increasing to 3.0 in 2001, probably reflecting that Værø y is a fishing society, where the men have been and still are exposed to more dangers than in an average community.

While the interventions directed towards the fishermen seem to have given rather high positive effects, the interventions targeting children seemed less effective. A reason for this discrepancy could be that more structural (passive) modifications were directed towards fishermen and more behaviour-related (active) interventions were directed against children, the former being considered more effective than the latter [12]. Another explanation might be the vacancy of the public health nurse position at the mother and child health clinic during the late part of the 1990-ies.

The reasons for having more or less the same overall incidence rate in 2001 as in 1987 might be due to establishing some structural and lasting prevention measures in the community (See figure). Værø y obtained this level in 1987 and have since probably been influenced by the general preventive activities in Norway in the occupational, traffic, home, school, elderly and kindergarten areas. Værø y is a fishing community that had a high amount of injuries. A specially designed and active prevention programme was launched which contributed in reducing the injuries to the same level as in the rest of Norway, even if the exposure to dangers probably are higher at Værø y than in an average community in Norway. For future studies, qualitative methods could be utilised to better understand the attitudes and behaviour of the people and how they were changed in undertaking prevention measures.

Conclusions

The results of this study indicate that a long-lasting community-based intervention with defined aims can lead to a considerable and long-lasting reduction in injuries, at least in communities with high incidence rates. The factors associated with the reductions might be the small size of the community, enhancing synergetic effects of a multifactorial prevention method in the local community, and preventive measures tailor-made to the relevant risks.

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◄ FLOODS AND MUDFLOWS IN KURA-ARAS RIVER BASIN

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Introduction

Since the dawn begining of the civilisation, destructive floods have jeopardised settlements located in river valleys and plains. Altough developments in technology and investments in flood control works has been increased last years, flood occurrences and accompanying hardship and material losses continue to damage to the different branches of economy . Now, the global flood losses have grown worldwide to the level of billions of US dollars per year. According to the Red Cross, floods in 1971-1995 affected more than 1.5 billion people worldwide, including 318 thousand killed and over 81 million suffered [4].

On the top of direct human impacts, also climate chance is likely to contribute to the increase in flood risk.

Floods are natural events and will continue to occur in the future-one can never achieve complete safety. Yet, the flood risk can be seriously restricted, if an appropriate preparedness system is built, meeting the constraints of sustainable development-the principle guiding development policies in many countries [2, 3].

Flooding in Kura-Aras river basin

The maximal discharges of water in the basin Kura are formed as a result of combined impact of snow melting and intense rains.

In the basins of the rivers where the area of a feed is located highly on mountains, the role of melted snow in formation of maxima raises, and in one cases in a thaw-rain discharge the snow component with maxima mainly in spring-summer period prevails and in others – rain with an autumn maxima.

For all rivers of the east part of the basin Kura high-altitude position of reservoirs also defines the conditions of a feed and formation of the maximal charges of

water: if the reservoir is located higher it has a big role in formation of the maximal charges of water belongs to a thawed component. In process of reduction of height of a river basin, rain component gets big role in formation of a maximum. In the bottom flood of the rivers the role of a snow component considerably decreases [1, 7, 8, 9].

The amount of the rains, which is out only on April-June, in average makes nearly 40% of the annual sum. Therefore even at small stocks of water in snow, rains in this period form a high maximum.

The maximal discharges of water of a thaw-rain origin flows basically in May – June when the maximum amount of liquid precipitations drops out and there is an intensive melting of snow on mountains (at the height of 2500-3000 m).

According to the stated, characteristics of the maximal discharge of the river basin Kura are entirely defined by the impact of surface factors and climatic factors. It clarifies the significant difference between the maximal discharge of the rivers, coming out on the Main Caucasian ridge on the one hand, and on plateaus and less high ridges of Small Caucasus – from another.

Flooding in Azerbaijan in recent times took place on two large rivers: Kura and Aras. After construction of Mingechevir reservoir on the river Kura (1953) and Araz reservoir on the river Aras (1970), a situation has changed and large floods have actually no observed. However, practice has shown that the achieved high level of regulated flow does not relieve the population from danger and does not eliminate necessity of application of other measures. For example, in 1970 in a place of confluence of the rivers Kura and Aras as a result of flooding were destroyed the protective dams, the main channel after the name of Azizbekov was overloaded by a water, provincial town Imishli has been flooded.

On the rivers Kura and Aras in 1967, 1969, 1976, 1979, 1982, 1997 and 2003 resulted in flooding of significant areas of Salyan, Neftchala, Sabirabad, Saatli, Imishli, etc. areas. Rise of ground waters had caused to the salinization of the soils, destruction of many personal facilities. In Sabirabad, Salyan, Imishli, Saatli areas, there had suffered thousands of personal facilities where live a great number of population [9].

As it was already has been said above, in Azerbaijan meet as floods, so the flooding.

Mudflows are more often formed on southern slopes of the Big Caucasus. In the region of Small Caucasus most of mudflows are in Nakhchivan Autonomous Republic has been observed.

Mudflows cause big dangers to settlements, constructions and the roads located mainly on cones of river drift. Many pasturable areas and arable lands fully came in unsuitability, their areas are reduced from year to year, turning to the centers of formation and development of the mudflows.

Significant destructions caused mudflows, in the basin of the river Kishchay and Alazan (Ganikh). Here inundations were in 1896, 1901, 1903, 1910, 1911, 1916, 1926, 1936, 1941, 1955, 1957, 1958, 1959, 1965, 1978, 1988, 1997 and 2003. Mudflows put under long-term threat the Sheki town and small of villages Kish, Î khut, Dodig, Baltali and Kudula; frequently put out of action head constructions and derivational channel of Sheki HES, destroying roads and bridges [9].

The Republic of Armenia belongs to the areas of high mudflow hazard where erosion – mudflow phenomena has been strongly observed. More than half of the Republic's area is mudflow area. They regularly cause significant damage to the economy, of Armenia and even human victims and destruction of residential areas. Usually during one mudflow in a very short time period (0.5- 2 or 3 hours) as much material is driven out from river basin, as during tens of years through normal erosion [7].

The longest time series of observation data is available on the river Kura at Tbilisi (since 1904).

The analysis of initial materials show, that on the rivers of the Kura basin, there happen often most of floods has been missed in instrumental observations.

Peak discharges of main transboundary rivers in Kura-Aras river basin are given at the table 1.

Table 1.

**Peak discharges of the main transboundary rivers
in Kura-Aras river basin**

1	River-station	Basin area, êm2	Distribution curve parameters of peak discharges			Frequency (%) of peak discharges (m3/s)			
			Q, m3/s	$\tilde{N}_V$	C_S	1	2	5	10
1	Kura-Tbilisi	21100	1136	0,38	0,8	2370	2182	1922	1708
2	Kura-Mingechevir	62600	1640	0,26	0,5	2780	2620	2400	2200
3	Kura-Salyan	188000	(1820)	0,31	0,8	3470	3220	2870	2580
4	Ktsiya-Khrami-Krasny most	8260	371	0,61	4,4	1366	1091	790	576
5	Debed-Ahtala	3430	275	0,59	1,8	846	740	599	490
6	Akstafa-Krivoy most	1610	81,8	0,58	1,6	242	213	175	145
7	Iori-Kazaniani	1340	133	1,12	2,6	685	573	419	306
8	Alazani-Shakriani	2190	311	0,57	1,9	936	818	663	542
9	Araks-Kyubektala	97600	966	0,35	1,6	2125	1916	1639	1420
10	Akhuryan-Ahurik	1060	69,5	0,69	2,4	245	207	160	129
11	Arpa-Areni	2040	161	0,49	2,6	452	388	308	254
12	Vorotan-Vorotan	2020	139	0,69	4,5	526	421	309	237

Gaps in the knowledge for the problem:

• There is no enough information on the economic damage caused by floods, mudflows and flooding

• There are no data on frequency of floods and mudflows for last decades,

• Flood and mudflow prevention actions are carried out poorly

• There is no early warning system during floods and mudflows

• There are no systematized data of coastal erosion and most of available materials have sketchy character

Major environmental impacts and socio-economic consequences of the problem

Environmental impacts:

• The ecological condition of the river is worsened: during floods and mudflows all dust and firm waste products of a coastal zone flows into river

• The hydrographic network changes: erosive lakes are formed, channels are straightened

• The inhabitancy of hydrobionts is changed Socio-economic consequences:

• Flooding contribute to the economic damages to all branches of economy in a zone of flooding

• Floods and mudflows destroy roads, bridges, pipelines, transmission lines

• Sediments, brought by flows cover personal plots of inhabitants, roads

• The flows sometimes carry away people and pets.

As it has already been mentioned above, one of the factors, contributing to the increasing in frequency of floods and their maximal charges of water is deforestation.

Woodiness of a reservoir can reduce the peak of a flood that is has relation with the reduction of intensity of snow melting and increase of time of concentration. Because of absence of special water balanced stations, on the researched territory the influence of a wood on the maximal charge of water has not investigated almost. Only the analysis of the given hydrometric supervision in some river sections reservoirs of which have various woodiness, allows qualitatively estimate the influence of a wood on formation of the maximal charges of the mountain river waters.

In all three countries of Southern Caucasus there is an intensive deforestation. For example, during the last decade about 25% forests were cut down in Armenia due to energy crisis [7].

The expansion of the urbanized territories is also concerns to the number of important factors of floods.

Strategies for flood protection and management

For reduction of transboundary degradation of the ecosystems in the Kura river basin, caused by floods, the development of strategy of protection against floods and their management is necessary.

It is common to assume that flood protection measures can be structural ("hard") or non-structural ("soft"). Structural defenses have a very old tradition, as dams and dikes have been built since at least four thousand year.

However, the achieved results extend beyond the original objectives, defining non-structural measures not just as complementary measures to structural water resources systems, but as the very substance of integrated water resources management.

A category of non-structural measures agree better with the spirit of sustainable development, being more reversible, commonly acceptable and environment-friendly. Among such sustainable measures are: source control (watershed/landscape structure management), laws and regulations, zoning, economic instruments, efficient flood forecast-warning system, system of flood risk assessment, flood-related data bases, etc [5, 6].

The system of the early notification of floods in the countries of Southern Caucasus is practically absent.

Flood management data consist of a variety of data sets, each of which is used for specific purpose. The types of data related to flood management include: Topographic data, Imagery, Administrative data, Infrastructure data, Environmental data, Hydrometeorological data, Economic data, Emergency management data.

Conclusion

In the territory of all countries located in at the river basin Kura is observed floods, flooding and mudflows. These extreme hydrological phenomena take place annually and cause essential damage to the ecosystem and economy of the countries of the basin.

For reduction of transboundary degradation of the ecosystems in the river basin Kura caused by floods, it is necessary to develop of strategy of protection against floods and their management. Within the framework of this strategy it is necessary to develop model on management of floods.

This model have to cover all necessary structural (dams, flood control reservoirs, floodways and etc.) and non-structural (flood forecasting and warnings, Watershed management, Insurance, etc.) measures.

In the countries of the basin there is a certain experience on the management of floods with the help of engineering constructions. Regarding to non-structural measures, in this area the experience of the countries of the basin, especially Armenia, Azerbaijan and Georgia is insignificant.

For an estimation of institutional, technical and cultural opportunities of the countries with the purpose of development and realization of joint actions on management of floods, there can be used already existed international experience.

There is various evidence suggesting both natural and social reasons for the occurrence of destructive floods throughout the country. Hence, prevention and mitigation of adverse impacts and losses of destructive natural hazards are of utmost importance.

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◄AGGRESSIVE URBAN VISUAL ENVIRONMENT

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Visual environment has been deteriorating during last years. There were created many homogeneous and aggressive visual fields in cities and towns and especially in large ones. Aggressive visual fields are these ones where a lot of identical visual details are evenly distributed on some surface. For example a multi-storey building with great number of windows creates aggressive visual field (many identical visual elements). An eye can not determine what the window it is looking at, for all the windows are similar. There is nothing of such kind in natural environment: as a rule an eye "knows" for sure what it is looking at and what the element it is fixing now. In any cities people live in entire surrounding of aggressive fields. No one mechanism of vision can work properly in such conditions.

The problem of videoecology has particularly aggravated in recent 50 years due to the total urbanization which isolated the human being from its natural visual environment. This isolation became possible mostly due to the use of new materials in urban development. As a result we have a lot of cities with drastically changed visual environment, i.e. prevailing dark-gray color, straight lines and right angles, urban buildings being mostly static with a great number of vast flatnesses.

Visual environment has been transformed for city population due to the nature of urban labour. People work in rooms, i.e. in closed space – at plant and factory workshops, at schools and colleges. The interior is full of new materials of artificial nature, such as polished furniture, plastics, linoleum, tiles, glass, corrugated aluminium, net screens, grills and bars, design structures etc. Visual environment in privet apartments is made up with same kind of materials.

Visual environment means an environment with all its diversity a human being perceives through the organ of vision, i.e. woods, seashores, mountains, buildings, constructions, interiors of dwellings and industrial premises, motor-cars, ships, aircraft, etc. All visual environment may be conventionally divided in two parts: natural and artificial. Natural visual environment fully complies with physiological standards of vision since the nature "fashioned" an eye as if it was mak-

ing it for itself. Artificial environment is another pair of shoes. It differs even greatly from the natural one, and in many cases come into collision with laws of visual perception of a human being. Such environment gave birth to another problem of human ecology, i.e. problem of videoecology. Videoecology is the science of interaction between a human being and visual environment [Filin 1989, 1997, 2006].

A visual field consisting of a lot of visual elements evenly distributed on some surface is called an aggressive visual field. A typical example of an aggressive visual field is such: a lot of identical black spots evenly distributed on white surface (fig.1). It's difficult and unpleasant to look at it – one feels dazzled. Another example is an aggressive field consisting of many parallel black and white lines.
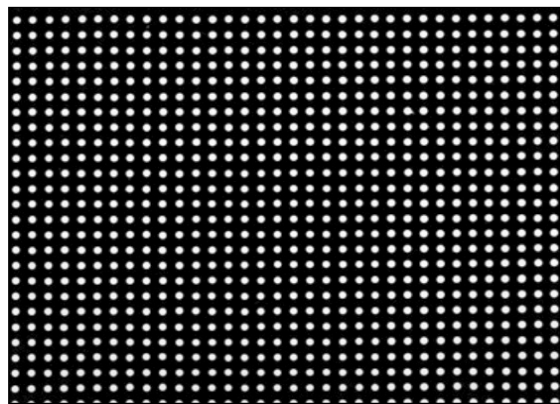
Figure 1. This is an example of a lot identical white spots ("spotted fabric").

Figure 2. This is "Russia" hotel. There are eight hundred windows on its wall.
The great number of identical windows creates typical aggressive field. An eye "does not know" what window it is looking at. Visual communicational channel stops working in its usual way.

800 windows are evenly disturbed on the wall of this hotel (fig. 2). This is a typical aggressive visual field. In this visual field an eye "doesn't know" what window it is looking at. Visual communication channel stops working in its usual way.

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There is nothing like this in natural visual environment, for example, in the forest where an eye "knows for sure" what it is looking at and what it sees.

In case you look at a bare wall very small amount of impulses is coming into brain, while in case of aggressive field the amount of impulses is large. Why is it so? Because there are very many contrasting edges in this building. In this situation eye retina photoreceptors, in particular on- and off-systems are strained. This current of impulses reaches visual centres of a brain and really "bombards" them, but the matter is that this current of impulses doesn't contain much information. The given picture is clear at a glance, and the contradiction is: the current of impulses is large, but there is not much information in it. This is an example of useless work of a brain. This is the reason why we call this visual field an aggressive field.

It was decided to demolish the hotel "Russia". The demolition is in process. We can say that Moscow is getting rid of aggressive visual fields. Aggressive appearance of the hotel "Russia" did damage to view on Kremlin breaking into its visual field.

In a city a man can see many aggressive fields looking from high floors (fig.3). According to the information submitted by psychologists on the basis of poll results in new districts, 72% of their inhabitants would like to leave these districts, and 35% didn't like them. Of course, it's difficult to become fond of a district, consisting of aggressive fields. In Moscow these districts are called "sleeping districts". Muscovites go there only to sleep.

Figure 3. View of the city of Seattle (USA, the photo taken by A. Kotkov).
A great number of skyscrapers create aggressive fields of different size and raster pattern with practically no check points for eyes' fixation after saccade.

You can come across the same situation not only in Moscow but also in any big city all over the world. A great number of skyscrapers create aggressive fields of different sizes and raster pattern with almost no check points for eye fixation after saccade.

If some mechanisms of vision can not work properly, we can state that an

aggressive visual field doesn't correspond to norms of vision at all. Furthermore we can affirm this is not beautiful.

We guess there are four reasons of the deterioration of visual environment of our cities and towns:

1. Revolutionary ideas both in society and architecture

2. Fast growth of cities and building industry

3. Artistic position of architects. Nobody could force architects to build as they used to, if it don't correspond to their own artistic position

4. Belated appearance of videoecology.

We believe that the significant impairment of urban visual environment could have been prevented, if the videoecology had appeared some years earlier and had indicated the negative processes in urban visual environment creation. But industrial building has been taking place for more than 80 years, meantime videoecology as a field of science appeared 18 years ago [V.A. Filin, 1989].

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ABOUT PERSPECTIVES AND DIFFICULTIES OF SOLAR AND WIND ENERGY APPLICATION IN ELEVATED PLANTS

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There are some difficulties of solar, wind energy for direct application in the elevated plants. For solution of the shown progressive ways of development and application of energy transformation and accumulation are necessary. At present there are some ways of solar and wind energy accumulation, in electrochemical accumulator as electric energy, in thermal accumulators as thermal energy, in pneumatic accumulator as compressed air, in hydraulic accumulator as potential energy of water raised up to high level, in accumulator of chemical energy carrier as liquid and gas fuel and so on.

In the current theme two plants working to these accumulation ways were described. Simplified functional schemes of solar and wind power plants and their working principles have been given.

1. Solar photoelectric electrolyzer plant (SPEP) for solar energy accumulation being transformed to chemical energy of hydrogen and oxygen

At present one of the most perspective accumulation ways is the accumulation of solar energy in the form of chemical energy of hydrogen and oxygen. Hydrogen is deniable as both chemical raw product and fuel. By this purpose hydrogen has great advantage in water electrolysis. First of all hydrogen and oxygen obtaining from water is carried out in «water – electrolysis – hydrogen and oxygen – burning – water» which is ecological clean closed circle, this reduces financial expense to minimum and there is no hazardous influence to environment from ecological point of view. The plant has no any negative influence to atmosphere heat balance. The second, the obtained hydrogen is high clean strategic product, that's why it is widely used for several purposes (ex, for generators with high power in electric stations, for cooling of reagents in strategic objects, as the fuel of space vehicles).

By this purpose atomized SPEP was developed and at Institute of Radiation Problems' helio-polygon of ANAS it was naturally tested. The simplified block-scheme of the plant was described in figure 1, it consists of electrolyzer working under the pressure 1, PCS 2, automatic exchanging plant (ACP) 3, gas separating for H_2 and O_2 gases 4 and 5, regulator of pressure difference (RPD) 6, tank for distillatory water 7, measuring apparatus 8, filter for N_2 and O_2 gases 9 and 10, cooling chambers 11 and 12, driers 13 and 14, recievers 15 and 16 and emergency valves.

SPEP works as follows.

Depending on PCS's 2 output voltage showings OSP 3 contacts defined electrolytic holes of electrolyzer 1 to the work. At the result decomposition process of water to H_2 and O_2 gases in holes of electrolyzer 1 and the obtained gases correspondingly pass through gas separating chamber 4 and 5, RPD 6, filters 9 and 10 cooling chambers 11 and 12 and drier 13 and 14 then enter the receiver for H_2 and O_2 15 and 16.

Due to high-sensible RPD 6 and measuring apparatus 8 pressures' difference are equal in both sides of diaphragm of electrolyzer's 1 holes (pressure of H_2 and O_2 gases), electrolytic level is kept as determined form that by this the possible explosion danger can be solved entirely.

PCS 2 was developed on the base of Si photoelements, which has ~ 100 W reference power at 900 W/m^2 SREF (correspondingly current charge and voltage are I_y=7,0A and U_y=14,3 V).
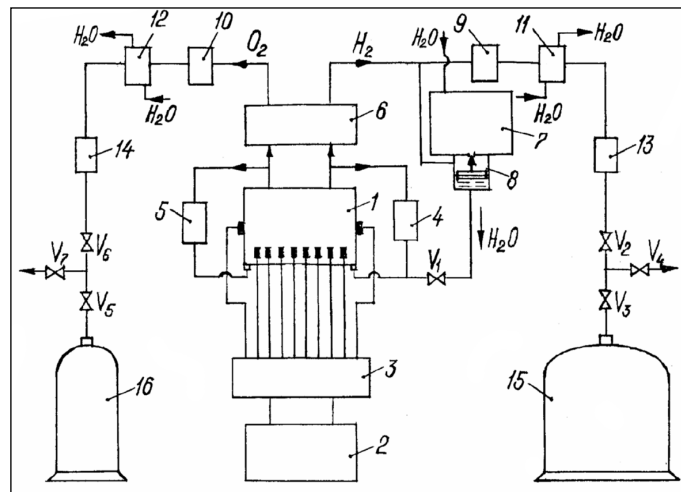
Figure 1. Simplified block-scheme of SPEP

Electrolyzer 1 was established at the Institute of Radiation Problems of ANAS and it is multifunctional filter press type, which can work under 0,6 MPa

pressure. As electrolyte KOH solution with 32,5% is utilized. Working temperature of electrolyzer is t = 353 K.

In this plant RPDs having small, high sensible pressure difference sensor and electromechanical working mechanism were used which influence directly with «till me» and «with me» type principle [2]. Some of RPD's modifications were tested. At the result of experiment it was revealed that while RPD tested is being applied, The difference of pressures between H_2 and O_2 gases may be kept exactly to 140-200 Pa, due to this high cleanness of the obtained gases is supplied (H_2 – 99,95% , O_2 – 99,8%).

One of the plants which provide secure working regime of SPEG is dosimeter metering gauge which operates electrolyte to be in necessary level inside electrolyzer.

OSP is the directly influencing block to efficiency of SPEG's which serves automatical changing of agreement between electrolyzer and PCS according to the SRED. Modifications of some OSG was developed and this was examined in model plant [2-4]. It was revealed that due to the OSP average daily productivity of SPEG increases ~ 12,5% and changing interval of current charge in electrolyzer circle decreases 2 times.

For providing effective work of OSP the program was prepared. In this case, the climatic conditions observed in the place where the plant is situated, photoenergy characteristics of PCS and heat balance of electrolyzer have been taken into consideration.

Mathematical model of SPEP was established and comparative analysis of theoretical current characteristics and experimental characteristics was carried out. It was determined that the obtained results agree with one-another among them.

According to the theoretical researches and tests done we may say that SPEP can be applied as autonomic plant for providing equipments with high-clean hydrogen and oxygen fuels which are situated far from the centralized energy source.

2. Pneumatic wind-pump plant

In Azerbaijan Republic between 40º–41º northern latitude, specially in Absheron peninsula and its sea-side near Caspian region annual amount of windy days is ~ 270 [5] for supplying wind plants' normal work regime. That's why such energy potential's effective application in our Republic is very actual.

As mentioned above because of stochastic changing of wind speed during a day working regimes of many equipments (specially equipment with reactive resistance, communication apparatus and so on) upset entirely or partially. That's why in such cases 2 or more stages energy conversion utilization has great advantage. In this case at the first stage wind energy can be transformed to another energy kind which may be accumulated, and then very energy is stably utilized for

equipments on their assignments. Present theme is about wind pump power engineering plant (PWPP) in which one of such two stage is applied Applying wind energy by pneumatic ways PWPP gives opportunity to pump water or other toxic, strategic liquids which conductibility is hazardous by other way or possible anyway from low level to up level continuously (50 m and more height) and by any pressure [6].
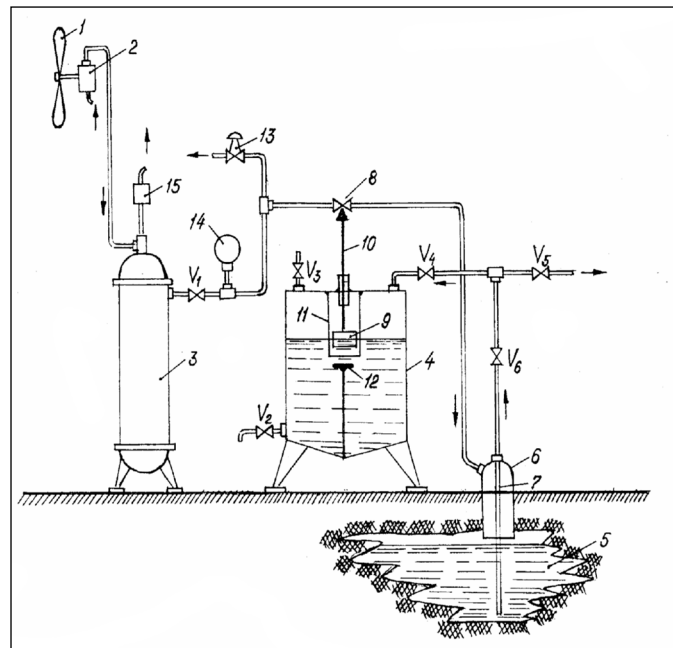
Figure 2. Simplified functional scheme of PWPP

In Figure 2 simplified functional scheme of PWPP was described. The plant consists of wind plant 1, compressor 2 connecting kinematically its valve, receiver 3 for compressed air, water tank 4, water well 5, pneumatic pump with external 6 and internal 7 pipes for pumping water to water tank, pneumatic valves 8 and float type regulating plug 10 having influence arm 9 which clean the passage canal, horizontal 11 and vertical 12 limiters, pressure regulators 13, manometer 14, maximal pressure relay 15 and additional valves B_1-B_6.

PWPP works as follows.

Compressor 2 being connected by wind plant 1 to the work fulfils receiver 3 with air. When air pressure in last volume reaches to set maximal stage maximal pressure relay 15 throws the additional air out to atmosphere. Then V_1 and V_3 valves open and necessary pressure regime is supplied by V_4 valve in the system. Compressed air passes through V_1 valve and pneumatic valve 8 enters to the hole

between external 6 and internal 7 pipes of pneumatic pump from receiver 3 and there showing of the pressure is getting to be more. At the result the water in the well 5 is compressed and by internal pipe 7 passes through $\hat{A}_4$ valve enters water tank 4, in which level of water is getting to be. In this case fin type regulating plug 9 goes up and influences to the passage canal of pneumatic valve 8 by influence valve 10 and gradually closes the very canal entirely, at this result compressed air does not enter to the hole between external 6 and internal 7 pipes of pneumatic pump. Plug 9 being used in this equipment gradually goes down, passage valve of pneumatic valve 8 opens and water enters to water tank 4 again.

In the propose PWPP volume of water tank 4 is selected taking into consideration, height of water up and maximal possible pressure stage of the system. While utilizing PWPP with $1,5 \div 2,0$ kW for an hour $\sim 5 \div 7$ m³ water may be pumped, this has $3,5 \div 5,0$ times more demandable power than majority of the pumps with $1,0 - 5,5$ kW in life at present. Such productivity is enough for many water users (cottages, farms, flower farms, vegetable farms, bathes, laundry and others). Besides the proposed PWPP has the following advantages in comparison with water pumps being used in life now.

a) Work regime does not depend on wind speed and also pump can continue its work principle in windless hours for some days;

b) Water or other liquid may be pumped to the necessary place by stable pressure, this in some cases has great advantage;

c) Main parts of PWPP is far from water, its continuous service duration is 20-25 year;

d) When it is necessary electric supply can be provided by using electric compressor by solar photoelectric current source and other renewable energy current sources;

e) PWPP is entire automatic that's why it is specially profitable in the area having difficult transport;

f) If it is necessary the compressed air may be utilized for some other purposes.

g) The plant consists of standard details among life goods being sold in real market.

It must be mentioned that because of simple construction the proposed PWPP's cost is not expensive and the major part of its cost concerns to wind plant so this is not yet produced in our Republic, as a rule wind plants are imported from other countries. If there is any financial support we ourselves can produce wind plant with 10 êW for Azerbaijan Republic on the base of our foundation (for beginning). Such wind plants are enough for even the biggest farms, too.

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DEVELOPMENT OF RENEWABLE ENERGY AND PRODUCTION OF SOLAR AND WIND ENERGY PLANTS IN AZERBAIJAN

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Introduction:

Environmental menace is linking with the unprecedented man-caused explosion and global warming at the result of atmosphere pollution. If similar tendency is continued radical changing's will not happen in future which catastrophically reflects in ecology, climate of the planet, finally in the population health of the Earth [1].

However, unfortunately one-sidedly economy increasing are chiefly directed to the oil-gas sector and from year to year amount increasing of means of transport causes man's impact to the environment. Further increasing of these processes obviously can lead to the dangerous ecological situation.

In the economical and efficiency increasing process world population depend directly on the level of energy consumption. Application of nature-conservative measures and technology, promotional efficiency increasing of energy usage, its total usage decreasing, simultaneous reduction of hazardous substance lead to the considerable but cardinal results.

That's why taking into consideration above mentioned circumstance, conclusion one is fossil fuels saving, reducing of hazardous substance, we can greatly economize by the gradual way of natural energy replacement into renewable energy.

Solar energy resources are available throughout the territory of Azerbaijan (Absheron peninsula, Kur-Araz lowland, Caspian Coastline, Nakhchevan Autonomous Republic).

On average 250 days in a year are sunny with radiation capacity of 800–900 W/m^2. In count of hours of sun shining 2000–2500 hours in a year. That's proper to 2000–2500 $kWhours/m^2$. Though Azerbaijan has such great solar and wind energy potential, it is not practically used entirely.

**Average hourly and annual direct solar radiation (MJ/m^2)
in different months**

Months	I	II	III	IV	V	VI	VII	VII	IX	X	XI	XII
during / for 24 hours	7,99	11,45	15,18	21,86	24,38	25,56	25,68	24,26	17,04	13,11	11,2	9,74
during the year	249	324	556	642	708	738	768	695	501	414	348	290

Average monthly and annual wind speed (m/sec) in different hours

Hours	I	II	III	IV	V	VI	VII	VII	IX	X	XI	XII	Year
1	5,9	6,2	6,4	5,6	5,4	5,3	6,3	5,7	5,7	5,8	5,4	5,3	5,7
7	5,9	6,3	6,4	6,0	5,6	6,2	6,5	6,0	5,7	5,4	5,4	5,2	5,9
13	6,8	7,6	7,8	7,9	7,9	8,0	8,1	7,5	7,4	7,3	6,2	6,2	7,4
19	6,2	6,6	7,1	6,6	6,5	6,6	6,7	6,4	6,3	6,2	5,9	5,8	6,4

In this connection, high-grade potential solar and wind energy usage is necessary in several fields of the world economy, especially in oil industry of the world. There is a real background for effective usage of high-grade potential solar and wind energy in oil industry. As the process of primary crude oil treatment in the condition of oil fields for its further treatment for refining and transportation to Oil Refining Plant the temperature is to be near 50-60°C to be very readily reached to various solar engineering systems.

Figure 1. Solar plant with parabolic trough concentrator

Base on the above mentioned for realizing this process we created and developed high-grade temperature solar plants with parabolic trough, parabolic concentrators and wind energy plant with the utmost obtainable temperature 250-900^0C corresponding to the technological process of primary crude oil cleaning from communal water (solar receivers, heat exchangers, capacities and so on) capability to 3 – 5 kW (Fig. 1, Fig. 2 and Fig. 3) [2,3].

Solar plant (parabolic trough concentrator) description: Dimension of double modular parabolic through reflector is L x B = 3 x 0.82 m with focal length f = 0.33 m and spanning angle 120°. Solar reactor – steel pipe with diameter D_{outer}/D_{inner} = 0.05/0.044 m, of length l_t = 3.0 m, with pipe wall thickness of δ = 3 mm is filled with water in concentrator focus.

Because of temperature obtained not being convected due to sun rays reflected from concentrator solar water heater was put inside of molybdenum glass pipe with d = 64 mm diameter, thickness b = 2mm, length of $L_{g.p}$ = 3.0 m . Integral ray transmition of molybdenum glass pipe in solar spectrum τ =0.9 ÷ 0.92. In order to increase efficiency and to obtain isothermal condition reactor surface adsorbing solar rays was coated with a selective black chrome surface and surrounded with clear glass tubes A = e = 0.91. The distance between glass and steel pipes was vacuumized that gives opportunity heat loss to be decreased to minimum.

Figure 2. Solar plant with parabolic concentrator.

Solar plant (parabolic concentrator) description: Dimension of double modular parabolic mirror is D = 1,5 m with focal length f = 0,736 m and spanning angle 120°. Solar reactor – steel pipe with diameter D_{outer}/D_{inner} = 0,12 / 0,104 m, of length l_p= 0,3 m, with pipe wall thickness of δ = 6 mm is filled with water in concentrator focus.

Generally because of not heat loss in whole system where water moves glass wool and special cover were used. Chromel-copel thermo pair calibrated

were put on suitable places to measure temperature difference on internal and external surface of solar reactor, glass pipe, heat exchanger, and to measure temperature of oil and heat transfer in entrance and exit. Exits of thermo pair were jointed to digital potentiometer [4]. According to potentiometer's factor temperatures are found in calibration table.

Figure 3. The general view of wind plant

Dimension characteristics of wind plant:

Nominal capacity of wind plant, W	4000
Initial velocity, m/sec	3,0
Nominal wind speed, m/sec	10
Maximum wind speed, m/sec	40
Fan number, piece	2
Diameter, m	6
Blade-swept area, m2	28,02
Reduction unit	1/20
Generator	
Maximum power,W	4200
Voltage, V	220-380±5
Frequency, Hz	50-60

Conclusion:

Economy till 30% of fossil fuels, ecological increasing, work condition and safety measures, also decreasing air venting CO_2, CH_4, N_2O on average 30-35%. Computations show that by utilization of proposed solar reactor based on parabolic trough, parabolic double modular concentrator and wind plant it is possible to achieve the temperature of water that reaches the vaporization temperature which enables the given installation for various technical purposes.

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◄ IMPORTANCE OF SOLAR AND WIND ENERGY APPLICATION FOR ECOLOGY SITUATION PROTECTION

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Lately one of the main reasons of forest destruction on a large scale is the energy demand of population. In the cold weather bituminous coal, liquid fuel, and firewood are used in heating of the houses. Too much increasing of fuels' costs makes the population utilize woods and this causes wide ruin of trees. Especially in the regions where there is loss of gas and electricity, major part of heat requirement is provided at the expense of the green trees cut. Such kind of solution on heating problem results great ecological damage to environment. Thus the forests particularly enrich environmental oxygen balance. That's why all forests have too great significance.

According to the statistical information forests are situated in 11% area of the Republic. Not only mountain zone but also other regions' firewood need leads to the loss of some nadir trees (fine wood) in forests. In its turn this costs a plenty of victims for Azerbaijan flora.

As far as we know, geographical location of the Republic gives opportunity to apply ecological clean energy sources. Azerbaijan's climate condition and geographical location gives practical opportunities for thermal and electric energy production by using solar potential. Statistically the annual amount of sunshine hours is 2500-3000 for Central Asia and USA, but for Russia this showing is 500-2000 hours and in Azerbaijan this amount is 2400-3200 hours.

To specialists mind solar power development can partially solve energy problem in majority of Azerbaijan's regions. At present many developed countries have recently started to widely apply photovoltaic program solar batteries (PV). For involving Azerbaijan to utilize solar power in its energy field, our country has enough natural potential. That's why renewable energy utilization may have important role in the Republic's energy industry. It stands that effective solar potential usage depends on each region's natural climate condition and geographical location. Generally the total solar power to the Earth is different due to the above men-

tioned factors, for example in USA it is 1500-2000 kWh/m2 annually, in Russia – 800-1600 kWh/m2, in France – 1200-1400 kWh/m2, in Chine – 1800-2000 kWh/m2, but in Azerbaijan this showing is 1500-2000 kWh/m2. In comparison with other countries it is entirely clear that the solar radiation's amount in Azerbaijan is higher than the shown regions, this is one of the main factors to attract investor's attention for solar energy application in any part of life and industry in order to safe environment from hazardous gas emissions.

Taking into consideration these parameters to protect forest strips, we consider renewable energy sources to advisable in house heating. For this purpose annual average measurements have been carried out in three test areas. Due to the monitoring done in Pirallahi, Badamdar and prove area of the Institute of Radiation Problems, wind potential on month has been shown in the following figure.
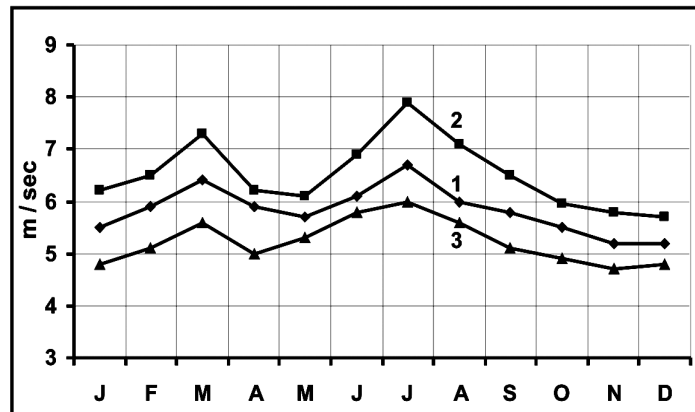
Figure 1. According to the results obtained from the measurements carried out in above mentioned regions, annual average solar potential was given in the graphical dependence.

Figure 2.

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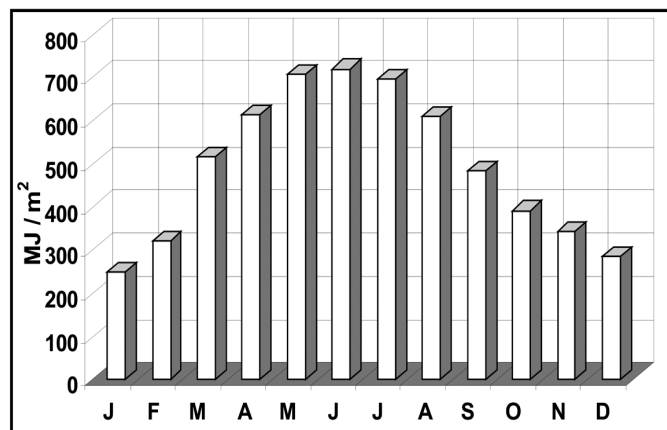
The above mentioned parameters are enough for forest strip protection. Taking into account this factor we have built the experimental energy efficient house and heated this by solar and wind energy in order to test. Testing activities included air quality (measuring methane (CH_4), oxygen (O_2), carbon dioxide (CO_2), carbon monoxide (CO) and hydrogen sulphide (H_2S) at ten and fifteen minute intervals) as well as intensive testing of household energy activities and inhabitant behavior on a daily basis.

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ECOTOURISM:
◄ANALYSIS OF EXISTING INTERNATIONAL EXPERIENCE

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The term "ecotourism" was put into practice at the beginning of 80s of the 19th century. There is no single definition for ecotourism. There are many interpretations of similar meaning, but varying in wording and context. Below are the definitions of international organisations: International Union for the Protection of Nature (IUPN): "ecological tourism or ecotourism is a responsible travelling to relatively undisturbed or uncontaminated areas with the specific objective of studying, admiring, and enjoying the scenery and its wild plants and animals, as well as any existing cultural manifestations (both past and present) found in these areas, "mildly" affecting environment, ensuring active socioeconomic participation of local inhabitants and getting advantage from this activity" (1, 4).

The Ecotourism Society (TES) defines ecotourism as: "Ecotourism is a responsible travel to natural areas that conserves the environment and improves the well-being of local people" World Wildlife Fund (WWF): "ecotourism is a tourism including the travelling to relatively undisturbed areas with the specific objective of studying the natural and cultural-ethnographic peculiarities found in these areas, which at the same time does not disturb the integrity of ecosystems and creates economical conditions where conservation of nature and natural resources becomes beneficial for local people".

Based on above definitions, we can underline the following specific features of ecotourism that can be classified as a set of principles:

1) motivate and satisfy the willingness to commune with nature;

2) travelling to natural areas where the main objective is the familiarisation with wildlife, as well as with local traditions and culture;

3) elimination of negative impact on nature and culture;

4) minimisation of negative environmental and social impacts, conservation of environmental sustainability;

5) promotion of nature conservation and local socio-cultural environment;

6) promotion of conservation of nature and natural resources;

7) ecological education and awareness;

8) participation of local people and gaining benefits from tourist activity that generates economical motivations for conservation of nature;

9) economical efficiency and assurance of socioeconomic development of the territories;

10) promotion of sustainable development of visited areas.

Sustainability in tourism means positive overall balance of environmental, socio-cultural and economic impacts of tourism, as well as their positive interaction. Thus the types of tourist activity having the highest overall positive effect from the point of view of environmental, economical and social development shall be the most sustainable types. Sustainable tourism is the tourism that expects unlimited prolonged maintenance of the resources used as a basis for such tourism. Sustainable tourism concept can also be put in perspective: "all types of tourism based both on natural and manmade resources contributing on sustainable development". As an example to principles of sustainable tourism (in addition to previously given principles) we can give show the principles accepted by Swedish Environmental Protection Agency: Non-destructive, sustainable utilisation of natural resources; Affordability and lack of waste in the form of luxury; Conservation of biological diversity and cultural diversity through ecosystem protection; Painstaking planning, holistic management and integration of ecotourism into regional development plans; Support of local economy; Sharing of financial and other benefits with local communities by having their participation in the management of ecotourism enterprises; Consultations with interested parties and communities; Education of personnel; Responsible marketing of tourism

Ecotourism and its types

Due to lack of definition in interpretation of ecotourism, it is often called by different terms and confused with other types of tourism (2, 5). Let's review these peculiarities of ecotourism, noting any possible interrelations between related types of tourism and varieties of ecotourism. Nature tourism (nature-based or nature-oriented tourism) is a type of tourism which directly depends on utilisation of undisturbed natural resources including landscapes, relief, water, plants and wildlife. As opposed to ecological tourism, "nature tourism" is based only on motivation of tourists (rest in wilderness, acquaintance with wildlife) and on their activity types (rafting, tracking) and does not consider ecological, cultural and economic impacts of these trips. Therefore, the usage of natural resources by this type of tourism is not always reasonable and sustainable (enough to mention such types as hunting, trips on speed boats, etc). Ecotourism is a more complex concept considering sus-

tainable usage and preservation of biodiversity for future generations, planning and management of tourist activity; in addition to interests of tourists ecotourism also involves the achievement of social objectives. One of the integral parts of ecotourism is the interaction with local people, creation of more favourable economical conditions in visited areas.

Thus, the difference between travel agencies offering "traditional" trips to nature and ecological trip planners becomes clearer. The first do not bear any responsibilities for preservation of nature or for management of natural territories, they simply offer the clients the opportunity to visit exotic places and get acquainted with native minorities "before the will disappear". The second establish partnerships with preserved territories and local people. With their business activities they try to contribute to wildlife protection and long-term development of local settlements. They try to improve mutual understanding between tourists and local people. Sometimes wildlife tourism and wilderness travel aiming to any wildlife subjects are specially noted among the types of ecotourism.

"Hard" tourism	"Mild" tourism
Group tours	Individual and family tours, tours with friends
Short-term tours	
Fast transportation means	Long-term tours
Previously agreed program	Slow and medium speed transportation means
"External" motivation	
Life style import	Spontaneous decision
Places of interest	"Internal" motivation
Comfort and inactivity	Life style conforming to the culture of visited country
Slight preliminary preparation for the tour	
Tourist does not speak the language of visited country and not willing to learn	Impressions
	Activity and variety
Tourist arrives to the country as a master used to be "served"	Language of the destination country is learnt - even at basic level
Purchases are practical (shopping) or standard	Visitor is acquainted with new culture
	Purchases are memorable souvenirs for friends
Only standards souvenirs are left after the visit	
	Visitor receives new knowledge, emotions and memories after the visit
Tourist buys postcards	
Curiosity	Visitors paints from nature or takes photos
Loudness	Tactfulness
	Quiet tonality

Often ecotourism is related to adventure tourism. However, ecological tourism does not always include component of adventure. From the other hand, not all adventure tours comply with ecological criteria, especially from the point of view sustainable usage of resources. Thus, such tours as sport and safari-tours

involving the capture of alive trophies or achievement of sportive results at any price – for example, cutting the trees for rafting – are considered as anti-ecological tours. Green rural tourism or agrotourism, especially popular in the States and Western Europe, means vacations in the country area (in the villages, farmyards, comfortable cottages). Visitors receive an opportunity to participate in rural activities, get acquainted with agricultural areas, local culture, applied arts, with national songs and dances, local traditions, to participate in traditional rural activities, national festive and hoedowns. Green tourism is a form of tourism that implements ecological methods and technologies in tourist industry. The adjective "ecological" is rarely used in German speaking countries and almost never used in "green" sectors of the tourism. "Mild tourism" or "ecologically and socially responsible tourism" are the main terms that are used in these countries. Comparison of peculiarities of "hard" and "mild" tourism

Types of ecotourism

Ecological and other related tourism types (subject to adequate planning, organisation and management) includes wide range of activities – starting from long-term scientific expeditions to short-time weekend outdoor recreations (3). All these varieties can be classified into different categories, mainly according to traveller groups, main places of visit, types of tourist activities, duration of stay, etc. Main ecotourism subjects in their narrow classical nature conservation treatment are relatively undisturbed natural complexes or their individual components. More often than not the most "popular" and distinctive biological populations of animals and plants become the targets of informative or scientific ecotourism. Ecotourists are also attracted by unique subjects of inanimate nature, geomorphologic, hydrological and other features (individual mountains and canyons, caves, waterfalls, lakes and rivers, etc.), as well as by palaentological findings. Ecotouristic targets can be unique vegetative communities and biocenosis in general, for example, forests, plains, tundra and other similar places in different seasons.

In addition, cultural, ethnographic, archaeological and historical landmarks, as well as natural-artificial (cultural) landscapes in general, which is more characteristic for ecological tourism in its wide meaning. Based on special nature of activities English speaking countries relatively divide the tourism into scientific, informative and recreational tourism. Scientific ecotourism sometimes includes expeditions of scientists, summer field exercises of students, other trips involving the collection of scientific information about visited region. Scientific tourism usually accounts for a relatively small proportion of total flow of ecotourism, however it may play quite significant role in it. In particular, it may give considerable information about poorly studied regions and objects. Received information will be beneficial not only for development of science, but also for future development of

sustainable ecotourism in the region. This type of ecotourism may contribute to extension of scientific and educational relations between different countries, establish the foundation of important international projects funded by charity grants. Most Russian conservation areas mostly prefer scientific tourism (which is also most easy to organise) to other types of international ecotourism. Some foreign preserved areas often use the assistance of "common" tourists – volunteers in field surveys not requiring high skills or qualification. Many ecotourists are willing to participate in mapping and protection of individual natural areas.

Informative ecotourism is "the ecotourism in its classical meaning". It includes bird-watching tours, observation of whales or exotic butterflies, archaeological, ethnographic and palaentological voyages, eco-safaris, tours for photo and video survey amateurs.

The main chain of recreational ecotourism is the outdoor recreations, though, it also has some informative objectives. Such tourism can be active (being a type of "adventure" tourism) and passive. Active tourism may often include hiking, horse riding and skiing, mountaineering, spelean-tourism, different types of mountain and water trips (rafting on catamarans and rafts, paddle boats, canoe). Passive recreational tourism includes, for example, camping, short walks, journeys and picnics. Fishing and harvesting on the principles of ecological sustainability can also be considered as a passive recreational ecotourism. It must be noted that in Western countries tourism has wider meaning than recreation. In other words, western specialists take recreation as a part of tourism. On the contrary, in Russian scientific tradition and practice recreation covers more aspects than tourism. Sure enough, recreational activities are purely short-term activities of broad range. They last less than 24 hours, thus being already excluded from the scope of the tourism definition accepted by WTO.

Classification of the ecotourism types is relative, especially in western countries. It is very difficult to indicate exact boundary between different types of ecotourism, for example, between informative and recreational ecotourism (if we accept such form of tourism notwithstanding the interpretation and definition system used in Russia). However, classification of ecotourism types can be useful in identification of categories of the visitors worth to work with and in determining the most suitable visitors for your territory. In general, there are several tendencies in recent development of ecotourism. From one side, ecotourism is extending with new types emerging all the time. From other side, it is getting integrated with other sectors of tourist industry. Supporters of classical nature preserving ecotourism in its narrower meaning are getting worried with increasing negative impact of significant number of ecotourists and are offering to extend the ecotourism outside the boundaries of preserved territories and include other cultural landscapes; at the same time most "resort" or "sightseeing" tourisms include the components of ecotourism, e.g. short-time visits to national parks and other natural areas.

Classification of ecotours

Ecological tours can be classified in accordance with number of features – as per transportation means, as per the number of participants, as per duration, as per attitude to the boundaries of country of residence of tourists, etc.

Type: ecotourism   Ecotours

Classes

1. Ecotours in "wild" nature in the boundaries of preserved territories
2. Ecotours outside the boundaries of preserved territories.
3. Ecotours in the area of cultural landscape

Types

1. As per the main targets
2. As per the main object

Forms

1. As per the age of participants (children and adults)
2. As per their health (disabled)
3. As per group size (small and big)

First of all, all varieties of ecotourism are divided into two main classes:

Ecotourism within the boundaries of specially protected natural areas (water bodies) and in the conditions of "wild", undisturbed or slightly changed nature: Organisation and arranging of such tours is the classical trend of ecotourism; the relevant tours are considered ecotours in their narrow meaning, they are assigned to "Australian" or "North American" ecotourism models. Ecotourism outside the boundaries of specially protected natural areas and water bodies, in the cultivated or cultural landscape areas (mostly rural areas).

Quite a wide range of ecologically oriented tourism can be included into this type of tours: starting from agrotourism to the cruises in comfortable ships; this ecotour type is assigned to "German" or "Western European" ecotourism models. However, two specific characters are considered as most significant – targets and objectives of ecotours. As per the main targets the ecotours are divided into: Observation and studying of "wild" or "tamed" nature (with environmental education components); Outdoor recreation with emotional and esthetical objectives; Naturopathy; Tours with sportive and adventurous objectives

As per the main objects that specify the context and organisation forms of the tours, ecotours are divided into: Botanical, zoological, geological and similar types of tours; Ecological-ethnographic or archaeological, ecological-cultural tours; Agrotours; Spelean, water, mountain tours, etc.

Certainly, tour targets and objectives are interconnected; these main specific features cannot be taken as absolutely independent classification basis (in real tour program the targets and objectives of the tour combine and overlap). However, every trip planner and participant can identify the main features of the tour and

assign each specific tour to one or another type.

As an example to prevalence of different types of ecotours we can use the generalised statistical data of the US Ecotourism Committee for 1998. Due to some methodological differences it is difficult to ensure the accurate statistics of ecotours, therefore we give the general information on "nature oriented" tourism. In average about 48% of all American tourists are willing to devote the part of their vacation to nature oriented tourism. From different types of nature oriented tours Americans prefer to visit national parks and other preserved natural territories.

Natural and ecotours in Europe prevail in German market; trips to America (North and South) are in the second place. The most popular European tourist destinations are France, Greece and Poland, followed by Norway, Iceland, Sweden, Ireland and Italy (E. Petrasov). Age and state of health of the participants (in most countries with developed ecotourism traditions there are special tours for disabled people) and the size of the groups are the important classification criteria for identification of ecotour forms. It is quite clear that, the content of tour programs and their organisational features will be completely different for children journeys and for expeditions aimed for adults, and for small and large groups of participants.

Criteria of ecological tours

In many cases they ask: "can ecotourism be popular or is it an elite recreation type?" Before ecotourism was conventionally opposed to popular tourism and was considered as limited and somehow exclusive natural tourism. However, based on modern concept of ecotourism, this definition is not always justified. Economical and nature preserving impacts of tourism limited by such narrow definition will be mostly insignificant. Thus, for example, birdwatchers can be motivated by noble environmental oriented intentions. But if there are few of them during whole season, this will not provide serious alternative options to forest cutting, expansion of farmlands and settlements. At the same time more "popular" types of natural tourism have significant potential, subject to reasoned and "competent" organisation. National Park Amboseli in Kenia is one of the shining examples. More than 250,000 people visit this park every year. This gives ten times more profit than the local Massai tribe was gaining from cattle-breeding. Income from tourism creates economic resources for preservation of natural ecosystems and development of the region, providing that the significant part of the income stays in the region.

Therefore, from ecological point of view, the impact of travels is more significant than the scale of tourism or motivation of travellers. First of all this impact is specified by the way of organisation of the tour. Ten visitors may cause more damage than hundred visitors if their route is planned and organised incorrectly. Therefore, they also can be considered as ecotourists like small groups of visitors making complex camping into wilderness with rucksacks and sleeping in tents.

The similarity of ecological tours with the types of amateur tourism once pop-

ular in Russia must be noted. But some amateur tours – for example, number of sportive and safari tours may be anti-ecological. The ecological criteria of the tour (depending on ecotourism principles) are identified as reference points for these questions.

Ecotourism principles

Ecological criteria of the tour

Minimising the negative ecological and socio-cultural consequences and maintaining of ecologically sustainable environment. Maximum allowable recreational load is not exceeded.

Development of tourism is carefully planned, controlled and managed. Behaviour rules set for visited natural areas are followed. Transportation means used by tourists are ecologically acceptable. Waste is not disposed into one general landfill, but segregated, removed from the site and then disposed for ecologically technological treatment. Camps, bivouacs and wood fires are made only in specified places. Purchase of souvenirs made of wildlife species is not allowed. Mushrooms, berries, flowers, herbs other natural souvenirs are collected only in permitted areas. Hotels, camping areas, cordons and huts used by tourists are located so that they don't disturb normal, ecologically sustainable growth of surrounding landscape and do not deform it. These hotels and camping sites are built using ecologically harmless materials, inhabitants save water and power, drainage and sewage are treated and some wastes are recycled. Ideally, "enclosed" ecological technologies are used. Food consumed by tourists is ecologically clean and healthy, with local products being included into menu.

Contributions to nature preservation and local socio-cultural environment

Tourist activity ensures additional funding sources for protected areas or for nature preserving measures. Tour participants make best efforts in nature conservation activities (volunteers, children ecological camps, etc). Tourists respect local cultural traditions, customs, life style, try to learn and understand them. Development of tourism enables the cooperation between SPNA and local population, improvement the public image of SPNA, the expansion of international contacts of SPNA.

Ecological education and training

Tourists receive information about nature, behaviour rules in the tour area before the tour. Tourists are totally aware of their responsibility for preservation of nature, follow the behaviour rules in SPNA. Tours and excursions include obligatory ecological-informative component. Tours are managed by qualified guides

Places to be visited are the interesting and ecologically favourable natural and cultural landscapes.

Visits to educational ecological pathways, nature museums and local history museums, ecological-technological properties, etc. are included into program.

Integrated approach to development of tourist activity

Careful planning, monitoring and management

Integration of ecotourism into local plans of regional development

Close cooperation of organisations of different profiles

Tourist revenues are not totally withdrawn from local budget, but nurtures the budget and supports local economy

Demand for ecotourism

Up to date analysis and assessment of existing or possible demand for natural tourism and ecotourism is based mainly on data obtained from North America – European market potential and the potential of Japanese market is still unstudied. Large scale researches of the world ecotourism market are almost non-existent up to now (À.V. Galanin, L.M. Dolgolaeva). There are only some marketing researches of individual tourist regions (for example, Costa-Rica, Belize, Kenya).

Within the framework of preparation to International year of ecotourism in 2002 following a request by the World Tourist Organisation (WTO) the marketing researches of Europe markets (Austria, France, Germany, Spain, Italy, Great Britain), Canada and USA were carried out on this background. Existing assessments of the share of ecotourism in the world tourism market considerably differ from each other. Special scientific literature often indicates 7% (assessment of WTO – 1992, TES -1998); but in other assessments this factor can reach 20-60% (1996). In accordance with some assessment the number of ecotourists increases for 20% every year (2001).

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STATE OF HEALTH OF PREGNANT WOMEN AND BABIES IN CONNECTION WITH A DEGREE POLLUTION OF ATMOSPHERIC AIR

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Pollution of atmospheric air undoubtedly is the factor of the heighlened risk for obstetric and per natal pathologies. Dependence of parent death rate on a degree of pollution of atmospheric air investigated by the method of pair correlation proved the link between frequency of death rate of pregnant women, lying-in women and puerperant, and mid-annual concentration definite, harmful substances. Obtained data have shown, that only oxide carbon has straight line correlation dependence with frequency of parent death rate (r = 0,7, m_2 = 0,29, t_2 = 2,4) and the moderate correlation dependence is revealed between frequency of parent death rate and the contents of dioxide of nitrogen in atmospheric air.

Diseases of cardiovascular system are one of the basic pathological processes of internal bodies at pregnant women and lying-in women. The level of cardiovascular diseases at pregnant women, lying-in women and puerperant, in large industrial centers of the republic of has no essential difference has no. It is characteristic, that in changes both in the republic on the whole, and in cities Baku and Sumgait obvious changes of growth of number of diseases of cardiovascular system at pregnant women, lying-in women and puerperant are traced. The highest speed of dynamic increase of a parameter is noted in the city of Sumgait. In the city of Sumgait where precise changes of growth of number of diseases of cardiovascular system among pregnant women, lying-in women and puerperant have been noted, the share of this pathology noticeably grows in the reasons of the death rate. This phenomenon is traced on the background of the obvious tendency of reduction in a death rate of pregnant women, lying-in women and puerperant and reduction of propertion of other reasons in structure of death rate of the given cohort. Taking into account an established fact, the correlation estimation of dependence between frequency of diseases of intimately vascular system among pregnant women, lying-in

women and puerperant and intensity of death rate of the same group has been done. Statistically authentic strong direct correlation dependence between compared parameters according to the city of Sumgait has been convincingly

From among the blood diseases complicating the current of pregnancy and birth, the special attention attracts an anemia. The level of an anemia at pregnant women lying-in women, and puerperant in Azerbaijan has 42,2±0,54 % and had the notable tendency of growth. In Baku the level of an anemia (52,7±1,26 %) a little above comparing with average republican level. The maximal frequency of an anemia among pregnant women, lying-in women and puerperant is noted according to the data in the city of Sumgait (85,1±3,63 %). In all three industrial centres changes of growth of a level of an anemia was observed. In spite of the fact that the general increase in frequency of an anemia among pregnant women, lying-in women and puerperant has been noticed, correlation connection of a level of this pathology with intensity of death rate of women of a corresponding cohort is found out only according to the data in Sumgait where the return moderate correlation dependence is revealed.

Parameters of pair correlation between frequency of an anemia and the level of pollution of atmosphere harmful substances: Sulphurous gas, oxide carbon, dioxides of nitrogen, chlorine have shown, that the level of the examined harmful substances in atmospheric air has no essential connection with frequency of an anemia at pregnant women, lying-in women and puerperant. The Pyelonephritis was considered to be one of the most frequent exstragenital diseases of pregnant women. The level of pyelonephritis in Azerbaijan on the whole, in the cities of Gandzha and Sumgait is rather low (accordingly 3,2±0,2 %, 5,2±0,9 % and 5,7±0,98 %). Frequency of pyelonephritis among pregnant women, lying-in women and puerperant according to the republic data on the whole had direct correlation connection with the death rate of women of corresponding group (r = 0,63, m_2 = 0,21, t = 2,98, P < 0,05). According to the data of cities Baku, Sumgait and Gandzha this connection has not been proved to be true. At the same time between frequency of a pyelonephritis and a level of concentration of harmful substances in an atmosphere (dust, sulphurous gas, oxide carbon, dioxide of nitrogen and chlorine) in these cities dependence is not established.

Comparison of parameters of disease, physical and nervous-psychological development of babies in zones with different level of an atmosphere pollution, carrying out of the correlation analysis between parameters of the state of health of children and atmospheric air allows to prove with convincing results a degree of risk of influence of harmful impurity for children's organisms in urban conditions. The deviations of researched parameters revealed at this research on the character correspond to the results of the researches led by a number of other researchers. It confirms stability and objective conditionality of dependence of the state of health

of babies from a degree of pollution of an atmosphere.

Both according to the data of scientific literature, and by results of our researches, the most appreciable deviations in the state of health of children under the influence of polluted atmosphere is connected with the pathology of breath organs. The reosonobitis, that the main way of penetreating in an organism of chemical impurity of the atmosphere is the respiratory system.

In the structure of babies desease the first place is occupied by sharp respiratory diseases, sharp respiratory virus infections, otitises, rhinitises and catarrhal quinsy. Frequency of these diseases which can be united in the group of illnesses of the upper respiratory ways, has strong direct correlation connection with concentration of dust, sulphurous gas, oxide carbon, dioxide of nitrogen, hydrogen sulphide, soot, formaldehyde and the total size of a degree of pollution of the atmosphere. Connection of this group of pathologies at children of other age periods with total concentration of sulphurous anhydride, a dust, Dioxides of nitrogen, oxide carbon, etc. is revealed in the works of a number of researchers.

Thus, influence of harmful impurity of an atmosphere on a condition of respiratory system basically has no specific character.

The pneumonia, being the basic complication of diseases of the upper respiratory ways, is the prevailing initial reason of infantile death are rate in city Baku. Frequency of this pathology had the obvious correlation connection with concentration in the atmosphere of hydrogen sulphide, soot of total parameters. Similar data met in the scientific literature. Hence, correlation connection between concentration of the basic harmful impurity in the atmosphere and the disease of organs of breath at children of the first year of life was not always accompanied by the increased risk of development of a pneumonia. At the same time such risk is found out by us only in connection with the superfluous contents of hydrogen sulphide and soot in air. Probably, it is caused by the influence of hydrogen sulphide on resistibility of a child's organism.

In the structure of the reasons of infantile death rate in the city Baku the share of a pathology of digestion organs is also high. According in our data, frequency enteritis at babies had appreciable correlation connection with concentration in the atmosphere of only firm impurity (dust and soot). Probably, that firm impurity of air, without getting into an organism through the respiratory system, getler in the upper respiratory ways then it is swallowed and cause toxic affect of a gastroenteric alimentary canal.

In the literature there are data on connection of chemical pollution of the atmosphere (dust, sulphurous anhydride, hydrogen sulphide, phenol, oxide carbon, dioxide of nitrogen, etc.) with frequency of a rachitis and hypotrophy of children. We could reveal the connection of this group of pathologies at babies with the concentration of dust and soot that has formed the basis of corresponding mathemati-

cal models.

Taking into account, that this kind of impurity directly damage organs of digestion and cause enteritis in babies, it is possible to assume secondariness of occurrence of hypotrofi and rickets at inhalation receipt of soot and dust in an organism. In the literature the opportunity of influence of chemical pollution of an atmosphere on the risk of development of anemias at children is described. We could find any connection between the frequency of anemias in babies and the concentration of chemical substances in atmospheric air. It can be caused by that carrying out of blood analyses at this age with scope of all children is accompanied by organizational difficulties and in this connection diagnostics of an anemia is dificult.

Affection of the central nervous system, encephalopathy and infringement of psychological development of babies at the hygienic estimation of atmospheric air in the literature are elucidated insufficiently. We have revealed small lagging behind of psychological development of babies in the zone with a high degree of pollution of the atmosphere.

Correlation connection of frequency of encephalopathies has been found out only on concentration of dust and hydrogen sulphide.

Sensibilizing influence of atmospheric impurity was shown by the increase of frequency of exudativ-catarral diathesises at babies. The level of this pathology, according our data, was correlated with concentration of oxide carbon and dioxide of nitrogen. The increased allergic reaction at children under the influence of a complex of harmful impurity (sulphurous gas, dioxide of nitrogen, oxide carbon and others) is noted in the works of a number of scientists. Probably, the increased risk of exudativ-catarral diathesises at babies can be estimated as the specific display of harmful influence of dioxide of nitrogen and oxide carbon. Concentration of dust and oxide in an atmosphere is rather less than carbon during spring-and-summer seasons of the year that can be connected with intensity of movement of motor transport and a protective role of green plantings. Monthly changes of the contents of sulphurous gas and dioxide of nitrogen in atmospheric air corresponds those, with are characteristic to emissions for intensity of the industrial enterprises.

Developed on the basis of the profound estimation of relationships of cause and effect mathematical models can be used monitoring the environment and in forecasting disease. The equations dependence of a level of disease of babies in connection with change of a degree adequately describes pollution of an atmosphere. Taking into consideration that growth of disease of babies comes not at once, but after some certain exposition time of influence of harmful impurity of air, in children's polyclinics it is possible to make preliminary forecasts of disease of babies for what it is required to receive on a regular basis corresponding data of the Azerbaijan Republican management on hydrometeorology and to use offered by us mathematical models.

The second directions of application of mathematical models of disease of babies – a substantiation of alternative sanitar-hygienic actions. It becomes a legal reality in connection with strengthening of independence of local authorities and expansion of local self-management. The enterprises and the motor transportation associations, being the direct source of pollution of atmospheric air being by direct sources, can be involved in financing sanitary-and-hygienic and medical-improving actions in the city according to their individual share in formation of the developed situation of pollution of an atmosphere.

Proved by us the parameters of superfluous levels of disease of babies in zones with the high and moderate degree of pollution of the atmosphere, can be the basis for calculation of medical, social and economic damage of the population in connection with atmosphere pollution.

Application of the described mathematical models of disease of babies should be taken into consideration because the formation of staffs and rates of loading of the medical personnel are assigned to local bodies of public health services. Integration of pediatric sites only according to the number of children, without taking into account their disease in connection with zone pollution of the atmosphere, will promote unreasonable overloads of the medical personnel of separate sites. On the basis of the mathematical models offered by us the expected quantity of patients on sites in connection with pollution of an atmosphere can be calculated.

The precise and adequate mathematical description of dependence of disease of babies from a degree of pollution of atmosphere by various impurity gives the scientific basis for formation and carrying out of sano-ecological monitoring of an theenvironment of ecological complex programs, sanitary-security actions for the safety of the population.

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AZERBAIJAN KAHRIZES AND USAGE SITUATION OF THEM

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Abstract: History of the underground-pipes is quite ancient in Azerbaijan. It is necessary to use them today, too.

Keywords: Kahriz, kankan, Azerbaijan, Ordubad, "girkh pilla", culture, common tradition

Introduction

Azerbaijan has an irrigative agricultural cultural, as the Near East and the Middle Asian. According to the famous Geographic Strabon the plain of Azerbaijan was irrigated much well than Misir and Babilistan with the channels and other water systems. In the area of Azerbaijan where was less river network, the soil was rich and for the irrigation needs mainly used kahrizes.

Kahriz is called ameliorative system which underground water flow up by the result of creative activities of people. Kahriz is a miracle which created by people. In a difficult work condition flowing out of water to the land is unity of science and experience.

Kahriz systems of Azerbaijan, their activities and work process have not been learnt from the sciential point of view till today.

Majority of Kahriz, reach Kahriz technology, high water using culture, Chaheriz digging experience affirmed that Azerbaijan is a place of ancient Chaheriz culture.

The history of Kahriz usage in Azerbaijan is very ancient. In 1938 archeological digging in the valley of Shamkir river by I.Y Hummel affirmed that Kahrizes belong to first century BC. In the begging of our era also Kahriz found out in Gabala district.

According to famous geographer Strabon's writings plains of Azerbaijan was irrigated better than Babylonia and Egypt with aryk and other water sources.

Today Kahriz have in forty-four countries of the world. The name of Kahriz is differentiated in each country. Germany-"Kenel", North Italy-"Kande", Arabian and Yemen-"Shariz", North Africa-"Fugara" (foggare), Morocco-"khatara or rotara", Tunisia-"Kharija", Central and south America-"Galarea filtirante".

In Azerbaijan it noted that the name of Kahriz is originated from Persian.

Tell the truth the name of Kahriz is originated from word "kuhriz" and in Persian it's called "kuh"- mountain and "riz"-road in the meaning of underground water canal. It is called "Kahriz" in Azerbaijan, western part of Iran and in Eastern Azerbaijan. In the middle Asia republics – "kyeriz", in Turkey – "kerez", in Uigurian province of China – "keriz". It showed that origination of Kahriz name from Persian is doubtful. Investigations showed that the name of Kahriz originated from Persian despite of majority of terms which connected with Kahriz is belonged to Turkish. We consider that Kahriz have more ancient history. Using the word of Kahriz in Persian has occurred in latest times. That time we are obliged to think about relationship of "Keriz", "Kariz", "Chaheriz", "Kyeriz" words with Turkish countries.

The name of Kahriz is called "ganat" in scientific literature. It is linked with the "akadi gano" which has Arabic origin and which meanings come from the word ghamis.

In spite of the word "ganat" is considered origin of Semitic, according to thought this word had passed from Shummer to Akkads and other Semitic voluble people.

The digging of Kahriz is about long time profession or profession from generation to generation. According to tradition Kahriz was dug in foothills and river beds. There was a special Cancan group for digging. Those groups consisted of three or five person. Each person had a special work function. They were consisted of head cancan, cancan assistant, sewerage, grinder and filler. They had special tools, for example: dolamachark, pick, felt spade (chalov), fill (which is preparing from cow leather), hook, rope and Shoulder underskirt.

Essence dig of the Kahriz is as the following, first of all cancan observe the territory and relief then he analyses existence of water and specified first well and dig it. It called "gumana" well. After digging of "gumana" well cancan started to dig additional wells. After digging 2-3 m the wheel placed on the well. After approximate depth they are starting undermining. For exact digging and giving coordination to head cancan they stretch tree to the mouth of well. Undermining is digging in a same size and level in each point of Kahriz. For this head cancan fill the bottle with water and put "gurucara" on the smooth wood. Keeping of Emptiness of air in the middle of gurucar is supplying cancan with exact digging.

The come down cut sizes of Kahriz kurehs are changing width 0,65-0,70 m heights 0,75-1,20 m sometimes 1,40-1,60 m, depending on grunt digging features, water physical properties and mechanical structure.

Ability of water heating of grunts are changing between 0,4-30 m/d where the Kahrizes have spread. When head cancan undermine he put on heading which prepared from ship leather that guarded him from water and stone crumb.

Figure 1. Well of ancient kahriz, Cahalagerdan.

Falling down occurs in kureh when undermining passes from soft rocks.

Laying works is carried out with the stone (saybend, salbend or sengebend) to prevent falling down. According to structure there are two types, "saya" and "saybendli". "Saya" have kept in natural form as tunnel digging. Burn walls of tunnel 120-130 cm height are faced with stone or dish brick and ceiling is closed with plate stone.

60-65 cm distances are kept between burn walls that need for cancans moving in kureh.

The mouths of wells are faced with stone which is called "cahalagerdan", then its mouth was closed with plate stone.

Cancan collected soil to dol and then dolkes carried out it to the bottom of well. According to length Kahrizes are divided into feeding and transit zones.

The feeding zone covered total of kurehs and transit zone covered from end of Kahriz feeding zone till exit of Kahriz.

Morfometric members of Kahrizes are different. Length of their down cut is 20-50 cm and longest one is 3-5 km.

Depending on relief the distance between wells has changed. For example,

50-60 m in deep wells, 30-40 m in shallow and 5-10 m in feet.
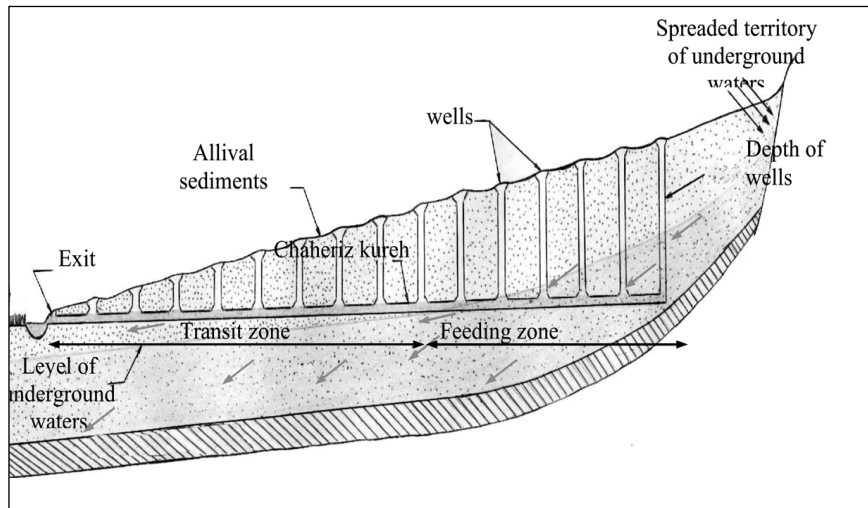
Figure 2. Scheme of feeding zones of Kahrizes

Kahrizes are encountered in little Caucasus, bring cones of the rivers and in tectonic zones in Azerbaijan.

According to investigations the feeding process of Kahrizes in Azerbaijan divided to the following groups.

1. Feeding from underground waters.

2. Narrowed cuts of valleys of the river.

3. Bring cones of the river.

4. Kahrizes which are feeding from underground flows.

5. Kahrizes which are feeding from old castles and rock flows.

6. Kahrizes are existed in Baku, Ganja, Nakhchivan, Ordubad and other cities in Azerbaijan. According to east traditions there are "girkayaq" or "qirxpille".

Such kind of devices has built in mosques, streets and yards. Their shape and sizes has built depend on the physical-mechanical properties of rocks, work profession of cancans and owner's economic condition.

Today such kind of monuments are using for cooling, keeping food-stuff and other things. In most constructions dish brick had been used.

There are following superior sides using from Kahriz.

– Kahriz which does not use any energy source, mechanism was source of ecological clean, reliable water and supplied population with drinkable water.

– It has ability to give continuous water with less repair expenses.

– Being of Kahrizes heritable monuments proved that people have high water using culture.

– Kahrizes are concerned to ameliorative systems which water usage efficient

is 0,95-0,97
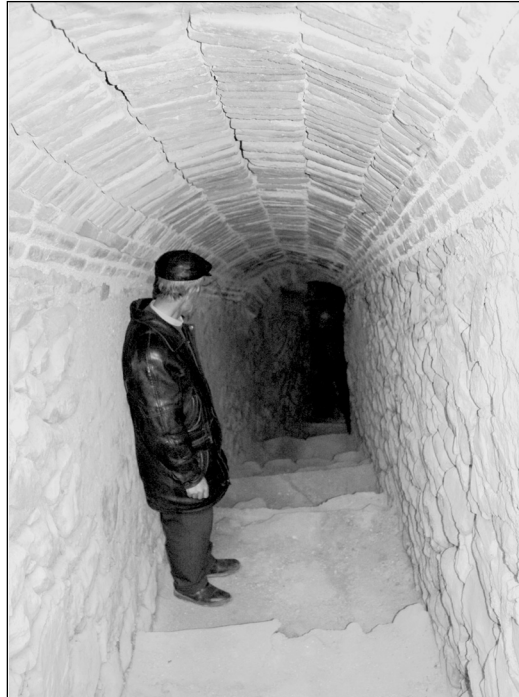
Figure 3. Internal view of «Sersheher» «forty-stepped» in the city Ordubad.

– When Kahriz has stopped its activity it caused serious ecological changes in surround territories. Underground water regime changes, ecological balance distributes, and level of grunt waters is approach to the land. Soon bog and repetition salted of the land happens. Current world of animal and plant perishes.

Dirtiness happens in water as a result of mixing underground waters with surface waters.

Apparently collapse of Chaherizes is resulting with water losing. According to calculations in 1995 total water discharge of 356 (three hundred fifty six) Kahriz were 2,722 m³/s in Nakhchivan AR. Today this quantity is more than ten times from Uzunoba water store and seven times from Sirab water store. In the middle of 20th century Kahriz office was activated in SAWNA and all documents were collected and documented. In 2004 under the control of SAWNA the Kahriz Department was formed.

According to information which was showed in the above in 1974 decreases activity of Kahrizes caused to bog and repetition salted of the land. Irrigation has been implemented with Kahrizes where the net of river is weak in Azerbaijan.
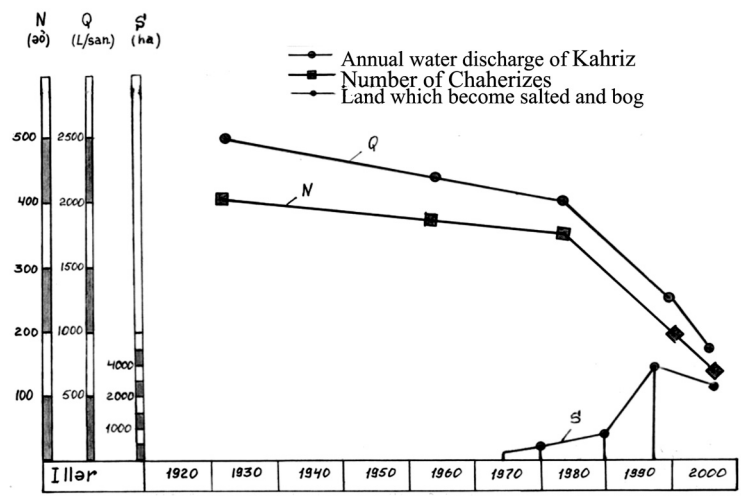
Figure 4. In 20th century decrease of water discharge and number of Kahrizes.
Bog process in soils.

Figure 5. Kahriz see of his speech.

Till the 20th century Kahriz was main irrigation water in Azerbaijan. 885 Kahriz were active in 1938 in Azerbaijan and their water discharges were 13,354 m³ /s.

Having of rich underground water of Azerbaijan territory there are 899,36 mil m³ water sources. Today Kahrizes are covering twenty or thirty percent of Azerbaijan's underground water. It turns out that if Chaherizes can renovate its potential will be available.

KAHRIZES IN THE REPUBLIC OF AZERBAIJAN

№	Name of the regions	Number	Discharge l/s	Length, km	The number of the wells	Wells distance middle distance with/by m	Middle length of the kyarizs by m
1	Kazakh	8	97,0	17,710	530	33,4	2213
2	Tovuz	5	297	12,719	361	35,2	2543,8
3	Shemkir	29	842	14,926	734	20,3	514
4	Genja	103	2500	166,829	7062	23,6	1619,7
5	Goranboy	20	261	21,644	693	31,2	1082,2
6	Barda	45	1428	40,051	2024	19,8	890
7	Yevlakh	4	150	3,759	222	16,9	939,7
8	Terter	2	54	1143	49	23,3	571,0
9	Agdam	105	2040	112,424	3908	28,76	1070
10	Agjabedi	68	1618	124,278	4630	26,84	1827,6
11	Fizuli	71	603,75	37,830	1491	25,4	533,0
12	Jebrail	111	1099,5	59,311	2234	26,55	534,3
13	Nagorni Karabakh	52	134	20,181	887	22,75	388
14	Sherur	99	203,6	21,974	903	24,3	221,7
15	Nakhchivan	86	1365,5	31,714	1058	29,98	368
16	Shahbuz	4	100,0	1042	29	35,93	260
17	Julfa	5	50	1533	43	36,6	306
18	Ordubad	68	528,5	31,940	992	32,19	468,9
	Total:	885	13535,9	721,008	27850	26.5	333.8

Note: This information have taken from Azer State Water Project University

Today most of Kahrizes of Azerbaijan (339) are in occupied lands.

At present no any new technology uses in Kahriz renovation. Most of them are ancient tools. Old cancans can use these tools easily. At present the renovation of Kahrizes are actual problem. Before renovation using of tools and methods did not be postponed. Observations showed that new technology should use in renovation. Then work process will be fast and efficient. Today we should think about new

technology and new methods in Kahriz renovation. It has proved that the Kahriz is a cheapest water source from economical point of view. From this reason maintenance and digging of new Kahrizes are keeping its actuality.

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METHODS OF CONTROL OF ENVIRONMENTAL SAFETY OF CARBURETOR ENGINES UNDER OPERATING CONDITIONS

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This article considers the increase of accuracy of a method of definition of weight of emission of the carbon oxide with discharge gases of carburetor engines on the effective power, developed under operating conditions.

One of the main atmospheric pollutants with the toxic substances in cities is cars of carburetor engines. Thus, the development and implementation of progressive and exact methods of regular surveillance over the toxicity of the discharge gases of carburetor engines are one of the important problems of preservation of cleanliness of air pool of city.

The method of definition of weight of emission carbon oxide for carburetor engines under universal toxic characteristics [1] is of common knowledge, according to which, the weights of emission of carbon oxide are determined on the value of effective power of the engine. Thus, the engine's effective power is offered to be defined under the uniform relative high-speed external and partial characteristic of gasoline engines.

However, the existing method may produce good results if the engine is at a serviceable condition. If it is not in good condition, especially if the fuel consumption is changed (increase or reduction) that occurs regularly under operating conditions, the existing method is poorly acceptable owing to the greater errors caused by inexact definition of effective power of the engine.

To increase the accuracy of a method of definition of weight of emission of the carbon oxide, there is offered a method implying the definition of weight of emission of carbon oxide with discharge gases of carburetor engines on effective power, remarkable for the fact that for securing this purpose, the effective power of the engine is defined on a difference of fuel consumption, in the case if it runs free (a single maximal high-speed mode) and on the maximal loading mode, simulating

the loading by orificing of discharge gases or on the chassis dynamometer supplied by load devices [2]. Further, the received value of capacity is corrected, multiplying it on the factor K_{N_e}

$$K_{N_e} = a \ \exp\left(b \frac{N_{e_H}}{N_{e_{max}}} \right)$$

(1)

where *a* and *b* – are value rates, which are chosen from the limits of 0,1…1,0 0,2…2,4 accordingly depending on the type of the engine; N_{e_H} – is a power rating of the engine, determined by the factory-producer; $N_{e_{max}}$ – is a maximal power of the engine.

The rating magnitudes *a* and *b* are fixed experimentally. To determine their significance for the same types of engine, there is carried out a complex experiment in various combination of disrepair, arisen under the conditions of ordinary exploitation of cars.

As per the results of this experiment, there is built up a dependence $K_{N_e} = f(N_e^I)$ for the different levels $N_{e_{max}}$, which are approximated by the empiric functions of the exponential kind. The coefficient level for the carburetor engines are varied within the following limits: $a = 0,1…1,0; b = 0,2…2,4$.

The maximal power of the engine is offered to define as per the brakeless method (on the fuel consumption difference if it runs free and on the maximal load regime) as per the following equation [2:

$$N_{e_{max}} = \left(\frac{G_{T_N} - G_{T_X}}{V} \right)^{1/\alpha},$$

(2)

where G_{T_N} - is a value of the fuel consumption in the maximal power; G_{T_X} -is a value of the fuel consumption if the engine runs free; *V* – is an empiric coefficient, describing the intensity of change of the fuel consumption in the function of the engine power; – *is a dimensionless empiric coefficient, characterizing the form (bending) of the specified dependence.*

This method has been investigated sufficiently fully and applied for the diesel engines. The hypothesis on the equidistance of the curve $G_T = f(N_e)$ on the regular characteristics of diesels of the same mark regardless their engineering conditions serves a as basis for it. In other words, the regularities of a change of the fuel consumption in the function of power for diesels of the same mark are of the same nature [3].

The know works and the several load characteristics fixed for various marks

of carburetor engines certify the relevance of the above mentioned regularities.

To determine the value of the fuel consumption, the corresponding maximal power of diesel, it is offered to simulate the load through orificing of air at the intake with the help of imitator of load KI – 5853-QosNITI [4]. However this method of simulating of a load for the carburettor engines is not acceptable, so as, in this case the operation of carburettor is infringed because of ejection, there is taken place a transfer and over-expenditure of a fuel. Therefore, there is offered to load the carburettor engines while determining of a power by throttling of the discharge gases at the intake or in the power benches with the chassis dynamometer, supplied with the load devices for simulating the load regimes of work of vehicle via braking of drums.

As it follow from the expression (2) that for accomplishing the method of determination of the carburetor engines maximal power as per the difference of the fuel consumption, we have to possess the empirically determined coefficients *V* and *, which are stable for the engines of the same mark. To resolve this task, there was carried out a processing of statistical data of break tests of engines contained in the journals, implemented in the car and engine factories.*

The processing has been carried out as per the special program through the method of the least squares on each mark of engines separately. According to the average minimal error, there was chosen optimal values of empirically determined coefficients V and. As per the received data, based on the expression (2) there were built up monograms for determining of power of engines as per the difference of the fuel consumption [5].

The technological process of determining of the weight of ejection of the carbon oxide taking into account the effective power for the four-stroke carburetor engines is implemented in the manner set forth below.

The fuel flow meter is connected to the engine and it is warmed up in the nominal fuel condition. In the course of operation of the engine in the free maximal high-speed regime, there is measured the value G_{T_X}. Loading engine, simulating the load through throttling of the discharge gases or on the chassis dynamometers, supplied with the load devices, there are measured G_{T_N}. As per the formula (2) or the nomogram there is measured the value $N_{e_{max}}$. Then, according to the formula (1) or on the nomogram there is determined the coefficient K_{N_e}. Measuring the condition of the throttling choke and the frequency of rotation of the crankshaft in the examined engine with the help of regime meter, there is determined the percentage of using the power of the engine $N_e / N_{e_{max}}$. Then, being aware of the value $N_{e_{max}}$, the value N_e is determined and correcting it by multiplying to the

received value K_{N_e}, the weight of blow-out of the carbon oxide is fixed as per universal toxic characteristics.

The specified technology was approved by the fleet of taxi of Baku city. There was determined that the application of the offered method in comparison with the known ways enables to heighten the determination of the carbon oxide blow-out weight averagely in 25%.

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PROTECTION AND RATIONAL UTILIZATION OF NATURAL RESOURCES OF THE CASPIAN SEA AND COASTAL ZONES

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This research is devoted to complex geographic features of the Caspian sea, its oil-gas sources, environmental condition, also different interests of the Caspian states, related to the upper problems. Specially noted the role of the Environmental Protection Program of UN (UNEP) and others in the conduction of the National Action Plan on environmental protection of Azerbaijan Republic after the Contract of the century.

The Caspian Sea (lake) is a closed, drainless water body in an internal part of Eurasia. It is often called "monetary sea" due to abundant resources of "black gold" – oil and caviar.

The length of the Caspian Sea from north to south is 1200 km, width is 300 km. It is situated on the tectonic depression which is 28 meters below the ocean level. Volga (80% of the whole river stock), Ural, Kura, Terek, Samur, Sulak and etc. flow into the Caspian Sea. Maximum depth is about 1000 meters. Average depth is 184 meters. The average capacity of water is nearly 80 million km^3. Coastal line approximately 7000 meters in length is a bit indented.

The climate of southern and northern part of the Caspian Sea differs sharply. The temperature of weather in the north is 7-11°C minus in winter and +25-26°C in summer.

Annual precipitation varies from 800 to 400 mm, rising 1500-1700 mm in the south-west. Saltiness changes from 0,3% to 14% close to outfall of the Volga in the south-west and more 30% in the Karabogazqol gulf. Northern part of the Caspian Sea freezes in winter.

Reserves of oil of Azerbaijani sector of The Caspian shelf is estimated more than 4-5 billion tons. Stock of natural gas was estimated 600 billion m^3 in 1996 and most probably after Shahdeniz field discovery has been increased to 400 billion m^3.

Soviet side produced 2500 tons black caviar in 1980s but Iranian 250 tons (10 times less). However, former soviet republics' caviar production was decreased but it remained in Iran in 1995 as the same.

The Amount of sturgeon on the northern sector of the Caspian Sea was reduced to 7 million for the period 1983-1989.

There are not datum about amount of sturgeon fishes in Azerbaijan.
Russia vented 60-65 million pieces sturgeon to the Caspian Sea per year in 1995-1996.

Fish reproduction in connection with the rise of a level of the Caspian Sea and inundation of the basic fish farming factories located on the coast of the Caspian Sea was not produced in Azerbaijan.

At the same time, it should be noted, that breeding of sturgeon fishes have made 12,9 million copies in Azerbaijan in 1985.

However, this quantity has decreased and made only 2,98 million pieces in 1992.

Furthermore, it is necessary to note, that the biomass of sturgeon fishes makes 30,5% and sprat – 51,4 % (A.G.Gasimov, 1994).

According to the International program on protection of a biological variety of the Caspian Sea and with a view of reproduction of fish resources, the International Consortium of Kazakhstan has planned to construct in Aturau a fish factory which production is 3 million sturgeon per year.

Similar work on construction fish factory has already been begun in Neftchala, Azerbaijan. Financing is performed by the World Bank.
In the Caspian Sea, on static data of 1991, acted more than 12 billion m^3 the polluted drains, from which nearby 11,0 billion m^3 . It was necessary on a share of the river of Volga.

However, the same year, before opening the First International Conference on environmental problems of the Caspian Sea, pilot surveys on the river Volga have shown, that the volume of the polluted drains exceeds 25 billion m^3, and other volume of the polluted drains – 800 million m^3, it is necessary on a share of Georgia, Armenia and Azerbaijan, that also mismatches the validity.

The matter is that municipal drains of cities Tbilisi and Rustavi, and also industrial wastes of the enterprises of city Rustavi entirely also were completely dumped also this day strongly and deliberately become soiled industrial drains Gafan-Gadjaran iron – molybdenum combines and mine in which the contents of iron, copper and molybdenum exceeds admissible norm in 100-200 and 1000-1200 times.

Besides, tributaries of the rivers of Kura, Agstafachay, Tovuzchay, Choqazchay, Hramchay and others are polluted by Armenia, as well.

Naturally, 20 more contracts have been signed on investigation and an oil and gas recovery on the sea that causes an additional ecological load on the sea environment since 1994 after «the Contract of a century».

However, it is necessary to note that all contracts have passed correspon-

ding state ecological examination with participation of public representatives and independent experts. Besides, projects of documents according to influence of oil extracting on an environment (OBOC) are considered in each case separately and each time is developed concrete measures on neutralization (to removal, recycling, a burial place) waste at drilling chinks and at an oil recovery.

One should take into account that all waste products generated at investigation and extraction an oil and gas (drill cuttings, the reagents, extracted sand and etc.) were dumped into the sea till 1968. The reason was the development of the sea environment which has been begun at absence of sufficient means, the reliable and perfect technology on accident precaution and their consequences, and also necessary quantity of capacities which results were the floods of oil exceeding rules, stipulated by corresponding specifications. At frequent storm weathers in the Caspian sea, the extracted oil was dumped into reservoir because of absence of capacities for gathering and storage of oil, in order to prevent infringement of a mode of production rate of the chinks. Today the volume of these dumps is difficult for defining.

The volume of water removal from the objects deployed on a land, according to statistical reports, annually makes 5 km^3, Including the polluted sewage of 350-400 million m^3. Moreover, 3,0-3,5 km^3 strongly mineralized (17 g/l) drainage waters, as well as containing pesticides was dumped into channels, and later to the Caspian Sea.

 The basic sources of pollution of water objects, mainly, the Caspian Sea, were a municipal services (80 %), chemical (14 %), fuel and energy (2,5 %), metallurgical (1,0 %) and agroindustrial (2,5 %) complexes.

It is necessary to ascertain that, unfortunately, only 25 cities from 80 cities and settlements of city type has clearing constructions of the polluted sewage (biological and mechanical) which majority because of settlements are loaded on 30-50 % and work inefficiently the weak sewerage system. At normative terms of construction for 3-5 years, nowadays effective clearing constructions, were built for 10-15 and more. Naturally, it has already been put in operation in the unusable (out-of-date) condition. For example, Hovsan clearing constructions in Baku with a designed capacity 800 thousand m^3 has been under construction Since 1972 and their first turn with the capacity of 600 thousand m^3 per day which are nowadays loaded on 65-70 % and again because of nonsewage system over Inhabited areas of city (the north-east and southwest areas of the city)is handed only in 1990.

Thus, as a result of proceeding dumps of waste to the Caspian sea, which volume makes 0,8-1,0 million m^3 in a day, the ecological condition of many parts of water area is unsatisfactory. Therefore, the maintenance of mineral oil and phenols exceeds maximum-permissible norm (maximum concentration limit) in the Baku bay 15 and 25 times, in Sumgait beach 5 and 10 times, in area of "Oil

Stones" 3 and 5 times. Associated with pollution during 100 with superfluous years oil and mineral oil at the bottom of the Baku bay ground adjournment from 0,5-up to 2,5ì are impregnated by hydrocarbons, and according to pre computations, stocks of oil here make 8,0-10,0 million tons oil. Attempt testifies it to extract this raw material per 1988-1989 by clearing a bay. However, foreign businessman has been given up in the conclusion of the contract for this work, because of huge volume of a dirty ground (1,0-1,5 billion m^3), a subject extraction from a bottom of a bay and threat of pollution of all shore of Baku,

One source of pollution of the sea, damaging bioresources in the sea is the thrown of single-layered metal both ferroconcrete support and the numerous sunk vessels which quantity are difficult to calculate.

Seemingly, in connection with destruction of the USSR and break of communications, volumes of the polluted dumps from many industrial enterprises of Baku and Sumgait, 25-50 % of a designed capacity working at a level had to be decreased rise of a level of the Caspian Sea would promoted this, as well. However, because of large-tonnage technological lines and the equipment, appreciable changes it is not observed at the enterprises.

The original role in pollution of water area of the Caspian sea belongs also to emissions of harmful substances from the industrial enterprises deployed in cities Baku and Sumgait. 2,0-2,5 million tons harmful substances was thrown out in an atmosphere In 90th years of the last century which part, most likely, settled on a surface of water of the Caspian Sea. Now industrial emissions have decreased, but there were emissions of the motor transport, differing with toxicity.

Under statistical reports, 500 million cars, including more than 200 thousand mobile means in Absheron zone (Baku, Sumgait, Absheron district) and In coastal areas worked in 2005 in the republic. 500 petrol filling stations serve them. However, in our opinion, it is extremely decreased quantity of the cars, especially outdated and working on diesel fuel are much more. The approximated calculations allow to assume that emissions of motor transport make 450-500 million tons in a year. And it can be a source of pollution of a shelf zone of the Caspian Sea lead waste.

The raising of a level of the Caspian sea which is dated from 1977 refers to the phenomena rendering essential influence on an ecological situation of the Caspian region undoubtedly. Two large phases are allocated in variation of a level of the Caspian Sea for the last 110 years. The first which is characterized by lowering of a level – (the beginning of supervision), from a minus of 25,2 m up to a minus of 29,13 m (speed is about 4 sm per year) since 1881 up to 1977.The second – with 1977 till now, is characterized by rise of a level (from a minus of 29,13 m up to a minus 27,7) with a speed of 15 sm/years. Now rise practically is not present. However, according to predictive datum for 2010, the level of the Caspian Sea can reach critical size – a mark a minus of 26 m and even a minus of 25 m.

A number of researchers considers climatic factors, including reduction of volumes of evaporation from a surface (mirror) of water, on account of strong impurity of water and a covering hydro-carbonic film as the reasons of rise of a level of the Caspian Sea. Other scientists link it with the change of volume of the Caspian Sea floor. For supporting this opinion they explain that between the cities of Makhachkalas and Turkmenbashi there is a large deep break above which there is an intensive modern rise (bend) of terrestrial surface, both in area of Dagestan and the Chechen Republic, and in an area Turkmenbashi. Accurate repeated geodetic observations have shown that the velocity of current rise of a terrestrial surface makes about 50-70 mm a year. It will make 1,5 m for 20 years. It has been specified that a bend of a terrestrial surface occurs as a result of horizontal compression of blocks of the earth's crust divided by a regional fault at the western coast of the Caspian Sea. Pace of horizontal compression composes much larger quantity – 60 mm/year.

High seismic activity of basin of the Caspian Sea and its framing is deemed as one of factors of rise of a level of the Caspian Sea, as well. Consequently, it is possible to assume that process of an intensive bend of a surface of a bottom has seismotectonic nature.

Precomputations determine that superfluous water mass which leads to increase a level of the Caspian Sea constitutes about 40 km^3. Alongside with increase in volume of atmospheric precipitation, it is associated with filling water basins on Volga up to a critical level and dump of additional waters to the Caspian Sea. However, there is an assumption, that in order to prevent flooding coast St.-Petersburg, a part of water from Baltic Sea is thrown into the river Volga. Nonetheless, this version should be specified by an organized commission simultaneously.

Process of rise of a level of the Caspian sea can be qualified as act of nature which unlike other unexpected and sudden natural phenomena has slow speed and slowly causes huge damage to ground resources in coastal zones and to objects of a national economy in the near-Caspian countries. Thus, only in Azerbaijan, as a result of rise of a level of the Caspian Sea 80,7 acres hectares, including arable lands – 3,66, vineyards – 1,22 million hectares, pastures – 15,34 million hectares, other acres – 60,5 million hectares have been flooded and deduced from an agricultural turn. Meanwhile, the size of the caused harm made 685 billion manats in 1996.

In connection with a raising of a level of the Caspian Sea on all extent of a coastal line, alongside with flooding of settlements, automobile roads and railways, processes of abrasion of coast, flooding of territories, formations of boggy sites, increases of a level of subsoil waters and others have simultaneously sharply amplified. Most likely, activization of mobility surface territories in abrasion coast, renewal and activization landslide motions in areas Bayil and Zigh slopes,

in Ahmedli are because of increase of a level of the Caspian Sea and in this con-nection, necessity of the organization and carrying out of fundamental research works, creations of system of monitoring on all extent of a shore is dictated. Separate sites of the coast require engineering protection which general extent is 146,5 km. According to several materials, it is necessary to carry a site of the Baku bay (31,5 km), sites in area Karadag (3,0 km), a site from village Olhovka of area Lenkoran up to a mouth of the river (40 km), a coastal zone in area Neftchala (22 km), a coastal zone in a Sumgayit (10 km), a coastal zone in area Nabran Nizovaja (40 km).

Fluctuations of a level of the Caspian Sea and its sharp rise for last years have strongly affected a relief and a landscape of an offshore coastal strip in Azerbaijan. It is clearly observed in areas Nabran, Absheron, Lenkeran, Astara and Baku. It is possible to stress that a combination "Sea-forest" in Nabran is extreme-ly broken. It is aggravated also with that reclamation of forest by different "busi-nessmen" infringement of «Ecological capacity» territories, has brought to ruin trees and to pollution of a shore. In Absheron, practically all beaches have appeared flooded, and thus, autocratic development and exports of beach sand for the building purposes are observed. However, Seaside boulevard has been declared a national park in Baku that is a part of work. It is necessary to clear the Baku bay and to expand territory of National park along coast to capes the Sultan and Shixov, and deep into the seas up to island Nargin. It would promote an eco-logical accomplishment of a zone for the rest of the population.

The problems associated with pollution of the Caspian sea, rational utiliza-tion of its natural resources, and also prevention of consequences of rise of its level continually were in the center of attention of the Azerbaijan government both during Soviet time, and after gaining independence. The numerous directive doc-uments providing realization of water-security actions have been accepted, agree-ments on the environmental reservation have been concluded, particularly, with Kazakhstan and Georgia, cooperation has been begun and continues with interna-tional organizations, at connection to international conventions protection of the environment.

The National Plan of action of Preservation of the environment of the Azerbaijan Republic, various projects on protection of the Ozone layer, a biodiver-sity of the Caspian Sea, on change of a climate, on struggle against desertification, etc. have been developed by means of the Program of Protection of the environ-ment of the UN (UNEP), the World Bank, Global Economic Fund, the Program of Development of the United Nations (UNDP) and others. The Coordination Bureau on protection of the Caspian Sea has been organized in Baku which carries out Caspian Ecological program which basic purposes are:
    – Restoration of a favorable ecological situation in the region of the Caspian Sea;

– Renewal of biological resources of the Caspian Sea;

– Long-term steady development of near-Caspian region;

– Forecasting of a level of the Caspian Sea and realization of the actions connected with the prevention of consequences of variation (increase) of a water level in the Caspian Sea.

Except for the specified purposes, the Caspian Ecological Program is called to execute set of other works relating to the indicated purposes.

With the efforts of foreign partners under contracts certain work has been done on ecological well-being of the Caspian Sea, especially in the sea water area since 1994 to this day. However, there is work in a continental part (on a land) significant. This full termination of municipal and industrial sewage in water area of the Caspian Sea; protection and reproduction of a biological variety (microorganisms, fishes, birds) Caspian sea and areas adjoining to them; struggle against the processes connected with fluctuations of a level of the Caspian Sea (abrasion, flooding, landslips and etc.); restoration subject to destruction economic, including nature protection objects (a building and a construction, highway and railways, agricultural fishery objects, clearing constructions, etc.); Restoration of the destroyed recreational balance of a shore and an accomplishment of coastal territories; use of an environment and resources of coastal zones of the Caspian Sea with ranking and without waste technology (mineral resources, underground drinking, mineral and thermal waters); use nonconventional energyof the Caspian sea, instead of daily (energy of waves, energy of underground currents).

Alongside with the above-stated practical works it is necessary to solve and other problems, concerning to definition of the status of the Caspian Sea, development of standards and ecological rules for Caspian sea in connection with investigation and development of oil-and-gas deposits, the conclusions of contracts and agreements with the near-Caspian countries in the field of protection of the Caspian Sea and use of its natural resources, creation cooperative expeditions on studying an ecological condition of the Caspian Sea and on struggle against poaching on the sea, development joint and multilateral about gram on steady development of coastal areas.

The significant economic and ecological value would have use of the mineral and thermal resources of the areas that is directly adjoining to a coastal strip of the Caspian Sea.

It is determined that in territories along a coastal line of the Caspian sea Medical mineral and thermal underground waters in Hachmaz (Yalama, Nabran, Hudat sites) area which stocks are considerably sufficient for the organization resort recreational complexes on thousand population (discharge -more than 35,0 thousand m^3/day) are dissolved and opened.

The areas Absheron, Devechi, Kuba, Hachmaz, Sumgait deployed entirely

on coast of the Caspian sea are rich with deposits of walling limestone, sand, clay, gravel and facing materials, too.

Their use on non-polluting (low – wasted) technologies, for creation of an oil infrastructure would be the worthy contribution to the work of steady development of the region.

The status of the Caspian Sea is included into a prerogative of presidents of the near-Caspian countries and its definition has the important political value for Azerbaijan and other countries.

It is pleasant that the preliminary agreement has been achieved among former republics of the Union, and the bilateral agreement has been signed separately among Russia-Kazakhstan-Azerbaijan in definition of the status of the Caspian Sea, specifically, in its sector division on the basis of a median line. Question concerning attitude with Iran will be solved on the basis of experiences of the international practice. The offer of Iran on the parity beginnings of use of a bottom of the Caspian sea (i.e. on 20 % to each party) has no basis since then it would be necessary to utilize resources equally on a land, as well.

It is necessary to include to the questions of political value at management use of the sea environment and natural resources of the Caspian sea:

– research and operation of depths according to the status of the Caspian Sea;

– The responsibility of the near-Caspian countries to prevent contamination of the sea environment during researches and field operations;

– Conducting underwater transport pipelines (gasoline lines);

– The responsibility for the caused damage to the Caspian Sea;

– Fishery and extraction of other bioresources from the sea;

– Renewal and reproduction of bioresources in the sea;

– The responsibility for prevention of drains from a land in the sea;

– The responsibility for the notification about variation of a water level and pollution of the Caspian Sea;

By development of the frame convention across the Caspian Sea along with all obligations, the parties should unify standards and rules in order to prevent divergences in approaches and estimations of a level of pollution of the Caspian Sea. For instance, as a whole in the field of ecology and wildlife management, more than 2500 legal normative documents have to be developed in Azerbaijan. However, unfortunately for the 10 superfluous years of independence of republic it has been made too little work in this direction. Besides, the Soviet specifications have already become outdated and have lost the force in conditions of market economy and practice in which «pays contaminant».

The ecology of the Caspian Sea cannot be separated from the general ecological thinking and therefore, all positive steps in the field of maintenance of welfare of the republic should be directed aside to rationalization and improvements

of structure of management by nature protection point. The body, allowed to operate this work, should function under the scheme: «the Science – forecasting-designing – introduction in production-monitoring-reproduction». Thus each constituent link of the scheme should be precisely and thoroughly studied and fulfilled.

The Qualified mental potential of republic has to be used within the limits of personnel selection regarding a principle: knowledge, experience, qualification. Problems of the Caspian sea should be examined and solved by skilled experts in the field of oceanology, hydrology, hydrometeorology, ichthyology, biology, geophysics, seismology, mathematics and oil geology.

A problem of the Caspian Sea can be solved only in a view of the set forth above conditions tremendously. However, crucial step should be made by the central body of executive authority of republic which is admitted conduct ecological, geological, hydro-meteorological, forest reclamation, the fish-breeding and supervising policy on the right and personnel basis, too.
Certainly, it is impossible to disclose essence and to specify approaches to all problems of the Caspian Sea in one clause. Therefore, it would be expedient to leave always problems of the Caspian Sea opened on the agenda.

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TECHNOGENOUS ACCIDENTS ARE INTEGRAL PART OF DEVELOPMENT OF CIVILIZATION

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Since ancient times up to 19 century the Earth population changed insignificantly and remained within limits of several hundred million persons. However, as a result of approach of the industrial period of development (1830), it began to grow drastically and presently has reached 6,3 billion persons. According to predictions the population will be 7,7 billion persons by 2010.

On general background of increase of population, urbanization and megalopolises develop with huge rates. If 3 % of the population lived in cities in 1930, now this indicator has exceeded 50%. Modern megalopolises have no historical precedents by number of inhabitants. So, in case of continuation of present rates of population growth, city of Mexico will likely reach 30 mln persons by 2010 i.e. will exceed predicted population of Canada.

Huge congestion of people in cities compels them to master bents, highwater beds, swamp and coastal areas, which are of little use for residence and subjected to dangerous natural processes. The situation gets often aggravated due to absence of preliminary engineering preparation of territories under development. This leads to the point that cities get more frequent in a zone subjected to risk of occurrence of destructive of natural calamities, generated human intervention. Thus, we have already indicated about the problem of city Mexico (subsidence of land of more than 8m.).

The problem of technogenous safety is of priority problem. Only at this stage people start realizing it, as a global problem of social and economic character.

Scientific and technical progress not only promotes increase of productivity and improvement of working conditions, growth of material well-being and intellectual potential of society, but also leads to increase of risk of accidents of big and small technical systems.

This is connected with increase of their number and complexity, increase of

unit capacities of aggregate at industrial and energy facilities, their territorial concentration, i.e. more complex is technical system-higher probability is occurrence of accidents.

Existing two regularities of technogenic risk state:

– risk increases in process of continuation of activity in such way, that one day size of losses exceeds sizes of benefits;

– though risk may be essentially lowered by introduction of various measures of protection, it basically may not be brought to nil.

Many countries in the second half of the 20th century experienced industrial accidents, which have scale of national accidents. They took place in facilities of different purpose: nuclear (the USSR, the USA); chemical (India, Italy, the USSR); space (the USA, Russia); surface and underwater (the USSR, the USA, Estonia).

Unfavorable situation in the field of technogenic safety is caused by following reasons:

– Dynamics of technosphere, as artificial human environment i.e. its fast development and involving of increasing number of people into it;

– complication of economy, manufacture, technologies, processes and, as a consequence, increase of vulnerability factors;

– moral and physical wear of fixed capital;

– human factor, i.e. actions of operators with infringements of requirements of instructive positions on safe operation of technogenic system.

To estimate level of threats of technogenic accidents more completely, it is sufficient to realize, that about 1 thousand facilities of nuclear equipment of peace and military purpose, more than 50 thousand nuclear ammunition, 800 thousand tons of chemical ammunition, ten thousands of enterprises with chemical and fire–hazardous technologies is in the planet.

Interdependency of natural and technogenic factors of risk increases in such world. Natural disasters even exaggerated often by cumulative factor of technosphere.

Characteristic example of growth of technogenic threats is process of application of nuclear energy.

111 years ago the French scientist Bekkerel discovered radioactivity phenomenon. First victims as a result of radiation application appeared literally in a year. Since that time there is no end.

During development, use and application of atomic energy, by data of open publications according, in the world for the last century the following took place:

– application of the nuclear weapon during combat – 2 times (USA);

– radiation experiments on people – 11 occasion (USA);

– military maneuvers with application of nuclear weapon – 12 (the USSR – 2, the USA – 10);

– accidents on facilities of nuclear-weapon complex – 2 (the USSR, the USA);

– Accidents during nuclear tests – 23 (the USA, the USSR);

– Accidents with carriers of nuclear weapon – 36. As a result of accidents 51 nuclear ammunition (44 – the USSR, 7 – the USA) was lost (by data of the Green Peace), besides, seven nuclear reactors (5 – the USSR and 2 – the USA) from three nuclear submarines of the USSR and two APL of the USA were sunk as a result of accidents, additionally, 19 nuclear reactors (18 – the USSR and 1 – the USA) were deliberately flooded in the sea.

– Accidents of space facilities with nuclear power installations – 7 (the USSR – 4, the USA – 3);

– Accidents on the atomic power station – 29, including notorious Chernobyl accident (the USSR, the USA, France, Czechoslovakia, Japan, Spain, Ukraine, Russia, Hungary);

– Accidents on civil nuclear fleet – 3 (the USSR);

– Nuclear terrorism – 13 occasions;

– Bombardments of nuclear facilities – 4;

– Accidents at transportation of radioactive materials – 14;

– Cases of radiation from abandoned radioactive sources – 38;

– Cases of illegal circulation of nuclear materials – 18.

This sad list should be supplemented with thousands nuclear test explosions on the earth surface, under the earth surface, in atmosphere and under water which brought black contribution in the process of environmental contamination, millions of people were endangered to radioactive infection.

For the last half century in the world has three large scale accidents with death roll of more than 1000 persons occurred in the world for the last half century:

– 1984, in Bhopal, India. Leakage of 40 tons of highly toxic gas at the factory on production of pesticides took place. 500 persons died at once, 2 thousand died within several weeks, and for the past 20 years the death toll has exceeded 20 thousand persons.

– 1986, accident in Chernobyl atomic power station. As a result, 8 tons of radioactive fuel was discharged outside. About 400 thousand persons was evacuated from zone, the infection area was more than 160 thousand square kilometers. In general, more than 4000 persons died during liquidation of consequences and afterwards due to radioactive infection.

– 2001, air attack on the World trade centre and the Pentagon (USA), 1,5 thousand persons died.

Explosions in mines, oil, gas and chemical enterprises, accidents of passenger airliners, trains and the ferries, incessant fires etc. may be added to the list of technogenic accidents

As an example, more disastrous ones took place for the last time.

Airplane crashes: 583 persons died, as a result of collision of two airplanes in Canary Islands, in 1977. «Boeing-747» collapsed in Japan, in 1985ã, causing death of 520 persons. 300 persons died, as a result of accident of airplane An-32 in Zaire,1996.

800 persons died during railway accidents state of Bihar (India) in 1981.

120 persons died in New York State (USA) in 1994.

350 persons died in Firozabad in India, in 1995. 100 persons died and 300 persons were injured as a result of collision of two trains in China in 1997, 800 persons died, as a result of explosion of air-gas mixture during passage of opposing trains, in Russia, in 1989.

The biggest death toll in sea accidents numbers during crashes of sea ferries (in Norway, Greece, Philippines, China, Bangladesh, England, Egypt, and Estonia). The highest number of victims was collision of Philippine's sea ferry «Dona Paz» with the tanker in 1987, when 4400 persons perished, as a result of destruction of ships.

The fire problem in the world is also rather dangerous issue. As a whole, it is impossible to assess actuality and gravity due to absence of common definitions of fire, victims of fire, damage from fire, general principles of account from fire, methods of definition of damage etc.

World fire statistics is only arising. It is being accumulating and generalizing only for the last three decades. Nevertheless, despite this, presently it is already possible to present justified estimate of parameters of problems of fires in the world.

Annually, 7-7,5 mln of registered fires arise on the earth. If to take into account non– registered fires (as a rule, small ones, without victims and mostly of material damage), then their quantity may be estimated approximately in 10-11 mln. For the last years 70-75 thousand persons dies in fire on the earth annually.

Researches, conducted under leadership of UNESCO, have shown that due to tsunami more than 1 million persons died during «historical time» all over the world. For the last century 9 million persons died because of flooding, 2 million persons died due to earthquakes 1 million persons died due to hurricanes and typhoons and 5 million persons died and about 30 million persons were injured because of fires. For comparison, 10 mln persons died in auto accidents, in the second half of the 20th century. This means, that social consequences of fire in the world are comparable to the most terrible acts of natural calamities and technogenic accidents and disasters.

According to the Russian Ministry of Emergency situations, about 4 million fires are registered annually in 10 largest countries numbering half of the earth population.

By number of fires on 1000 persons "leading place" belongs to the USA,

the Great Britain, France, and Brazil. Presently, (21-25 October 2007), as a result of fire in California (USA) it was necessary to evacuate about 1 million persons, but the fire has not yet been localized.

The highest number of victims during fire, per 100 000 persons, belongs to republics of the former Soviet Union: Russia – 127persons, Belarus – 9,1 persons, Ukraine – 7,4 persons, Kazakhstan – 4,1 persons, Estonia – 11,6 persons, Latvia – 10 persons. Therefore, almost the third part of all fire victims fall to the CIS and Baltic states. Namely, this sad fact attracted attention of the World centre on fire statistics.

Sum of losses from fires and expenses on fire control in developed countries annually is in average 1% from gross domestic product. Hence it becomes clear, that in 21 century the problem of fires in the world is very sharp, it is of global character and much efforts are required for its solution.

The annual social damage from technogenic accidents is comparable with number of victims from extreme situations of natural character.

Kazakhstan is not an exclusion from world regularities of occurrence of extreme situations and their negative impact on social sphere and environment.

Annually direct damage from ES in republic is estimated in amount of 3,5–4,5 billion tenge (in the absence of global natural calamities). By estimates of experts the indirect damage in this case is estimated in amount of 15-20 billion tenge, and damage from loss of people and treatment of injured persons is about 3 billion tenge. In general, annually it can make to 25 billion tenge.

Above indicated examples testify that principal causes of technogenic accidents are:

1. The economic activity of human, directed on energy production, development of energy, industrial, transport and other complexes;

2. Objective growth of complexity of manufacture with application of new technologies requiring high concentration of energy, substances, dangerous to human life and having appreciable impact on environmental components;

3. Losing reliability of technogenic systems, imperfection of technologies, decrease technological and a labor discipline;

4. Hazardous natural processes and phenomena, which are capable to cause accidents and disasters at industrial and other facilities.

General analysis of possible threats and dangers for the last period allows concluding:

– Growth of quantity and scales of extreme situations of natural and technogenic character has acquired stable and meantime irreversible tendency;

– Threats have complex character, they are interconnected, as arising extreme situations involve whole chain of other ones.

Hence, one may deduce logically, that it is impossible to provide safety only

on basis of individual approach, implying counteraction to some specific threat. Systematic, complex approach is required, it assumes consideration of connections and dependences of phenomena and processes, undertaking of measures by the whole list of threats.

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EARTH SCIENCES

FORECASTING OF EARTHQUAKES:
THE REASONS OF FAILURES AND THE NEW PHILOSOPHY

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Resume

There has been produced the review of the views at the possibilities of forecasting the earthquakes. There were considered the new technologies of earthquakes forecasting.

Conclusions of the author: The main reason of low efficiency of short-term earthquakes forecasting is the wrong interpretation of physical mechanisms of forming the earthquakes harbingers and the displacement of local and long-range harbingers. Overwhelming majority of stable and high-quality harbingers of earthquakes reflects the reaction of the measuring parameters on passing the tectonic waves from strong earthquakes sources, distanced from the registering instruments for more than 1000 km.

Introduction

During the whole history of humanity the people have been trying to learn about possible natural cataclysms beforehand. It is mentioned in ancient historical sources, legends, myths and in religious writings. For this purpose they used all accessible for them opportunities in accordance with their level of knowledge and philosophy. They tried to use astronomical phenomena and they associated the natural cataclysms with them. For example, ancient people take the solar eclipses, approaches of the Mars to the Earth, appearance of spots on the Sun, unusual behavior of animals and unusual phenomena in atmosphere as special signs of approaching of the catastrophe.

How far have the modern scientists gone from their predecessors? If we try to make parallels, we'll see that the modern science with more interest studies the influence of planets of solar system, solar activity and other cosmic factors on seis-

micity and volcanism. Meanwhile, for short-term forecasting the earthquakes are also used (as earlier) the different harbingers of earthquakes. The main difference is in explanations of the mechanism of connection between the observed harbingers and the process of preparation of the earthquake. Another main difference is the application of modern recording equipment, which use high tech. In other respects "philosophy" of forecasting the earthquakes practically hasn't been changed.

The scientific researches, aimed at creation of effective technology of forecasting the earthquakes were financed about 100 years in many developed countries of the world. Disappointment of public officers and wide mass of the population because of absence of serious achievements in this sphere can be understood. Seismologists, who forecast the earthquakes and spent milliards of dollars in the whole world, found themselves in difficult and delicate situation. Most of them were looking for justifications of their scientific failures, and gladly found them during international scientific meeting which was called in London on 7-8 November 1996 on the subject of interrelation of earthquakes with other phenomena in order to forecast them. Transactions of this meeting were published in Geophysical Journal International, vol. 131, pgs 413 to 533, 1997.

During this authoritative forum the famous seismologist Dr. Robert J. Geller declared the impossibility in principle of forecasting the earthquakes. His main idea is that the process of preparation of the earthquake source has a big probability of randomness and influence of many external factors. That is why he considers this process as a maximally approximate to chaotic processes. Many further articles and speeches of Dr. Robert Geller were the continuation of his idea about impossibility of forecasting the earthquakes. This idea is reflected in his basic statement: "Research in the sphere of forecasting the earthquakes have been carrying out more than 100 years without evident success. The results of researches didn't allow to receive the great achievements. The extensive researching was not able to find reliable harbingers. Our theoretic work supposes, that break displacement is nonlinear process, which is very sensitive to unknown details of structure of the Earth in bulk, and not only in immediate proximity to the epicenter. The reliable accordance of alarms about unavoidable strong earthquakes is inefficient and impossible" /9/.

What did Dr. Robert Geller achieve with his critical statements?

Firstly, he gave a perfect opportunity to the hands of "seismologists-pessimists" to "scientifically" avow their failures.

Secondly, he slowed down the development of science in the sphere of earthquake forecasting more than ten years, as after his speeches "the epidemic of mass pessimism and scepticism" had come in the sphere of earthquake forecasting.

Thirdly, he divided seismologists in two enemy camps – the adversaries of earthquake forecasting and the adherents of earthquake forecasting.

The followers of Robert Geller published and publish now the articles which "prove" the impossibility in principle of earthquake forecasting /10, 12-15/.

As Robert Geller thinks "Modern theories of earthquakes consider that they (earthquakes, author's notes) are critical or self-organizing critical phenomena, which means the system which is kept on the border of chaos, with integral random element and the dynamics of avalanche, with strong sensibility to weak variations of stress".

Does Robert Geller really believe that a part of "chaos" in the process of display of all earthquake harbingers increases a part of strict regularity?

The matter is that the mistake in choosing the physical model brings to the mistake of all further mathematic models. Everything depends on correctness of the choice of "system of coordinates" or "reference frame". If your physical model is inside the system of coordinates where the physical processes are changed together with the system of coordinates, you will never "see" these processes. In order to see these processes you have to exit this system of coordinates and go to another system of coordinates. This conclusion proceeds from the postulate of special relativity theory. We advise Dr. R. Geller and other critics not to forget this postulate of special relativity theory.

We don't want to say that Dr. Robert Geller and his followers are not right at all. Our assertion is that these statements are true only for one type of earthquake harbingers – local harbingers. But the point of view of Dr. Robert Geller and his followers isn't kept for long-range earthquake harbingers, which we'll talk about below. Meanwhile, we also want to draw attention to the works with optimistic viewpoints of the problems of earthquake forecasting /17-21/.

Fortunately, during the last years there was traced the serious "impulse" in the problem of earthquake forecasting, and these new researches allow to better understand the physical origin of earthquake harbingers and the reasons of failures of their forecasting.

1. Registration of different harbingers in big distances from epicenters

Now there is known more than 300 harbingers of earthquakes of different character and origin.

During the last years a number of scientists published the results of researches, indicative of possibility of registration of harbingers of strong earthquakes in the distance of more than 5000 km, and in some cases more than 10 000 km /1-4, 6-7,11, 21-24/.

1.1. Seismic-gravitational harbingers

So, as a result of researches, carried out by the department of physics of the Earth of Petersburg's State University, seismic-gravimetric complex in Petersburg has registered the long-term tensile deformation (vertically) with duration of 12 days and nights, which forestalled the cycle of strong earthquakes of December 2004, including the strongest earthquake on the north of Sumatra island on 26.01.2004, which caused the catastrophic tsunami. Before each strong earthquake there were registered the deformations of less continuation (1-2 days and nights), which were observed earlier too. There was also noted the increasing of intensity of seismic-gravitational fluctuations, which accompany these deformations, the beginning of which always advanced the moment of breaks of strong earthquakes for 1-4 days and nights. At that, the first estimates of speed and length of waves. Low-speed waves (speed from 0.35 to 0.68 km/sec) of seismic origin had waves from 1520 to 7310 km. As a result of analysis of the received data the scientists came to the conclusion that the observed fluctuations are connected with the defor-mational processes, which are taking place inside the continent with the complex block-hierarchical structure /3/.

1.2. Tideless variations of gravity

So, from 2002 the Scientific-Research Institute of forecasting and studying the earthquakes (Baku) has been carried out the continuous measurement of tide-less variations of gravity in the station "Binagadi", which is located in Absheron peninsula in 24 km from Baku. The measurements were carried out simultaneous-ly by four high-precision quartz gravimeters of KB an KC types /21/.

As a result of measurements and interpretation of the received data, there were found out the gravitational signals in variations of gravity, which preceded the strong earthquakes, the epicenters of which are in big distances (in the radius of two thousand to tens of thousands km) from the registered stations. In the process of interpretations of results of researches there were deducted the gravitational effects from lunar and solar tides. As it is known, the solar tides cause the varia-tions of gravity which do not exceed 0,1 mGal, and the amplitude of lunar varia-tions is about 0,2 mGal.

Changes of tideless variations of gravity were registered before strong earth-quakes in Indonesia, Pakistan, Japan, Taiwan, India, the Philippines, Iran.

Statistic data show that the gravitational signals were registered more than in 85% cases, on the average, 8-15 days before strong earthquakes /21/.

1.3. Geochemical harbingers

In series of works (A.A. Hasanov, R.A. Keramova, 2006) there was noted the change of geochemical composition of fluids on the registering stations of the Republican Centre of Seismologic Service of Azerbaijan, before catastrophic earthquakes (M_{LH} = 8.9) in Indonesia on 26.12.2004 in the distance of about 6000 km from the epicenter of the earthquake /1/. In the works of A.A.Gasanov and R.A.Keramova are considered the facts of change of hydro-geo-chemical mode in the registering points of Azerbaijan before strong ($M_{LH} \geq 6.0$), deep-focus ($h \geq 100$ km) earthquakes, the sources of which are within Hindu Kush seismic zone of Alpine-Himalayan tectonic belt of the Earth, in spite of the fact of remoteness of these sources from the objects of observations ($\Delta = 2000 \div 5000$ km) /1, 11/.

1.4. Seismic-hydro-geological harbingers

Studying of seismic-hydro-geological harbingers of earthquakes allowed to determine the presence of connection of changes of the level of ground waters in the region of Kamchatka peninsula with strong earthquakes, more than 8000 km distanced from the measurements point /3/.

1.5. Seismic harbingers

In a series of works /4.6/ was determined that before strong earthquakes, on a seismic stations, situated in the distance of more than 3000 km from the epicenters, there was displayed the synchronization of micro-seismic noise.

The authors of researches (G.A.Sobolev and others, 2007; Lyubushkin, 2008) offer to use this effect as a harbinger during forecasting the strong earthquakes. It was determined that in big remoteness from epicenters of strong earthquakes the seismic stations registered the synchronic fluctuations of micro-seismic noise with the periods of 1-3 hours a few days before the tremor.

1.6. Low-frequency three-dimensional variations of gravitational field

During the last years there began the researches of earthquake harbingers, which were based on discovery in 2003 of unknown earlier the effect of low-frequency three-dimensional changes of gravitational field before strong earthquakes in big distances from their sources, at times increasing 10 000 km (E.N. Khalilov, 2003) /7, 22, 24/.

These signals are registered with the help of unusual physical instrument – "Torsion three-component detector of low-frequency gravitational variations"

which was called by the author as station ATROPATENA. The station ATROPATE-NA uses the physical principle never applied before. The method of measuring and the instrument itself are patented in PCT, Geneva (E.N. Khalilov, Method for recording the low-frequency gravity waves and device for the measurement thereof. Patent of PCT. WO 2005/003818 A1., Geneva, 13.01.2005) /23/.

The station ATROPATENA uninterruptedly registers in three mutually-perpendicular directions the influence of changes of gravitational fields of geological origin on interaction of masses in "Cavendish balance" and on tideless variations of gravity. So, simultaneously was received the answer to one of the most actual questions of fundamental physics about reasons of variations of "gravitational constant", registered by different scientists at different time in many countries of the world.

From 2007 there were officially given many forecasts of strong earthquakes for Special Region of Indonesia – Yogyakarta and to Pakistan Academy of Science, and to the Center of Studying the Earthquakes of Pakistan, with which the Scientific Research Institute at Institute of Earthquakes has bilateral memoranda about cooperation.

1.7. Classification of the considered "long-range" harbingers

So, the carried out brief review allowed to mark out a few harbingers of earthquakes, which appear in big distances between registering points and epicenters of earthquakes:
– Seismic-gravitational anomalies /2/;
– Tideless variations of gravity /21/;
– Changes of hydro-geo-chemical mode /1,11/;
– Changes of the level of ground waters /3/;
– Synchronization of micro-seismic noise /4, 6/.
– Long-period three-dimensional variations of gravitational field /7/.

We didn't review some other harbingers, which also display in big remoteness from epicenters of strong earthquakes (variations of different parameters of ionosphere, electromagnetic noise disturbances, electric, magnetic and other harbingers).

2. What and how did the seismologists forecast heretofore?

Philosophy of short-term forecasting of earthquakes hasn't undergone essential changes during the whole history of its presence. The basis of all technologies of short-term forecasting the earthquakes is to create the network of stations, which

register the changes of geophysical, geochemical, hydro-geological and other parameters of geological medium before strong earthquakes near potential sources of possible earthquakes. It is considered that the more the stations and the closer they are to the potential earthquake source, the higher the probability of successful forecasting.

Meanwhile, in practice it was much more complicated. In spite of the increasing of the number of stations in immediate vicinity from potential sources, the probability of authenticity of short-term forecasts hasn't gone over the level of 70-75%.

As it was shown in the brief review, before strong earthquakes there take place the changes of geological medium in big distances from the sources of future earthquakes. What is the physical mechanism of these changes?

In the works /7/ the authors come to conclusion that the main reason of long-period three-dimensional variations of gravitational field are tectonic waves, which are generated by the earthquakes source in the process of its preparation.

3. About possible influence of tectonic waves on different properties of geological medium

3.1. General information

Bases of the concept of tectonic waves were laid in the mathematical model of V.Elsasser in accordance with which the redistribution of compressive forces, averaged on cross-section of elastic lithosphere, are compensated with the tangential forces, which arise under horizontal shift of lithosphere along the viscous asthenosphere (Elsasser W., 1969). Afterwards, this model was used for quantitative assessment of aftershock activity transfer (Kasahara K., 1985; Baranov B.V., 1980).

Afterwards, the model of Elsasser was supplemented by J. Rice with the effect of viscous-elastic reaction of asthenosphere on horizontal shifts of lithosphere. He also took into account the real two-dimensionality of the process (Rice J.R., 1982). Theoretical analysis of propagation of waves of seismic activity in lithosphere was given in the works of F.Lehner and other researchers (Lehner F.K., Li V.C., Rice J.R., 1981). The effect of bend of lithosphere on liquid lithospheric base found its reflection in the works of Nadai A. and Artushkov E.V. (Nadai A., 1969; Artushkov E.V., 1979). Afterwards, in the works of Nikolayevskiy N.V., Karakin A.V. and Lobkovskiy L.I. was made an attempt to develop the two-dimensional theory of waves of bend – compression of lithosphere on viscous asthenosphere (Karakin A.V., Lobkovskiy L.I., 1984).

V.V. Rujich put forward hypothesis according to which (Institute of the Earth's crust, Irkutsk, oral report, 1998), each earthquake is accompanied with gen-

eration of condensational waves with extremely low velocity of propagation (V < 0.1 m/sec). V.V.Rujich gave them the name – slow deformation waves (SDW). This hypothesis well corresponds to the contrast deformation anomaly, fixed by Stepanov I.I. on 27 June 1998, 26 days after Shipun earthquake of 1 June (which is consisted of 3 contrast single impulses with amplitudes of 92, 140 and 43 conventional units and intervals between them about 7 hours). It allows to assess the speed of velocity propagation of SDW about 0.05 m/sec. In the high background of cubic strains in the day of perceptible earthquakes 1,5 – 24 hours before the event there are observed the unit impulse signals, which 2-3 and more times exceed the noise. For example, on 1 June 1988 there were registered 2 such signals with amplitudes of 38 conventional units for a day and night and 41 conventional units 1,5 hours before the event. And on 27.08.2000 before weaker event there were also noted 2 impulse signals: 68 conventional units 6,5 hours and 40 units 3,5, hours before the earthquake at the background of about 20 units. It allows to suppose that such kind of impulse signals in the high background can act the role of short-term harbingers before strong seismic events.

More extensive analysis of researches devoted to tectonic waves with a lot of references to original sources has been cited in the works /7,24/.

What way can the tectonic waves influence on changes of different parameters of natural environment?

3.2. Gravitational harbingers of earthquakes

In Fig. 1 is schematically shown the model of tectonic wave generation by the earthquake source and their successive passage under the stations ATROPATENA–AZ (Azerbaijan) and ATROPATENA-PK (Pakistan).

In accordance with many researches and the rated models of different authors, the tectonic wave, similarly to the seismic one, has condensational and transverse components. In Fig.1 is shown the model of possible mechanism of tectonic wave propagation by the earthquake source, which is not spherical one.

The condensational tectonic wave propagation causes the alternate changes of rock density in a big stratum of lithosphere, along the direction of wave movement, Fig.2. Successive compression and expansion of lithosphere in the field of the passing condensational wave causes the alternating increasing and decreasing the mass of rocks under the registering stations. Therefore, the stations ATROPATENA register the alternate changes of gravity acceleration, as it is shown in the model, Fig. 2.
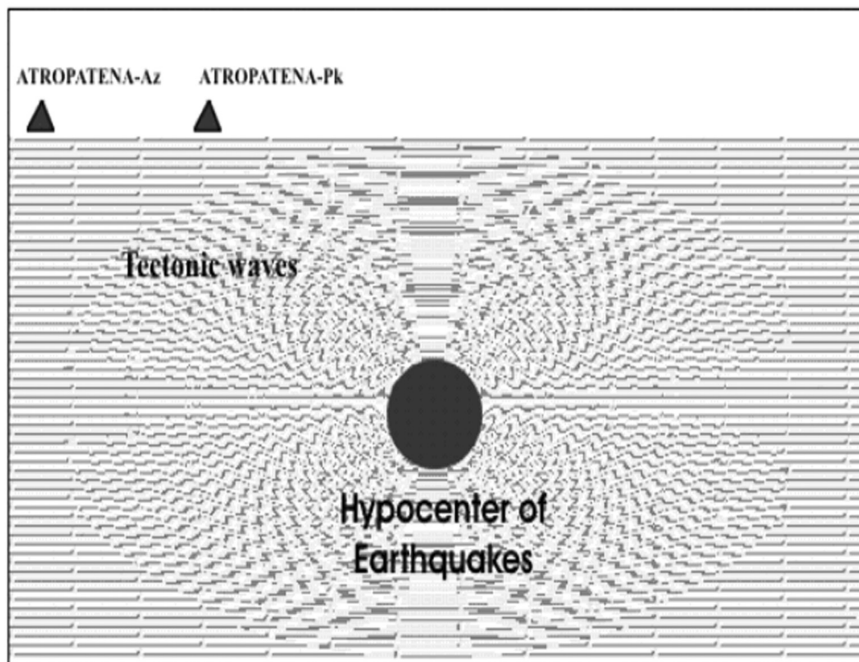
Figure 1. Schematic model of tectonic wave generation by the earthquake source.
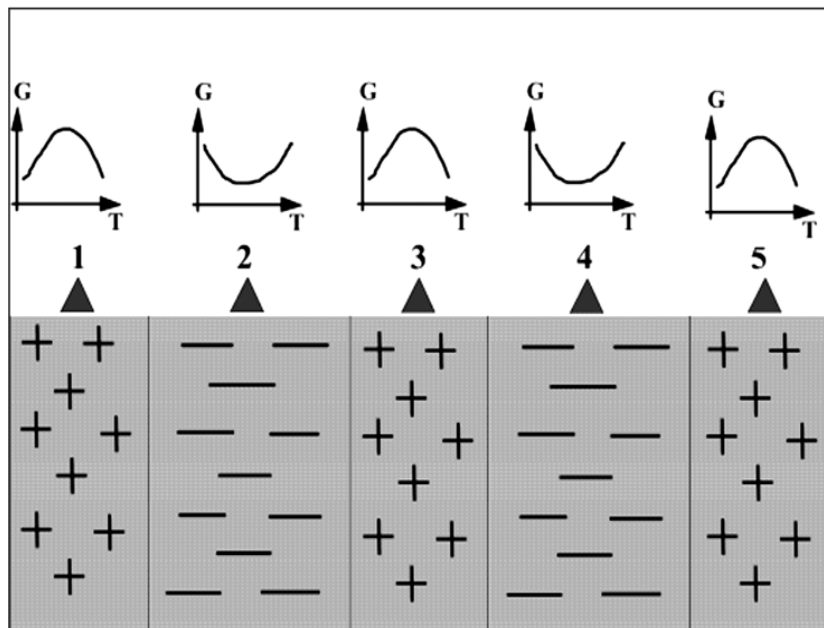
Figure 2. Model of influence of condensational tectonic wave on alternate changes
of rock density and the corresponding variations of gravity.
1-5 – the registering stations ATROPATENA.

Movement of transverse tectonic wave causes the alternate changes of the density of rocks in a big stratum of lithosphere, perpendicularly to the direction of wave propagation, Fig.3. The successive alternate compression and expansion of lithosphere in the field of the passing transverse wave, causes the alternating increase and decrease of the mass of rocks from different sides from the registering stations. Therefore, the stations ATROPATENA register the alternate changes of the gravitational field in two mutually perpendicular horizontal directions, as it is shown in the model, Fig.3.
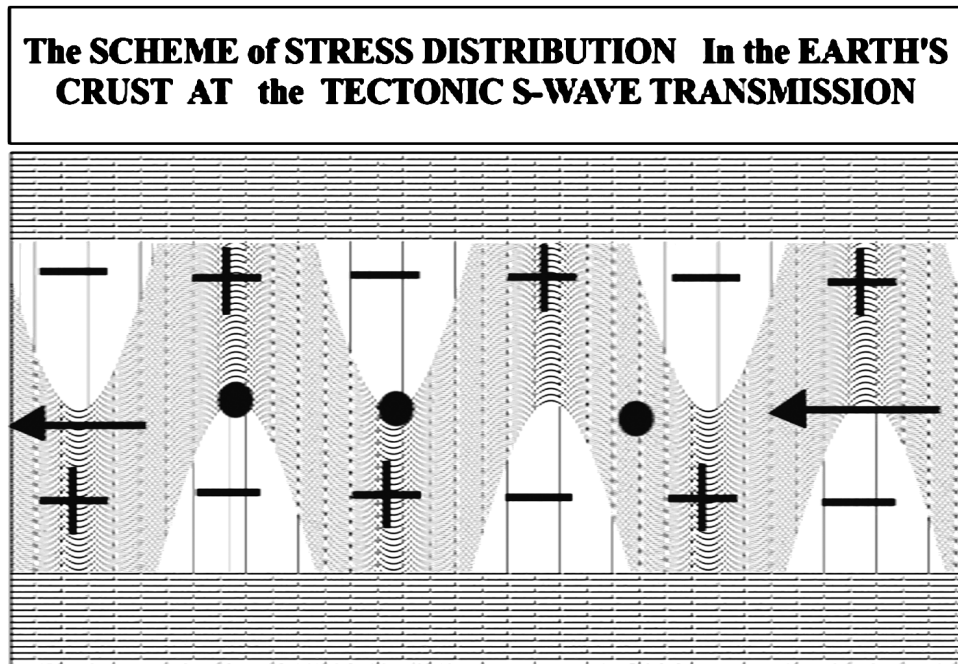
Figure 3. Model of influence of the transverse tectonic wave on variations of changing of the density of rocks in horizontal direction.

In Fig.4 as an example there is shown the gravitogram which was recorded by the station of earthquake forecasting ATROPATENA-AZ before strong earthquakes in the province of Sichuan (China) in May 2008.
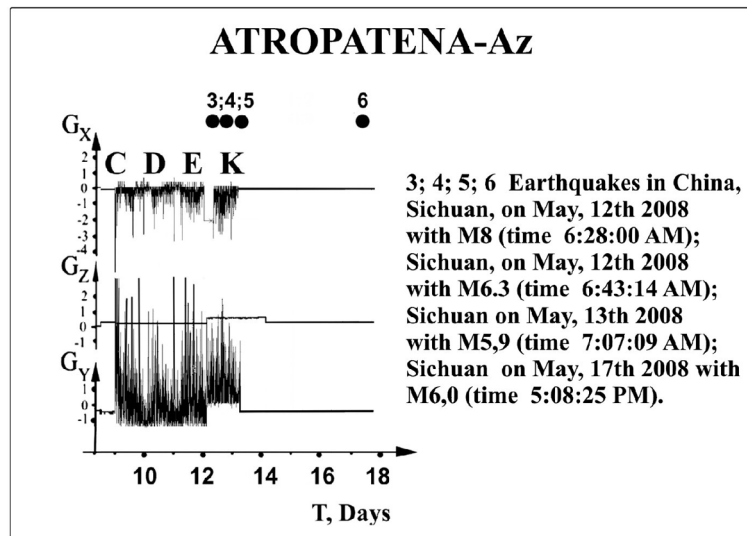
Figure 4. The registered anomalies of the gravitational field by the station ATROPATENA-AZ (Baku) before strong earthquakes in the province of Sichuan, China in May 2008.

Thereby, the physical mechanism of influence of tectonic waves on gravitational field of the Earth, to our opinion, is logically convincingly substantiated. This mechanism can explain all existing harbingers of earthquakes of gravitational character: long-period three-dimensional variations of gravitational field, tideless variations of gravity, seismic-gravitational effects, variations of gravitational gradient, etc.

Meanwhile, there is also the logical explanation of the mechanism of influence of tectonic waves on geochemical characteristics of geological medium, including hydro-geochemical, gas-geo-chemical ones and others.

3.3. Geo-chemical harbingers of earthquakes

In the work of I.I. Stepanov (I.I.Stepanov, 2002) were given very important, to our opinion, results of researches on monitoring of volume deformations with the help of geochemical deformometer in the region of Avachin bay /5/. The concept, taken as a principle of deformometer, is based on the discovery of I.I.Stepanov the special condition of atoms of some chemically inert elements, which are able to be in the volume of crystal lattices of minerals, similar in some relations with the ideal gas, and therefore, called "quasi-gaseous" one. According to the opinion of I.I.Stepanov, such substances are able to play the role of sensitive indicator of quantity of deformations of crystal lattices of minerals. During decreasing of the volume of lattices, the partial pressure of this "quasi-gas" inside it is increased. So far as this process in first approximation can be considered as

adiabatic, a part of atoms gains additional energy and gets the possibility to overcome the potential barrier which exists on the borders of partition: lattice – open environment. If the system "mineral – the surrounding atmosphere" is the closed loop, then the equilibrium position inside it will vary to increasing of concentration of steams of this substance in the gas over the mineral. This state is reversible, and during increasing of the volume of crystal lattice of the mineral, the "extruded" from it atoms come back to the mineral. So, uninterruptedly measuring the content of atoms of this element in the gas over the mineral, one may judge of degree of mineral deformation. At sufficiently low detection limit of measuring device, registration of small deformations, about 10^{-6} or less, becomes possible.

Thereby, the applied by I.I.Stepanov /5/ method of measuring the volume deformations of geological medium with the help of geochemical deformometer, uses the principle which can be also displayed in natural geological medium during passing the tectonic waves.

As it is known, the rocks and minerals have the structural anisotropy, and consequently, they are differently compressed, depending on the direction of compression. Under this feature, there is observed the peculiar selectivity of geochemical indicators of the medium (liquid or gaseous), depending on the direction, under which the tectonic wave passes through the rocks.

Similarly there can occur the changing of concentration radon on the zones of deep breaks under the influence of the passing tectonic wave.

3.4. Hydro-geological harbingers of earthquakes

Changes of the level of under waters during passing of tectonic wave are also logically may be explained by the process of extrusion of water at compression of pores of rocks (increasing of level of groundwater) and draw of water into the pores at increasing of their volume under influence of tensile strains (decreasing of level of groundwater).

3.5. Seismic and acoustic harbingers of earthquakes

As it is known, the seismic characteristics of medium directly depend on its density, particularly, velocity of seismic wave propagation, the refraction index and absorption coefficient, spectral characteristic, etc.

Thereby, the alternate change of density of big rock mass under the influence of the passing tectonic wave brings to periodic changes of its seismic properties that cause the modulation of micro-seismic noise and the so-called "synchronization of micro-seismic noise" by the tectonic wave.

Anisotropy of rocks putting down the layers of lithosphere brings to the fact

that the tectonic waves which pass at different angles to seismic stations, differently synchronize (modulate) the micro-seismic noise. It means that there is the selectivity on the direction (asymmetry of directional diagram) of kinematic and dynamic parameters of micro-seismic noise, modulated under the influence of tectonic waves /25/.

Similarly is substantiated the display of acoustic, particularly, ultrasound and infrasound harbingers of earthquakes.

3.6. Electric, magnetic, electromagnetic, optical and other harbingers of earthquakes

Alternate changes of stress condition of geological medium under influence of tectonic wave should bring to display of other known harbingers of earthquakes too. As it is known, the change of level of underwater and density of rocks brings to change of electric properties of rocks that displays as electric harbingers of earthquakes (changes of electrical resistance of rocks).

On the other hand, change of density of rocks brings to change of their magnetic properties (changes of density and other characteristics of magnetic field).

Besides, under the influence of alternate deformations, quartz-containing rocks (piezocrystals) can display the piezoelectric effect and, as a consequence, stipulate the appearance of static electricity in huge stratum. It, in its turn, can influence on ionization of lower layer of atmosphere above the projection of the front of tectonic wave on the surface of the Earth.

4. Main reasons of inefficiency of classical methods of earthquake forecasting

The results of our researches and discussions have shown that the display of earthquake harbingers has considerably more complicated nature, than the seismologists have thought till now /7/.

Thereby, we can suppose that there are two types of earthquake harbingers:
– Local harbingers of earthquakes;
– Long-range harbingers of earthquakes;

The biggest problem is that the main reason of both types of earthquake harbingers are the same mechanisms – changes of stress condition of rocks.

4.1. Local harbingers of earthquakes

Local harbingers of earthquakes are directly connected with the processes of critical increasing of stress conditions of rocks in focal zone. As a result of it, are

displayed the processes of compression, extension, displacement, bend, etc. of big strata of the Earth in different areas of focal zone. It is practically impossible to model this process because of its nonlinearity /Dr. Robert J. Geller, 1997/. Therefore, the same source of the earthquake can have different (dissimilar) displays of harbingers during the repeated earthquakes. Majority of local harbingers of earthquake unstably display near the earthquake epicenter (gravitational, seismic, geo-chemical, electrical, magnetic, electromagnetic, deformational ones, etc.).

4.2. Long-range harbingers of earthquake

Long-range harbingers of earthquakes are secondary ones and reflect the display of change of different parameters of geological medium (gravitational, seismic, geo-chemical, electrical, magnetic, electromagnetic, deformational ones, etc.) under influence of tectonic waves, generated by source of the preparing earthquakes. Physical mechanism of display of these harbingers was described above.

5.Fundamental mistake of seismology at short-term forecasting of earthquakes

From the above-mentioned arguments it is clear that at short-term forecasting of earthquakes there are simultaneously registered the local and long-range harbingers of earthquakes. Therefore, frequently, as a principle of local short-term forecasting of earthquakes (in the radius of several hundreds kilometers from the epicenter of the earthquake) were taken the long-range harbingers from the earthquake sources, which are in big distances from the registering points (up to 10 000 kilometers).

As the local harbingers obey the model of Doctor Robert Geller, their display is hardly forecasted.

Meanwhile, the long-range harbingers of earthquakes, which are the result of generation of tectonic waves by the sources of strong earthquakes, are the stable and high-quality. As the experience of using the station ATROPATENA during two years shows, the long-range gravitational harbingers of earthquakes allow to forecast with 90% accuracy, and this probability will be increased as including the new stations ATROPATENA into the Global Network of Forecasting the Earthquakes.

5. What to do?

Almost during 100 years of history of forecasting the earthquakes the seismology has not only stored the extensive information about different harbingers of earthquakes, but also created the unique local networks of points of monitoring of

different parameters of geological medium around focal zones of strong earthquakes and deep breaks. In different countries were created the multiple seismological polygons for monitoring of geological medium.

To our opinion, the only way out of the arisen situation is the creation of the Global Network of Forecasting the Earthquakes, consisted of the united into the single network the stations of forecasting the earthquakes, registering the most stable and high-quality long-range harbingers of earthquakes. The global network must be connected with multiple local networks. Thereby, the Global Network of Forecasting the Earthquakes will allow to register the long-range harbingers of earthquakes, and the local networks will simultaneously register the local harbingers. Interconnecting of long-range and local harbingers will allow to increase the accuracy of short-term forecasting the earthquakes.

I would like to inform that the analog of similar network has already begun to be created on the basis of the stations ATROPATENA with points in Baku (Azerbaijan), Islamabad (Pakistan) and Yogyakarta (Indonesia).

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ABOUT POSSIBLE INFLUENCE OF SOLAR ACTIVITY ON SEISMIC AND VOLCANIC ACTIVITIES: LONG-TERM FORECAST

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It has been determined that in the period of solar activity increase (11-year cycles) there increase seismic and volcanic activities in the compression zone of Earth and at the same time there decreases the activity in the tension zones of Earth. On the basis of the discovered stable 11-year and 22-year cyclicalities in the seismic and volcanic activities and their high correlation with solar activity there has been made the long-term forecast until 2018. The next maximum of seismic and volcanic activity with very high amplitude for the compression zones of Earth is forecasted for the period 2012-2015.

1. VOLCANISM AND SOLAR ACTIVITY

The attempts of detection of statistical connection between solar activity and volcanic manifestations were made in the number of works of A.I.Abdurakhmanov (1976), N.K.Bulin (1982), Y.A.Gadjiyev (1985), N.I.Guschenko (1985), Sh.F.Mekhtiyev, E.N.Khalilov (1984, 1985), S.V. Tzirel (2002).

Thus, A.I.Abdurakhmanov, P.P.Firstov and V.A.Shirokov (1976) made a guess about connection of volcanic ejection with 11-year cyclicality of solar activity. In the opinion of the authors, the years unfavorable for volcanic eruptions are located in the neighborhood of maximum solar activity whereas the most favorable years for eruptions are located not far from minimum solar activity, mainly, in the middle and in the end of solar cycles decay.

Stoyko A. and Stoyko N. showed in their works the high correlation of duration of days and dates of short-moving sunspots, fig.1 (Stoyko A. and Stoyko N., 1969).

On the basis of study of Akhtal (Georgia) mud volcano activity B.M.Valyayev and others came to a conclusion about existence of statistically sure connection between Akhtal mud volcano activity and solar activity, (Valyayev and others).

However, the results of the research reflect the mud volcanoes activity of only one small region of our planet. The detection of connection between mud volcanoes activity and solar activity reflecting better the specific character of solar-terrestrial connections is of certain interest.
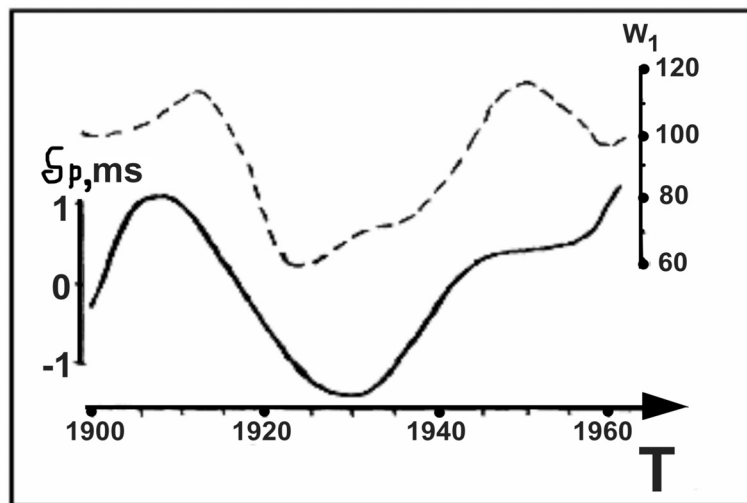
Figure 1. Changing of the duration of days with the excluded linear trend (solid line) and dates of short-living sunspots (dashed line) in accordance with the data of A.Stoyko's works (1969).

For detection of possible connection between solar activity and activity of mud volcanoes of the world we have analyzed the data about eruptions of the largest mud volcanoes of the world and built a diagram characterizing the change of mud volcanoes activity in time. When building a diagram there were used data of more than 300 mud volcanoes eruptions of the world (Mekhtiyev Sh.F., Khalilov E.N., 1985).

Practically, all mud (M-type) volcanoes of the world are located in the zones of subduction and collision and, consequently, reflect the activity of compression processes of Earth. Fig.2.

As it was mentioned above, the attempt of detection the connection between the activity of the Sun and magmatic volcanoes activity was made by the number of scientists. However, there was not taken into consideration that the volcanoes are divided into geodynamical types and each type of volcano reflects the activity of various processes: C-type volcanoes characterize the compression processes of Earth (due to subduction); R-type volcanoes characterize the tension processes of Earth (due to spreading).

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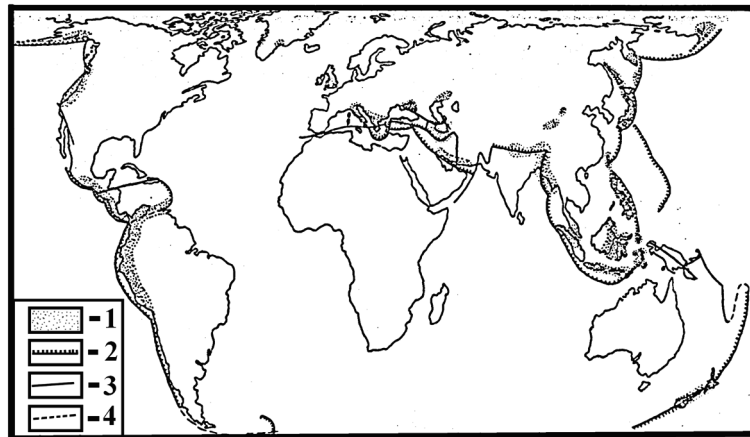
Figure 2. Location scheme of mud (M-type) volcanoes and subduction zones of the world.
1 – zones complicated by mud volcanism;
2 – subduction zones; 3 – transform ruptures; 4 – supposed ruptures.

Thus, making conclusions about the periods of volcanoes activation on the basis of general diagram for all types of volcanoes, the researchers proceeded from the suggestion of activation simultaneity of all volcanoes, i.e. from the suggestion of simultaneity of compression and extension of Earth whereupon its radius would remain unchangeable.
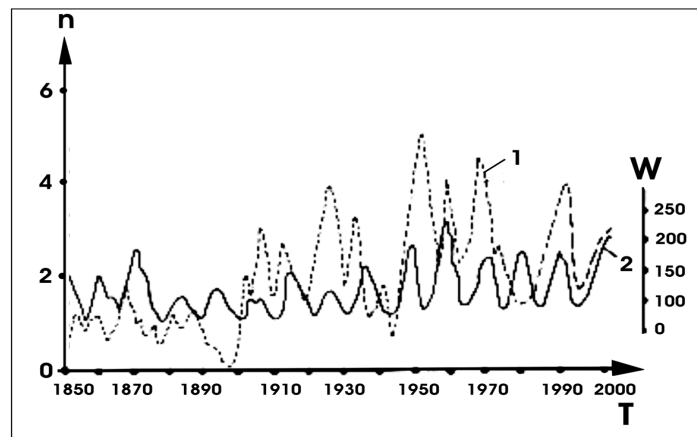
Figure 3. Comparison of solar and mud (M) volcano activities diagrams.
I – mud volcano activity diagram; II – solar activity diagram
(Wolf number);   n – average number of ejections

Comparison of the built mud volcano activity diagram with Wolf numbers characterizing 11-year cycle of solar activity showed that 9-12-year periods of mud volcano activity, mainly, coincided with 11-year cycles of solar activity (Fig.3.). Thus, increase of activity of mud volcanoes of the world corresponds with the solar activity increase Sh.F. Mekhtiyev, E.N. Khalilov (1985).

For ascertaining of more objective picture in magmatic volcanoes activity there were built diagrams separately for C and R-type volcanoes. For this purpose we have created the map of geodynamic zones of Earth where the entire planet is divided into four basic zones of geodynamic type: compression zones – type C; ocean rift zones – type OR; continental rift zones – type CR; ocean internal plate zones of minor seismicity and volcanism – type OI, fig.4.

The catalogues of magmatic volcanoes eruptions number approximately 1000 active volcanoes (Guschenko N.I., 1979). Regardless of the system of data collection about the ejection of the volcanoes there is no guarantee that there collected all the information about eruptions of volcanoes of the world within the recent period. The information losses are unavoidable, but they are of casual character at least.
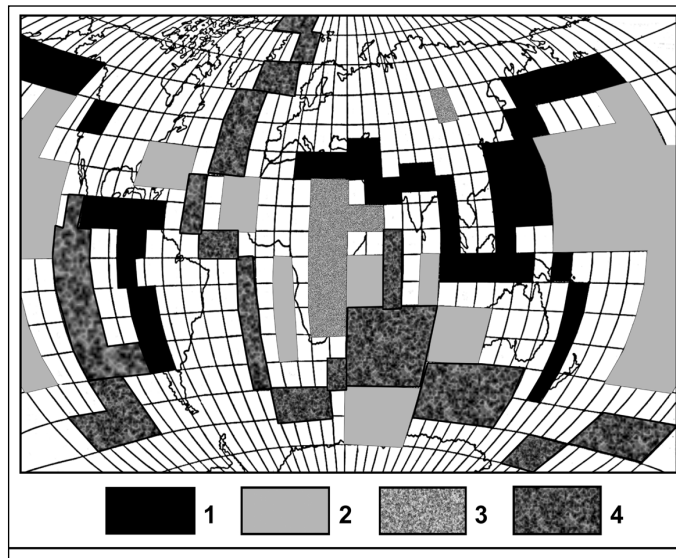
Figure 4. The map of geodynamic zones of Earth.
1 – compression zones of Earth – type C; 2 – ocean internal plate zones – type OI.
3 – continental rift zones – type CP; 4 – ocean rift zones – type OR

In order to reduce maximally the influence of possible losses of information there were chosen data about volcanoes eruptions within little time period (from 1850 to 2000), while in catalogues there are given data about volcanoes eruptions from 1500 BC to the present day.

Study of C-type magmatic volcanoes activity enabled to detect certain periodicity of ejections. 9-15-year cycles of magmatic volcanoes hyperactivity became apparent.
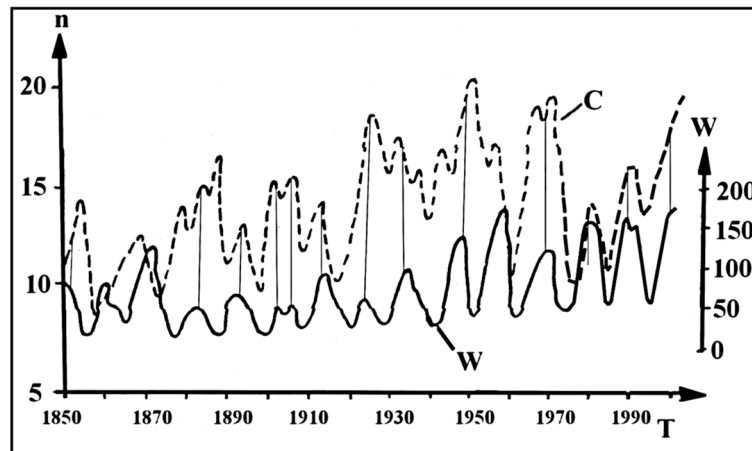
Fogure 5. Comparison of C-type volcanoes activity diagrams and solar activity.
I – "C"- type volcanoes activity diagram; II – solar activity diagram (Wolf number).
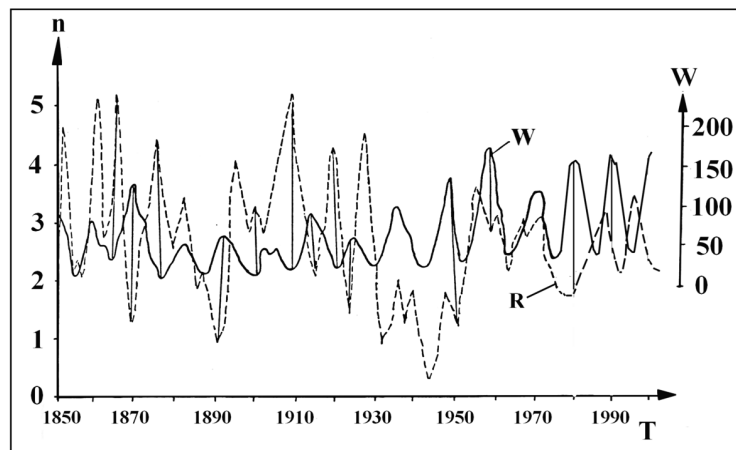
Figure 6. Comparison of "R"-type volcanoes activity diagrams and solar activity.
R – "R"-type volcanoes activity diagram; W – solar activity diagram (Wolf number).

As follows from pic.5, the periods of C-type volcanoes hyperactivity coincide with 11-year periods of solar hyperactivity. At the same time, the comparison of "R"-type volcanoes activity diagrams with the solar activity diagram caused contrary conclusions. With the increase of solar activity there decreases R-type volcanoes activity (fig.6.).

The achieved results enable us to come to a conclusion that in the periods of solar activity increase, there increases the activity of volcanoes Earth compression zones while in the periods of solar activity decrease there increases the activity of

tension zones volcanoes that should cause periodical change of Earth radius. The results of the researches enable to suppose that the compression periods of Earth (due to subduction) change into the periods of extension (due to spreading).

Thus, the researches of volcanoes activity conducted with the use of linear transformation of initial number of volcanoes eruptions through moving average enabled to establish on average 11-year activity cyclicality in various geodynamic types of volcanoes. The cyclicality of "C"-type volcanoes and mud volcanoes is dephased relative to "R"-type volcanoes activation cycles.

However, as it was mentioned above, the application of moving averages method for detection of activation cycles has a number of significant shortcomings. Thus, each variant of smoothing filters out the cycles with periods the duration of which is less or equal to the smoothing interval length. Consequently, for full analysis of stochastic processes and detection of various duration periods it is necessary to use a great number of smoothing variants of various smoothing intervals length. Nonlinear transformation of the initial number, for example, by Lanczos method or maximum entropy are more effective for conducting of such kind of analysis.

We have estimated the functions of spectral density of various types volcanoes eruptions as well as Wolf numbers by the method of maximum entropy. The estimations had interesting results. In the eruptions of all geodynamic types volcanoes there were detected activation cycles similar with solar activity cycles. In table 1 there are shown the volcanoes activation cycles periods and Wolf numbers.

Thus, there detected single cycles in the activity of all types of volcanoes and solar activity with the periods 5-6 years, 8-9 years, 10-12 years, 14-15 years and 22 years.

Table 1.

No. No.	Wolf numbers	Activation cycles periods (in years)		
		C"-type volcanoes eruptions	Mud volcanoes eruptions	"R"-type volcanoes eruptions
1	5,6	6	6	5
2	8 4	8	9	9
3	11,2	10	12	11
4	14	14	14	15
5	22	22	22	22
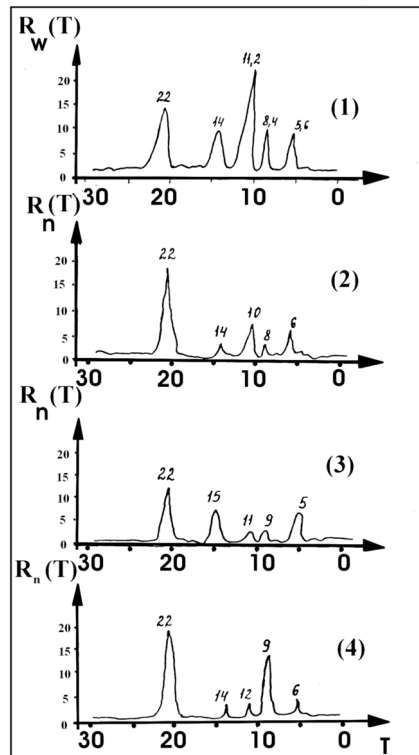
Figure 7. Periodograms of volcanoes eruptions and changes of Wolf numbers.
*1- periodogram of changes of Wolf numbers; (2), (3), (4) – periodograms of volcanoes eruptions,
"C", "R" and "M" types correspondingly.*

In fig.7. there can be plainly seen the similarity of activation cycles of various geodynamic types of volcanoes and solar activity. In Wolf numbers there distinguish 11-year cycles, in activation of "C"-type volcanoes – cycles the duration of which is 6, 10 and 22 years, "R"-type volcanoes – 15-year and 22-year activation cycles.

Evidently, 22-year cycles became apparent in all geodynamic types of volcanoes and it seems that they are genetically coherent by the influence of a single factor – 22-year cycle of solar activity consisting of two 11-year cycles.

Thus, spectral analysis of the volcanoes eruptions and solar activity enabled to examine their cycles in details and additionally detect cycles with various periods.

Is it possible to say that the similarity of solar activity cycles and activity of various geodynamic types of volcanoes is casual? From our point of view – no. Undoubtedly, it is quite possible that some of the detected cycles are connected with the purely endogenous global processes. Nevertheless, in our opinion, 11-year and 22-year cycles the most typical for solar activity have direct influence upon the earth's processes, including volcanism and seismicity. One of the possible mechanisms of solar activity influence upon geodynamic processes is described below.

When solar activity increases the corpuscular emission and solar magnetic field strength increase rapidly as well, inducing ring currents in various layers of Earth, particularly, in lithosphere and asthenosphere. Currents in asthenosphere appeared as a result of solar activity increase cause mantle heating, its plasticity growth and as a result convection currents acceleration. Convection currents acceleration leads to spreading acceleration, and increase of mantle temperature – to its heat expansion while Earth extension is taken place due to spreading. In the periods of solar activity decrease the ring currents magnitude inducing in the mantle, decreases as well and as a result there decreases temperature and Earth compression, accompanying by the process of subduction. The difference in time from the moment of solar activity increase until spreading acceleration process is no less than 5-7 years that is connected with a number of processes starting from the appearance of ring currents and finishing by the increase of mantle temperature. The time period favors delay of Earth pulsation for half a period relative to 11-year cycles of solar activity. That leads to the activation of spreading process during solar activity decrease while subduction process is activating during solar activity increase.

Thus, the results of the researches described above enable to suppose that the periodicity of solar activity have an influence upon the periodicity of geodynamic processes.

2. SEISMICITY AND SOLAR ACTIVITY

Setting of a statistic connection between the activity time of volcanoes and solar activity allows to deem the existence of such connection between solar activity and the seismicity of the Earth. The fact about existence of geodynamical and correlational connection between volcanism and seismicity serves a prerequisite for such a hypothesis.

As it follows from the results of above-stated researches, solar activity influences on activation of volcanic eruptions of rift zones, which reflect the activity of the processes of lithosphere release and also influences on the activation of the volcanoes of the compression rims of the Earth. As it known, the compression and release rims of the Earth are also characterized by high seismicity, that evidently predestinates, the same connection of seismicity with solar activity.

A range of works is devoted to the study of the connection between parameters of solar and seismic activities: Y.D. Bulanje (1984), G.Y. Vasilyeva (1975), Y.D.Kalinin (1973, 1974), O.V. Lusmanashnili (1972, 1973), A.D. Sitinsky (1963-1998), I.K. Gribbin (1974), F.A. Machado (1973), I.F. Simpson (1968), I.V. Ananin, A.O. Fadeev (2002) and others.

G.Y. Vasilyeva and V.I. Kojanchikov relying on the research about 2000 earthquakes occurred in different parts of the Earth for the period of one cycle of

solar activity from 1962 to 1973, came to the conclusion that the number of surface earthquakes is increased as the solar activity increases, but the number of deep-focus earthquakes is decreased during the epoch of the maximum of solar activity. The seismic activity for all the earthquakes, as well as during the years of maximum and minimum of solar activity is higher on 10-30%, when the Earth crosses projection of the galactic magnetic field on the plane of the ecliptic. Is stated that the earthquakes have electromagnetic nature and connected to the structure of magnetosphere (G.Y. Vasilyeva, 1975). In Y.D. Bulanje's work (1984) a number of earthquakes are collated in seismic zones of USSR where the solar activity was observed, on the basis of this he made similar conclusions. Y.D. Kalinin, collating the earthquake data with the solar activity for the period of 1897-1958 and 1963-1968, marks out that the, zones of high seismic activity gradually appear within 11-year solar cycle on the geographical latitudes, more and more remote from the North Pole. It's also suggested that the solar wind has influence on seismic activity (Y.D. Kalinin, 1973).

In his further work Y.D. Kalinin (1974), working on the proposed hypothesis, marks that, the shift of solar activity causes nonregular oscillations of the angular velocity of Earth rotation, that as a result influences on seismic activity.

In his work O.V. Lusmanashvili (1972) observed that, there is a possibility of influence of the Sun activity on earthquake distribution in the Caucasus. Observing the earthquakes in the Caucasus for the period of – 1900 to 1970, he comes to the conclusion, that there is a close connectivity between seismic activity of the Caucasus and the fluctuation of Caspian Sea level on the one hand and between the change of sea level and the Sun activity on the other hand. The comparison of spectra of the Sun activity and the repetition of large earthquakes in the Caucasus showed their similarity. (O.V. Lusmanashvili, 1972, 1973).

A.D. Sirinsky in his range of works (1963-1998), P.M. Sichov (1964), V.D. Talalayev (1980) also try to set a connectivity between the Earth seismicity and solar activity. In particular, they mark out that the common Earth seismicity, expressed in terms of total energy of earthquakes and the number of large earthquakes for the period of one year, depends on the 11-year solar cycle phase. It also indicated that the earthquakes, substantially occur 2-3 days after the active zone crosses the central solar meridian. In the A.D. Sitinsky's work (1973) is marked out, that the connection of the seismicity with solar activity is carried out by wide-planetary atmosphere processes. The mechanism of dependency is that in connection with the amplification of the solar activity the perturbation of quasistationary state of the atmosphere occurs, that leads to the redistribution of atmosphere mass on the Earth, that is center-of-gravity motion of Earth – atmosphere, and consequently, deformation of the Earth.

So, A.D. Satinsky (1998) notes that the seismicity dependency on 11-year

cycle that he previously elaborated was checked and confirmed by experimental forecasting of common seismicity of the Earth and it's separate parts. The maximums of seismic activity of the Earth were forecasted for the period of 1963-1995. In their works I.V. Ananin and A.O. Fadeev (2002) come to the conclusion about existence of correlational link between the variations of seismic activity, average annual temperatures on the Earth surface and solar activity. Whereas, they consider this link as a possible proof of the influence of solar activity, both on average annual temperatures as on seismic activity.

A range of works of foreign researches is devoted to studying of connection between seismiscity and solar activity: I.K. Gribbin (1974), F.A. Machado (1973), I.F. Simpson (1968).

Thus, in I.K. Gribbin's work (1974) the subject of research is the reasons of destructive earthquake in San-Andreas fault in California in 1982. The reasons that serve as a triggering mechanism for San-Andreas fault is the confrontation of the main Planets of Solar System and increase of solar activity for the period of 11 years. It's also marked out about the influence of 11-year cycle of solar activity on seismicity of the Earth in the work of F.A. Machado (1973). In the work of I.F. Simpson (1968) the solar activity regards as triggering mechanism for the relaxation of the Earth interior.

In V.M. Latkher's work is marked, that course of changes of average interval between earthquakes is conforms to the changes of lengths of solar cycle. In particular it's noted that in the variations of solar activation the quasiperiodical component of approximately 60-100-year period is observed. At the same time it should be mentioned that there are some works that refute the possibility of existence of the connection between the solar activity and Earth seismicity. Thus Van-Jil, after the analysis of more than 20000 small earthquakes that happened from 1910 to 1945, he marked out the absence of the connection between solar activity and seismicity. Meanwhile, we would like to note, that 99% of seismic energy of the Earth is plated out during large earthquakes. For the purpose of detection of possible connection between solar system and the processes of the Earth seismicity, we conducted the following researches. A spectral analysis of time series of different geodynamical earthquakes was made: the rims of compression of the Earth – type "C", oceanic rift zones – type "OR", continental rift zones – type "CP" and oceanic interplate zones – type "OI".

It should be noted, that a separate studying of periodicity of small earthquakes ($M<7$) and large earthquakes with $M \geq 7$. 99% of the earthquakes with $M \geq 7$ take place on the compression rims of the Earth, in regard to this, the studying of periodicity of large earthquakes was made only for "C" type.

Spectral analysis of time series of the earthquakes was carried out by the method of maximum entropy, using filters the lengths of which was selected tak-

ing into account the necessity of studying of high-frequency spectrum component (with T≤30). The results of studying of spectral particularities of time series of the earthquakes with M ≥7 showed, that the major part of the harmonics in the spectra of earthquakes and Wolf number coincides. Picture 8 shows that character harmonics in spectra are T=18-22 years, 10-11 years and 8 years. It should be noted, that in the spectrum, that covers time series of the earthquakes from 1600 to 2000, the indicated harmonics were detected more accurate, than of the same for the period of 1902-2000. According to our explanation that occurs because of specificity of the method applied, the effectiveness of which increases when increasing the lengths of original row.

As you see from the shown spectra, the 11-year and 22-year cyclicity is appears more accurate.

Table 2. shows the periods of Wolf numbers harmonic and earthquakes with M≥7.

Table 2.

No. No. nn	Periods of Activation Cycles		
	Wolf Numbers	Earthquakes of "C" type with M≥7	
		1600-2000	1902-2000
1	5,6	-	6
2	8,4	8	8
3	11,2	11	10
4	14	15	-
5	22	22	18

Interesting results were also produced during the studying of earthquake spectra with M<7. A large amount of small earthquakes created the conditions for making statistically objective processing of the data of the earthquakes of all geodynamical types: "C", "OR", "OI", "CR" for the period from 1902 to 2000. The pic. 9 shows the comparison of spectra of the "C" and "OR" types of earthquakes along with the graphic of solar activity. As it seen, the harmonics with T=5, 11-12, 13-14, 22-27 appear close in spectrum. Harmonics with T = 8 appear only in spectrum of "C" type of earthquakes.
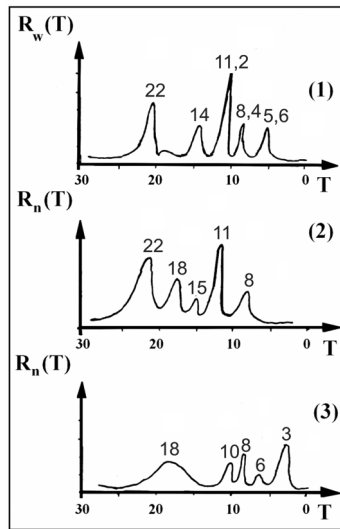
Figure 8. Periodograms of changes of Wolf numbers and seismic activity (for "C" type earthquakes)
(1) – periodogram of changes of Wolf numbers;
(2) – periodogram of changes of seismic activity for the earthquakes with M≥7,
for the period from 1600 to 2000;
(3) – periodogram of changes during plating out of seismic energy of the "C" type of earthquakes
with M≥7, for the period from 1902 to 2000.
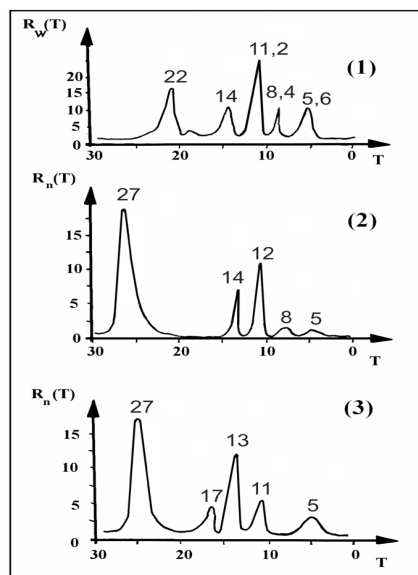
Figure 9. Periodograms of changes of Wolf numbers and seismic activity.
(1) – periodogram of changes of Wolf numbers; (2), (3) – periodogram of seismic activity, for
earthquakes, respectively of "C" and "OR" types with M<7, for the period from 1902 to 2000

The comparison of earthquakes spectra of "CR" and "OI" with the solar activity spectrum (pic.10) showed the existence of similar range of harmonics: 7-9 years, 9-12 years, 19-22 years. In the spectrum of the "CR" type of earthquakes the 5-year harmonic doesn't appear, and as for the spectrum of "OI" type of earthquake – 14-year respectively.

At the same time it's possible to note the similarity of between the spectra of "C" and "OR" types of earthquakes and also between "OI" and "CR" types (fig.10). Whereas, spectra of the "C" and "OR" types of earthquakes are less similar with spectra of "CR" and "OI" types.
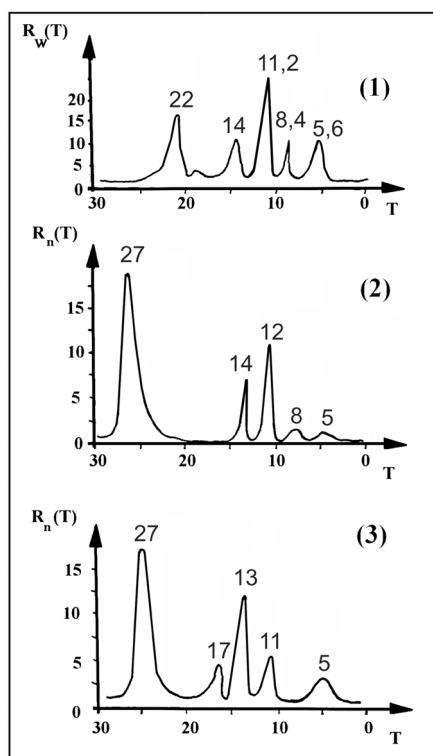
Figure 10. Periodograms of changes of Wolf numbers and seismic activity.
1- periodogram of changes of Wolf numbers; (2), (3) – periodograms of seismic activity, for earthquakes, respectively of "CR" and "OI" types with M<7, for the period from 1902 to 2000.

An identical mechanism was also observed on the low-frequency spectra of volcanoes eruption, manifesting high similarity in the manner of eruptions of the "C" and "OR" type of volcanoes, at the same time the spectra of eruptions of the "OI" and "CR" types of volcanoes were also identical.

Table 3

No. No. nn	Periods of Activation Cycles				
	Wolf Numbers	Type "C"	Type "OR"	Type "CR"	Type "OI"
1	5,6	5	5	-	5
2	8,4	8	-	7	9
3	11,2	12	11	9	12
4	14	14	13	13	-
5	22	27	27	19	22

In our point of view, it's wrong to simplify the interpretation of the link between tectonic processes and solar activity. It's known that the solar activity influences on climate processes, changes of the ocean level, that in turn has the influence on the energetic condition of lithosphere and mantle, and as a result, on the tectonic processes. Thus, G.S. Ivanov-Kholodniy marks out, that processes of ionization of ionosphere initiated by solar activity have different character depending on the altitude. A theory of calculation of the influence level of solar flare on the ionization processes of different layers of ionosphere was suggested. At the same time it's noted, that the mechanism of influence of solar activity on geophysical processes is rather multifarious and requires detailed and many-sided study (Ivanov-Kholodniy, 2000).

In our opinion, the fact of existence of cycles in tectonic processes comparable with the period of solar activity is very important. Taking into consideration the complexity of interrelations and inertness of many physical and chemical processes, the shift of one part of cycles comparatively with another becomes evident.

3. RESULTS

It's necessary to note that during the detailed analysis of high-frequency components of spectra of time series of volcanoes eruption and earthquakes, were calculated with different filters length, the following was clarified:

1. The most stable high-frequency components of the spectra are the harmonics with T ≈ 22-24 years and T ≈ 10-12 years.

2. During the studying of spectra of time distribution of volcanoes eruption the following was determined:

a) High-frequency components of volcanoes eruptions of "C", "R" and "M" types are similar with each other as well as similar with the spectrum of Wolf numbers, meanwhile the period of harmonics in different spectra differ from each other, as an average for the period of 1 year.

b) On all spectra of volcanoes eruption and Wolf numbers a single-valued harmonic with T=22 years is marked out.

3. The studying of spectra of time distribution of earthquake number showed the following:

a) In large (with M$\geq$7) and small (with M$\leq$7) spectra of earthquake the only the harmonics with T$\approx$20-23 years are marked out.

b) In the spectra of earthquakes with M$\geq$7 and Wolf numbers similar harmonics with T$\approx$10-11 years and T$\approx$8 years were also marked out.

c) Special analysis of time series of small earthquakes showed, that the most close spectra character possessed by the type "CR" and "OI" of earthquake. These results conforming with the determined mechanisms of volcanoes eruption, especially in low-frequency components of spectra (with T$\geq$20);

d) The spectra of time series of small earthquakes contain harmonics with the periods relevant to the spectrum of solar activity: T$\approx$22-24, T$\approx$12-14, T$\approx$10-12, T$\approx$5.

These researches allow us to suggest about different influence of 11-year and 22-year cycles of solar activity on the manifestation of modern tectonic activity in the compression and release rims of the Earth expressed by volcanoes and earthquakes. In particular, during the periods of increased 11-year cycles of solar activity the activity of the earthquakes and volcanoes of compression zones of the Earth also increases, but during the periods of decreased solar activity the activity of the earthquakes and volcanoes increases in the release zone of the Earth.

4. LONG-TERM FORECAST

The detection of cyclicity inside the seismic and volcanic activity and their correlation link with the solar activity and other cosmic processes is of great importance for understanding of interaction of different cosmic and geodynamical factors and creation of single conceptual system of cosmo-earthy interaction.

The attempt to forecast the next 24th cycle of solar activity is quite interesting. First of all, for any forecasts there are created models of processes on the basis of which the forecast is realized. A more exact model of sunspots origin was elaborated in 2004 by the group of scientists, worked under the direction of Mausumi Dikpati from National Center of Atmosphere Researches USA (NCAR). By their reckoning, the magnetic structures, that form the sunspots are initiated from the equator line of the Sun. They become impressed in plasma and along with it moves to the poles. Reaching the pole, plasma plunges into the star on the depth of about 200000 km. From here it flows back to equator reaching a speed of 1m per second. Such a circle is equal to the cycle of solar activity of 17-22 years. This model was

called by the researches "model of dynamo-transportation of magnetic flux". Now we are at the beginning of 24th 11-year solar cycle. Building into the model data about 22 solar cycles preceded the 23rd, scientists considered what like the 23rd cycle would be. The result coincided with the result we observe on 98%. By this way checking out their model scientists in the beginning of 2006 calculated 24th cycle of solar activity, the peak of which will fall on 2012. According to the forecast the 24th cycle of solar activity will 1,5 times powerful than the previous 23rd.

Hereunder shown a forecast graph of solar activity that was made by authors on the basis of analysis of existing previous data and forecast of American researchers.
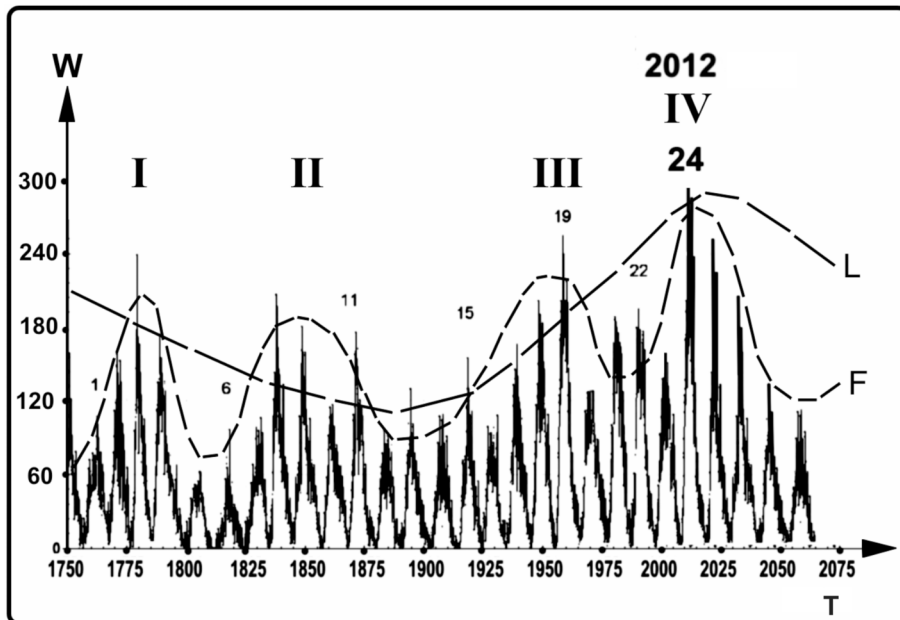
Figure 11. Forecast graph of solar activity.

As it seen from the graph in 2012 not only the peak of the 24th, that is more powerful, 11-year cycle of solar activity is expected by scientists but also a peak of the 4th 75-85-year cycle (F). This cycle is shown in the form of envelope of maximums 11-year cycles of solar activity. As it seen from the graph, one more maximum of a more large, approximately, 300-year cycle of solar activity (L) falls on the same period, the fragment of which is also shown on the graph. The amplitude of 24th cycle is overrated by the authors up to 20% comparing with forecast of NCAR, that can be explained by special reasons in the result of putting cycles of three order.
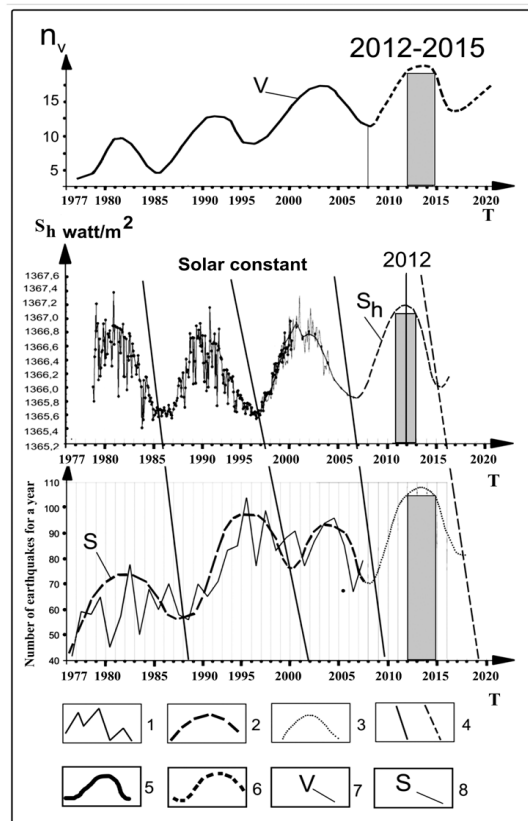
Figure 12. Forecast graphs of solar activity, seismic and volcanic activity
of compression rims of the Earth.
1 – graph of real numbers of earthquakes of compression rims of the Earth with M?5;
2 – circumflexing graph of seismic activity of compression rims of the Earth with M?5;
3 – forecast part of the graph of seismic activity of compression rims of the Earth;
4 – lines connecting the minimal indexes of solar and seismic activities and showing the delay of
seismic activity against solar; 5 – graph of volcanic activity of compression rims of the Earth;
6 – forecast part of the graph of volcanic activity of compression rims of the Earth;
7 – drawing up of volcanic activity graph for zones of type C;
8 – drawing up of seismic activity graph for zones of type C.

Thus, the research of the mechanisms of cyclic volcanism and seismicity gives an opportunity to solve a practical problem – the realization of long-term forecast of the activity of volcanoes and earthquakes. That is the reason of why it's so interesting and important for us the realization of such a long-term forecast on the basis of the results of a large-scale and laborious work devoted to the study of spacious mechanisms of modern manifestation of volcanism and seismicity.

Fig.12. shows forecast graphs for the period until 2018, for solar activity, as well as for seismic and volcanic activities of compression rims of the Earth.

As it seen from the picture, we haven't the curve of Wolf numbers in the

capacity of the index of solar activity, but the graph of changes of solar constant, because exactly this characteristic has the energetic expression.

(http://www.kosmofizika.ru/ucheba/sun/564.jpg

http://www.kosmofizika.ru/ucheba/sun/68.jpg).

It should be noted that the solar constant has a high correlation with Wolf numbers, that is logical.

Even visual comparison of graphs gives an opportunity to catch a high likeness and some delay of cycles of seismic and volcanic activities of compression rims of the Earth against solar activity. The time of delay is fluctuating from 1,5 to 2 years. The reasoning of such a mechanism of delay was given above.

Starting from 2008, forecast parts of graphs were given, that were built on the basis of usage of previous, stable for a long period of time, mechanisms.

On all the graphs show another cycle of activity, equal on the average period to 11-12 years. As graph shows, the maximum of the cycle of high solar activity falls on 2012. Thus, the maximums of the cycles of volcanic and seismic activity of compression rims of the Earth fall on 2012-2015, taking into account previously observed time shift. The longest period of volcanic and seismicity activity (4 years), in comparison with solar activity, can be explained by sufficient inertness of geodynamical processes on one hand, and by influence of a whole range of other factors as well as endogenous and cosmic, excepting solar activity on the other hand.

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ON THE COMPLEX REGIONAL AND GLOBAL NETWORK SETS FOR RESEARCHING THE POSSIBILITIES FOR RELIABLE NATURAL RISKS ESTIMATION INCLUDING "WHEN, WHERE AND HOW" EARTHQUAKE PREDICTION

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Abstract

A project for complex regional (Adriatic, Black Sea, Caucasus, Caspian Sea regions) NETWORK for prediction the earthquake's time, place (epicenter, depth), magnitude and intensity using reliable precursors is proposed and shortly analyzed. The precursors list includes usual geophysical and seismological monitoring of the region, including hydrochemical monitoring of water sources and their Radon and Helium concentrations, crust temperature, and hydrogeodeformation field, monitoring of the electromagnetic field under, on, and above Earth surface, meteorological monitoring of the atmosphere, including earthquake clouds and electrical charge distributions, near space monitoring aimed to estimate the Sun or Earth origin of variations, and biological precursors. The Project is based on contemporary data acquisition system for preliminary archiving, testing, visualizing, and analyzing the data. The theoretical part of the Project includes wide interdisciplinary research based on the unification of standard Earth sciences and using of nonlinear inverse problem methods for discovering the empirical and hidden dependences between variables. By means of special software the complex environmental and real time analyzed Satellite data shall be used to prepare regional daily risk estimations.

The imminent "when" earthquake's predictions are based on the correlation

between geomagnetic quakes and the incoming minimum (or maximum) of tidal gravitational potential.

There is unique correspondence between the geomagnetic quake signal and the maximum of the monitoring point of the energy density of the predicted earthquake.

The probability time window for the incoming earthquake is for the tidal minimum approximately ± 1 day and for the maximum $- \pm 2$ days.

The statistic evidence for reliability is based on of distributions of the time difference between occurred and predicted earthquakes for the period 2002-2006 for Sofia region (one component of geomagnetic vector) and 2004-2006 for Skopje (geomagnetic vector monitoring in variometer mode).

The predictions are valid for the earthquakes with magnitude greater then 3 at distance up to some 700-800 km.

The analysis of distance dependence of the prediction accuracy on the magnitude and geology as well as the non understand problems is presented.

Some results of collaboration PrEqTimPlaMagInt, which is trying to create the earthquake research and prediction NETWORK in Balkan- Black Sea-Caspian region are presented:

The Sofia and Skopje geomagnetic data and geomagnetic quake as reliable imminent regional earthquake precursor;

The preliminary analysis of Kiev and Lvov INTERMAGNET geomagnetic observatories;

The preliminary analysis of correlation between hydrogeodeformation field variations and earthquakes for Georgia;

A reliability of predictions made for the 2006 world spectral earthquake numbers;

The possibility for systematic of earthquake parameters Richter Magnitude, Seismic Moment, Intensity and Depth;

The world statistic of tide- earthquake correlation;

The correlation between global warming and increasing seismicity on the basis of Sun Spots, Sun Irradiation budget, CO_2 anthropogenic production and atmospheric concentration, Ocean level, number and energy of hurricanes is analyzed and the Project for researching the natural or anthropogenic origin of Climate change;

The distribution of the earthquake with magnitude > 4 with depth.

The project

1. History of Earthquake Prediction Research

2. Experiment

Complex research of Earthquake precursor's reliability:

Geological and seismological precursors, including depth and surface distributions of Electrical resistance and Temperature of the soil, Gravimetric isolines and priciest GPS monitoring, Hydrochemical monitoring of water sources and their Radon and Helium concentrations

Electromagnetic monitoring under, on, and over Earth Surface, including Geomagnetic and Earth Current monitoring, ULF and LF Radio wave Pulsed LF-HF-VHF Ionosphere Radio Emissions monitoring, Attitude electropotential Shuman resonance distribution,

Standard meteorological monitoring, including Ionosphere condition parameters, Earthquake clouds

Near space satellite monitoring of Earth Surface radiation and temperature, geomagnetic field and charge distribution and its correlation with surface and atmosphere data

Sun influence: radiation, storms, magnetic variations

Biological precursors

Laboratory simulation of earthquake's processes.

3. Theory

Research on the common parts of different models of Earth and its Crust conditions,Tidal processes, Earth geomagnetism, Ionosphere and magnetosphere perturbations revealed from combined satellite and ground records (Lithosphere-Atmosphere-Ionosphere Coupling), Earthquake physics models, possible unifications of above sited and new created models

Researching of empirical dependences between planet Earth condition parameter on the basis on nonlinear inverse problem methods, systematic of earthquake parameters: magnitude, intensity, depth, the size of volume and surface fault on the basis on nonlinear inverse problem methods

Global warming, ocean level and increasing seismicity Etcetera

4. Technologies

Real time data acquisition system for preliminary archiving, testing, visualizing and analyzing the data and risks estimations.

Procedures and Software for solving nonlinear problems

5. Complex World NETWORK for researching the solution of "when, where and how" earthquake prediction problem.

◄ DISASTER MANAGEMENT POST EARTHQUAKE IN YOGYAKARTA, INDONESIA

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PREFACE

On May 27, 2006 at 05.55 local time, a big earthquake with 6.2 Richter Scale hit Yogyakarta Special Region (hereinafter named as Yogyakarta) and part of Central Java. The earthquake resulted huge damages and casualties. More than 5.000 people were killed, not less than 150.000 people were wounded and many others were missing. Some 205.604 houses were totally damaged, this not to count the numerous moderately and slightly houses. A rapid assessment indicated that the total losses and damage was around US$ 30 billion.

In the recent years, Indonesia was shocked by catastrophic disasters like; tsunami and several earthquakes that occurred consecutively. There is no technology or methodology to avoid from natural disaster, what human being can do is to mitigate the disaster to reduce the loss, damage and victim, and to learn from experiences is a need to prepare such a disaster mitigation concept.

This paper is not to describe academic explanation concerning with the earthquake occurred in Yogyakarta but to provide lesson learnt for the participants to be considered as references in preparing to prepare a disaster mitigation concept.

BRIEF DESCRIPTION OF YOGYAKARTA.

Yogyakarta is located in the center of Indonesia, in the center of Java Island for precise (111ºE 07ºS). With a size of 3,185 km2 but inhibited by 3.3 million people give a population density of more than 1,300 people per km2. Unfortunately, the densest area is located right above the fault that caused the earthquake occurred in May 27, 2006.

From geological point of view, Indonesia, and indeed Yogyakarta, is located on disaster prone area or with more popular term is "on the ring of fire" , as there are two faults known as Asia-Mediteranian and Pacific Rim. The implication is not merely related with earthquake that further may create tsunami waves, but more of this will also trigger the volcanic activity.

Yogyakarta has long been known as a peaceful region with fertile land, rich of cultures, and tolerant people with thick hospitality. The last biggest natural disaster was volcanic eruption of Mt. Merapi (some 27 km. north of Yogyakarta Municipality) occurred in November 1994 with 60 dead victims. After that, the anticipation to disaster was concentrated to the volcanic eruption of Mt. Merapi without any alertness to other disasters that might occurred unpredictably in other part of Yogyakarta.

The earthquake occurred in Yogyakarta on March 27, 2006 was really a big hit on the back, as at that time the Disaster Quick Response Team was activated to watch the Mt Merapi in the north that was going to erupt, but the earthquake hit the southern part of Yogyakarta

CASUALTIES OF THE EARTHQUAKE

The earthquake hit Yogyakarta on May 27, caused a catastrophic casualties. More than 5,000 people were killed and some 150.00 people were injured, not less than 200.000 houses were totally damaged, not to account the number of public facilities that were destroyed, such as; school buildings, community health centers, mosques, churches and others. Up to now, the disaster left around 15.000 permanently wounded people and increased the number of orphans double than before.

A rapid assessment done by National and Regional Developing Planning Board indicated that the sum of total loss and damages was around US$ 30 billion, including the loss of incomes and opportunity to earn money.

THE VICTIMS OF THE EARTHQUAKE
AS PER JUNE 6, 2006 AT 15.00

NO	DISTRICT/ MUNICIPALI-TY	NO. OF VICTIMS			LOSS LIFE
		COMMUNITY	HOUSE HOLDS	PERSON (EVACUA-TED)	
1.	District of Bantul	5.632	227.030	778.251	4.480
2.	Municipality of Yogyakarta	2.355	48.244	195.456	218
3.	District of Kulon Progo	1.665	18.081	74.592	23
4.	District of Sleman*	1.074	45.127	13.543	243
5.	District of GunungKidul*	n.a.	n.a.	n.a.	84
	TOTAL	10.726	338.482	1.201.895	5.048

There were several reasons why the number of victims were enormous, among them were:

1. The earthquake hit the highly populated area with population density over 1.500 people per km^2.

2. Man-made failure to built earthquake resistant structures. Although the precondition for earthquake resistant buildings was stipulated in Building Code and Building Permit, there was lack of adherence to safe building standards and basic earthquake resistant construction methods

3. No appropriate Disaster Management System was available. Although Quick Response Emergency Team had been re-activated, it was for focused to Mt. Merapi that was indicating signs to erupt. The Team was not being prepared to manage a huge amount of casualties and never conducted training or drills in managing disaster. There was no guideline or standard operating procedure to respond to disaster available for the people.

4. Although lived on disaster prone area, people had no alertness to disaster. Yogyakarta was known as peaceful region, center of culture, outstanding tourism destination, and fertile land in moderate climate. In this situation, there was negligence among the people to aware that such disaster may occur unpredictably. This is also the reason why the people as well as government officials did not know what to do after the earthquake.

CONDITION AFTER THE EARTHQUAKE

1. Chaos, people with their own capability and skill try to help the vulnerable victims. Un-organized individual initiatives played big role in handling the situation, but within a day or two, people organized themselves to help the others based on their local wisdom and local social capital such as; *gotong-royong* (voluntarily work together).

2. Rumor arose that a tsunami wave was going to hit from the sea shore in the south (although it is 27 km away).

3. Local hospitals overloaded with excessive numbers of dead-body and wounded people.

4. Government system, especially in center of the disaster, was collapsed as most of the officials and staffs were also the victims. They all were shocked with the disaster and did not do anything.

5. The actions taken by government officials as well as people were more reactive rather then responsive.

6. The situation was worsen by the following earthquakes and rains

7. Logistics distribution system was not available at that time.

THE IMPACTS OF DISASTER
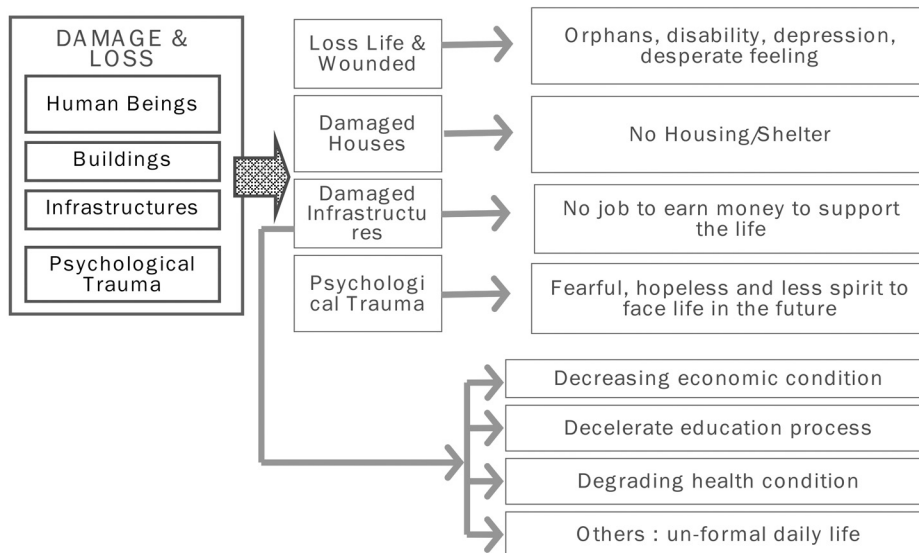
LESSON LEARNT

It is a common sense that experience is a good teacher. On the other hand it is also a bad teacher because it gives certain results that in several cases, were negative, before someone understand the lesson learnt.

The earthquake hit Yogyakarta on May 27, 2007 gave lots of precious lesson to learn, especially in anticipating other disaster that may occur un-predictably in the future. Some of the lessons are as follows;

1. Let people be alerted and "familiarized" to disaster.

Without any mean to frighten, people should be reminded that they are living on disaster prone area, and that disaster may occur un-predictably. Training, drill and simulation in anticipating a disaster should be conducted periodically.

2. Establish a reliable Disaster Response System.

It is the responsibility of the government to develop a reliable Disaster Response System and it should be regularly examined and tested to insure that the system is reliable enough to respond to any kind of disaster. Quick Response Emergency Team should be trained and follow a scheduled drill to keep their capability maintained.

3. Experience indicated that after the disaster, individuals with their own local wisdom played a big role in solving their problems resulted from the disaster. It was the people themselves who know exactly what the most urgent help they need to survive is. Local initiatives should be respected and taken into account by foreign volunteers and donors.

4. Officials and individuals should not give any fake promises just to comfort the victims. Promises that could not be realized given intended just to comfort the victims are actually against humanity.

5. It is common, days after the disaster there always an increasing distrust of the people to the government as they thought that response of the government did not satisfy them. It is important to insure people that the efforts done by the government is the duty of the government to help and protect the citizen. Political interest should be kept away from the disaster area.

6. Volunteers and Assistance Management. It is common that after the disaster, there are many volunteers and donors offer their helps and assistance. This will require a certain effort to manage all the assistances and helps so that these can be delivered efficiently.

7. Let the people to speak. Complains and critics from the disappointed victims should be properly responded by the government. This will give such a moral support to the people that the Government is concern with their problem.

HOW THE PEOPLE OF YOGYAKARTA REVIVE.

With the richness of cultures and local wisdoms, the people of Yogyakarta revive from grieves and sadness caused by the disaster. Spirit of togetherness, friendship, patience, tolerance and devotion to God the Almighty becomes our precious social capital to do the efforts of recovering the life to face the brighter future with a better social welfare for our next generation. There was a believe that the disaster was something to be happened in their lifetime and not a thing to regret, the disaster was accepted in such a patiently way as a form of their faith to the God the Almighty.

This is the spirit that encouraged people to realize that they should awake from their bad dream to start rebuild their life from the very beginning. It was like when God the Almighty initiated and ended the life of human race, from nothing to nothing.

With the characters of people as the most precious social capital, Jogjakarta began to revive. Based on the people's social capital, a Strategic Action Plan for Rehabilitation and Reconstruction has been made ready.

It was deeply realized that the burden was very heavy, and they could not manage the impact of the earthquake without aids and assistance from other regions and even other countries. It was also realized that those parties which help the people of Yogyakarta did hope that their aids and assistances should be used maximally for the shake of the people

STRATEGIC ACTION PLAN FOR REHABILITATION AND RECONSTRUCTION

1. BASIC PRINCIPLES TO THE REHABILITATION AND RECONSTRUCTION PROGRAM :

Following are some of the principles to the Program on Recovery and Reconstruction in Response to the Earthquake in Yogyakarta for 2006:

1. The people of Yogyakarta will build their self-reliantly.

2. Assistance delivered by the Government (national, provincial and district/municipal) is seen as part of the government's task of protecting and assisting its citizens.

3. The people of Yogyakarta will not accept assistance which would later on burden the people of Indonesia, for example; loan from donor agency.

4. Rehabilitation and reconstruction is based on the principle of community-based development executed on the principle of mutual participation (*gotong royong*).

5. Assistance from outside (government, donor, individual and other) will be accredited as "to help the people to empower themselves".

6. Responses not only to rehabilitate and reconstruct physical but also socio-cultural matter, and for that reason local culture and wisdom must be recognized and will form the basis in planning and implementing the program.

2. ACTIVITIES

Following are activities for implementation during each of the phases described above:

EMERGENCY RESPONSE & RECOVERY D – D+7/ D+7 – M+1	REHABILITATION M+1 – M+7	RECONSTRUCTION M+7 – Y+2
Objectives: Rescuing lives • Rescuing victims • Treating injured victims • Setting up a emergency response/ Satkorlak team • Establishing service centres (posko) • Distributing supplies (logistics, tents, etc.) • Setting up shelters • Enhancing distribution paths • Collecting data on disaster victims & impacts (media centre) • Providing psychological assistance • Shifting from development to emergency response programming	Objectives: Recovering minimum service standards: • Recovering government systems (district, sub-district, village) • Recovering public services (education, health, etc.) • Rebuilding homes • Recovering basic social services • Reconstructing basic infrastructure & facilities • Recovering economic facilities • Psychological rehabilitation • Other	Objectives: Rebuilding the entire system: • Economic system (production, trade, banking) • Transportation system • Telecommunication system • Social and cultural recovery • Institutional recovery • Shifting back (mainstream-ming) from emergency response to development programming • Other

3. SECTORAL PRIORITIES

In national level, the National Government through the Housing and Settlement Reconstruction Program and pursuant to terms and conditions of the National Disaster Management Coordinating Board for Mitigation of Disaster and Refugee Management, (Badan Koordinasi Nasional Penanggulangan Bencana dan Penanganan Pengungsi/BAKORNAS PBP, hereinafter named as BAKORNAS) will prioritize the repairing and rebuilding of housing and settlements. Relevant line ministries (in this case the Ministry of Public Works) will prioritize the repairing and rebuilding of transportation (roads, bridges) and clean water infrastructure.

Sub-nationally (on provincial level), public facilities prioritized for reconstruction are:

a. Education infrastructure and facilities: repairing and/or rebuilding school buildings, providing learning and teaching facilities, recovering teaching staff.

b. Health infrastructure and facilities: repairing and/ or rebuilding health service centers (PUSKESMAS, hospitals, POSYANDU, etc.), supplying/ replacing medical equipment, recovering health workers.

c. Economic infrastructure and facilities: repairing and/or rebuilding traditional markets, repairing irrigation systems, empowering Micro, Small and Medium Scale Enterprises (MSMEs), repairing access to markets, etc.

Locally (village and sub-village level), the identification of reconstruction priorities will take into account local wisdoms agreed on by communities.

4. LEGAL ASPECT

Unless arranged otherwise, any activity implemented under the Program on Recovery and Reconstruction in Response to the Earthquake in DIY for 2006 must be based on laws and regulations in effect in the Republic of Indonesia, including both statutory regulations at national level (laws, government regulations and their derivatives) and local level (local regulations and their derivatives) governing amongst others the following areas:

a. Immigration

b. Security and order

c. Spatial planning

d. Construction (building permit and other similar permits)

e. The environment

f. etc.

It must be noted that the earthquake disaster hitting DIY in 2006 is not an excuse for overriding laws and regulations in effect.

BASIC CONCEPT FOR IMPLEMENTATION

1. HOUSING CONSTRUCTION

▪ Extent of assistance from the National Government through BAKORNAS for housing was based on damage extent of houses (collapsed, heavily damaged, lightly damaged) as defined by criteria set by BAKORNAS.

▪ Construction of housing should not be contracted to third parties, but instead be done self-sufficiently by the community using local cultural mechanisms (*gotong-royong*, village deliberations, etc.). Residents have the right to decide on house model, construction timeframe, building material, etc. as far as it suited to earthquake resistant criteria.

▪ Local governments (provincial and district/municipal) should provide technical assistance either on technical aspects of building earthquake-resistant constructions or social aspects concerning with procedure in applying Building Permit, withdrawing of fund and others.

▪ Housing construction assistance from institutions/agencies/ donors must heed the concept of autonomy and prevent social jealousy among communities.

▪ Any individual and party implementing housing construction must follow relevant rules and permit requirements of each region (district/ municipality), e.g. disturbance permit, building permit, etc. Designs must follow earthquake-resistant building codes.

2. CONSTRUCTION OF PUBLIC INFRASTRUCTURE

▪ Construction and rehabilitation of public infrastructure (roads, bridges, and office buildings) was the responsibility of the government. Any assistance from other agencies must be notified to and receive permission from the local government.

▪ Construction may be done in cooperation with third parties (contractors) pursuant to goods and services procurement regulations in effect.

▪ Any individual and party implementing housing construction must follow relevant rules and permit requirements of each region (district/ municipality), e.g. disturbance permit, building permit, etc. Designs must follow earthquake-resistant building codes.

OUTSIDE ASSISTANCE

The Provincial Government of Yogyakarta and all Yogyakarta's district/municipal governments were very grateful for the assistance delivered by other parties (institutions/agencies/donors) for managing the emergency phase, recovery phase and later on the rehabilitation and reconstruction phase.

It is recognized that during and after the disaster the Republic of Indonesia and local (provincial and district/municipal) governments have received generous assistance from other agencies, be they bilateral or multilateral, though it is reminded that in principle the Provincial Government of Yogyakarta has not called for assistance from any party whatsoever.

Considering that offers for assistance from outside agencies continue to be considerable, there is a need for identifying specific needs required for each phase of the Program on Recovery and Reconstruction in Response to the Earthquake in DIY for 2006 to ensuring beneficence and effectiveness.

N	PHASE	ASSUMPTION	ASSISTANCE REQUIRED
1	EMERGENCY PHASE	▪ Situation chaotic, communities impacted and rendered vulnerable ▪ Local Government immobilized ▪ Economy paralyzed	1. Medical supplies (traumatic centre, medicines, doctors/ paramedics, ambulances, etc.) 2. Transportation (land, air) 3. Coordinators and volunteers 4. Logistics and its distribution 5. Communication support 6. Media centre 7. Shelter/tents 8. Assistance administration mechanism 9. Etc.
2	RECOVERY	▪ Situation less chaotic, communities starting to meet primary needs individually or in groups ▪ Local Government starting to consolidate itself ▪ Economy paralyzed	1. Medical supplies (traumatic centre, medicines, doctors/ paramedics, ambulances, etc.) 2. Transportation (land, air) 3. Coordinators and volunteer 4. Logistics and its distribution 5. Communication support 6. Media centre 7. Shelter/tents 8. Assistance administration mechanism 9. Human resources for data collecting and damage assessment work 10. Etc.
3	REHABILIATION	▪ Situation under control, communities starting to consolidate themselves, logistics needs maintained ▪ Local Government starting to function ▪ Economy starting to come round	1. Community health centers 2. Land transportation 3. Public works experts 4. Human resources for data collecting and damage assessment work 5. Logistics 6. Building material 7. Psychologists 8. Heavy equipment for rubble removal 9. Etc.
4	RECONSTRUCTION	▪ Situation under control, communities returning to work and meeting needs on their own	1. Technical assistance according to need 2. Public works experts 3. Auditors 4. Building material 5. Etc.

CONCLUSION.

The earthquake that hit Yogyakarta Special Region and Central Java on Saturday, May 27, 2006 was a catastrophic disaster that caused a great loss, in terms of moral as well as material losses, which were very difficult to heal.

With the richness of cultures and local wisdoms, the people of Yogyakarta started to revive from grieves and sadness caused by the disaster. Spirit of togetherness, friendship, patience, tolerance and devotion to God the Almighty became the most precious social capital to do the efforts of recovering the life to face the brighter future with a better social welfare for the next generation. This is the reason why the rehabilitation and reconstruction program was based on the principle of community-based development executed on the principle of mutual participation (*gotong royong*) and also that assistance from outside (government, donor, individual and other) should be accredited as "to help the people to empower themselves"

The Local Government and the people realized that the burden was very heavy, and they could not manage the impact of the earthquake without the aids and assistances from other institutions, regions and even other countries. Good and professional management of the aids as well as the assistances was a key factor to the effectiveness of the distribution to the beneficiaries. This indeed, will need a complete identification of specific needs required for each phase of the Program on Recovery and Reconstruction in Response to the Earthquake.

◀ ACTIVITIES AFTER EARTHQUAKES IN BULGARIA

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1. Introduction

In Bulgaria the earthquakes are relatively frequent events. About 1100 earthquakes are known that should have been felt in Bulgaria since ancient times (s. the catalogues of the region). For the time when the intensity was leading value for earthquake parameters estimation, i.e. till 1980, the territorial distribution of felt earthquakes in Bulgaria, with or without damages, was as in Fig. 1. During the latest XX and the early XXI century, some of the earthquakes disturbed seriously the population and let the people feel powerless. They concerned the whole country or some smaller regions. The 1977 Vrancea earthquake (Mw=7.4) caused human losses, destructions and deformations, also fear in almost all people [Grigorova et al., 1978; Brankov /ed./, 1983]. The 1977 Velingrad (M=5.3) [Petrov et al., 1980], the 1986 Strazhitsa (M=5.1 and 5.7) [Glavcheva, 1987; Christoskov et al., 1988], the 2002 Krumovo (M=4.2) [Glavcheva et al., 2003], the 2006 Kurdjali (M=4.5) [Hadjiyski, Glavcheva, 2006; Glavcheva et al., 2006] earthquakes, etc, caused local problems. The great part of weaker earthquakes attracts the attention of the population in small localities.

In all the cases the seismic phenomena must be localized. The information for them must be distributed. The earthquakes must be studied. The people need special attention.
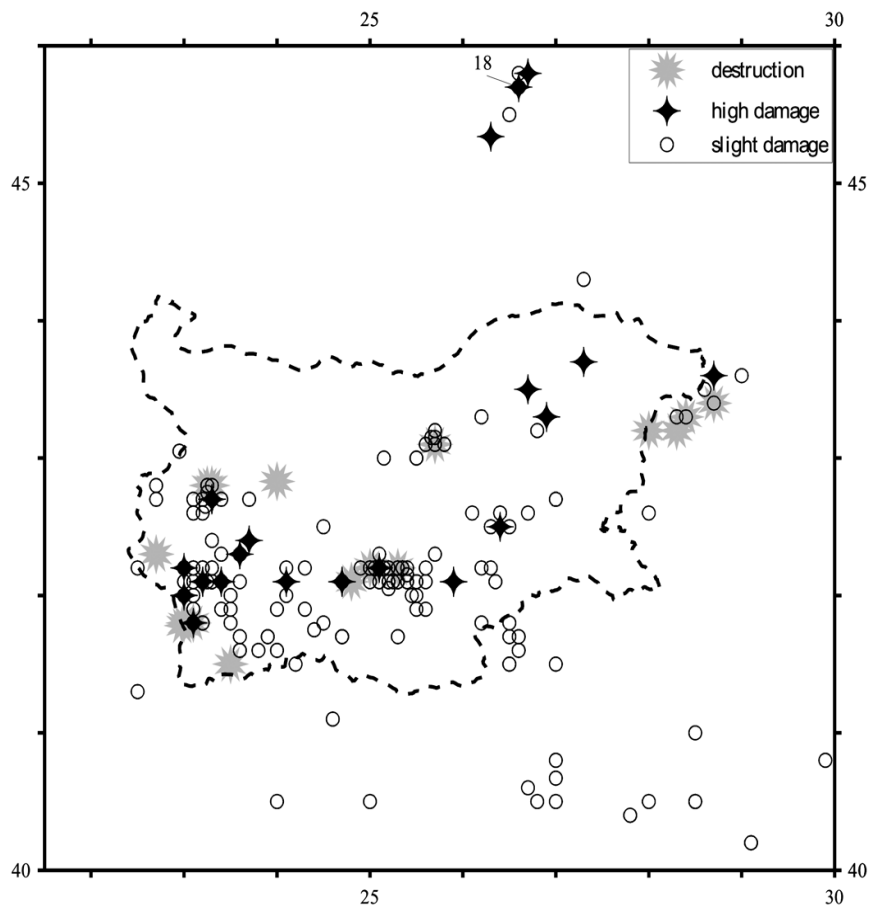
Figure1. Earthquake epicenters of events which caused intensity 6 MSK or more in Bulgaria
occurring prior to 1980 – in each epicenter maximal intensity in Bulgaria is marked

2. Expected consequences and which way to overcome them

The experience in investigating and study of earthquakes allow outlining the consequences expected in case of a strong seismic impact. We propose here the systematization of such kinds of effects that has been given to the responsible authorities in the Ministry of State Policy for Disasters and Accidents of Bulgaria.

Expected Consequences of a Strong Earthquake
- Complete and strong destruction of a part of the buildings;
- casualties, buried people;
- a great part of the population remaining without any shelter;
- damaged system of electricity supply;

- damaged water pipelines for drinkable water and difficulties in ensuring fresh water for the population;
- shortage of water for technological needs – stopping of some productions (for example in food industry)
- danger of fires – a complicated fire situation;
- significant damages of hydrotechnical equipments, danger of floods, even disastrous in some places;
- damages of road equipment (bridges, overhead crossings, tunnels) – disturbance of automobile and railroad traffic;
- disturbed National communication system;
- disturbed technological processes in industrial sites – danger of explosions and chemical pollution;
- a possibility of epidemic situation;
- losses in livestock – urgent need of veterinary-sanitary and incinerator operations.

Under the hard conditions in case of a strong earthquake some activities should be with preference. Hereafter, an excerpt from the National Programme for Fight against Disasters follows.

Main tasks after a strong earthquake

Reconnaissance of usable routes (roads) in the damaged area;

To organize passages for introducing the teams for carrying out rescue, damage and supply activities;

To pull out people from the ruins;

To build up temporary roads and bridges for evacuation of the population;

To secure drinkable water immediately and the water supply systems to be repaired;

To secure electrical energy for the rescue work

To stabilize or liquidate dangerous structures;

To establish temporary medical posts;

To equip water and food supply posts;

To organize the police service for keeping the order

The same hard conditions need an excellent coordination and very stable interaction between the responsible bodies. Recently, a variant of a system for state response to strong earthquakes was proposed [Christoskov, 1995]. The scheme in (Fig. 2) of this study is a supplemented, improved version.
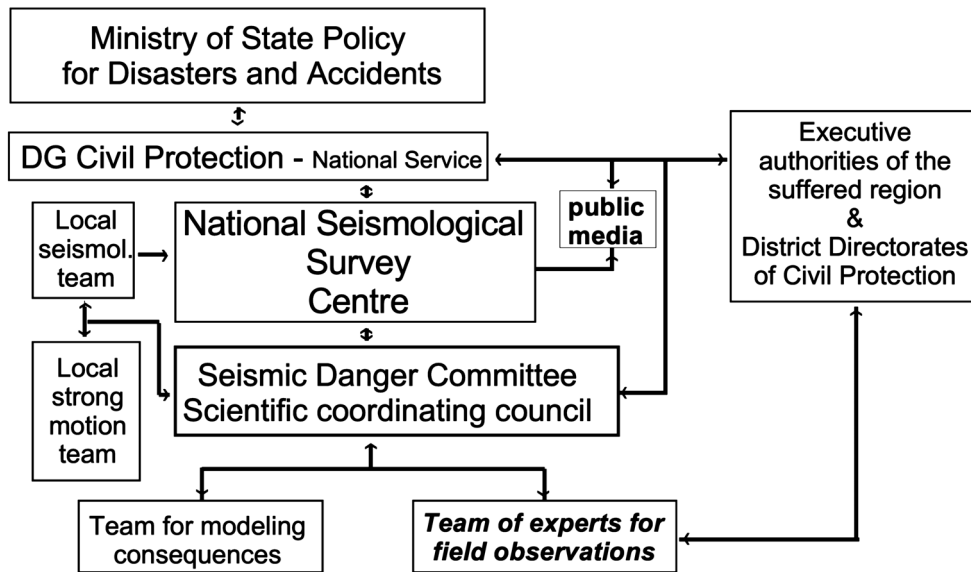
Figure 2. Principal scheme of interaction between sources of information and state bodies

3. First seismological activities after felt earthquakes

When the seismic activity is in a process of realization, the Geophysical Institute at Bulgarian Academy of Sciences is the responsible institution, the source of general information, and a consultant about what has happened, what might proceed and which the appropriate actions would be. That is why the seismological team on duty which acts in the Operative Center at the Geophysical Institute keeps the specialized equipment under good working conditions to ensure continuous seismic data flow. This experienced staff of experts uses proved seismological approaches to obtain reliable earthquake solutions. When felt earthquakes in Bulgaria occur, this team, in close contact with The State Agency for Civil Protection, realizes a fast macroseismic survey on strongest effects' distribution by phone communication.

4. Preparation for field observations

If the case is considered interesting for detailed survey – large felt area like at earthquakes from the Vrancea source (Romania), a case of Bulgarian shallow earthquake of M5 or more with plenty of aftershocks expectable, felt area with great possibilities of appearance of secondary surface effects, etc. – the field investigation team (seismologists and earthquake engineers, as a minimum) is called to an express discussion on the specific tasks of the forthcoming field inspection and equipment needed. Depending on the case, specialists in geology (tectonics, engineering geology, soil conditions, etc.) also participate in the team.

After very quick preparation of the transport, the equipment, and the experts, the completed group for field observations contacts the Civil Protection Agency to ensure free access to the strongly affected zone. Figure 3 illustrates the activities and contacts in the time of a field expedition.
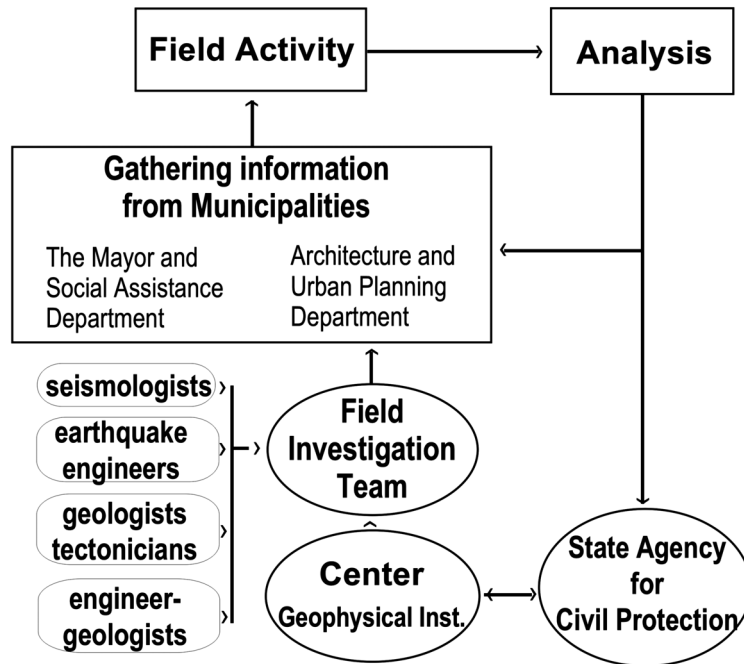
Figure 3. System of operational connections at nowadays field investigations

5. *Start of the field observations in situ*

In the area for inspection, the team contacts firstly the local authorities. The experts receive generalized information about the events and their influence from each suffered locality. The information includes:

– State of the building stock: typical damage and top damages (the experts ask for the locality cadastral map);

– Amount of objects belonging to each constructive type (in general);

– Territorial distribution of light to heavy damages (ask the corresponding districts to be marked on locality cadastre);

– Territorial distribution of terrain and soil peculiarities (ask to mark on locality cadastre)

– State of the infrastructure, electricity supply and drinking water supplying equipment;

– The human behavior under extreme conditions;

– Circumstances in the settlements around.

Very often the contacts with the local authorities are followed by supplementary expert engagements. This happens because the local power has a lot of problems after the earthquake and its aftershocks. The local authorities need, in fact, to obtain advices concerning their next activities in the seismic activated territories from the experts that had visited them. It is well to have a good coordination in the works of the experts and the local authorities.

The local authorities usually ask the experts for organizing meetings with the inhabitants of the territories with considerable influence of the seismic movements. It is very important for the people to receive information and primary recommendations from the experts who had visited their settlements and surroundings.

Being acquainted with the situation after an earthquake, the experts, who plan to visit the epicentral zone, include in their working program meetings with the local authorities and the population. These meetings represent a reasonable part of the activity of the experts.

A quite responsible task of the field team is to install seismographs and/or strong motion instruments for recording next shocks, especially the weakest ones.

6. Field observation of the building status

One of the most responsible tasks of the experts consists in direct inspection of buildings. The inspection is usually accompanied by a certain local responsible. In this way, the inspection is leaded by the municipality interest and it gives competent advices to the inhabitants of the constructions. When the field team does not include local representatives, the inventory of effects is made according to the schemes in Fig. 4.
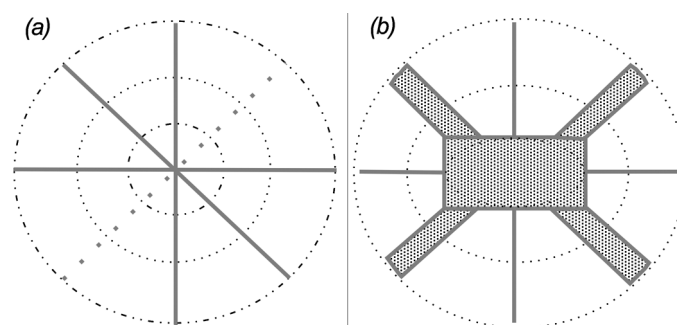
Figure 4. Typical schemes for conducting a seismological field inspection
(a) weak earthquakes – radial;
(b) strong earthquakes – the whole epicentral area (the ellipse) and almost radial to the periphery

Public buildings need special attention because they are visited from a great number of people. An important activity is to inspect those public buildings which are specified by the local government like schools, libraries, cultural and sport buildings, etc. need

The next task is to inspect private residential constructions in order to systematize most frequent damages to different types of buildings. The owners of these constructions ask advices what to do in the future.

The team of the experts usually helps the local authorities and the people by experienced intervention into the visited sites. It proposes consultations on how to restore some structures.

The rapid observation of the damaged constructions and the quick information about the seismic effects that is received from the inhabitants permits to form the first impression referring to the earthquake influence. Thus, on the basis of the accumulated initial impression, the time comes for some exchange of useful preliminary conclusions with the local people.

The expert missions for the field observations are of big importance for the study of the seismic phenomena. They give objective assessment of the seismic effects.

These missions ensure possibility the experts to get into contact with the people hurt by earthquakes. The visit of experts in the suffered places gives knowledge to the population about the earthquakes. The discussions with the local people inspire belief in consecutive decrease of the seismic activity. The expert missions have not only significance for the scientific research, but they ensure the psychological support to the population.

7. Finalization of the activities

The collection of data from the field observation is a subject of a number of further analyses. In most cases the data collecting is limited. It depends on the number of experts, duration of the mission, frequency of shock occurrence etc.

The field observations during expert missions permit to localize the macroseismic epicenter. Distinguishing the macroseismic (of the intensity field) from the instrumental epicenter suggests which direction the new rupture has developed. The express observations, not influenced by aftershocks, give knowledge not only on the earthquake already occurred but represent very useful scenario for the future distribution of the seismic effects.

The results from the analyses represent the finalization of the undertaken work which refers to the consequences inspection; the work on instrumental records is forthcoming. The obtained documents include tables, schemes and important assessments proceed from the analysis. The documentation is well saved by the experts in the archives of Institutes and Laboratories of the Bulgarian

Academy of Sciences. It serves in the scientific investigations and is predominantly used in preparing reports to the Council of Ministers.

The final results are delivered to The State Agency for Civil Protection. Abstracts of them are sent to the mayors of the inspected villages or towns.

At present, there are new perspectives for knowledge distribution. The Internet reveals new possibilities for the dissemination of the obtained results for the seismic history of the activated region and the field trip observations in the epicentral areas. These possibilities are rationally used in our days. In this way, the results from the field observations are accessible and at disposal of plenty of people of different professions all over the world.

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GLOBAL CLIMATE FLUCTUATION AND CYCLICITY OF THE VOLCANIC ACTIVITY

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The arguments of the international experts and various scientists on the reasons of the global climate fluctuation were analyzed. On the basis of studying the cyclicity of volcanic eruptions of Earth the conclusion on the important role of volcanic activity on the global warming was accepted. The researches, carried out by the authors, have shown that, the increasing of the activity of volcanoes brings to the increasing of the concentration of volcanic gases in the atmosphere. Consequently, the greenhouse effect, which brings to the global increasing of the temperature of atmosphere of the Earth, becomes stronger.

INTRODUCTION

In later years the great attention is given to the problem of climate fluctuation. The special expert structures of UNO have come to the conclusion, that during the last centuries the main reason of the global fluctuations of the climate is the man-caused activity of the man. But is it the main reason of the global warming in fact?

At the first half of December 2007, in Indonesian island Bali was held the next conference of the parties of Framework convention of UNO about climate fluctuation. In the Bali conference the solution of the matters, determining the future of climatic process were expected in the first place. Two key points of the agenda were:

1) The long term cooperation on the solution of the problems, connected with the climate fluctuation, and

2) The future obligations of the developed countries in the framework of Kyoto protocol. The compromise has been found, the coordinated solutions have been confirmed, but the future of the climatic process still remains not quite obvious.

The deep reasons of the indefiniteness are both connected with the history of

the international relationships on the stabilization of the climate (in particular, accepting the Kyoto protocol and refusing of the USA its ratification), and with changes of antropogenic emissions of the greenhouse gases in the global structure.

We consider necessary to give a brief information. The framework convention of UNO on the climate fluctuation was accepted in 1992 in response of scientific evidences which stated that, the global climate fluctuation is determined by antropogenic changes of the content of the greenhouse gases of the atmosphere. Series of consequences of the warming, particularly, the increasing of the frequency of extreme weather demonstration, the thawing of the mountainous glaciers, the raising of the ocean level negatively influence on the condition of the natural environment and development of the society. The long term purpose of the Convention was proclaimed the stabilization of concentrations of the greenhouse gases of the atmosphere in such level that will not make the dangerous antropogenic influence on the climatic system of the world. The key form of the activity on the softening of the climate fluctuations was accepted the limitation of the antropogenic emissions of greenhouse gases (hereinafter the term "the measures of softening" will be used correspond to the activity which is connected with reducing of the emissions of greenhouse gases and strengthening their absorption (for example, in planting of the forests). Inasmuch as the emissions are mainly connected with combustion of fossil fuel, which is the main source of energy in the modern world, this kind of the long term goal of FCCF UNO inevitably should have been reflected on the development of the world economical system.

The main element of the Convention became the principle of the common but differential responsibility. All countries were divided into two groups: the developed countries (countries of the USA, Canada, RF, Japan, Australia, New Zealand) and the developing countries. The full list of the developed countries stated in Annex1 of FCCF UNO. According to the Convention, the countries which were included to Annex1, must take an active part in the struggle of climate fluctuation and its negative results. Besides the limitation of the national emissions of greenhouse gases, regulations of FCCF UNO obliges the developed countries to supply the financial and technological resources to the developing countries for the softening measures, for the more vulnerable countries – for adaptation to the climate fluctuations. The countries of the Annex1, which carry out the transmission to the market economy (including Russia) was submitted the definite degree of flexibility in the implementation of their obligations.

The majority of the regulations of FCCF UNO have been formed in the common order, their detailing is realized with the decisions of the annual conference of parties of FCCF UNO. These decisions become the juridical compulsory ones for all countries-participants of FCCF UNO. The first conference of the parties was held in 1995 in Berlin, the conference of Bali became the 13th.

The Kyoto protocol to FCCF UNO was accepted in 1997 for the hardening of the obligations of the developed countries. The protocol has a limited period for the implementation (2008-2012) and states for every country the strictly defined levels of the emissions till the end of this period. So, the emissions in 2012 must be no more than 93% in the USA, in the European union – 92%, 100% – in Russia. By the Kyoto protocol the financial mechanisms which assist in the implementation of the obligations of the developed countries, were introduced, in particular, in the trade of the quotas on the emissions, mutual implementation, the pure development. (The essence of the trade on the quotes is that the countries which are not able to realize their obligations on the reducing of emissions, may buy the quotes from the countries which overfulfiled their obligations. The projects of the mutual implementation are realized among countries which are included to Annex No 1, in this case the country which makes the investment, acquires a right to reduce the emissions, that is the result of the project. The mechanism of the pure development is used in the case if the country of the project is the developing one).

In order to join into force the ratification of Kyoto protocol by the countries-participants was necessary. The ratification of the protocol by the developing countries, which don't have the qualitative obligations on the reducing the emissions, has mainly passed with success. In the developed countries the process was going hardly. In 2001 the republican administration of the USA declared the rejection to ratify the Kyoto protocol. After the USA followed Australia, however now the position of the country has changed. During Bali Conference Australia declared about ratification.

We, in no way, set the task to enter into polemics with the expert structures of UNO regarding the conclusions made by them. Our goal is to show that, against the background of negative pernicious influence of the man-caused activity of humanity on the natural environment, in particular, on global climatic changes, the role of the endogenous geological processes which also negatively influence on the climate fluctuations in worldwide level, cannot be minimized. Summarizing the long term researches on the investigation of space-time conformity of the volcanic and seismic activity of Earth, it is very hard for us to avoid the expression that currently the observed global climate fluctuations, especially the global warming, to a greater extent, arise on the background of the activity of the magmatic volcanoes, the lines of oblateness of the Earth, keeping this tendency during last 200 years.

During writing the present article, we used the materials of the report (2007) of the Intergovernmental commission on the climate fluctuations (IPCC).

So, according to the data of IPCC, in 2007 the concentration of CO_2 in the atmosphere was 380 pro mils. Every year the activity of people increases this number. Some scientists-climatologists and economists, such as David Stern and James Hansen consider that the concentration in 450 pro mils is maximum permissible

value in order to avoid the harm which CO_2 will do to the ecosystem and economy of the planet.

In XX in the natural run of the natural processes involved the influence of the humanity, which became notable in ice-borne sediments. The antropogenic concentration of atmospheric nitrates and sulphates is increased: during 100 years the content of anions in ice SO_4 (-2) has been increased in three or four times, from 1950 began to increase the concentration of NO_3 (-), which could be redoubled because of motor transport emissions.

However, according to the opinion of IPCC, the humanity influences on the climate by the increasing not so much the aerosoles, as greenhouse gases: CO_2, CH_4, NO_2 and freons. The detailed observation of the concentration of CO_2 in the atmosphere during long years are carried out in the observatory of Mauna-Loa (Hawaii islands) and in the south pole. According to these data, from the beginning of XIX century till 80s of XX it was increased from 285 ppm which is typical for the interglacial conditions, to 335-338 ppm, which does not have analogues in the data of holes from Vostok station. The modern concentration of methane in the atmosphere is equal to 1.7 ppm and 2.5 times more than the maximum which is revealed to the core from the region of Vostok station (IPCC, 2007).

If to compare the current concentration of greenhouse gases with the definite on glacial core for pre-industrial epoch, it turns out that, during last two hundred years their growth was 25% for CO_2, 100% – for CH_4 , 8-10% – for NO_2 (IPCC, 2007).

The last indications agree with the data about the scales of combustion of the mineral fuel, however the common growth of content of greenhouse gases in the atmosphere –with increasing of the population of the Earth, which have been increased for 200 years from 1 to 5 billion people. It means that, namely the growth of the population bring the humanity closer to the ecological catastrophe (IPCC, 2007).

Actually the glacial-interglacial fluctuations test on itself the influence of the quick-feedback, conditioned with the existence of water steam in the atmosphere, of the cloudiness, the snow cover and sea ice, as well as more long, slow alterations in the structure of the atmosphere, that transfer the cold conditions of the glacial epoch to interglacial ones.. In order to understand the mechanism of these processes should be researched the sensitivity of the global climate to the fluctuations of the concentrations of the greenhouse gases (IPCC, 2007).

It is known that, the warming-up of the earth surface under the influence of antropogenic factors during last century was 2 Wt/m2, and in future because of the expected doubling of concentration CO_2 in the atmosphere (from 300 to 600 ppm) it can reach 4 Wt. It seems that it is not so much in comparison with the average

stream of the absorbed solar radiation equal to 240 Vt/m2, but this value also brings to increasing of the surface temperature on average on 1.2o C. Taking into consideration the stated effects of the feedback, increasing such heating, the common warming may be considerable. The modern measurement is 2.8-5.2o C (on average 4⁰ C). This is three times more excluding feedback relations. Namely this value defines the sensitivity of the climate to the increase of the concentration of the greenhouse gases (IPCC, 2007).

Thus, during the last climatic cycle the contribution of the greenhouse gases to the temperature fluctuation in Central Antarctica may fluctuate in the frame of 40-65% or approximately $50 \pm 10\%$. It means that approximately 3^0 out of 6^0 C are the amplitudes of the glacial-interglacial changes – form in the result of greenhouse effect (IPCC, 2007).

However "the greenhouse" warming comes forth, in the result of it may thaw some ice covers, and water level will be 5-7 m increased only during dozen of years. It will be really global catastrophe: many countries (for example, Holland), the biggest cities of the world –New York, Tokyo, St. Petersburg and others- will be under water (IPCC, 2007).

This is the chain of reasoning, which lasts from the ancient ice core extracted from the depth of more than 2 km, to the future of the environment considerably depending on the conscious activity of the humanity (IPCC, 2007).

We, practically word for word quoted more tensive points of the report which are given on the site in order to exclude the possible reproaches in the inaccuracy of their statement.

1. POSSIBLE REASONS OF GLOBAL CLIMATE FLUCTUATIONS

The position of IPCC is well-known. Now let's try to consider the main geological factors which also may influence on the global climate fluctuation.

Let us consider the main geodynamic factors which also may influence on the global climate fluctuations:

1. Drift of the geographical pole of the Earth;
2. Drift of the geomagnetic pole of the Earth;
3. The change of the angle velocity of rotation of the Earth;
4. The increase of the endogenous, particularly, volcanic activity of the Earth.

In 123 b.c.b Hyparch discovered the phenomenon of precession of equinoxes. In 1755 J.Bradley discovered the other phenomenon – nutation of the rotation axis of the equator. In Fig 1. is shown the trajectory of the movement of the north geographical pole 1996-2000.
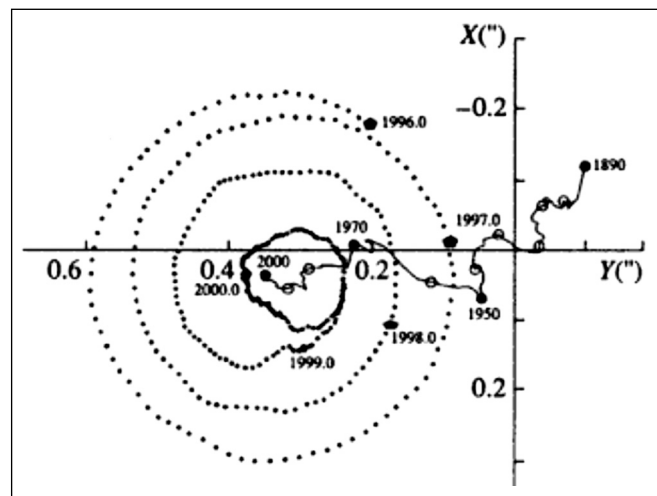
Figure 1. The trajectory of the movement of the north geographical pole in 1996-2000
Full curve – the trajectory of the middle pole from 1890 to 2000 (according to the
data of the international service of the Earth rotation, 2000)

The maximal moving off the instant pole from the middle one was noted in 1996. Then the pole began to twist, and in 2000 approached to the minimal distance to the center of the spiral. From 2000 to 2003 the pole was untwisting, but now again begin to twist, gradually resettling along the spiral to its middle position (N.S. Sidorenkov, 2004).

The moving off the instant pole from the middle one does not exceed 15 m. The untwisting and twisting of the trajectory of the instant pole are explained by the fact that it makes two periodical movements: free or Chandler (is called in honour of the man who discovered it in 1891 S. Chandler), with the period of approximately 14 months and the forced one with the period of a year.

The Chandler movement arises when the axis of rotation of the Earth is deviated from the axis of its biggest moment of inertia. The forced movement is caused by the influence of the periodical powers of the atmosphere and hydrosphere to Earth, which have a yearly cyclicity. We will not stop on the principles of Chandler and many other types of movements of axis of the Earth, very well described in the work of N.S. Sidorenkov (2004). Meanwhile, it is obvious that, the difficult fluctuations of the axis of the Earth and as a consequence of it, of its geographical pole influence on the global climate processes, because namely "oscillation" of axis of the Earth arise the seasonal changes of the climate.

In figure 2 is shown the graph which characterize the movement of the geomagnetic pole. As it is seen in the graph, to the end of 90s the velocity of drift of the geomagnetic pole was increased five times in comparison with 1980. This fact may testify the considerable changes in the energetic processes of the core of Earth,

which forms the geomagnetic field of our planet. Undoubtedly, this fact may testify the beginning of the next cycle of the sharp activation of the endogenous activity of the Earth.
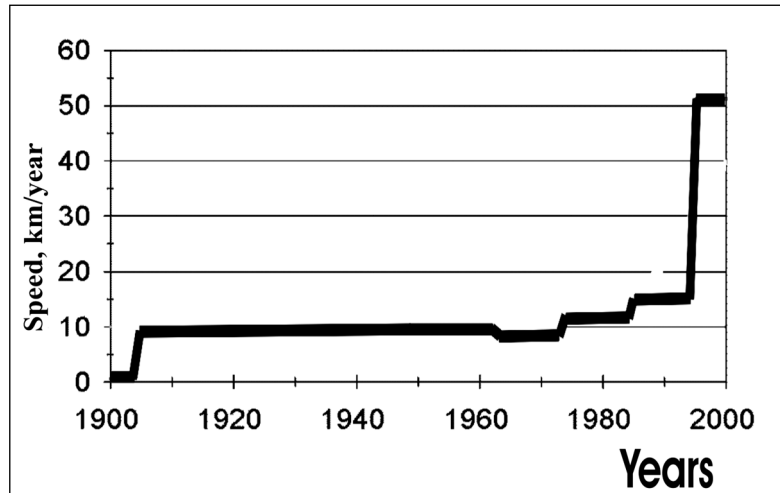
Figure 2. The speed of movement of the geomagnetic pole (Cocourov V.D., 2006)

On the other hand, as it is known, the geomagnetic field forms the peculiar magnetic screen, which prevents the penetration of solar radiation, including the charged particles of the high energy to the surface of Earth. At the same time in the field of the polar caps there are the so called cusps – the polar holes. As a result of it, the radiation material of the solar wind and interplanetary space is directed to them, i.e. the additive substance and energy began to fall to the polar fields, that brings to the "warming-up' of the polar caps. It is natural that, the changes of the position of the geomagnetic poles bring to displacement of the cusps. It is natural that, this process must cause rearrangement of the system of the cyclones and anti-cyclones in our planet that brings to the severe global climate fluctuations.

2. THE VOLCANIC ACTIVITY AND GLOBAL CLIMATE FLUCTUATIONS

Meanwhile, as it was mentioned above, in the report of IPCC the main reason of global climate fluctuations is called the sharp increase of greenhouse gases in the atmosphere of the Earth. At the same time it is obvious that, during eruption of the volcanoes to the atmosphere of the Earth is emitted the big volume of different gases, including the greenhouse ones: CO_2, CO, SO_2, H_2S, CS_2, OCS, NO. The concentration of the carbon dioxide fluctuates from 1 to 10% of the common mass of the volcanic gases, CO is 0.1-0.7% (Gerlach N.M., 1980).

The sulphur content of the volcanic eruption most pernicious influences to

the global climate fluctuations. During eruptions of volcanoes to the atmosphere, sulfur dioxide SO_2, hydrogen sulfide H_2S, carbon bisulfide CS_2, carbonyl sulfide OCS and the particles of the hard sulfur is emitted. In the works of Cadle is shown, that the gas SO_2 is approximately 10% from all gas emissions of the volcanoes, and its annual emissions are $2 \cdot 10^7$ t. (Cadle R.D., 1975). The analysis of the emissions of the volcanic gases showed that, the main sulfur-content gas is SO_2 (2-10 Mt/year). As a whole, in the volcanic gases the part of the sulfur gas is from 1 to 10% (Athaturov M.L. and others, 1986).

The analysis of the changes of concentration of CO_2 in the atmosphere of the Earth in the geological past and comparison of these data with the level of the volcanic activity is of great interest. The results of these researches are shown in Fig. 3 (Athaturov M.L. and others 1986).
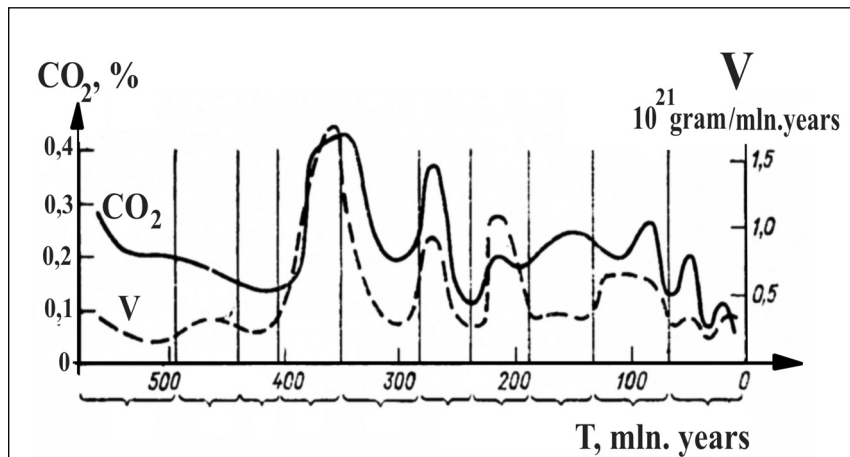
Figure 3. The changes of the amount of the carbon-dioxide gas in the atmosphere and the speed of the formation of volcanogenic rocks during phanerozoe (Athaturov M.L. and others 1986)

In figure 3 is seen that, the concentration of carbon dioxide gas in phanerozoe was changing from 0.1 to 0.4%. The volcanic activity in the scheme characterizes the speed of formation of the volcanogenic rocks during phanerozoe.

In figure it is clearly seen that, in the volcanic activity of phanerozoe the cycles with periods 80-100 million years stand out sharply.

The results of the comparison of the schemes show the existence of the direct dependence of the concentration CO_2 on the volcanic activity. To our point of view, interesting and important specification of the dependence is the delay of the increase of the concentration of CO_2 relative to the speed of formation of the volcanogenic rocks, which is distinctly seen in Fig.3. It is absolutely logical if to proceed from the principle cause-effect relation: first, the activity of volcanic eruption

is increased, then the concentration of CO_2 in the atmosphere and the sequence of these processes has the definite delay in time. The more the scale of the considered period of the cyclicity, the longer the time of delay.

Carbon-dioxide gas is transparent for the short wave radiation, but it absorbs the long wave radiation of the electromagnetic waves in several diapasons. As a result of it, it is essential factor which makes the greenhouse effect, increasing the temperature of the bottom layer of the air of the atmosphere of the Earth.
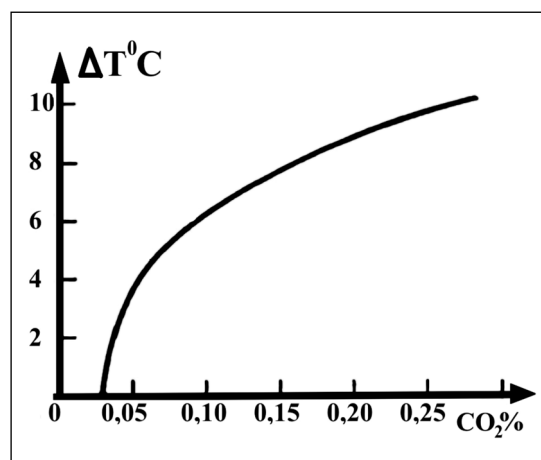
Figure 4. The dependence of the average temperature of the air on
the concentration of carbon-dioxide gas (Budico M.I., 1979)

In the researches of the connection of concentration of CO_2 in the atmosphere and average annual changes of the temperature is used the logarithmic dependence, which is shown in fig.4. Budico M.I. researched this dependence according to the empiric data on the basis of the research of the geological past. In the works of Budico M.I. is shown the presence of the direct connection between volcanic eruptions and global climate fluctuations (Budico M.I., 1968-1984).

We reviewed some main works, which show the presence of the objective and reliable connections between volcanic activity and global climate fluctuations.

The limitation of the volume of the article does not allow to submit larger review of multiple researches in this field. Meanwhile, from our point of view, even the mentioned works are strong enough evidence of connection of the volcanism with climate of the Earth.

3. THE RESEARCHES AND RESULTS

For the clearance of the degree of the possible influence of the cyclicity in the eruptions of the volcanoes to the global warming of the climate, we compared the graphs of the average fluctuation of the temperature on the Earth and average number of eruptions of magmatic volcanoes of the oblateness lines of the Earth from 1850 to 2000, Fig.5.
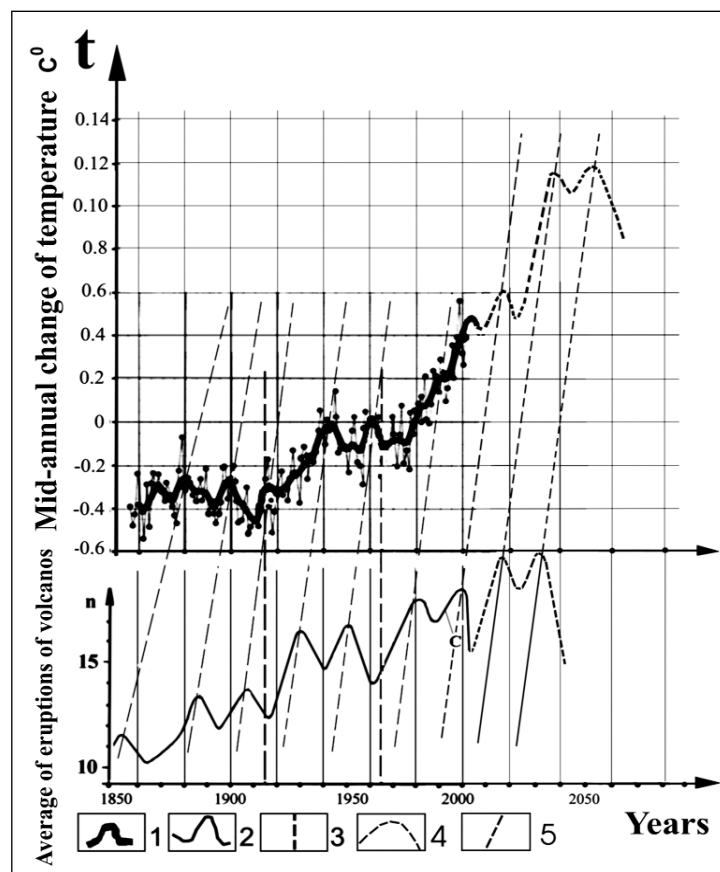
Figure.5. The comparison of the graphs of the average fluctuation of the temperature on Earth and average number of eruptions of the magmatic volcanoes lines of Earth oblateness from 1850 to 2000 (Khain V.E., Khalilov E.N., 2004).
1 – the graph of the fluctuations of the temperature on the Earth in C^0
(the prognosis part of the graph was added by Khain V.E. and Khalilov E.N., 2008)
(http://www.seed.slb.com/ru/scictr/watch/climate_change/index.htm);
2 – the graph of the volcanic activity; 3 – straight lines, limiting double cycles of the volcanic activity and fluctuation of the temperature; 4 – prognoses parts of the graphs of the average fluctuation of the temperature and volcanic activity; 5 – straight lines, connecting the points of extremum of the cycles of the volcanic activity and variation of the annual temperatures.

As it was noted in the previous chapters, approximately 90% of a part of energy and emissions to the atmosphere is released during the eruption of the magmatic volcanoes of C type.

The comparison of the graphs showed the high similarity of characters of changes in time both the annual temperature, and volcanic activity. Both graphs can be symbolically divided into three periods: 1853-1915, 1916-1965, 1966-2000. Each period is characterized by sharp increase of both temperature and volcanic activity in 1915 and 1965. It is notable that, in the first period on the both graphs three cycles of the activation are distinguished. In the second period –two cycles, in the third period – also two incomplete cycles.

A more interesting fact is the delaying of the cycles of the increase of the temperature regarding the cycles of the increase of volcanic activity. At the heart of this delay there is cause-effect relation between these two processes. This peculiarity was noted by us during comparison of the graphs of the volcanic activity and concentration of CO_2 in the atmosphere of the Earth during phanerozoe, Fig 3.

Let's revise the mechanism of the cause-effect relation of the volcanic activity and fluctuation of the temperature on the Earth. The increase of the amount of the eruptions of volcanoes brings to the increase of coming of the volcanic gases, which make the greenhouse effect, and as a result of it, the temperature of the atmosphere is increased. From 1860 to 2000 the amount of the eruptions of volcanoes has been 80% increased.

According to the graphs of Fig.5 the increase of the amount of eruptions of volcanoes for 5 eruptions a year, corresponds to the increase of the temperature on 0.4^0 C. The high similarity of the graphs of the global changes of the temperature on our planet and volcanic activity of the Earth has the logic basis from the point of view of the physical aspects. Almost double increase of the annual number of eruptions of the volcanoes, must bring to the double increase of the gas, coming to the atmosphere during volcano eruptions, and first of all CO_2, which has the leading hand in the formation of the greenhouse effect and increasing of the annual temperature on the Earth.

On the basis of the defined correlation specifics and usage of the put forward by us principle of cause-effect relation in various natural processes, in Fig. 5 was made an attempt of long term prognosis of both fluctuation of the volcanic activity of the lines of Earth oblateness and global fluctuation of the average temperature in our planet till 2060. During drawing up of the prognosis part of the graph, we took into account the period of delay of the maximums of the average increase of the temperature of Earth in relation to maximums of the volcanic activity, as well as correlation of amplitudes of the cycles of the increase of the average temperature of the Earth in relation to the cycles of the increase of the volcanic activity.
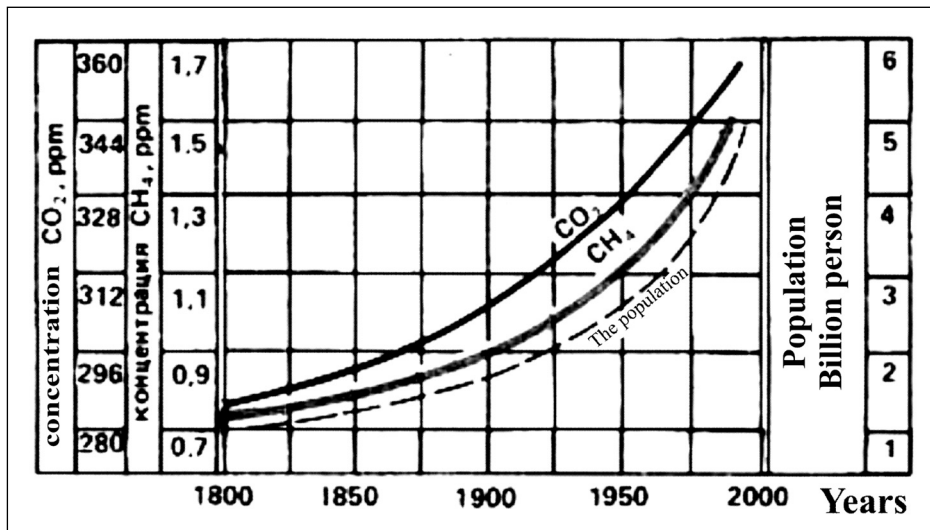
Figure 6. The fluctuation of the content of CO_2 and CH_4 in the atmosphere, as well as the population upsurge on the Earth from 1800 to 2000 (http://www.ipcc.ch/).
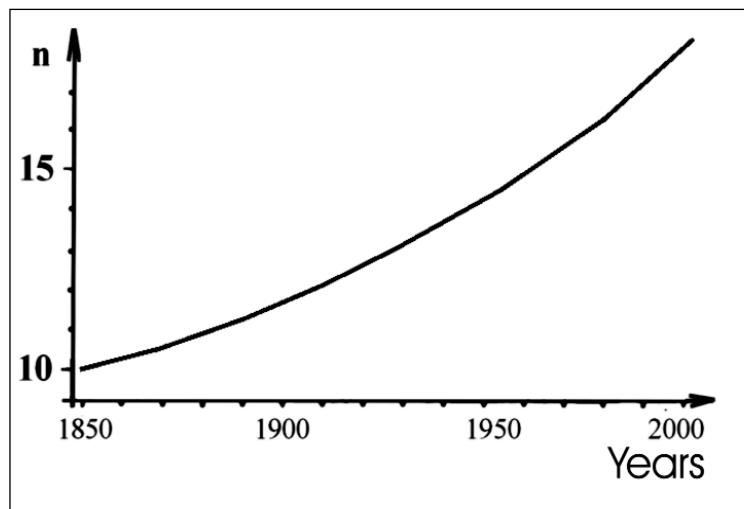
Figure 7. The trend of the volcanic activity

In Fig.6 are shown the trends of changes of content of CO_2, CH_4 and population upsurge from 1800 till 2000. In Fig. 7 is shown the trend of the volcanic activity which expresses the common character of the increase of the amount of the volcanic eruptions from 1850 till 2000. The comparison of these graphs shows their high similarity.

To our opinion, the comparison of growth of the content of CO_2 and CH_4

in the atmosphere and the volcanic activity of the Earth may be the indirect testimony of existence of the definite relation between these processes.

The researches, carried out by us, testify that the endogenous processes in our planet have been considerably activated for the last two centuries, and the maximum acceleration of these processes has been observing during last three decades. The character of changes of seismic and volcanic activities, the speed of movement of the geomagnetic poles, global changes of the temperature of the atmosphere of the Earth and the content of the endogenous gas in it, the changes of level of the world ocean, etc. are evidence of it.

4. CONCLUSIONS

− The role of the volcanic activity of Earth in the global climate fluctuations is considerably higher than it is accepted to consider.

− The main reason of the global fluctuations of the temperature is the increase of the number and power of volcanic eruptions in the periods of the peak values of the cycles of volcanic activity. It brings to the increase of coming of greenhouse gases of volcanic origin into the atmosphere. So, from 1850 up to day the index of the volcanic activity has been 80-85% increased. Consequently, it is logical to consider that the volume of volcanic gases, emitted during volcano eruptions, has also been 80-85% increased.

− The global increase of the annual temperature on the Earth at the background of the insignificant variations, to our opinion, will be observing till 2050. During this period the annual temperature will be increased up to 0.7-0.8ºC (Fig.5).

− Acceptance of the significant role of the volcanic activity in the global warming of the Earth will allow approaching the appraisal of the real consequences of the global climate fluctuations more fairly. We want to note that, the periods of the increase of the volcanic activity are changed with the periods of its decrease. To our opinion, from 2030-2035 will begin the decreasing of volcanic activity of the Earth, which will bring to decreasing of the annual temperature, beginning from 2050.

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THE INFLUENCE OF GLOBAL CLIMATE CHANGES ON HYDROMETEOROLOGIC CONDITION OF AZERBAIJAN

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1. The brief information concerning hydrometeorological condition of Azerbaijan

The republic of Azerbaijan is one of the South Caucasus countries and has a territory of 86,600 km^2. The Republic borders with Russia in the north for 289 km along Samur River, 340 km with Georgia in the northwest, 766 km with Armenia in the west and southwest, 11 km with Turkey, and 618 km with Iran in the south. The length of its Caspian Sea coastline from the Astara River to Samur River is 825 km.

The range of elevation within the country varies from 4,480 m. in the Major Caucasus Mountains (Bazarduzu crest) to –26.0 m (Caspian Sea level). The average altitude of its area is 384 m with 18 per cent of the area below sea level, 39.5 per cent is between 0 and 500 m, 15.5 per cent is between 500 and 1,000 m., and 27 per cent is more than 1,000 m. Sharp changes of altitudes due to the relief structure of the Major and Minor Caucasus Mountains and the location of the Kur-Araz lowland form the unique climate in the republic. Climate conditions and relief of the area have a special role in formation of the water resources of country. The observed historical absolute minimum temperature was – 33.0°C (in Julfa and Ordubad) and the absolute maximum temperature of +46.0°C was again observed in Julfa and Ordubad.

The main transboundary rivers of the Republic (21 rivers) are Kur, Araz, Qanykh (Alazan), Qabirli (Iori), Astara Rivers, and small rivers that flow through Armenia that are tributaries of Kur and Araz Rivers.

2. Natural hazards and global climate changes

During last decades as a result of global changes in climate, the frequency of natural hazards related to climate patterns, such as floods, mudflows, storms, droughts etc. is increased. According to the statistics of UN more than 85% of all natural disasters are connected with hydrometeorological processes and it has been shown in all reports and annuals of UN. Consequently, the last decades of XX century for the period of instrumental observations became most warm period at the almost sites of the world. For example, highest air temperatures have been observed in the decade of 1990-2000. Warmest years with the temperature peaks have been observed in 1995, 1998, 2003 and 2006.

As it has been noted by Vernadski, there is no much sense to look at the as only a material oblast, since this oblast is an oblast of energy as well. Indeed, between the surface of the Earth and the layer of the atmosphere occur complex physical and physical-chemical processes. As a result of abovementioned processes hazards can be happened. Climate changes which are observed during last decades in the planet of Earth have been increased intensity and duration of unusual atmospheric processes, which are contributed to natural disasters in the different parts of the planet. Such disasters became the reason of many damages for the economies of the world countries. Nowadays the one of main problems of the civilization is to evaluate natural disasters and prevent their consequences. In other words development of new technologies for prevention of harmful influences of global climate changes is necessary.

Over the past half century ice cover of the northern hemisphere's oceans was decreased more than 10-15%, the thickness of ice cover in the Northern Ocean also was decreased about 40%. Glaciers recognized as being among the most sensitive indicators of climate change, advancing substantially during climate cooling and retreating during climate warming on moderate time scales. Glaciers grow and collapse, both contributing to natural variability and greatly amplifying externally forced changes. For the last century, however, glaciers have been unable to regenerate enough ice during the winters to make up for the ice lost during the summer months.

As it has been expressed in the General Secretary's appeal of WMO that today the world changes more quickly and human being is more dependent on natural cataclysms due to frequently observed natural disasters and climate changes. What is the main reason of climate changes? This question has made engaged many researchers at the second half of the last century. The main direction on this path must be investigations over the climate forming factors, because only climate forming factors are have changed under anthropogenic impact, therefore, has been observed fluctuations over the climate characteristics.

Impact of the astrophysical processes to the climate has more influence than

other factors determining main characteristics of the climate patterns. The main astrophysical factor which makes major climate features in any part of the world is a solar radiation. The stability and allocation of solar radiation on the Earth is connected with the processes occurring straight in the Sun. The second major impact occurs as a result of the position and movement of the Earth in the Solar system. In this case the form of the Earth has a major impact to define climate patterns on the planet, because the spherical form determine climate zones as well as the distribution of the solar radiation. Oceans are one of the major factor defining life forms on the Earth as well. By the influence of the oceans atmospheric conditions on Earth have been significantly altered by the presence of life forms, which create an ecological balance that modifies the surface conditions. As a result of combined impact of the oceans and solar radiations the main origin of the life – hydrologic cycle have been determined. This hydrologic cycle is a vital mechanism for supporting life on land, and is a primary factor in the distribution humidity over time and space. Therefore, oceans and other water bodies on the planet have usually been considered as a "life kitchen", which maintain all life forms on the planet.

As it has been observed over the last decades, since the beginning of 1970s an intense warming occur in the upper layers of the oceans, which results in changing energy exchange between atmosphere and ocean surface. Therefore, on the scale of decades, climate changes can also result from interaction of the atmosphere and oceans. These changes became the reason of changing in the distribution of large air pressure centers.

Many climatic fluctuations, the best known as the El Nino Southern oscillation but also including the pacific decadal oscillation, the North Atlantic oscillation, and the Arctic oscillation, owe their existence at least in part to different ways that heat can be stored in the oceans and move between different reservoirs. On longer time scales ocean processes such as thermoline circulation play a key role in redistributing heat, and can dramatically affect climate. As a result of the impacts of aforementioned factors to climate, in many parts of the world instabilities of formation of cyclones and anticyclones is observed. Apart from that there are many infringements in distribution of precipitation and humidify over the climate zones of the planet. On the scale of decades, climate changes can also result from interaction of the atmosphere and oceans. Many climate fluctuations owe their existence at least in part to different ways that heat can be stored in the oceans and move between different reservoirs. Sharp distinctions of meteorological characteristics from the long-term parameters have led to cataclysms in climate zones of the oceans, which are unusual for local conditions. External temperature fluctuations across the oceans are known as a El Nino and La Nina phenomenon.

Generally, classification of climatic factors influencing to hydrometeorological condition is given in the following diagram:

THE INFLUENCE OF...

Changing of Sun system's condition and motion in the Galaxy	Physical processes, occurring in the Sun	Earth's orbital motion around the Sun	Changes, occurring in the declined corner to the Earth's orbit coordinate

RESULTS IN...

The variation of Sun beam's failing corner catching Earth's surface and its intensivity

There occurs anomaly warming process on the ocean water's surface, which is countered "the climate kitchen" and it results in the increasing of temperature of sum radiation balance on the Earth

In this queue it results in a variation of humidity cycle, humidity distribution law, stress zones and transgression of wide and small water cycle in the whole on Earth's atmosphere

In result global and regional climate changes occur and create anomaly atmosphere processes in any areas of Earth.

Contribute to the hydrological disasters

Classification of factors influencing to hydrometeorological condition

3. Regional appearances of global climate changes in Azerbaijan

Last years in the territory of Azerbaijan there has been observed extreme temperature data for the all period of instrumental observations. For example, in August 1st and 2nd 2000 in Julfa site of Nakhichevan 46oC (historical maximum

was 43oC), in Kurdamir 43oC (historical maximum was 41oC) were observed. In 29 May 2007 the historical maximum for Baku site was changed as much as 35,5oC instead of 34oC.

As a result of stochastic analysis it became obvious that after 1980 both meteorological and hydrological characteristics were changed. For evaluation of the climate changes and estimating of possible impact for the territory of Azerbaijan comparative analyses of climate norms for the periods of 1961-1990 and 1991-2005 have been made.

Analyses confirm that only in 2007 temperature norms were 0.7oC more than for the period 1961-1990 (table 1). Similar analysis for the precipitation has been made (table 2). Comparative analyses verify that there are no serious trends for precipitation data over long-term periods.

Table 1

Temperature norms in 2007 for various heights and their long-term norms for the period of 1961-1990, ToC

Height, m	0	0 - 200	201-500	501-1000	1000	For the territory of Azerbaijan
Norm, oC 1961-1990	14.6	14.3	13.3	11.9	7.8	12.4
Average annual, 2007	15.3	14.9	13.7	12.4	8.5	12.9
Increasing	*+0.7*	*+0.6*	*+0.4*	*+0.5*	*+.0.7*	*+0.6*

Table 2

Precipitation norms in 2007 for various heights and their long-term norms for the period of 1961-1990, mm

Height, m	0	0 - 200	201-500	501-1000	1000	For the territory of Azerbaijan
Norm, 0C 1961- 1990	335	327	478	534	639	462
Yearly sum, 2007	313	330	540	624	664	495
Increasing	*+22*	*+3.0*	*+62*	*+90*	*+25*	*+33*

Comparative values over the years 2006 and 2007 with long-term values of 1961-1990 shows that in 2006 increasing in temperature was +0.8°C, in 2007 + 0.6°C

Comparative values over the year 2007 with long-term values of 1961-1990 shows that in 2007 increasing in temperature were + 0.6°C (figure 1).
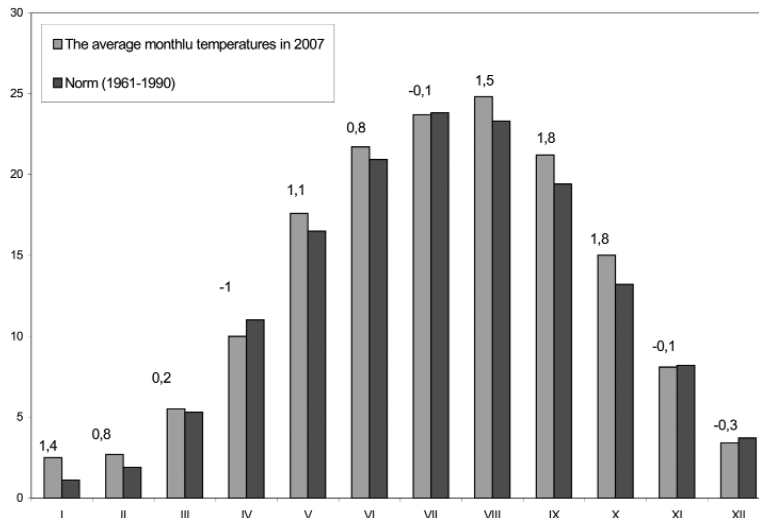
Figure 1. Comparing of 2007 and long-term monthly values (1961-1990) of temperature

The influence of climate change on the flows of Azerbaijan's rivers has been presented in figure 2.
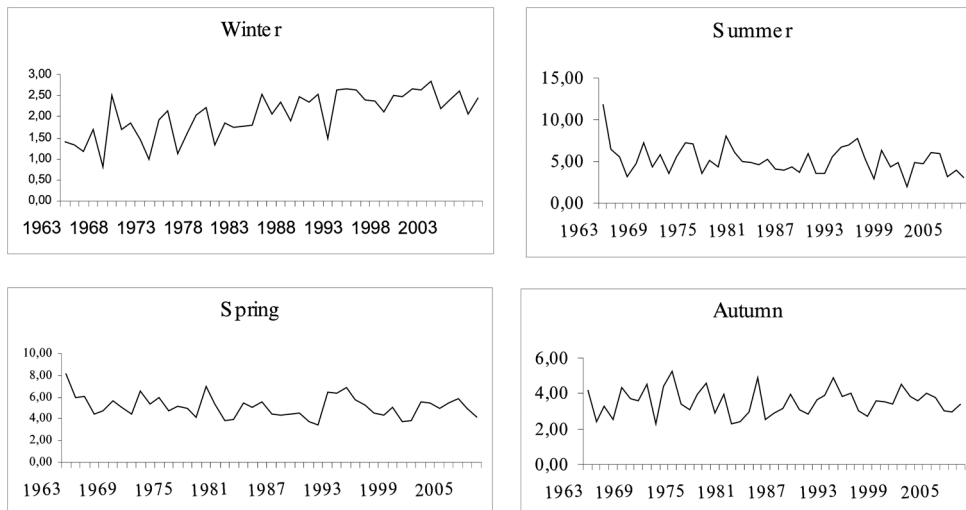
Figure 2. Long term time series of seasonal flows of territorial rivers, Talachay-Zagatala

As we see at the figure that the regime changes on seasonal flows has been observed. It means that by the increasing of winter flows the spring-summer flows are decreased. It is considered for more increasing of winter temperatures. Because in winter months the increasing of temperature by the increasing of dynamics of snow thawing influences to the river's regime.

For different values of temperature increasing (+1°C, +2°C, +3°C) decreasing of water resources in the territory of Azerbaijan is given in the table 3 (in percentages):

Table 3

**Decreasing of water resources of Azerbaijan for different values
of temperature increasing, %**

+1^{0}C	+2^{0}C	+3^{0}C
9-12	18-25	25-30

4. About the mudflows observed in the territory of Azerbaijan

Azerbaijan Republic belongs to the countries, where many mudflow event are observed. Mudflows are caused by the complex of factors such as physical geography, orography and geomorphologic structure of territory, plant cover and hydrometeorological processes etc.

Mudflows, observed in the territory of Azerbaijan consist primarily of geological material mixed with water. The mudflows, observed in Azerbaijan contain more than 65-70% of geological material.

Mudflows in territory of Azerbaijan can be divided into five categories:

• Sandy mudflows, Debris flows mudflows, Rocky-debris mudflows

According to the regime type, they can be divided into two categories:

• Turbulent mudflows, Structural mudflows

Most of mudflows in the territory of Azerbaijan are observed in high areas of Sheki-Zagatala and Nakhichevan regions. In the Kishchay and its tributaries of Damarchik sometimes amount of carried materials reaches about 250-300 tones.

Global climate changes have influenced not only the water resources of Azerbaijan, but also frequency of mudflows. As a result of long-term investigation it has been evaluated that during last decades the frequency of mudflows which is fed by rains has increased rather than mudflows which snow origin. In spite of that frequency of mudflows has increased, there is an immense decreasing in duration of them. In the figure 5, monthly allocations of mudflows in territory of Azerbaijan is illustrated:
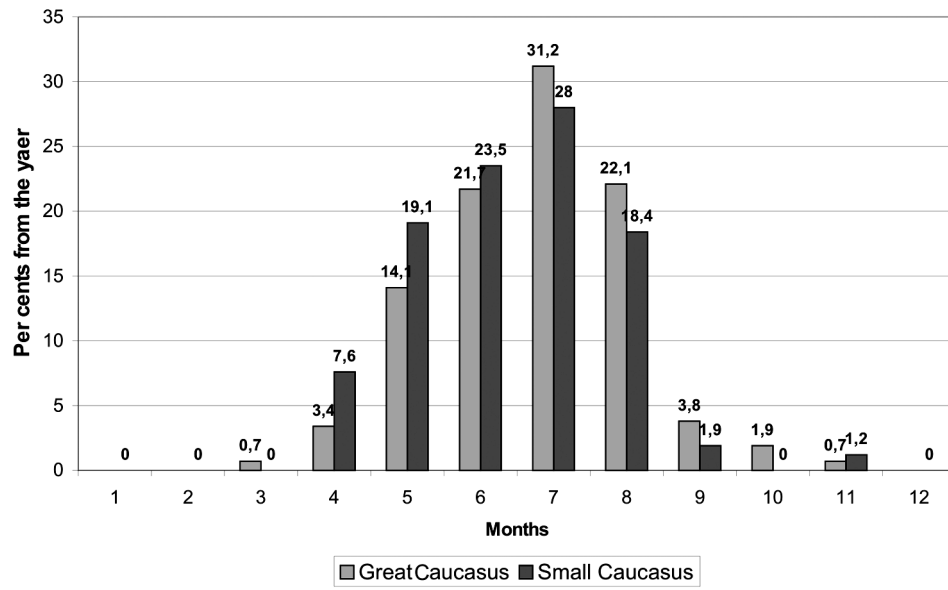
Figure 3. Allocation of monthly values of mudflows in Azerbaijan.

TECHNICAL PRINCIPLES WITHOUT ORIENTED THE WELL BORE SETTER OF CLUSTER DRILLING AT THE CONDITIONS OF CONTINENTAL SHELF

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The development of Modern technology of the cluster drilling of deviated holes in the conditions of continental shelf at the bottom of its proceeding characterized on integrated clusters, (about 50 holes and more in a cluster) as most economic effective, sharply reducing the total installed cost on building of cluster drilling. However, directional well drilling in the enlarged cluster produce the most required technology and technique for drilling.

Especially on the stage of primary setting and deviate that hole in the given directions, since exactly, on these drilling intervals its possibility to sharply rise near miss or coming across the bore hole in a cluster that can result in the very serious consequences, inclusive of slackening substructure of hydro technical constructions.

Like the analysis of conventional technology of the cluster drilling of directional holes showed on off shore of the Caspian Sea, well bore, still to setters by their directional tool, deviated at the stage of driving water isolation casing,

The inclination angel which already at depth 170-200 m plots to a scale 5-70 arbitrary azimuth. Subsequent bore holes deviation in an arbitrary azimuth result from inaccuracy, appear at the orientation of bottom hole assembles (BHA) and using them at the following kick- off point, which in totality being the main sources of 3-D- of deviated bore holes in cluster. As to prevent the mentioned errors, the department of oil and gas wells drilling in Azerbaijan state oil academe, modern technology and technique of without oriented setter and deflecting bore holes in a cluster is developed, in abeyance for all drilling interval of every steerable system BHA.

The Essence of this technology consists in primary setter of bore holes in a cluster as early on the stage of the oriented touch down (marine stationary platform in deep-water) on sea floor, in which the water isolation casing of well cluster is in

advance of deviation in the direction of rated azimuths in these holes. In this case the necessity of application of the oriented BHA falls off on roll-out of deviated holes, that allows all control process of deviated holes to carry out with the help of non-orientable BHA, technological advantages of which are in effective and correspondence quality of hole deviation, as compared with orientable BHA, unchallengeable.

Taking into account the positive signs of the presented technology of setter in holes of well cluster, as well as operating experience of cluster drilling of directional holes in the conditions of continental shelf in the Caspian sea.

Where marine stationary platform in deep- water on sea floor are steady oriented, relative to cardinal point, and the advanced of well azimuths is defined by geological survey, here an example marine stationary platform – 9 (antisubmarine. 28 may) supply technological principles of without oriented technique, deviation technique and setter of well bore for the conditions of off shore cluster drilling of the Caspian sea. Technological principles without oriented setter of bore hole in cluster included in the first studied, place and calculation of the oriented position of running skirt on marine stationary platform, providing curved water isolation casing, study and solving problems by definition the design factor of running skirt subjected to the penetration conditions in these casing, as well as supporting its ability via running skirt, located on the oriented curvilinear trajectory in the direction of rated azimuths.

Off-the-shelf technology forgives engaging of marginal costs is occurred in work shop in the process of assembles of marine stationary platform. Technical and technological bases of this development, realized in workshop conditions, underway on the base of results of theoretical calculations, taking into account the followings basic conditions:

1) It is necessary to know the calculations values of the deflection amount of water isolation casing, occurring from lateral force by escaping under every socket, and its possibility to deviate vertically at the entrance in a previous socket.

2) Running skirt by setting them on the leg of platforms must be displaced in the direction of rated azimuth on nominal spacing interval (depending on inclination of the given state), and tilting, corresponding to the angel of entry of water isolation casing in its end.

3) Top end of socket, in which penetrate the lower side of water isolation casing, must be equipped by coordinate cone-socket, the greater diameter which comprised if the deviation of the end of water isolation casing is possible, Increase the effect of lateral force.

4) The bottom of water isolation casing must be landed in the direction of rated azimuth.

We will consider the flow diagram of curved water isolation casing in marine

stationary platform-9. In this marine stationary platform, the height of which makes 110 m, it was planned to drill 12 deep- well, 7 from which draw up are tilting controlled. Fig.1. shows the orientation position of marine stationary platform-9 after running in and setting on the sea floor, as well as azimuths and the directional bore holes developed from her. As clear from fig, axis of platform, after landing it on the sea bed must put together a project in relation to the axis of north direction 3380, that allows us to know the design of drift direction, to define the setting directions of running skirt at the assembles of platform on land. Fig. 2 shows that the position of well head of bore holes on the block of platform and their distance between itself and bed. Fig.3 illustrates horizontal projection of the directions of deviated wells. According to the plan of cluster construction in deviated wells with marine statioary platform-9 in table .1 designing data of deviated wells is described her.

Table.1

Designing data of cluster deviated wells of marine stationary platform-9

1	*Depth of wells, m*	*Rate of azimuth, degree*	*Deflections, m*
1	3000	350	500
2	3000	295	250
3	3200	250	500
4	3300	225	625
5	3200	202	440
6	3000	148	175
7	2900	44	240

The diameters of water isolation casing composed of 720 mm, driving depth under – 200 m, sea depth 90-100m.

Study and calculation the oriented position of running skirt at the panels of marine stationary platform and deviation parameters of water isolation casing.

For realizing the design data of cluster bore holes with **marine stationary platform** - 9, and estimations of all kinds of variants during runningin of curved water isolation casing in the direction of azimuths rate, it is necessary to make cal-

culations for determining the character of curved trajectory, site the oriented place-ment on this trajectory of running skirt at the panels of platform, bending and devi-ation angel of water isolation casing on escaping every running skirt and the moment of going in a following socket, and as well as the type of construction and deviation angles of placement of running skirt at the panels, supplying in a com-plex unsupported cross-counter ability of water isolation casing on the oriented curved trajectory.

Fundamentally depend on undertakes the final angel, with which the end of water isolation casing will blocked on the sea floor. Figs.4 and 5 presented the flow diagram of the deviation of water isolation casing on marine stationary platform-9.

Marine stationary platform-9. Consists of 8 panels ($D_1 \div D_2$), six of which is rig by running skirt for 12 water isolation casing, 7 from which the deviation must be at different rate azimuths on angel 3°. With a view to ensure the smoothness of deviation water isolation casing in ordered angel 3° is uniform distributed between panels $D_3 \div D_6$,that supply the deviation between the panels of D_3-D_4 in 1°, D_4-D_5 in 2° and D_5-D_6 in 3°. Between the panels of D_1-D_3 the purpose of producing the normal conditions of Kelly stem preserved verticality of hole. However, the devi-ation of the water isolation casing in 1° being given of socket panel D_3,, and thus settle on a vertical axis, but the inclination angle of hole in a rated azimuth com-prise 1^0. We make the calculation of seating running skirt on panels to the final angel in driving water isolation casing equal 3°. by equal apportionment of angel between the panels of $D_4 D_6$, angel α_i between construct $D_4 \div D_5 = 0,75^o$, $D_5 \div D_6 = 1,5^o$, $D_6 \div D_7 = 2,25^o$, $D_7 \div D_8 = 3^o$.

By Knowing the drift angel α_i − between the panels of platform, will define the quantity of shifting A_i of running skirt at the panel by the following:

$$A_i = L_i \cdot tg\alpha_i \tag{1}$$

Where L_i – distance between both (i) panel, mm
On a platform NO-9 distance L_4 between panel $D_3 \div D4$ equal 14520mm
L_5 between $D_4 \div D_5$ equal 15972 mm, L_6 between $D_5 \div D_6$ equal17569 mm,
L_7 between $D_6 \div D_7$ equal 19326 mm, L_8 between $D_7 \div D_8$ equal 17413 mm

According to the rate and design parameter to define the quantity of curved water isolation casing at the end of socket entrance on the panels of D_4-D_6. Preparing the deviation on panel:

$$D_4 \, A4 = 14520 \times tg0, 75^o = 190 \text{ mm,}$$

$$D_5 \ A4 = 190 \text{ ч } 15972 \ \text{Ч} \ tg \ 1,5^o = 608,$$
$$D_6 \ A6 = 608 \text{ ч } 17569 \ \text{Ч} \ tg \ 2,25^o = 1298 \ mm$$

Deviation of water isolation casing through passing 7th and 8th panels:

$$D_7 \ A7 = 1297 \ \text{ч } 19326 \ x \ tg \ 3^o = 2311 \ mm,$$
$$D_8 \ A8 = 2311 \ \text{ч } 17413 \ x \ tg \ 3^o = 3223 \ mm$$

In this way, at the final of deviation angel of curved water isolation casing $\alpha = 3^o$, total shifting of casing when escaping from the last panel of platform will be equal A = 3223 MM. when the final angel of deviation $\alpha = 4^0$ A- will equal 4301 mm, and when $\alpha = 5^o$ A = 5380 mm.Cylindrical part of running skirt, resting on a nominal distance, must be inclined from the vertical line in the given azimuth for every angular panel $_i$, so that in a smooth manner the bending of water isolation casing occurs in the same plane. Also cylindrical part of running skirt resting on a

3- panel, must be inclined at an angel $\alpha_3 = 0,75^0$, on (D-4) – at angel $\alpha_4 = 1,5^0$,

at (D-5) – $\alpha_5 = 2,25^0$, at (D-6) – angel $\alpha_6 = 3^0$.

Thus the final angel of driving water isolation casing equal 4°, inclination angle of cylindrical part of running skirt must be distributed on the panels of D_3-D_6 in a rated azimuth as follows:

$$D_3 \ \alpha_3 = 1^0 \ D_4 \ \alpha_4 = 2^0$$

$$D_5 \ \alpha_5 = 3^0 \ D_6 \ \alpha_6 = 4^0$$

Similarly the inclination angles of cylindrical part of running skirt for the angel of driving water isolation casing equal 5^0 on the panels of D_3-D_6 is distributed as follows:

$$D_3 \ \alpha_3 = 1,25^0 \ , D_4 \ \alpha_4 = 2,25^0 \ ,$$

$$D_5 \ \alpha_5 = 3,75^0 \ , D_6 \ \alpha_6 = 5^0$$

After detecting the placing of running skirt on panels it is essential to ensure the penetration condition of water isolation casing in running skirt and unconstrained crossover through them. The penetration condition of running skirt has been considered, that with the unsupported station keeping part of water isolation

casing between panels, its perform distributed lateral load , under the effect of which the casing is deflect. The value of this bending can be defined as bending of *f* arm, blanket load weight, which can be defined by the known function:

$$f = \frac{q_i \cdot \ell^4}{8EJ}$$

(2)

Where qi – blanket load of kn/m; *l* - length of the survey section; EJ – bending stiffness for the given setter (frame), Kn·m^2.

For water isolation casing the diameter ϕ = 720 mm at wall thickness δ = 14 mm, bending stiffness EJ=40,64×10^4 Kn·m^2, and weight of a 1 linear meter of these pipes in air q$_0$ = 2,44 Kn/m.

Transversal load Distributed on weight of part length, *l* – reside in sea water, will define from equation:

$$q_i = (1 - \gamma_o / \gamma_{st}) \, q.*\sin\alpha$$

(3)

Where γ_o and γ_{st} – specific gravity of sea water, γ_o = 10, 3 kn/m^3 and became γ_{st}= 78.5 kn/m^3; αi - inclination angle of water isolation casing on the given section, degree.

Then, putting initial data in equation (1.2) of the curved water isolation casing with a final angle 3^0, we will get the bending from the moment of corresponding weight of casing when passing through the panels of D$_5$, D$_6$ and D$_8$:

$$f = \frac{(1-\dfrac{10.3}{7.85})*2.44*\sin 1.5*15.972^4}{8.40,64*10^4} = 1.11 ìì$$

Like manner for a panel D$_6$, *f* = 2.44 mm, and for panel D$_8$, *f* = 62.2 mm.

Exactly by the same manner it is possible to define the bending, by corresponding weight on water isolation casing with final angle 4^0:

D$_5$ *f*=1.48mm. D$_6$ *f*=3.25mm. D$_8$ *f*=82.93mm.

For water isolation casing with final angle α = 5^0 the bending for panels arranges:

D_5 f=1.67mm, D_6 f=4.06mm, D_8 f=103.55mm.

Since the maximal value of dead-load deflection of water isolation casing become less than f=110mm, the diameter D of upper base of truncated cone of running skirt is detected by:

$$D = d_k + 2 + \Delta = 730 + 2 \times 200 = 1150 \text{ mm.}$$

Where Ä − clearance, supporting the water isolation casing in running skirt.

By the Computed results noted above, the behavior and calculation for curvature of water isolation casing at 4^0, resulted in table.2.

Table. 2

Computed Results of curvature water isolation casing in a rated azimuth with deflection at 4°

NO Of panels	Displacement of running skirt on panels in a rated azimuth. A_i mm	The inclination angle of running skirt in a rated azimuth, α degree	Deviation of water isolation casing from vertical panels, A, mm	Bending the end of water isolation casing approximately at running skirt f_i, mm
D_1	0	0	0	0
D_2	0	0	0	0
D_3	0	1	0	0
D_4	253	2	253	0
D_5	811	3	811	1.48
D_6	1732	4	1732	3.25
D_7	Socket not	Socket not	3083	-
D_8	steady	steady	4301	82.93

Study and calculation the design factor of Running skirt at the penetration conditions and passing ability through water isolation casing

A construction and geometrical dimensions of running skirt should be taken into consideration, during setting them on a curved trajectory on the corresponding panels of platform, they would be inclined in a computed azimuth to meet the flow of water isolation casing, and ensure if it's un constrained of passing ability through it.

Fig 6. is schematic diagram shows the developed construction of running skirt, and also shows its passing ability through water isolation casing. As is clear from this fig, a running skirt consists of two parts: tapered and cylindrical 2, between centers of which there is the taper angle α_i, the degree of which changes according to the number of panel, at which running skirt will be set.

Tapered Cone section (trap) is appearing the cone frustum with the ellipsoid section in lower base and intended for interception the full motion of socket casing. The diameter $D_{ëi}$ of upper base of this socket is determined; by assumption of safe condition of casing entry in a socket, according to the offset value of socket piece on each panels and bending the end of water isolation casing at the entry point of each socket:

$$D_{li+1} = 2L_i(tg\alpha_i - tg\alpha_{i-1}) + d_k/\cos\alpha_{i-1} + 2H_{li-1} \cdot 2f_i + d_k/\cos\alpha_i - d_k + \Delta/\cos\alpha_{i+1} \qquad (4)$$

here Li – distance between the panels mm; d_k – outside diameter of water isolation casing mm; α_i – inclination angle of cylindrical part of socket from vertical line; H_{Li} – height of cone frustum. D_{Li} – the Diameter of running skirt at the lower base (ellipsoid) of entertainment separator equal to the greater diameter of ellipsoid unit of cylindrical part of socket with which its interface. H_{Li} – Height of cone frustum; determined from the condition of overcoming the resistance forces of flowing the water isolation casing at the walls of running skirt (entertainment separator):

$$H_{Li} = \frac{D_{Li} - \dfrac{d_k + \Delta}{\cos\alpha_i}}{2} \cdot ctg\beta \qquad (5)$$

Where â-point angle truncated head. Cylindrical part of running skirt considered the truncated cylinder. $D_{is.Hi}$ – Inside diameter of lower base of cylindrical part of socket equal:

$$D_{isHi} = d_k + \Delta \qquad (6)$$

Where Δ – safe clearance between casing outer diameter and inner diameter of socket, taken to be equal 10 mm. Dis.Bi – Upper base of cylindrical part of socket ellipsoid, which takes shape after dropping by value of Δ_i (fig.5), can be defined by the following equation:

$$\Delta I = (d_k + \Delta + 2\delta) \cdot tg\,\alpha_i \qquad (7)$$

Where δ – wall thickness of cylindrical part of socket, mm

Maximal H_1 and minimum H_2 formative the truncated cylinder is determined from the security condition of passing ability of casing through socket and must be expected on the basis of the followings conditions:

$$H_1 \left\langle \left(\frac{\dfrac{d_{k+\Delta}}{\cos\alpha_i} - \dfrac{d_k}{\cos\alpha_{i-1}}}{\cos\alpha_i(tg\alpha_i - tg\alpha_{i-1})} \right) \right. \tag{8}$$

$$H_2 = H_1 - \Delta_i$$

Table 1.3 presented the computed results of geometrical dimension of running skirt by the above function. Free end of water isolation casing after escaping the latest panel D_6 under the action of uniformly distributed lateral loading from dead weight will be bent on certain angle Θ, the value of which can be defined from equation:

$$\Theta = \frac{q^{l^3}}{6Ej}$$

Table.1.3

Geometrical dimensions of new construction of running skirt set on panels (marine stationary platform)

NO of panels on which change geometer. Sizes of socket	Cone part (truncated cone)			(truncated cylinder) Cylindrical part		
	Greater Diameter of unit, Dli, mm	Smaller diameter of unit, Dli, mm	Height truncated cone, H_1, mm	Internal diameter Du, mm	maximum forming, H_1, mm	minimum forming, H_2, mm
D_3	-	730,1	-	730	579	566
D_4	1217	730,5	89	730	592	566
D_5	1274	731	99	730	604	564
D_6	1339	732	III	730	617	564

The calculations shows that, maximal loss value of angle for the curved water isolation casing with the end of curved angle 3°, 4°, 5°, respectively equal $\theta_3 = 0,13^0$, $\theta_4 = 0,17^0$, $\theta_5 = 0,22^o$. In view of insignificance of these losses, it is possible to ignore them.
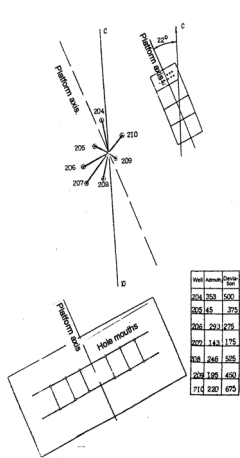
Fig.1.-Oriented location for marine stationary platform - 9 and directional hole azimuth
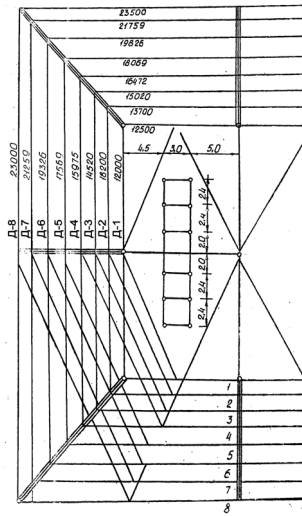
Fig.2.-Position of bore well head in block marine stationary platform - 9
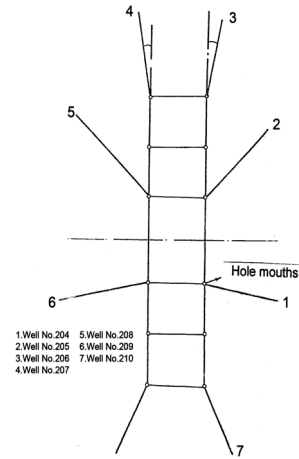
Fig.3.- Configuration of deviated bore hole (in horizontal section) platform - 9
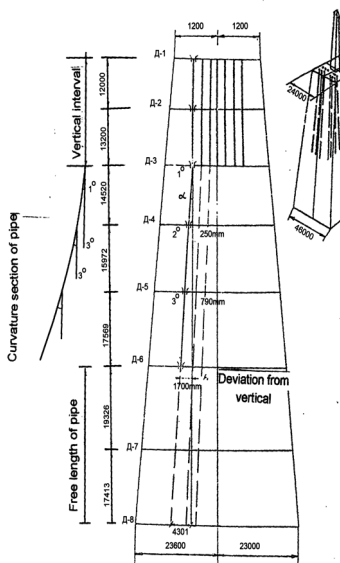
Fig.4.- Flow diagram of carved water isolation casing in marine stationary platform - 9 (zone 28 may)
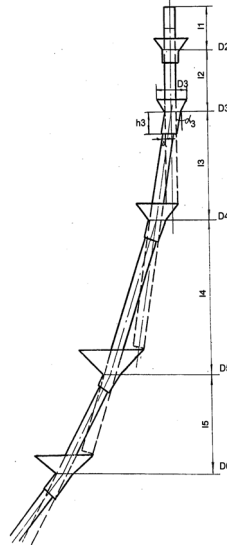
Fig.5.- Flow diagram of calculation curved water isolation casing by helping the new design of running skirt, situated in curved trajectory
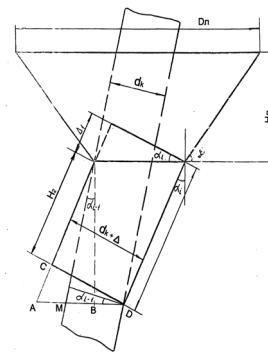
Fig.6.- New design of running skirt and diagram cross over with curved water isolation casing

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ESTIMATION OF MAXIMAL ACCEPTABLE FLOWS USING GROUNDWATER-SURFACE WATER RELATIONSHIPS FOR THE KURA RIVER, AZERBAIJAN

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Abstract. Floods in the Kura River of Azerbaijan occur most often along the alluvial plain of the cachment area, where the river frequency meanders and streambed slopes are very shallow. It is illustrated that construction of dykes and leaves actually do not prevent flooding, where hydrologic connections between groundwater and surface water are high. The paper suggests an approach to define maximal acceptable flows (MAF) in the lower part in order to predict floods and regulate outlets from the upper reservoirs. MAF computations before high-water season allows for further regulation of outlets further downstream in order to prevent flooding and enable to forecast floods. While the study focuses on the specific region, the overall approach suggested is generic and may be applied for elsewhere.

Key words: flooding, high water, channel capacity, riverbed siltation, maximum acceptable flow

Introduction

The Kura River is the largest international river of the South Caucasus. The origins of the Kura can be found in east Turkey, and flows across the Ardakhan plateau, through Georgia and enters Azerbaijan. In Azerbaijan, the Kura crosses the Kura-Araks plain, where it joins with the Araks and finally flows out into the Caspian Sea. The Kura River plays a vital role in both local and regional economies and has been used to generate energy production, irrigation and water supply in Azerbaijan and Georgia (Figure 1).
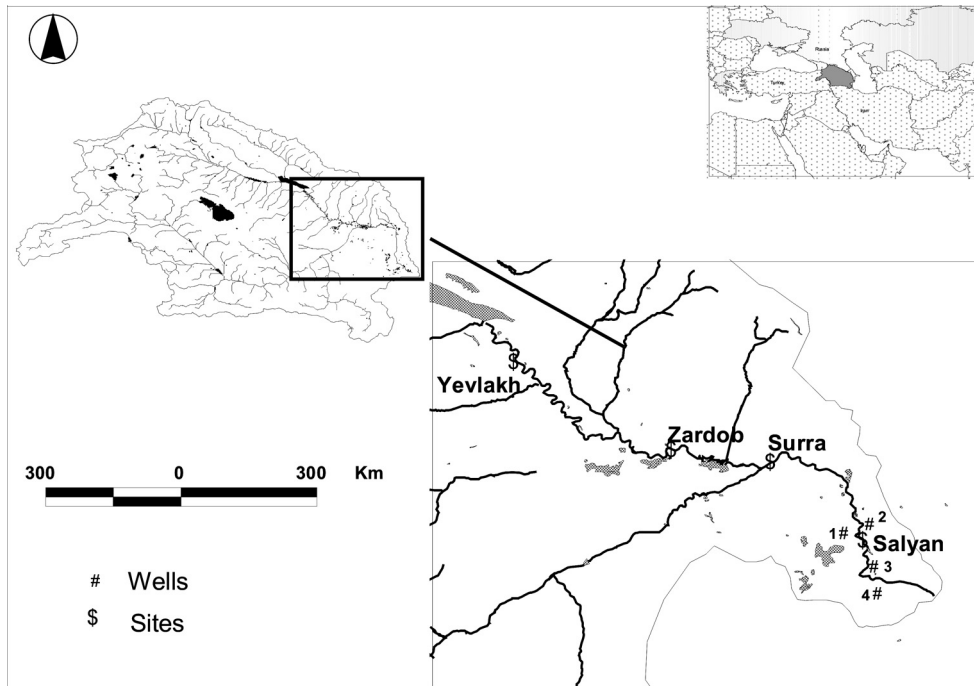
Figure 1. A map of the Kura river basin and the area of interest showing
the sites and experimental wells referred to in the paper

Consistently high flows caused by intensive rains, creates flooding conditions near the mouth of the Kura. As a result, agricultural lands of the Kura-Araks lowlands are flooded and colossal economic and social damage is caused to municipalities a located near the banks. Flow regulation has historically been considered the most effective method for flood prevention, although large flood events began to occur even in the highly regulated reaches in recent years. Also, while most of the Kura River's flood events have usually occurred during high flow periods, flooding events have been more recently observed even during low flow water periods. Floods in the Kura River occur most often along the alluvial plain of the watershed, where the river frequency meanders and streambed slopes are very shallow. This recent change in the river's flood frequency and magnitude has increased the threat to floodplain residences and the productivity of floodplain agricultural activities. Larger flood events have the potential to cause colossal economic and social damage to municipalities located near the banks of the river by not only flooding the surface of the floodplain, but also by raising local groundwater levels that affect the normal function of households both at the banks and the territories located far from the river.

Estimation of maximal acceptable flows for the mouth of the Kura river.

Some authors consider that flooding occurs when the volume of water passing through a channel per unit time exceeds the volume of the channel reach, or the channel capacity (Andrew 1992). However, this general definition assumes the surface channel's streambed is composed of impervious material, inhibiting any hydrologic connection between the surface channel and the nearby alluvial aquifer. This "hydrologic connection" can also be considered streambed leakage (seepage), a type of groundwater-surface water interaction that occurs when the hydraulic head of the surface channel is greater than the hydraulic head of the nearby alluvial aquifer. If there are such interactions between the surface channel and groundwater, a flow event that falls under normal high water levels can lead to the rise in groundwater levels, causing "groundwater flooding" which are able to disrupt the normal economic functioning of buildings and households along of coastal areas. This can occur in low-lying areas along the floodplain, where the water table is driven upward by stream discharge and intersects the land surface. Because of the potential for economic damage to be incurred without the need for the Kura River to physically spill over its surface channel banks, it is prudent to use the term "maximal acceptable flow", rather than "channel capacity". As defined by Alexeevskiy and *et. all* (2000), the maximal acceptable flow discharge (MAF) is a threshold discharge value, with any flows below the MAF do not cause any danger to households and other establishments. The MAF may also be defined as a maximum amount of water flowing through a cross-section in the given unit of time that does not cause danger to floodplain facilities and households during this flow (Abbasov, 2007). Water discharges that exceed the MAF can be defined as undesirable discharges. "Undesirable discharges" have been typically considered flow events that produce surface flooding and have the potential to damage bridges, agricultural lands and other facilities situated on or near banks and floodplains. However, considering the effects of non-flood events on nearby groundwater levels, an "undesirable discharge" may occur even though the flow may not have spilled over its stream banks. An example of an undesirable discharge event that did not result in surface flooding occurred in the Kura basin in 2005, when groundwater levels rose enough to disrupt agricultural productivity at irrigated fields along the bank, even though the channel itself did not overflow. This situation occurred after the construction of several dykes on the Kura River that are aimed at eliminating surface channel flooding. Because these dykes are higher than the natural riverbanks, they cause the ground water level to rise and damage floodplain facilities even though no surface channel flooding occurred. As a result of this, undesirable flow discharges in the Kura River are observed long before flooding occurs. This example illustrates how groundwater-surface water interactions between the surface channel and the alluvial aquifer can cause the water table to rise above the ground surface

in some fluvial systems. For this situation, the channel's MAF is always less than the channel capacity. Excessive in-stream sedimentation in the lower regions of the Kura River basin can cause not only a diminution in the overall channel capacity but also an increase in surface water elevation, which can drive water through the streambed and into the nearby aquifer. Both of these can affect the MAF values for the river reach. This has been observed in the river Kura during last years, with active sedimentation in the streambed caused by intensive deforestation in the cachment area.

The MAF can be estimated by simply multiplying velocity of flow by maximum area of cross section:

$$Q_{MAF} = V\omega_{max}$$

(1)

Where, Q_{MAF} is maximal acceptable flow, V velocity of flow in the riverbed, ω_{max} is maximum area of cross-section that does not create undesirable flow discharges.

To accurately define a MAF value for a location along a river, the hydraulic connection between the riverbed and the level of groundwater in surrounding areas needs to be carefully explored. In other words, the channel stage at which groundwater levels are altered enough to cause floodplain damage must be observed before that event's discharge value can be identified. For studying surface water-ground water connections on the Salyan site area data taken from 4 experimental wells were used (Figure 1). Depth of the each well is about 8 meters and they are located on several distances from the Salyan site. Measurements were taken every 4 days during high water season, since the end of the April until the beginning of May, in 2004. Figure 2 illustrates the relationship between underground water tables and water level at Salyan site in 2004 using data from the experimental well 1. Similar relationships have been established for all 4 wells. The R^2 for such relationships ranges from 0.92 to 0.92. Such relationships can be used to estimate $_{max}$ for any area and to be used to forecast underground flooding using hydrologic forecasts.
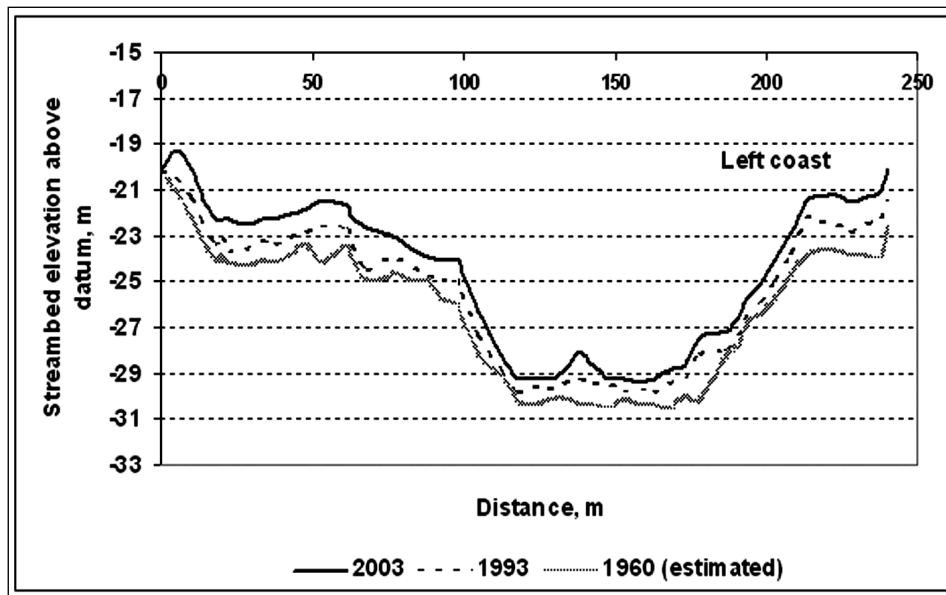
Figure 2. A relationship of groundwater table with water level at Salyan site, 2004

This relationship shows that when the water level in the riverbed is up to − 22 m BC (Baltic system), the level of underground waters does not disturb the usual functioning of residential facilities. However, above that level, the water level intersects land surfaces and floods agricultural lands, even though surface channel flooding is not observed. This is considered the threshold water surface elevation, which can then be used to compute the MAF for that location using relationship between water discharge and cross section. Figure 3 illustrates the channel cross-section, surveyed on April 15, 2004, and a Q=f (ω) curve for the Kura river at Salyan (a site on in the Kura) for several flow events that occurred in 2004. As seen in from the figure, the area of maximum cross-section area for a surface water elevation of -22 BC was computed to be approximately 998 m². This curve reflects the relationship between cross-sectional area and discharge flows. This site's MAF may be computed for maximum capacity based on this curve. It was defined that flows no larger than 1100 m³/s could be conveyed through the maximum cross sectional area of 998 m². In other words, it was defined that at the MAF for the Salyan was 1050 m³/sec in 2004 and any flows exceeding 1050 m³/sec. can be considered "undesirable discharge" events (Figure 3). Riverbed elevation in the river, observed during the last half century has resulted in changing of MAF values as well. According to estimations, MAF value of the riverbed in 15.04.2004 was approximately 1050 m³/s. Nevertheless, the same value for the cross section of 1993, shown on the figure 4 has made 1300 m³/s. Consequently, despite of construction of leaves and dykes in the river coasts MAF value has decreased.
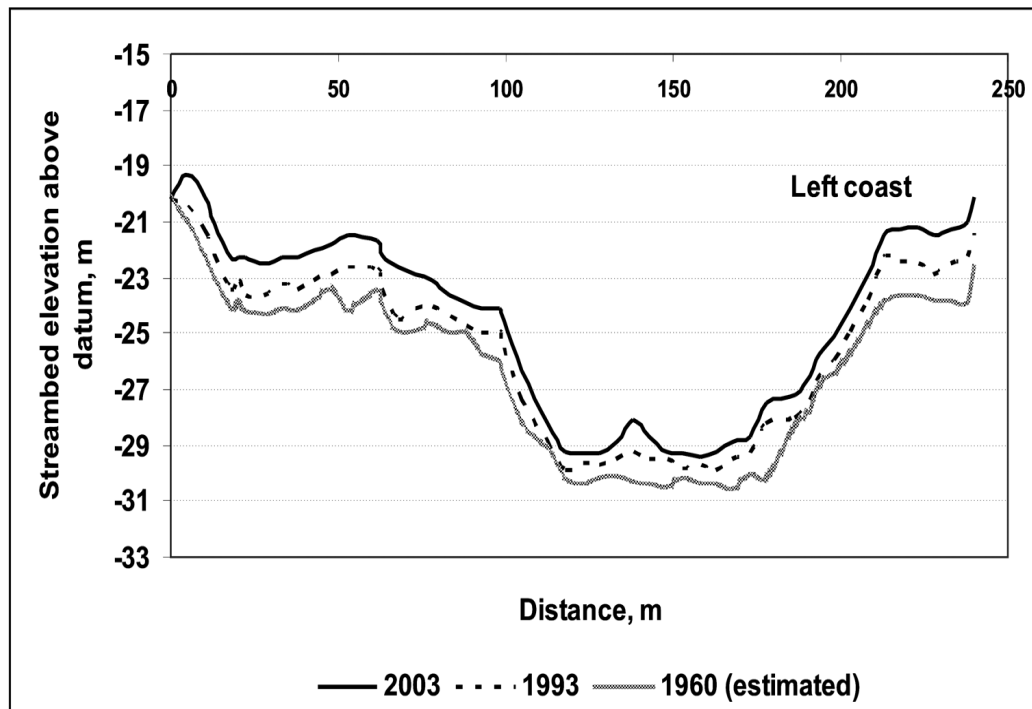
Figure 3. Rising of the riverbed at Salyan over the period 1960-2003

In dry climates where channel levels are consistently low, there is no need to estimate the MAF for the entire water year. In rivers with intensive in-stream sedimentation, MAF value may change very rapidly. For such rivers, it may be necessary to compute a new MAF at the beginning of every high-water season. MAF computations before high-water season allows for further regulation of outlets further downstream in order to prevent flooding and enable to predict floods, including underground ones.

For any site in the river, a MAF value can be determined using the following steps:

• Construct a cross-sectional profile of the surface channel

• Determine the maximum area of the cross-section determined based on this profile (If there is a hydrologic connection between ground and surface waters, the relationships like (1) should be used).

• Determine the maximum discharge rate for a given maximum cross-sectional area
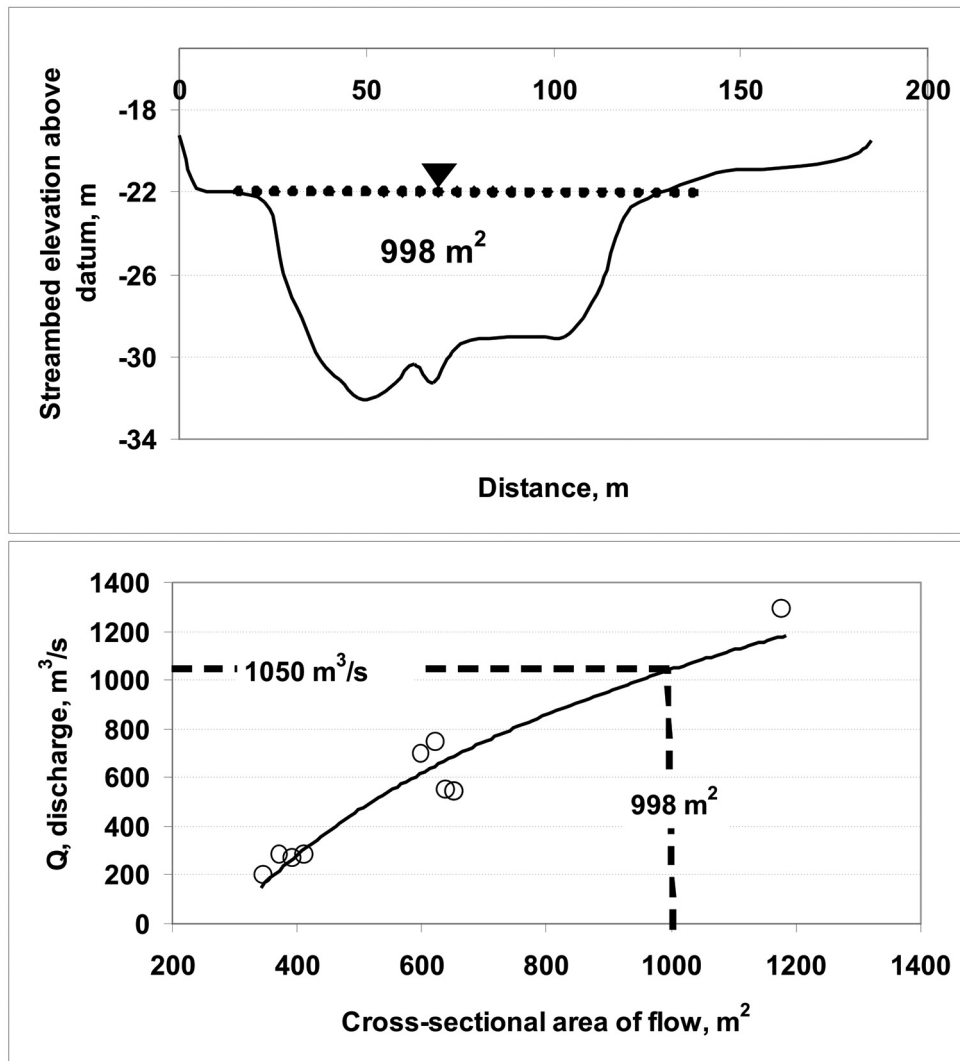
Figure 4. Cross section of the Kura river (top) and a Q=f() curve at Salyan on 15.04.2004.

CONCLUSIONS

Simple solutions have been proposed for estimation of MAF in mouth part of the Kura through regression relationships of underground water table with the surface water level. MAF referred in the paper as a maximum amount of water flowing through a cross-section in the given unit of time that does not cause danger to floodplain facilities and households during this flow. It has been illustrated that construction of dykes cannot increase MAF for rivers such as Kura, since there are

high interactions between the surface channel and groundwater, a flow event that falls under normal high water levels can lead to the rise in groundwater levels, causing "groundwater flooding". MAF computations before high-water season allows for further regulation of outlets further downstream in order to prevent flooding. Moreover estimating them enables to predict forecast floods, including underground ones

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ABOUT INFLUENCE OF GEODYNAMIC PROCESSES ON THE RESULTS OF MEASUREMENTS OF CAVENDISH BALANCE

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Has been experimentally determined the appearance before strong earthquakes the variations in time of gravitational constant G, depend upon spatial orientation of Cavendish balance.

Introduction

As increasing the accuracy of measuring the values of gravitational constant G, are strangely increased the differences between the results of G measurements, made by different scientists.

For the first time P.Dirac told about the possibility of changes of gravitational constant (1). Afterwards, a great number of scientific researches of different scientists were devoted to this problem.

P.Dikke showed the theoretical possibility of decreasing of G with increasing of the age of the Universe (2). According to the opinion of K.Stanukovich G is increased with the age of the Universe (3).

The authors (4) have received the variations of the measured values G, which considerably increase the error of the measuring instrument.

Meanwhile, summing up their researches, the above-mentioned scientists came to the following conclusion: "The analysis of variations of the results of measurements of the gravitational constant shows that the changes of geomagnetic field, the instability of temperature and atmosphere pressure, the residual gas flows in the vacuum camera, the changes of plant tilt cannot bring to the observable effects. Variations of gravitational field connected with the changes of relative position of the Earth, the Moon and the Sun are too small for direct sensible influence on the results of measurements."

The results of researches of variations G were published in World Data Center (most quickly it is possible to get access to these data by means of: http:zeus.wdcb.ru/wdcb/sep/GravConst/welcome.html). In work (5) it is shown, that variations of a gravitational constant have the certain cyclicity. In the work (6) is spoken about possible influence of super-long gravitational waves on indications of Cavendish balance. Morganstern R. made the assumption about existence of cosmological limit in the possible variations of G (7).

To this day two most accurate measurements of G have been received by groups of scientists in Washington University in Seattle and International Bureau of Weights and Measures of Paris, and in both cases the mistakes of the experiment were 1/10000, however, the difference of the received values is considerably more than the probable errors. In Seattle there have been received the value (8):

$$G = (6.674215 \pm 0.000092) \cdot 10^{-11} \ m^3 \cdot kg^{-1} \cdot s^{-2}.$$

Jean-Paul Mbelek and Marc Lachieze-Ray from French commission on atomic energy declared that they had succeeded in understanding the reason of similar discrepancy between experimental values. The researchers supposed that at the heart of the observed discrepancies is the interference of gravitational and electromagnetic fields.

In their works they produced the calculations of the expected values of gravitational constant in different regions of the planet. Into the basis of calculations were put the theories, supposing the availability of latent dimensions in space, particularly, theory of strings, in the frameworks of which the electromagnetic and gravitational fields are combined (9).

In the calculations it turns out that terrestrial gravity will be stronger in the places where the magnetic field is stronger, that is i.e. the maximum values can be expected in the regions of north and south magnetic poles. According to their opinion, the available experimental data fully agree with the theory, however is required the carrying out of precision measurements both in the regions of the poles themselves and in equatorial regions.

Meanwhile, some scientists do not share this concept (10).

In the work (11) is noted that during last years the spread in the values of measured values of gravitational constant have reached 0,7%. The new experiment of the group of Swiss physics from Zurich University allowed receiving the result, which is different from the French one. So, in special cemented cellar near Willigen (Switzerland), they measured by means of sensitive laboratory balance, the differences in the mass of two small weights, under or above which were placed two big capacities of mercury with the weigh of 13 tones. Measuring the changes of weights of trial masses by ultra-sensitive balance, the researchers calculated the value of gravitational constant, which equals to:

$$G = (6,6754 \pm 0,0005) \cdot 10^{-11} \ m^3 \cdot kg^{-1} \cdot s^{-2}$$

Their data are different from the results received by the group in Seattle and by French scientists.

In any case, the attempts to specify the measured values of G so far bring to strengthening of deflections in the data, received by different scientists of the world. It accentuates some confusion of the scientists, as the variations of G do not agree with the basic regulations of general relativity.

It could be possible to speak about the mistakes, connected with the error of measurements or unaccounted disturbances, if they were single instances. Meanwhile, the changes in time and space in the measured values of G are observed by many scientists during last ten years, increasing proportionally to rising the accuracy of measuring systems.

Modern ideas of gravity were for the first time described by A.Einstein within the general relativity (17). In accordance with general relativity, the coefficient G is the constant.

Methodology

For experimental studying the space-time variations of measured values of G there was created a new instrument, called by the authors as detector ATROPATENA. The construction ATROPATENA has the application for PCT patent (12).

ATROPATENA is the closed and isolated from the environment, system of sensors, using the physical principle of Cavendish balance, where are hung on the threads (instead of one) two balance-beams with small weights on the ends 2, and these balance-beams are situated mutually perpendicular. Between small weights, placed on the ends of two balance beams, equally spaced are placed the big weights 3, Fig.1 (a).

Besides, there is the third measuring sensor – the trial mass 4, hung on a special elastic lever and the available possibility of vertical displacements during changing the relative values of acceleration of gravity Δg. Variations of Δg are stipulated for lunisolar floods and for appearance of local gravitational anomalies, which can be caused by the changing of density of rock mass under the instrument as a result of the changing of their stress condition, and consequently their mass.

As it seen in the scheme, on the balance-beams with the weights 2 and on the lever of vertical sensor 4 there are tiny mirrors on which three laser beams are directed. Being reflected from the mirrors, the beams hit the sensitive optical matrix 6 and 7, where occurs the transformation of optical signal from laser mark into electric signals and their transmission into analog-to-digital converter. After

that, the digital signal is transformed to special block of the computer with the next record in special format. The software, worked up in Scientific-Research Institute of prognosis and studying the earthquakes (SRIPSE), allows automatically recording the information in the form of separate files for definite period of time, determined by the operator.

In Fig.1 (a) is schematically shown the instrument ATROPATENA.

(a)   (b)
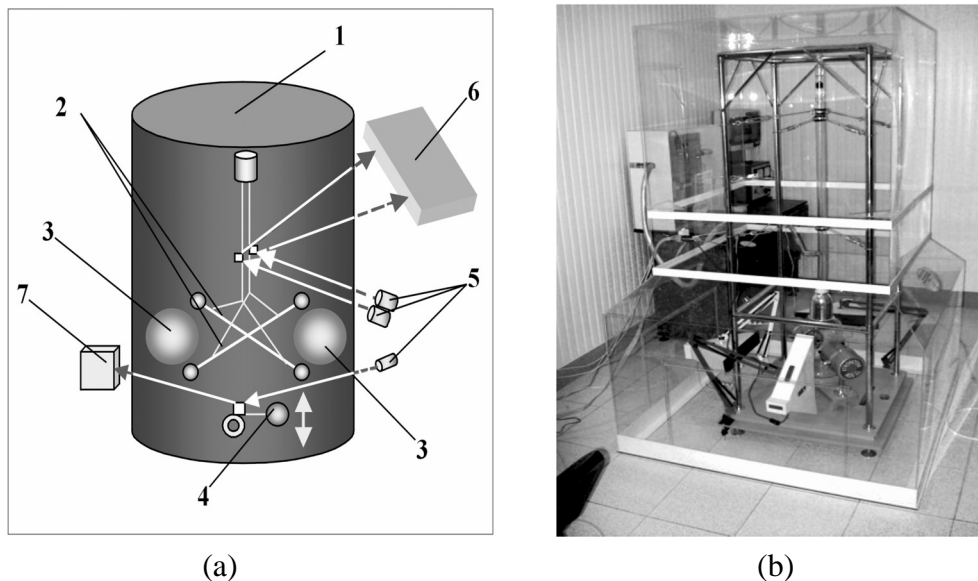
Figure 1. The scheme of the construction (a) and the photo (b) of detector ATROPATENA.
1 – glass body of the detector; 2 – balance-beams with small weights on the ends; 3 – big weights; 4 – trial weight, which is hung on elastic lever; 5 – laser emitters, 6 – sensitive optical matrix for horizontal sensors, 7 – sensitive optical matrix for vertical sensor.

All sensitive system is placed into the special, isolated from the environment, the glass body 1, where the deep vacuum has been created and is constantly supported (10^{-4} MPa).

In different spheres of sensitive system have been determined the sensors of temperature accurate within $0,1^{o}C$, which are connected with control block of temperature of system. In the room where ATROPATENA is located, is kept the permanent temperature with inaccuracy $\pm 1^{o}C$.

For excluding the mechanical effects and better heat insulation, the vacuum body with sensitive system is placed into translucent plastic body, which allows visually observing the work of system (Fig. 1b).

Together with the noted sensors, in ATROPATENA is also provided the digital seismic station using the three-component seismic receiver, the information of which is also transmitted to the computer and is uninterruptedly recorded in three

channels X, Y, Z. The recording of seismogram in three channels is carried out uninterruptedly in digital form.

The registration of seismic fluctuations is necessary in order to exclude the possible influence of these fluctuations on destabilization of sensitive system of detector ATROPATENA and appearance of false anomalies, caused by seismic processes.

The remote controlling of the detector and remote pickup of information minimize the external influences on sensitive system.

All elements of sensitive system have been made of non-metallic materials, what excludes the influence of magnetic field and electromagnetic radiation on these elements. ATROPATENA is placed in the building of Scientific Research Institute of Prognosis and Studying of Earthquakes in Baku (Azerbaijan). Since 1 April 2007 the station has been completely put into operation, that allowed receiving the high-quality information about variations of gravitational field in time in three axes X, Y, Z, and the seismologic information simultaneously recorded by means of wide-band digital seismic station Tethys-SD. First, ATROPATENA was provided for experimental researches of possible influence of super-long gravitational waves on the indications of Cavendish balance.

If to proceed from classical ideas of fundamental physics, then the detector ATROPATENA, at first sight, is accepted as absolutely senseless instrument, as it is considered the incontestable, that the gravitational constant is a fundamental constant and cannot be changed in time or in space. But the author didn't rule out the possibility of influence of super-long gravitational waves on Cavendish balance and wanted to check that idea (10).

Meanwhile, ATROPATENA registered numerous signals, which have definite regularities and high correlation with strong earthquakes in different regions of Eastern Hemisphere of the Earth.

In Fig.2 is shown the schematic sketch of actual orientation of Cavendish balance in the station ATROPATENA. The sketch represents the view from above, X and Y designate correspondingly oriented balance-beams with small weights on the ends, and m1 and m2 are big weights. S, N, W, E designate accordingly north, south, west, east.

So as the further statement of the text to be convenient, we called the recordings of the detector ATROPATENA "the gravitograms", by analogy with seismograms. The detailed studying of gravitograms with anomalous deflections of measured values of G can explain subtler physical nuances of these processes.
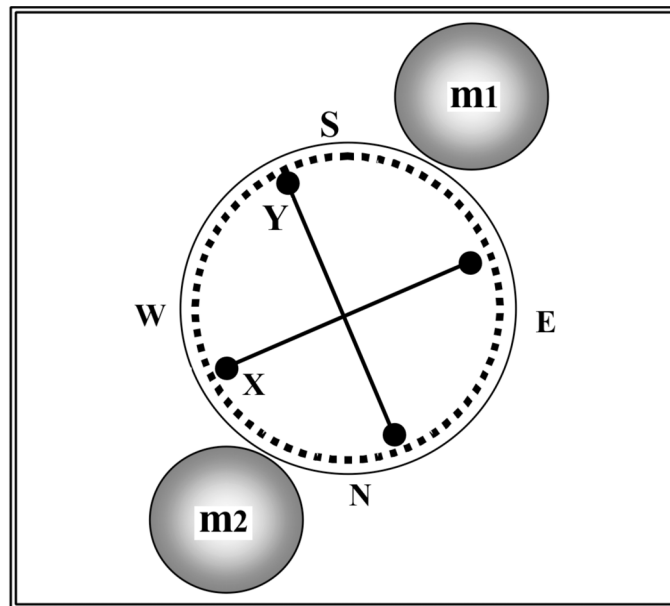
Figure 2. Schematic sketch of actual orientation
of Cavendish balance in the station ATROPATENA.

We want to remind that on the gravitograms the graph G_x reflects the movement of the balance-beam X, and the graph G_Y reflects the movement of the balance-beam Y (Fig.2), the graph G_Z reflects the changes of gravity, that is i.e. the vertical movements of trial weight. And the increasing of values G_X and G_Y means approaching of small weights on the balance-beams with big weights, and decreasing – moving off from the big weights. On the coordinate axis are shown the conventional units, which reflect the deviation amplitude of small weights on the ends of balance-beams relative to big weights.

The registration of values of all three sensors is carried out with discontinuity in one second. Using of red lasers with the length of wave 645 nm and special optical matrixes for registration of laser mark and its displacements allowed registering the deviations of laser-beams on the angle to 0,1 degree. The whole process of registration takes place in digital form automatically, without participation of operator, and the received time series are archived by means of special program.

We also want to remind that these deviations correspond with variations of gravitational constant G in the third and fourth signs after comma.

Results

In Fig.3 are shown the gravitograms with two gravitational anomalies, registered on 5 January and 10 January 2008.

In all graphs of the axis, G_X and G_Y show the conventional units of amplitudes of variations in time of the indications of Cavendish balance, oriented, correspondingly, in parallel with axes X and Y. The axis G_Z shows the conventional units of the amplitudes of variations in time of gravity Δg.
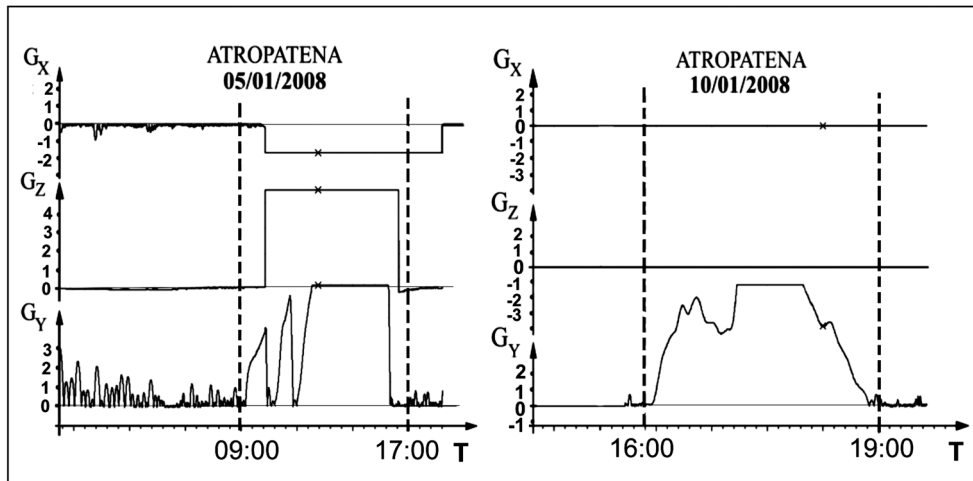
Figure 3. Gravitograms of 05 and 10 January 2008.
T – time.

As it is seen in the gravitogram of 5 January, whereas small weights of the balance-beam X are moving off from the big weights (G_X is decreasing), the weights of the balance-beams and G_Y are approaching with noticeably more amplitude (G_Y is increasing). At the same time, G_Z also shows the increasing of gravity almost synchronically with G_Y. The fact of lateness of the beginning of changes G_Z and G_X relative to G_Y for 64 minutes is also notable. At the same time, G_Z comes back to its former position 30 minutes later than G_Y, whereas G_X does it 2,5 hours later than G_Y. We see that all three sensors show the strongly pronounced gravitational signal, which evidently has the same nature, but there exist great displacements in time of its registration. Period of the signal is also quite long and it is 8 hours. During these anomalies, the seismic station didn't register any seismic fluctuations, which exceed the background noises. Besides, seismic signals cannot have the period of several hours. Strong earthquake took place on 7 January in the region of Indonesia of M (magnitude) 5,9 (coordinates are 0.795 S 134.012 E).

Is interesting the other example of registration of quite intensive variation in time of gravitational constant G with strict selectivity to the direction. This signal has been registered only by the sensor G_Y. Two other sensors, as it is seen in the gravitogram, "keep silent". The period of signal is three hours. During recording of

signal, any seismic fluctuations weren't registered. Strong earthquake of M6,5 took place on 15 January in the region of Fuji islands (coordinates are 21.966 S 179.530W).

The authors took all data about earthquakes in this article from the catalogues of U.S. Geological Survey Earthquake Hazards Program – USGS (the quickest you can get the access to these catalogues on the site http://earthquake.usgs.gov/eqcenter/eqarchives/significant/).
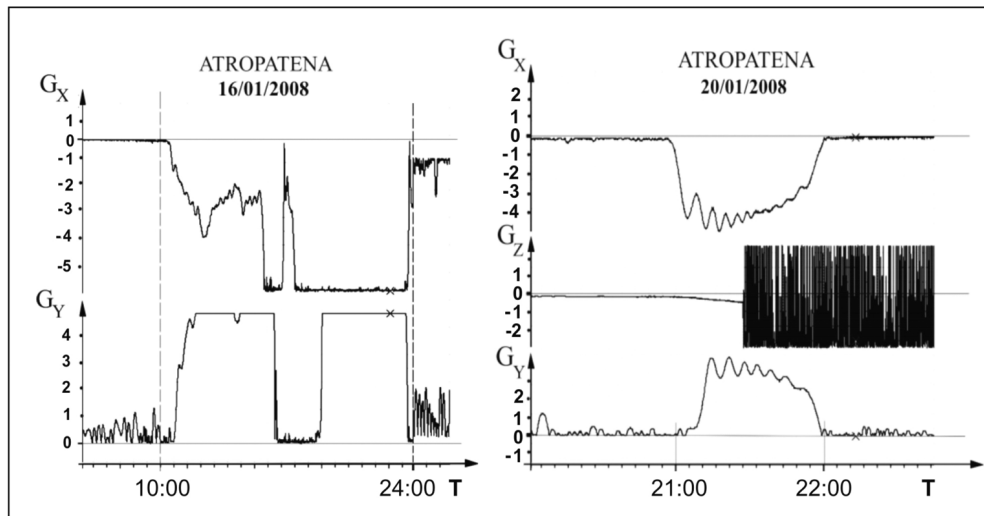
Figure 4. Gravitograms of 16 and 20 January 2008.
T – time.

At first we'll consider the gravitogram of 16 January. Because of absence of signals G_Z this graph isn't demonstrated. Since 10:00 the decreasing of value G_X and increasing of G_Y have begun synchronically. As it is seen there is some difference in the form of graphs G_X and G_Y, but the whole tendency, which shows the high negative correlation, does not raise doubts. The graphs practically mirror each other. While the small weights of the balance-beam X move away from big weights, the weights on the ends of the balance-beam Y approach, and the same takes place in reverse direction. The whole period of the observed signal is 14 hours. Quite interesting signal was also registered on 20 January, when the graphs G_X and G_Y during 2 hours register the signal almost mirrored in both gravitograms. Meanwhile, approximately an hour later, after appearing of this signal, G_Z begins to uninterruptedly register the high-frequency quasiharmonic signal with the period of 4-8 minutes. After the sensors G_X and G_Y stop registering the signals, G_Z continues registering the high-frequency signal right up to 23 January inclusive,

and such duration of uninterrupted appearing of signal is quite unusual for the sensor G_Z. On 22 January strong earthquake takes place in Indonesia of M6,2 (coordinates are 1.011 N 97.438 E).

In the gravitograms of 02-03 February were registered very interesting anomalies, Fig.5. If G_Y registered three in series alternate long-period signals with periods accordingly 11; 8 and 7 hours, then G_X registered the mirror image of these signals, but the first (I) and second (II) of them are modulated by high-frequency constituent with the period of 4-9 minutes, and the modulatory high-frequency signal in both cases lasts about 5 hours.

On 04 –05 February on the gravitogram again appears the typical signal, reminding in character the signal of 02-03 February, but the gravitational signal G_X is modulated by high-frequency constituent with period of 4-9 minutes at the beginning (III) and at the end (IV) of the anomaly. The duration of the modulatory signal is approximately the same and it is about 2 hours. This fact is quite interesting, as the signal G_X is clearly limited at the beginning and at the end of the high-frequency constituent.
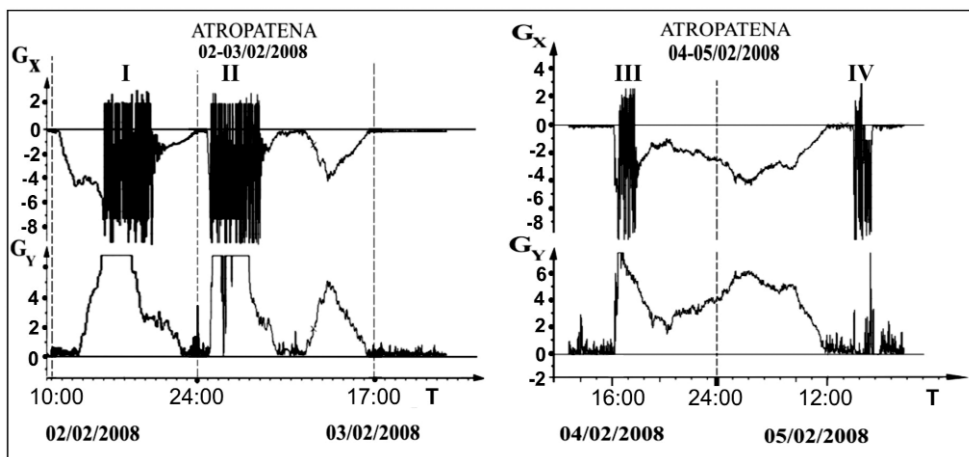
Figure 5. Gravitograms of 02-03 and 04-05 February 2008.
T – time.

The strong earthquake takes place on 8 February of M7.2 (coordinates are 10.725 N; 41.898 W) in the region of north middle-oceanic ridge in Central part of the Atlantic ocean, and on 10 February takes place the strong earthquake of M6,5 (coordinates are 60.757 S; 25.582 W) in the sphere of south Sandwich islands. To our opinion, it is possible that the anomalies, registered on 02-03 February, are connected with the earthquake of 8 February, and the anomalies of 04-05 February are connected with the earthquake of 10 February.

Two strong earthquakes took place on 07 May 2008 near the coast of Honshu in Japan: the first one – at 16:02:01 of M6.2 (coordinates are 36.21S 141.47E) and the second one – at 16:45:20 of M6.8 (coordinates are 36.14S 141.45E). The analysis of the recordings of ATROPATENA showed that on 2 May the sensor G_X began to register the intensive negative anomaly "A" (Fig.6) which lasted till 3 May 04:25. 2 hours later after this anomaly the sensor G_X registered the second negative anomaly "B", which lasted till 5 May. It is notable that these anomalies are the high-frequency pulse bursts with the periods 3,5 – 6,5 minutes. Two strong earthquakes took place in Japan on 7 May 2008 with a small difference in time. So, the earthquakes took place 5 days after the beginning of recording the anomaly and two days after the anomaly has stopped.

The catastrophic earthquake took place on 12 May 2008 in China in the region of Sichuan at 06:28:00 of M8 (coordinates are 31.08S 103.27E) and the second earthquake took place at 06:43:14 of M6,3 (coordinates are 31.25S 103.68E), as a result of which, according to provisional data, about 70 thousand people died, and the death-roll is being specified now.

On 9 May two sensors at once G_X and G_Y began to register the strong anomalies C, D, E, K of gravitational field (Fig. 6), and G_Y registered the intensive positive anomaly, which consists of high-frequency pulse burst with periods of 3,5-8 minutes, and G_X registered the negative one, which consists of pulse bursts with analogous periods. The amplitude of anomalies of sensor G_Y more than three times increases the amplitude of anomalies of sensor G_X. The anomalies of G_Y during visual analysis consist of four well-separable pulse bursts (anomalies) according to amplitude modulation – C, D, E, K.

The anomaly K differs from the anomalies C, D, E, in several signs. Firstly, on G_X, after completion of anomaly E, is observed the decreasing of indications on two conventional units, which lasts during 15 hours without modulation, and after returning of indications to the background value there begins the recording of anomaly K. The anomaly K begins at 15:22 on 12 May and completes at 09:30 on 13 May. Secondly, on the G_Y the anomaly K also differs from previous anomalies. The anomaly K begins on 12 May and completes at 10:55 on 13 May, and the smallest extreme of values of the anomaly K is approximately two units higher than the smallest extreme of anomalies C, D, E. After completion of the anomaly K, the values of recording return to background level.

So, to our opinion, the anomalies C and D are the harbingers of the Chinese earthquakes 3 and 4 (Fig.6), E and K are the harbingers of the earthquakes 5 and 6.

Detector ATROPATENA has simultaneously registered the differed from each other variations of G in two mutually perpendicular directions and the variations Δg before strong distanced earthquakes since April 2007 till now in 93% of cases.
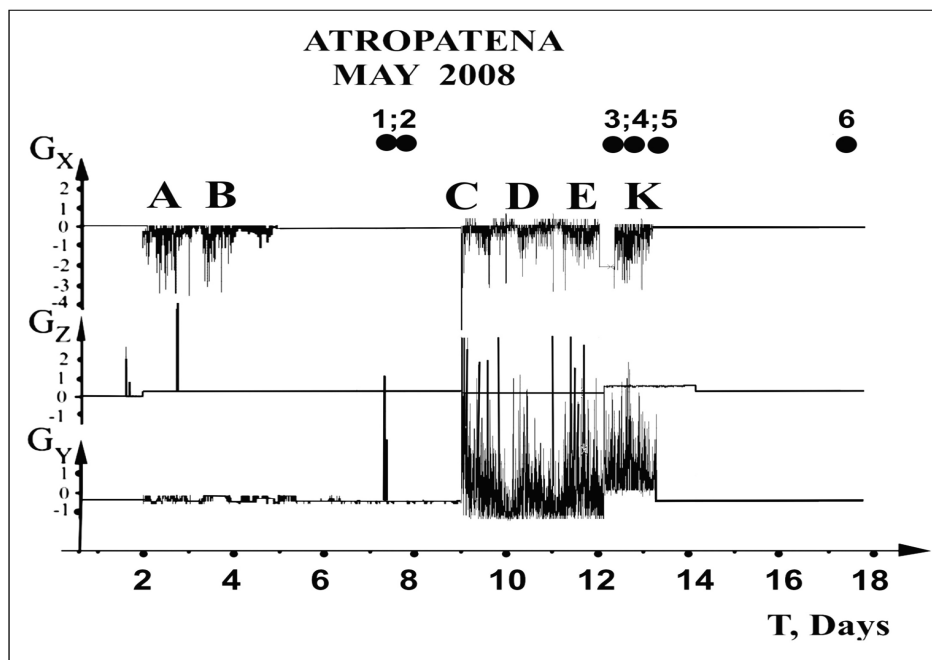
Figure 6. Gravitogram of 1-17 May 2008.
A, B, C, D, E, K – the registered anomalies of gravitational field;
1; 2 – the earthquakes in Japan near the coast of Honshu on 7 May 2008 of M6.2
(time – 16:02:01) and of M6.8 (time – 16:45:20); 3; 4; 5; 6 – the earthquakes in China, Sichuan on 12 May 2008 of M8 (time – 06:28:00); of M6.3 (time –06:43:14); Sichuan on 13 May 2008 of M5,9 (time – 07:07:09); Sichuan on 17 May 2008 of M6,0 (time – 17:08:25).

In previous researches the author together with V.E. Khain by means of standard gravimeters discovered the changes of gravity before strong distanced earthquakes (13).

Starting from the regulations of general relativity, the gravitational interaction by its nature represents the changes of space crookedness, which causes by masses and is their integral property.

In Cavendish balance takes place the interaction of small weights on the ends of the balance-beam, hung on a thin thread with big weights, what causes the turning of balance-beams on their axis for some angle. The angle of turning of the balance-beam is compensated with the elastic force of torsion of the thread, on the value of which the gravitational constant is calculated. But if other big weights appear near scheme, then they introduce additional distortions into the crookedness of space, formed by big weights in Cavendish balance. So, we'll have the new system of interactive weights, where the changes of space crookedness will be the resultant one of interaction of weights in Cavendish balance and additional weight. In this case, Cavendish balance will show another result.

In real conditions of the Earth there are many geological factors, which create quite intensive gravitational anomalies, changing in the space and in time and many times increasing the gravitational effects, caused by movement of planets of solar system, including the additive effect of lunisolar floods. These effects can be caused by convective flows in the mantle, movement lithospheric plates, tectonic waves, etc.

To our opinion, just in this way may be explained the fact that during last ten years, in spite of permanent increasing of the accuracy of instruments, registering the gravitational constant G right up to the sixth sign after comma, nevertheless, it is impossible to register G accurate within higher the third sign after comma, about which the yearly published data of CODATA witness.

According to our opinion, it isn't excluded that ATROPATENA registered the tectonic waves, which can be emitted by the centers of future earthquakes. Tectonic waves, in contrast to seismic ones, are very slow and long, and they are also called "the stress waves" (14). Tectonic waves, the same way as the seismic ones, are mechanical (15), and in sold medium they have longitudinal and transversal constituents. Passing through under the station, these waves compress and stretch the layers of the Earth of a big thickness and with it they change their density and, as a consequence, the mass. The changing of mass under the detector ATROPATENA is registered by three sensors – X, Y, Z depending on the type of wave and its direction. Longitudinal and transverse tectonic waves in different way influence on Cavendish balance, depending on the orientation of balance with respect to the wave.

For more accurate determination of coordinates of future strong earthquake, it is necessary to use, at the minimum, three stations ATROPATENA, spread on big distance from one an other.

Conclusions

On basis of these researches the author came to several important conclusions:

1. Has been authentically registered the anomalous changes in time of the measured values of gravitational constant G, which differ from each other depending on orientation of Cavendish balance.

2. It has been determined that the variations of the measured values of G, registered by different scientists earlier, are connected, mainly, with influence of external gravitational fields of geological origin on indications of Cavendish balance.

3. Has been created a new instrument – detector ATROPATENA, which allows uninterruptedly registering changes in time of variations of G in different directions together with the variations of acceleration of gravity Δg, that gives the

opportunity of access to a new resource of physical information about geological and cosmic processes.

4. Detector ATROPATENA simultaneously has registered time variations of gravitational constant G, which are different in sign and amplitude, in two mutually perpendicular directions and variations of gravity Δg before strong distanced earthquakes in 93% of cases, what gives us grounds for creation a new technology of prognosis the strong earthquakes in prospect.

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INTEGRATION OF AZERBAIJAN INTO SINGLE SOIL-GEOGRAPHICAL SPACE OF EUROPE

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At present process of integration into European and international structures is going on many directions, including science. Formation of adequate soil-information space, which will secure solution of actual tasks with purpose of mutual social-economic benefiting is principally important on background of globalization. Having important geographical location, Azerbaijan posseses huge potential for realization of modern concepts in field of effective use of land resources. Based on the above-said, it is possible to constatate that integration into the single soil-geographic space of Europe is one of actual tasks. Geographic location and climatic conditions of Azerbaijan makes use of its soil resources the area of different international interests including issues of joint production of agricultural products, transborder transfer of polluting substances, development of general strategy of basin land-use etc. Related to this it becomes principally important the formation of adequate soil-information space, which would provide solution of above-mentioned and other issues in order to receive mutual social-economic benefits in conditions of globalization. By occupying more than 8.6 mln ha, the region posseses huge potential for realization of concepts of effective use of land resources. Pecularity of the region is that soil cover is formed by huge variety of soil formation factors. Thus, 9 out of 11 existing climatic zones in the world are presented in Azerbaijan, and that is why bioclimatic conditions vary in very wide diapason. Relief is presented from low valleys which are located below sea level to high mountains of southern Large and Small Caucases. The variation of granularmetric, mineralogic composition and age of soil forming species.

Marked pecularities of soilforming conditions predertimines huge variety of soil forms. Soil variety was traditionally put forward as one of main tasks in inventory of soil resources. As per above-mentioned specification as fairly marked by prominent scientists it is necessary to elaborate such system of methods and approaches which will cover all variety of physico-geographical condition and soil

forms, will allow on unified base to carry out soil research in densely populated and well-learned regions as well as in distantt located difficult accessible regions (Stolbovoi, 1999). New methodology suggested by Stolbov V.S., includes complex of methods which are based on comparative geographical approach, which was developed by few generations of prominent and outstanding scientists on soil-genetic direction. The methodology includes principally new fundamental concepts of factor-geographical conditionality of soils, ecologic-genetic soil identification and classification, typology of soil-space units, methods of soil cartography. In whole it is worth to mention that soil science and practice fully fulfilled tasks and provided demands of agricultural production in soil information, in volume neces-sary for normal functioning of society's life. However, requirements to soil-infor-mation provision are always changing under the dynamics of appearing scientific-practical tasks. What is actual today seemed to be of small significance during peri-ods pof history. Good example for this is land reform which was carried out in Azerbaijan, in the result of which new land relations were formed. Objective of land reform is creation of qualitatively new land ownership relations based on eco-nomic freedom and social equity, development of market economy, food security, and increase of welfare of society. Naturally, the above-mentioned process of land reform was characterized by specific formulation of problem and naturally required specific soil research, from general soil-geographic descriptions through more detailed research to large-scale soil surveys. Present phase of Azrbaijan's develop-ment is not exclusion and has its own specific, conditioned by change of demand in soil information related to collapse of the USSR and disintegration of soil-resourse space, decay of state monopoly on land, trends to appearance of land mar-ket, which activates processes of modification and transformation of system of land use relevant to economic principles, demands of internal and external markets. In these conditions soil information should be first of all unified and oriented towards solution of tasks emerging in dynamic market environment (internal and external). Principally important part of the problem is in requirements for conformity of for-mats of national and international soil-information spaces, which will allow to pro-vide use of general system of evaluation models and monitoring of soil-resourse potential. The task is to reach critera comparativeness and results of qualitative accession of soil-resourse potential at international level. All this will serve as base for formation of single economic space within which it will be possible to realize agreed policy of soil use with best social-economic and nature protective results (Stolbovoi V.S. and other, 2007). As known, International Institute of applied sys-tem analysis in cooperation with leading national soil centers of Belorussia, Moldova, Russia and Ukraine, also with number of international organizations (UN International Food Organization (FAO), European Beuro of Soil Science, National Institute of Agricultural Research (France), International Soil Information

Reference Center (Netherlands) etc., understanding the importance of integration of different countries into solution of soil-resourse problems on global (international) level, concentrated efforts on elaboration of integral soil geograpgic database. As a result number of unique soil-information systems of different levels have been created: global (FAO-IIASA, 1999); Central-East-European (SOVEUR) and, European-Nothern-Asian. The developed systems allow to carry out evaluations suitability and productivity of lands of different countries based on unified internationally acknowledged standards by use of modern information technologies based on geoinformatics, integral modelling, connected with means of distance probing of new generation. Purpose of above-mentioned developments was introduction of new digital base of soil data, composed for territoty of Russia, Belorussia, Moldova and Ukraine in format of EU soil geographical information system, and the developed correlation of soil map legend of region in scale 1:2.5 mln with list of soils, used in EU system. As proffessor Stolbovoi writes elaboration of soil geoinformation system of EU started in 1986 and served to objectives of Pan-European programme. As a base of project was used soil map of Europe in scale 1:1 mln. Soil base has undergone few modifications in order to answer to requirements of the programme MARS (agricultural monitoring based on distance probing). Conceptually it gives various opportunities in showing as homogenous as well as heterogeneous in soil correlation polygons. Such approach is principally close to traditional in post soviet republics demonstration of soil cover of territories considering heterogeinity of soil cover. Especially bright development this method received in fundamental works on structure of soil cover. In total, concept of creation of base of soil characteristics envisaged to be of relation type which gives opportunity to compare different layers of information on schemes "one-to-many" and "many-to-one".

Accoding to the above-mentioned methodics, soil cover represented in form of digital soil map. It consists from mosaics of polygons which traditionally corresponds to closed countours of soil map. As source for revised base of soil data of Azerbaijan served existing soil maps of Azerbaijan of different scales and numerous soil cuts.

By efforts of many soil scientists of Azerbaijan, soil cover olf the Republic is fully covered by soil research. As a result of works of many years by prominent soil scientists of Azerbaijan the soil map of Azerbaijan in scale M 1:500 000 was composed in 1957. In 1991 soil map of Azerbaijan in scale M 1:600 000 was printed. In order to conform the nomenclature units of soil with names of international soil classification, correlation of classification of Azerbaijan soils with WRB system were carried out. Since 1990 works on systeming unified soil data are being carried out. As attributes of soil typological units were used such factors: climate ($\Sigma > 10^{o}C$), botanical zone, macrorelief, prevailing type of soil use, accompanying

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type of soil use, type of moistening, character of moistening ,type of water regime, type of antropogenically regulated regime, depth of potential layer of root-inhabitation, prevailing types of soil forming varities, mineral composition of clayish part, depth of subsoil waters, granularmetric composition, upper border of boiling from HCl, average annual sediments Σ (mm), S_{tk}/S_{fk}, pH, gross N, %, gross P, %, gross K, %, existence of impenetrable layers in soil profile, biomass t/ha.

The information on soil factors is incorporated into database only when necessary, where there is information about variation of corresponding attributes for concrete soil typological unit.

So, we can consider that attributive part is close to European soil standards.

As known, typological soil units besides general attributes are characterized by analytical data. Characteristics may be realized as with use of analytical data on concrete cuts as well as in generalized form. Information about which data type was used in each case is entered into database. Methods of soil analysis in differnt countries are not same, which is explained by variety of national traditions, differences in practical tasks etc.

Finally, all cartographic and attributive data are systemized and processed in GIS environment with application of programme software ArcGIS. All above-mentioned serves to use European geographical and analytical soil base data in the territory of the Azerbaijan Republic.

CONCLUSIONS

Application of European geographical and analytical soil data in the territory of Azerbaijan Republic have ben revised in this article. It has been shown that application of European soil standards in Azerbaijan will allow to carry out joint analysis of land resources, to develop single policy of land use and single agricultural monitoring, to carry out unified accessment of environment. Data base envisages full analytical characteristics for characteristic soil cuts. It is noted that special attention is given to correlation of national soil classification with cartographic units of European geographical database. Accent is made on Global reference of soil resources (WRB, 1998).

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THE PROBLEM OF RELIABITY OF GEOECOLOGICAL AND GEOTECHNICAL OBJECTS (SYSTEMS) NOWADAYS

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Reliability is one of the most important, determining, functional showings of any geoecological and geotechnical objects and systems. The steadiness, profit economy, resource and competableness of the considered designing and engineer-geological solutions depend on reliability.

The leading conception basing on which the problem of increasing the reliability of geoecological and geotechnical objects (systems) at the present it stage of its development is systematicness. Being the most important part of the system of provideness of quality the systems of provideness of reliability contain the whole life-cycle of geoecological and geotechnical objects (systems) from the beginning of anthropogenic or technogen influence or their working out in complex territories to the end of exploitation period. The methods of reaching proper level of reliability of geoecological and geotechnical are special for each period of provideness of reliability of geotechnical objects and systems are careful studies of soils, geological and hydrogeological surroundings, parameters of their steadiness, choice of proper technologies and building materials and constructions not letting the out come of the considered geotechnoecological objects and systems from steady (equilibrium) state during both building and the whole period of exploitation, providing reparability and reservation.

Technological reliability is provided by protecting stable technological processes of complex territories and carring out a zero cycle of work while building complex erections. Exploitation reliability of geotechnoecological objects and systems are determined by the arrangement of technical service where at the moment there are several tendencies. One of them is classical based on the static theory of reliability formed under mass development of free territories and building various erections, and allows to plan the strategy of introduction of the complex territory and caring out geotechnical and other kinds of building work and their further exploitation at average by means of identification for objects and

systems which may be specially classified and doesn't guarantee optimum introduction of a separate complex territory or optimum caring out geotechnical and building work for separate complex objects. Under such an approach the result of planning is finding some normative showings, for instance, the resource of geotechnoecological objects (system).

Though the storage of statistic data of refusals (damage, destructions, catastrophes) of the complex territories themselves or constructions erected on them showed the refusals take place both during the pointed resource of geotechnoecological object (system) and beyond its borders. So they are watching a constantly growing need in working out the methods of their serving each geotechnoecological objects (system) according to its real state.

Appearing during development of study of quality as a condition of providing defect less production, this one is especially useful for complex geoecological and geotechnical systems (objects), refusals (damage, destructions, catastrophes) of which are linked to the direct menace for people and animal's lives or ecological consequences (hydro technical objects, gas-oil-refining and chemical industries, power objects).

The identification of real state of complex geoecological and geotechnical objects (systems) finding pre-refusal (pre-accidental) state, prognostication the dynamics of the change of their state during building and exploitation finding the remainder resource (storage of steadiness and toughness) all the problems are the parts of the single problem providing of accidentless work of geotechnoecological objects (systems).

The solution of these problems is based on the usage of the whole experience stored by the present moment in scientific-technical direction reliability.

The scientific- technical direction reliability has come several stages through in its development. The desire of reducing accidentality of geotechnoecological objects (systems) stimulated the study of real loads in complex territories, unstable soils ground constructions during building and exploitation, bearing property of soils and structures of buildings, the processes of the change of their state because of growing old, tiredness and other factors.

The basis of the solution of the problem of providing of reliability of geotechnoecological objects (systems) is the theory of probability and mathematical statistics.

Before designers and geoecologists they have risen the following actual problems: 1) finding the main reasons causing damages of elements of geotechnoecological objects (systems), as well as the ways of their warning and elimination; 2) search and working out the ways of making reliable geotechnoecological objects (systems); 3) working out the methods of prognosis of reliability of designed geotechnoecological objects (systems).

In order to solve the mentioned problems it requires the study of stableness of engineering-geological surrounding and soils to the influence of various external factors – dampness, temperature, mechanical load, seismicity, various geophysical fields and so on. That will let gain rich statistic material to value the characteristics of reliability of geoecological and geotechnical elements and their dependence on different external loads. At the same time, the development of methods of analytical calculation of reliability of geotechnoecological objects (systems) will allow to predict their reliability.

Multitudinous tests on reliability of geoecological and geotechnical objects (systems) and their separate parts and their critical analysis of the reasons of accidental deformations, damage and catastrophes showed their magnificent dependence on the state of the territory the soils of which it consists, the constructions linked to and contact these soils, the technology of development of the territory and building, the conditions of exploitation of geotechnoecological objects (systems).

The building standards accepted for complex geotechnoecological objects (systems) must favour the providing of reliability of geological (soil) components and constructions placed on the ground, interacting with the ground during engineer-geological and geoecological prospectings, designing, building and preliminary tests of the whole object (system) or its separate elements. That will allow to reveal multitudinous engineering-geological, geotechnical, geoecological, constructional and technological defects leading to refusal (different accidents and damage) during building and exploitation with 100 per sent probability.

The development of the science of reliability raises the following more difficult problems: 1) the necessity of putting the opportunity of the providing of high reliability at early stages of making geotechnoecological objects (systems); 2) finding out the ways of optimal combination of programmes of providing of reliability of geotechnoecological objects (systems) with the degree of responsibility of the solved problems and expected effects.

Nowadays they are raising new demands for the reliability of complex geoecological and geotechnical objects (systems) making the basis of contemporary systems and programs of providing of reliability. Their basis consists of: clear planning and effective management of all the work in the field of reliability; determining special problems on providing of reliability; their places in the process of carrying out investigating, designing and building; the evaluation of reliability (meaning interinfluence, documental and mathematical providing) by means of engineer analysis, tests, experimental evaluations and prognosis; regular and timely information of the situation in the field of reliability of a geotechnoecological objects (systems) being worked out. The distinction of the mentioned demands is concentrating efforts to quality problems of reliability of geotechnoecological objects (systems) but at the same time quality problems mentioned above are not excluded.

The modern typical method of carrying out of arrangements linked to providing of reliability of complex geotechnoecological objects (systems) must be fixed in different standard technical documents in two principal directions. One of them is linked to the potential reliability of geotechnoecological objects (systems), based on constructional methods (selection of geomaterials, building materials, store of durability and so on) and technological (strictening designing demands, raising quality and clearness of geotechnical work carried out functional constructions and so on). The latter is concerned to the providing of exploitational reliability of geotechnoecological object (system), which is based on the methods of stabilization of exploitational conditions (protection from wetness, protecting screens, stabilization of stresses and so on) and technological service (repairing and preventive inspection).

THE LONGEVITY OF COMPLEX ENGINEERING GEOECOLOGICAL AND GEOTECHNICAL OBJECTS

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While forming and building complex engineering – geoecological and geotechnical objects, as a rule, we deal with a long time of service of the objects, so providing the initial reliability cannot gurantee their safe work during required time of exploitation. The detailed determinations of engineering-geoecological and geotechnical objects are given in our article published earlier [1].

Reliability of a real complex engineering geoecological and geotechnical object corresponding to the demands of stableness, durability and deformability is not stable and can change because of passed time both increasing and decreasing.

The intensity of changability of characteristics of the initial reliability corresponding to the passed time considerably depends on the influences of climatic, seismic and exploitational factors forming the environment of the object. All the external factors forcing the object are thought to be its environment.

Basing on calculations of maximum states the conditions of exploitation of complex engineering – geoecological and geotechnical objects and other favourable and unfavourable external factors influencing their transition to the maximum state are taken in consideration by the standart coefficient of the conditions of work. This coefficient is poorly studied and should be defined more exactly for specific conditions.

First of all, we point out the factors depending on environment and influencing the longevity of complex engineering-geoecological and geotechnical objects.

The longevity of a fragment (part) or the object itself is valued by the longevity of their reliable work (with possible breaks for preventive repairs) in the exploitation conditions from building to the full lost of exploitation properties.

The required time of service of complex engineering – geoecological and geotechnical objects is found by standard documents according to their functional purposes and other factors.

Two or several objects of the same purpose may have different characteristics of longevity if they are built of various soils and materials, differ with constructive solutions, are built with various quality of building work and exposed to various influences of environment, exploited in the conditions of different frequency and quality of preventing measures.

The regulator of the longevity of complex engineering-geoecological and geotechnical objects is repairability, in other words, ability of soil, constructions and their knots for periodical inspection and preventing measures.

Providing the reguired time of complex engineering-geoecological and geotechnical objects can be achieved: by a rational choice of the methods of stabilization of weak soils, materials and constructional solutions providing required longevity of elements and conjugate knots and responding to the demand of repairability; by guaranteed quality of work; by the right exploitation meaning regular technical examinations of the object, separate elements and constructions; taking timely preventing repairs; not letting over maximum exploitation loads appear; by preserving the object and its parts (elements) and knots from harmful influence of environment.

The longevity of complex engineering-geoecological and geotechnical objects, their parts (elements), knots and constructions is influenced by:

1) internal physical and mechanical and physical and chemical processes taking place in the ground and materials and causing changes of characteristics of their durability with passing time;

2) agressivenes of external and internal environment and the degree of their influence on the soils and materials of the parts (elements), constructions and knots of the object within a time;

3) changeability geometric parameters of soil strata, constructions because of the deformation of the ground, seismic, atmosphere, anthropoic, technical and other mechanical forces;

4) the conditions of technical exploitation of the objects.

An important problem of designing complex engeeniring-geoecological and geotechnical objects of consists of providing their work within the whole time of its service as reliably as it is solved by the calculation of the initial reliability. Moveover preserving measures defined for the offered time of service of the objects must be realized.

In order to find the quantity characteristics of longevity we consider the correspondence of the according parameters of reliability of complex engineering-geoecological and geotechnical objects (stableness, durability, deformability, etc.) and time.

If we letter some parameter as k and its initial value as k_0, then

$$K = (k_0, t) \qquad (1)$$

In this expression the main thing is the kind of the corresponding function which must be found both theoretically and experimentally.

We may state that the correspondence has a probability nature, such an idea is quite possible because it is known that there takes place sparseness of both showings of mechanical aging, wear and other characteristics of longevity of objects themselves and characteristics of external conditions.

The experimental basis of unknown functional correspondence cannot always be true enough yet because we do not always have the data systematized according to the unit method.

So we take as the first approximation the expotential law theoretically based and corresponding to the experimental data mentioned above.

The expotential law is known to submit chemical reactions which probably play an important role in changing the properties of soil, aging and corrosion of materials and many other phenomena.

Its theoretical basis is proportionality of velocity of changeability of some parameter (intensity of refusals, loss of durability and e.t.c.) to its present value.

From the differencial equation

$$\frac{dk}{dt} = -\lambda k \tag{2}$$

we have the law

$$k = k_0 e^{-\lambda t}, \tag{3}$$

here – the constant of wear measured in units inverse to time and characterizing relative velocity of changing the corresponding parameter of longevity, the number of refusals, etc. The finding of constant may be done basing on the experimental data but they do not take into consideration probable sparseness but the average data.

It we think that aging and wear z is described by formula (3), then in relative unites [2]

$$z = 1 - \frac{k}{k_0} = 1 - e^{-\lambda t}, \tag{4}$$

or

$$z = (1 - e^{-\lambda t})100. \tag{5}$$

Entering instead of wear z z safeness $y = 1 - z$ which is more suitable for mathematical calculations for expotential law, we get

$$y = \frac{k}{k_0}.$$

(6)

To find one measure is theoretically enough, thus to avoid the influence of inevitable mistakes it had better to find its average value basing on a number of measures.

After using the least squares [3], logarithmize expression (6) for moment t_i, then

$$\ln y_i = -\lambda t.$$

(7)

It for the whale complex of values of t_i we find y_i, then according to the method of the least squares we get the best value of equal to minimum of the expression

$$\sum n_i (\ln y_i + \lambda t)^2,$$

(8)

here n_i – the number of watching corresponding to t_i, so, we have

$$\lambda = -\frac{\sum n_i t_i l_n y_i}{\sum n_i t_i^2}.$$

(9)

Physical wear of comlex engeeniring-geoecological and geotechnical objects takes place as a result of material aging and long usage of the ground and constructions during the exploitation and the influence of nature forces on them.

More over, plysical wear depends on the kind and quality of the ground, building materials, details and constructions, quality of building work, systems, periodicity and quality of preventive and capital repairs.

The percent of wear of a complex engineering – geoecological and geotechnical object is found according to real physical statlat the moment of its examination.

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THE EXPRESS-METHODS OF THE ON-LINE FORECAST OF "HORIZONS OF MAGNITUDE, TIME AND THE SITE" OF THE EARTHQUAKE CENTER ON GEOCHEMICAL FIELDS OF FLUIDS

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It is considered to be, that the decision of a problem of the forecast of earthquakes is possible only at complex use of various methods explorations (seismological, geophysical and geochemical). However, in result of carrying out in the Seismological Center of Azerbaijan twelve-month seismic geo-chemical monitoring of fluids over long period of time (1979-2008), we are received some positive results at the decision of separate problems only on anomalies in geo-chemical fields of fluids. The analysis of database of seismic geo-chemical observations for the period 1979-2001 has shown that exactly geochemical fields are the express-data, which reflects change of geodynamic of environment. They allow operatively, daily to spend a qualitative and quantitative estimation of "intensity" of hydro, – gas, – radio geo-chemical fields of fluids and on the basis of received data to make an estimation of seismic environment to water areas of Caspian sea, territory of Azerbaijan and from the states (Russia-Dagestan, Georgia, Armenia, Turkey, Iran) where there are hypocenters strong ($M_{LH} = 5.5 \div 6.5$; $Mpv = 5.5 \div 6.5$) and catastrophic ($M_{LH} \geq 6.5$; $Mpv \geq 6.5$) earthquakes. The purpose of carrying out researches – studying of influence of the seismic, geological, physical and chemical processes occurring in large focal zones of strong and catastrophic earthquake on a geochemical mode of fluids of Azerbaijan; revealing of seismic prediction geochemical criteria; development of express methods of on-line "diagnostics" of the dangerous seismic centers on geochemical fields; an estimation of seismic conditions in region in a real time mode. As it is known that for the correct forecast of

strong earthquake it is necessary to establish presence of 3 main parameters: location of the centre, calculation of magnitude-force of the future seismic event and time which has remained before its realization. Thus, on the period of time on which the forecast is calculated, distinguish operative (flowing), short-, middle- and long-term. Obviously that the operative forecast of earthquake is the most difficult because it should reflect detailed, short-period changes of the environment of migration of fluids in bowels of the Earth. This final stage in preparation of earthquake for realization is accompanied by short-term, synchronous energization of physical and chemical, acoustic, tectonic, etc. processes in the seismic centre. In connection with that, for the decision of questions of the operative seismic forecast, the major problem is – development of technology of operative interpretation of the fact data of seismic prediction monitoring of fluids in a real time mode.

In Section of Seism geochemistry of Azerbaijan Seismological Center all-the-year-round observation for space-time variations of fluids mode are spent on 14 objects (wells of underground waters and mineral sources) which are located in seism active zones of Azerbaijan. In a result of the data analysis of long-term (more than 30 years) seism geochemical monitoring, for the operative and short-term forecast of earthquake have empirically been established **"time horizon" on anomalies in geochemical fields of fluids**. This term is used by us for the first time for a designation of a time interval which corresponds to the final stage in the course of preparation of the basic seismic push which in seismology is named – "shock". The term "horizon of time of the forecast" has been used for the first time by the American meteorologist E. Lawrence for the description of dynamic chaos in the determined systems of nonlinear dynamics – "Lawrence's system". The parameters reflecting a condition atmosphere, ocean, solar activity, etc. concern it. In G.Nikolis and I.Prigozhin's known works [Nikolis, etc., 1990], T.Ahromeeva and S.Kurdjumova [Ahromeeva, etc., 1992], G.Malinetsky and A.Potapov [Malinetsky, etc., 1995] are furnished convincing proofs assumption that according to Lawrence's system the future is unequivocally determined by past and has an end result. And, one of main is the major conclusion that for each system there is the "horizon of time of the forecast". In particular, meteorologists suppose that the horizon of the forecast for weather does not exceed three weeks. In other words, as though we did not define exactly the atmosphere parameters, predict weather by using of available devices in three weeks in the given place it is impossible. Horizon of weather for ocean condition experts estimate at one month. There is a lot of such examples. They are described in work [Keramova, Asadov, 2005].

From the point of view of nonlinear dynamics, earthquakes and the processes connected with them concern difficult systems. And for difficult systems as it is noted in the above-stated works the fundamental restrictions exist in the area of the forecast. In particular, we have been established that **the forecast of "time hori-**

zon" seismic event on anomalies in geochemical fields of fluids corresponds to a concrete interval of time. It is equal 1÷16 to days. The given conclusion has been made empirically, on a basis of interpretation an actual material of seism geochemical monitoring of fluids during 1979-2001. In particular, has been established that time of occurrence of geochemical anomalies in objects all-the-year-round observation corresponds to the formation final stage focal zones of strong and catastrophic earthquakes. All of them have been realized within 1979-2008 within the Anatoly-Iran-Caucasian tectonic block and water area of Caspian Sea (Caspian sea-1986, 1989, 2000; Armenia: Spitak-1988; Iran: Rudbar-1990, Bam-2003, Luristan-2006; Georgia: Rachin-1991, 2004; Turkey: Izmit-1999, etc.).

For the decision of a problem of the forecast of "horizon of a site of the seismic centre preparing for realization" we offer an express method "to identification of the dangerous seismic centers on anomalies in geochemical fields of fluids in real time" (Keramova, 2004; Keramova, 2005). Its basis is the method of "recognition of images". It is applied for compose of geochemical "portrait" of the earthquake preparing for realization. On fig. 1-2. which we are named by identification "diagrams", there are examples of geochemical "portraits" of the earthquakes realized in the concrete seismic centers: water areas of Caspian Sea and the Anatoly-Iran-Caucasian tectonic block. On identification "portrait" the axis of ordinates is presented by informative geochemical parameters (elements-indicators of the given earthquakes), and the axis of abscissas is presented by time which remains before realization predicted seismic event, at established by us "horizon of time of the forecast", being equal to 16 days. On the basis of an express method "identifications of the seismic centre on anomalies in geochemical fields of fluids" have been made "Atlases of seism geochemical portraits" for the concrete centers strong and catastrophic earthquakes, earlier realized (1979-2008) in water area of Caspian sea, limits of Azerbaijan, and frontier territories of the adjacent states (Russia-Dagestan, Georgia, Armenia, Turkey, Iran). As it is known, the whole this region is a part of the Anatoly-Iran-Caucasian tectonic block. For the purpose of an estimation of seismic conditions in the specified region on short-period anomalies in geochemical fields of fluids, by means of the offered express-method, operative processing of a seism geochemical material in a real press of time is daily carried out. As a result, to define "site of horizon of the seismic centre", geochemical "portrait" of predicted earthquake which is identified with already ready "portraits" from "the Atlas …". It is necessary to notice that at construction of identification geochemical "portrait" of the seismic centre preparing for realization, such major laws, as have been established:

– By preparation of earthquakes of various magnitudes, abnormal disturbance of a hydro geochemical field on time of display and in combinations of elements-indicators for the different seismic centers has individual geochemical "portrait".
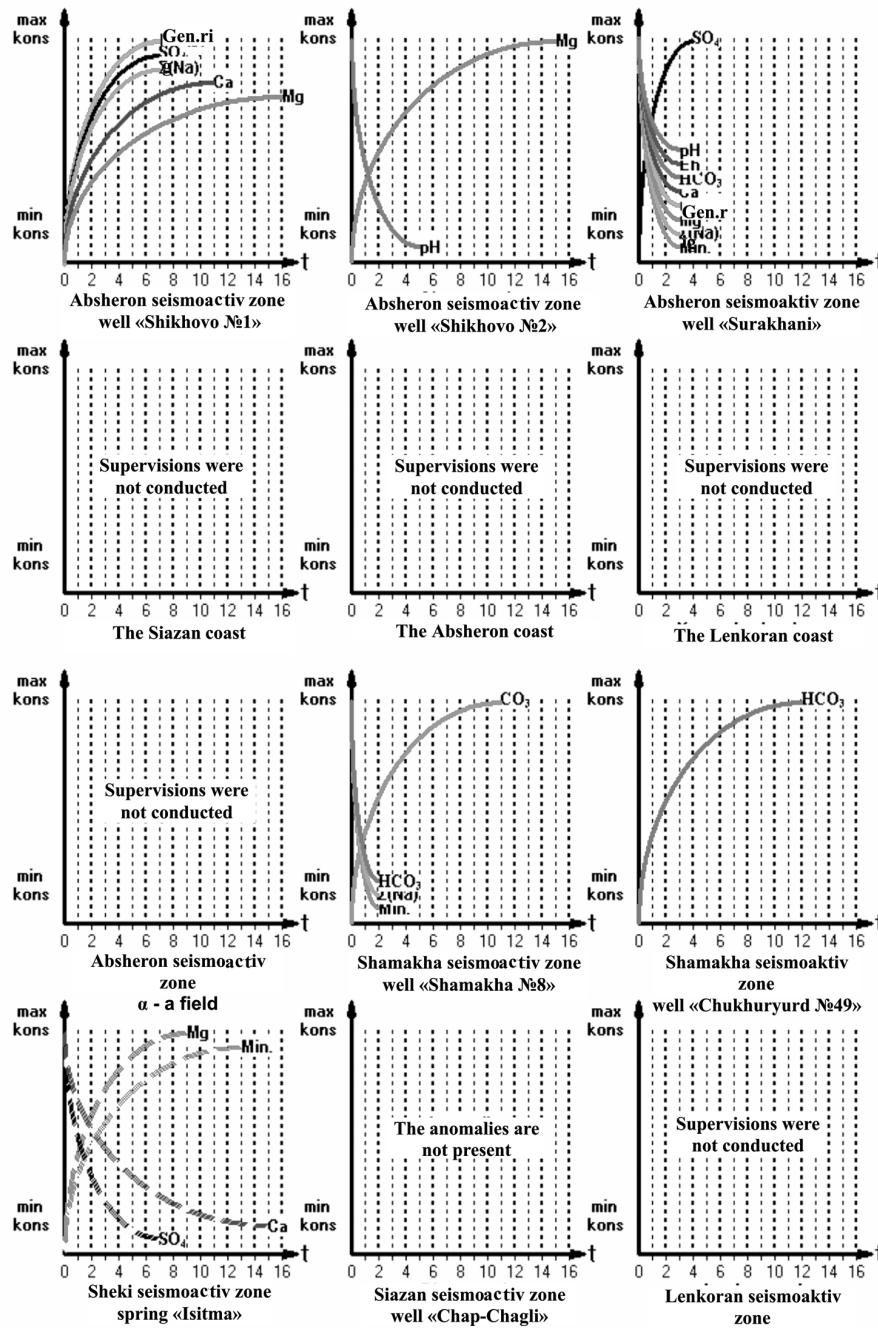
Figure 1. Indentification figure – geochemical "portrait" of the seismis center

Southen part of Caspian Sea – Baku's earthquake

(25.11.2000; M$_{PV}$=6.4; К=13.1; h=33 km)
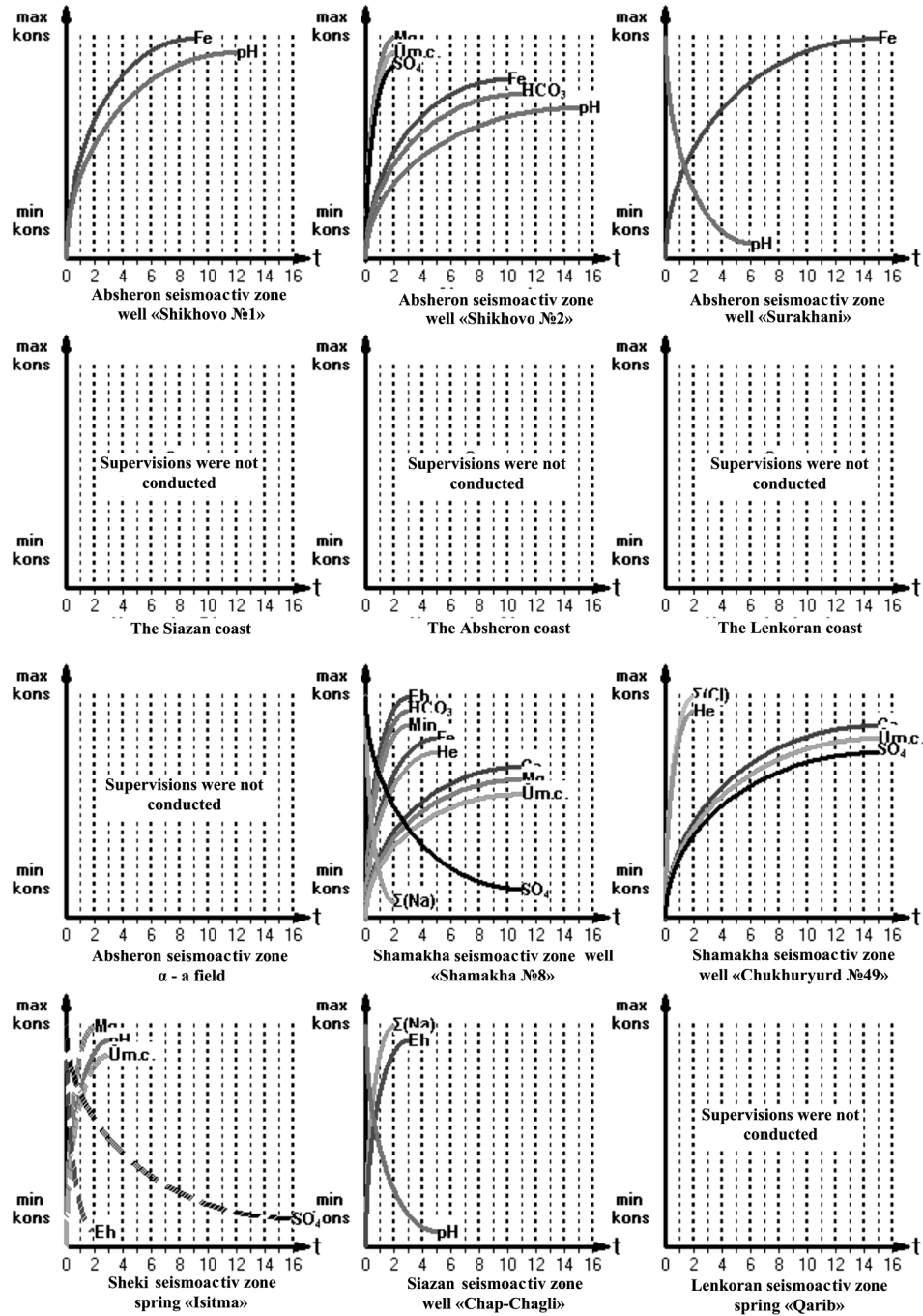
Figure 2. Indentification figure – geochemical "portrait" of the seismis center

– The less magnitude (Mpv $\leq$ 4.0; $M_{LH} \leq$ 3.5) is more depth of deposition the seismic centre (h $\geq$ 20 the km) and is longer a time interval before earthquake realization (t = 10 $\div$ 16 days), and the less combinations of abnormal parameters in water of observable object.

– In preparation period of weak (Mpv $\leq$ 4.0; $M_{LH} \leq$ 3.5) seismic events with depth of deposition of centre (h $\geq$ 20 km), in "portraits" of earthquakes on geochemical fields of fluids is observed a great quantity of "noise", i.e. the great number of informative parameters participates in combinations. They create certain hindrances at hypocenter identification in which processes of preparation for earthquake realization have begun.

– Presence of a great quantity of informative parameters in "seism geochemical portraits" envolves in 2 cases: a) preparation of strong (Mpv $\geq$ 5.0), close earthquakes at the hypo central distance equals $\Delta = 0 \div 500$ km or preparation strong ($M_{LH} \geq$ 6.0), but far earthquakes at the hypo central distance equals $\Delta = 500 \div 2000$ km; b) synchronous occurrence of the final stage of preparation for realization of earthquakes in different focal zones. To distinguish the first case from the second it is possible thanks to the express method of calculation offered by us of "magnitude horizon" when in the same object of observation the size of concentration of abnormal value of different geochemical parameters corresponds to different values of magnitudes.

– At repeated realization of earthquake in the same centre with similar seismic parameters (magnitude, depth), it's geo chemical "portrait" is stable.

– In spite of the fact that in a concrete seismic centre were realized at various times and had various seismic parameters, the basic set of combinations of informative geochemical anomalies, i.e. their template, remains stable.

This condition is the major principle of the offered express method of the forecast of "horizon of a site of the concrete seismic centre", or otherwise – operative identification of the centers of earthquakes on geochemical fields of fluids. It helps with high degree of reliability (70 $\div$ 75 %) to estimate seismic conditions in concrete region.

However it is necessary to notice that the express method of the forecast developed by us of "horizon of a site of the seismic centre preparing for realization" on geochemical fields of fluids, is highly effective for revealing only for those dangerous seismic centers which have been earlier realized within concrete region. This period should correspond to time of carrying out of all-the-year-round seism geochemical monitoring of fluids. In our case it is established that in 1979-2008 all the objects of observation of fluids of Azerbaijan were supervised by seismic conditions in water area of the Caspian Sea and whole Anatoly-Iran-Caucasian tectonic block.

Following important point for operative interpretation of the data seismic predictive monitoring in a real mode of time is correct revealing short-period anomalies in geochemical fields of fluids. It is known that on abnormal change of hydro geochemical, gas geochemical and radio geochemical fields of fluids the difficult complex of fluid dynamic, hydro meteorological, geologic-tectonic and seismic processes influences. However, in 1997 A.G.Gasanov and R.A.Keramova [Gasanov, Keramova, 1997; Gasanov, Keramova, 2007] following laws have been established:

a) influence of a complex of the seismic processes occurring in the centre of the future strong earthquake ($Mpv \geq 5.0$; $M_{LH} > 6.0$) on a geochemical mode of fluids in its final stage of preparation for realization — the most significant. It exceeds all other influences of environment on a geochemical mode of fluids;

b) the geochemical mode of fluids of Azerbaijan is influenced by seismic conditions not only on the given territory, but also — in water area of the Caspian sea and on territories of the adjacent states (Russia-Dagestan, Georgia, Armenia, Turkey, Iran) where there are hypocenters strong ($Mpv = 5.8 \div 6.7$; $M_{LH} = 5.1 \div 6.5$) and catastrophic ($M_{LH} \geq 6.6$) earthquakes.

In 2001, after the Caspian-Baku earthquake (25.11.2000 y.), the author had been developed and introduced essentially new technologies of computer processing and complex interpretation of an actual material on geochemical fields of fluids in real time. They have found reflection in the form of three (3) express methods of an operative estimation of daily arriving data of seism geochemical monitoring of fluids (148 parameters). The Ultimate goal of these workings out – an operative estimation of seismic danger as in territory of Azerbaijan and water area of Caspian sea, and the adjacent states (Russia-Dagestan, Georgia, Armenia, Turkey, Iran). These technologies have been tested for all strong and catastrophic earthquakes of the Anatoly-Iran-Caucasian tectonic block. They include our following workings out:

1. Formulas of calculation of borders of the maximum-minimum values of abnormal concentration of any parameter for an estimation comprehension of anomalies in geochemical fields of fluids which arise at the final stage of the period of preparation of earthquakes;

2. Formulas of calculation of borders of the maximum-minimum values of magnitude of predicted earthquake on anomalies in geochemical fields of fluids which allow giving the forecast of "magnitude horizon" preparing earthquake on anomalies in geochemical fields of fluids.

CONCLUSIONS:

Scientific novelty of the spent researches consists that following "know-

how" for the first time have been developed for a daily operative estimation of seismic conditions of concrete region on the basis of interpretation of the data of seism geochemical monitoring of fluids:

a) an express method of calculation for revealing of anomalies in geochemical fields of fluids;

b) an express method of calculation for the forecast of "time horizon" realizations of the seismic centre;

c) an express method of calculation for the forecast of "magnitude horizon" the seismic centre preparing for realization;

d) a revealing express method of "site horizon" the seismic centre preparing for realization.

Work on development of new technologies, express methods of interpretation of the data of seism geochemical monitoring of fluids has begun in 2001, after strong Caspian-Baku earthquake (25.11.2000; Mpv=6.5). This seismic event was accompanied by the big social both economic damage and human victims, but simultaneously it had huge scientifically-practical value. It is possible to consider it as a boundary after which in RSC ANAS intensively began to be reconsidered both seismic and seismic predictive materials which have been turned out for the period (1979-2000) carrying out of the seismogeochemical researches [Keramova, 2004; Gasanov, Keramova, 2007]. However, it is necessary to notice that results of testing of the developed express methods of interpretation of the data of seism geochemical monitoring of fluids have shown that work in this direction is not ended. Correctness of operative and short-term forecasts about possibility of realization of earthquake in the concrete seismic centre in water area of Caspian sea and within the Anatoly-Iran-Caucasian tectonic block is extreme high and reaches 65÷70 %.

Errors which arise for today at an estimation of seismic conditions in real time are in our opinion connected with following main reasons:

a) the extensive regional seism geochemical network of stations covering all seismogene zones in the countries, adjacent with Azerbaijan (Russia-Dagestan, Georgia, Armenia, Turkey, Iran) is necessary;

b) the statistics of the geochemical information from the countries, adjacent with Azerbaijan (Georgia, Dagestan, Armenia, Turkey, Iran) which will reflect a concluding period of preparation of the seismic centers of the specified region for testing of the methods developed by us is necessary.

The decision of the put questions demands the complex analysis of laws of seismic, tectonic, geophysical and geochemical processes with attraction of the experts living in limits of the Anatoly-Iran-Caucasian tectonic block. The new technologies offered by us – express methods of interpretation of an actual material in real time for all-the-year-round seism geochemical monitoring, can be used also for the decision of problems of the operative seismic forecast on various geophysical

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fields. These are our first steps in area of operative estimation of seismicity in region and the short-term forecast of earthquakes on anomalies in geochemical fields of fluids.

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THE NEW GEODYNAMIC MODEL OF THE SOUTH-CASPIAN MEGADEPRESSION (SCM)

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Water area of the Caspian Sea with the interfaced territory of a land covers heterogeneous area of an earth's crust, including three uneven-age geological units: in the north – a southern part of Russian platform, in the middle – a northwest part epihercynian plates and in the south – Alpine folding [Shlezinger, 1974, 1995]. These geological units, certainly, were formed during various epoch of cyclicity. It also defines a degree of complexity of a geological structure of Caspian Sea, in particular SCM. Modern scientific development of the mechanism of the tectonic processes occurring and in water area of Caspian Sea are based on the theory about tectonics lithospheric plates [Khain, Lobkovsky, 2004].
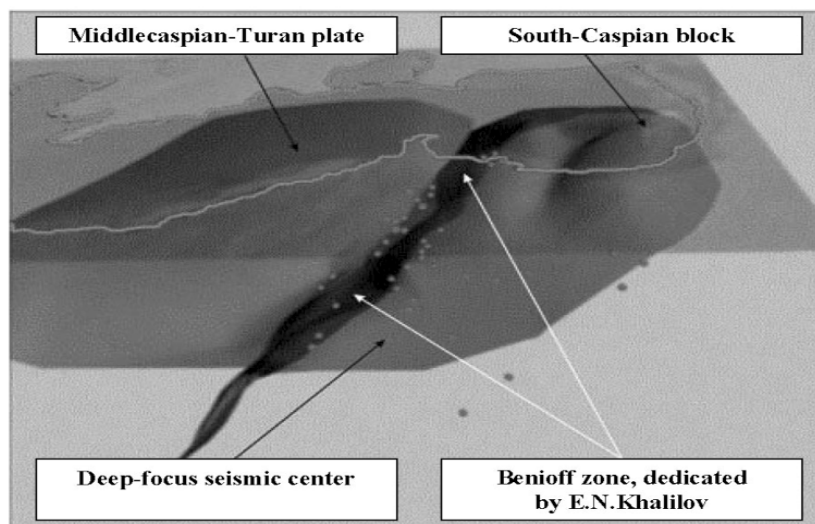
Picture 1. Fragment of geodynamic model and Benioff zone, dedicated by 3D-modelling of geology-geophysical data

Interpretation of geology-geophysical data on the basis of 3D-modelling, reflecting a true picture of a structure of environment, is the most modern method of studying of structurally-tectonic characteristics of investigated region. By means of this method many problems in geology are solved successfully. At creation of new geodynamic model SCM with application 3D-modelling from the point of view of the theory about tectonics lithospheric plates tectonic-structural evolution is represented as follows.

In the end of a mesozoic era at movement in northeast direction Hindustan of the microplate which have separated from the African continent as a result of collision with the Euroasian continent, block Deshte-Lut located in east part of territory of Iran, and block Srednekaspijsko-Turansky located at east coast of Average Caspian sea, separated Kopetdag and Binalud high-mountainous folding, have been subjected to deformation. As a result the direction of prodeleting Middlecaspian-Turan of the block has changed, namely, the block has turned in a direction counter-clockwise. In summary collisions of the Arabian board besides with the Euroasian continent, was exposed to deformation and Main Zagross thrust, and trust turn has occurred in a direction of clockwise. As a result of these deformations the main impact of force intrablock compression has got in a vicinity of a modern South-Caspian megadepression. On deep earlier existed rift faults mantle magma has risen to a surface of the Earth. In a modern epoch the same magma of mantle origins also is geological nature Mugan-Garabakh and South-Caspian regional maxima of a gravitational field.
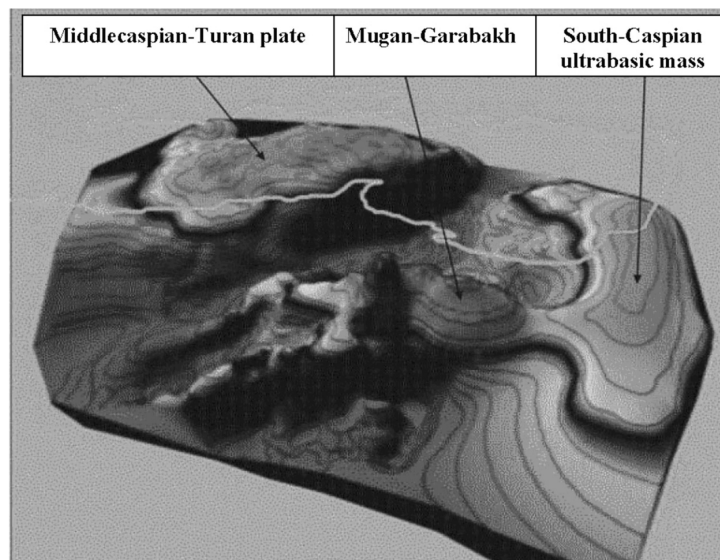
Picture 2. Fragment of geodynamic model, constructed by 3D-modelling of gravity field

Before collision Hindustan and Arabian microplates with the Euroasian plate the investigated territory was in a vicinity the sea Tethys [Khain, Khalilov, 1985, 2005]. After deep magmatism of mantle origins, on territories of the South-Caspian megadepression sea conditions were replaced on continental. Movement of mantle diaprism to a surface of the Earth became the reason of deformation of an earth's crust in a vicinity of a modern South-Caspian megadepression. As a result of this deformation, basically, adjournment of mesozoic age not according to lie from below and from above. At the same time, the lost mass colonies of fauna in continental conditions formed carbonate reef constructions. After completion of the magmatic processes caused by horizontal movements of plates, rather quiet geodynamic conditions were established, and there was a transgression. This territory again has been subjected to sea conditions, and anew began to occur sediment formation. The layers of the adjournment which have formed after Mesozoic time are characterized by monoclinal bedding and quiet falling aside the Caspian Sea.

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RESULTS OF USE OF EXPRESS-METHODS
OF THE OPERATIVE FORECAST OF EARTHQUAKES
ON GEOCHEMICAL FIELDS OF FLUIDS IN AZERBAIJAN
(2001-2007)

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Presented work is devoted to developed express-methods of complex, automated processing on the computer of an actual material all-the-year-round seism geochemical monitoring of fluids in Azerbaijan and to results of their daily interpretation with the purpose of operative diagnostics of dangerous seismic centers on anomalies in geochemical fields in real time.

It is known, that on our planet there are a plenty of seismically active regions where in various years periodically there were catastrophic and strong earthquakes which were accompanied by a huge material damage and human victims. Thus, within the limits of the specified regions the dangerous seismic centers are present at different quantity, depending on the geological, tectonic and physical and chemical processes proceeding in concrete territory. Under the term "the dangerous seismic centers" we mean the centers of those concrete regions, in which on abnormal variations in observable fields (seismological, geophysical, geochemical) the preparation for realization of strong earthquake is found out (Mpv=5.8; M_{LH}=5.1). However to establish in which center the preparation has begun for seismic event extremely difficultly even by seismological methods, because in one case the basic push – shock is anticipated by foreshock, and in other without preliminary pushes it is shown by one, unique terrible impact. For today the difficulty in the decision of problems on the forecast of earthquake are huge. Results seism predictive observations in Azerbaijan have got especially big scientific and practical value after strong Caspian-Baku earthquake (25.11.2000; Mpv=6.5; h=33 km). Only after the specified seismic event, there was an imperative need daily to spend the operative analysis seismic geochemical data, to

assess of seismic conditions on the territory of republic in real time, to inform on it RSC ANAS management by fax with the subsequent sending results in the Government of Azerbaijan. This problem has been executed only owing to all-the-year-round seism geochemical monitoring of fluids which is spent since 1979 on present time on 12 objects of observation in 5 seismic active zones of Azerbaijan. They are located within the limits of meganticline of Big Caucasus (its southeast termination, southern and northeast slopes) and in a southeast of Azerbaijan (near to border with northwest Iran). Especially it is necessary to note, that, for the first time in a world practice of seism predictive works, since 2001 in Azerbaijan, in the Seismological Center; in Branch of seism geochemistry it began to be spent all-the-year-round seism geochemical monitoring of sea water of coast of Caspian Sea. The analysis of a database of seism geochemical observation for the period 1979-2000 has shown that exactly geochemical fields are the express data which reflect change of geodynamic conditions of environment. They allow operatively, daily to spend a qualitative and quantitative estimation of "intensity" of hydro-, gas- and radiogeochemical fields, and then, to compare this data with seismic fields in real time. Thus, informative objects of observation and parameters, size of their abnormal concentration have been established, and then, the technology of identification of the seismic centre prepared to realization of strong earthquake has been developed. During 1990-1992 works for choice the most informative and not expensive geochemical methods of observation, and also ? informative and accessible objects of observation of fluids have been finished. As a result, the author [Keramova, 2004] has been established for the first time very important fact. It is impossible to explain separate high amplitude anomalies arising in variations of geochemical fields of fluids by neither seasonal fluctuations of a background, nor seismic conditions in territory of Azerbaijan and water area of Caspian Sea. It has appeared that comparison of geochemical fields of objects of observation to a seismological material only across Azerbaijan and water area of Caspian Sea (on the area in radius no more 200 ч 400 km) – is already not enough. Having convinced of reliability of an available geochemical actual material, it has been decided to increase the data gathering area about seismic events (Mpv = 5.5 ч 7.5) to radius in 2000 km since have repeatedly been found out short period abnormal splashes in amplitude of concentration of separate geochemical parameters which can be carried up the time of realization of strong and catastrophic earthquakes which have occurred in territories not only Russia-Dagestan, Georgia, Armenia, but even – in Iran and Turkey. **This territory has included water area of Caspian Sea, and also – whole Anatoly-Iran-Caucasian tectonic block which is a segment of the Alpine-Himalaya tectonic belt of the Earth.** As it is known, within this region there are centers of strong and catastrophic only crust earthquakes ($M_{LH} = 5.0$ ч 7.5; h ≤ 33 km). Besides, the big unexpectedness was the establishment of the fact of influence on a geochemical mode of fluids of the Absheron seismogene zone of Azerbaijan of the centers of strong and catastrophic

deep focus earthquakes ($M_{LH} \geq 6.0$; $h \geq 180$ ч 300 km) of Hindukush zone of the Alpine-Himalaya tectonic belt of the Earth. In further (1990-2000) on the basis of results of the retro analysis and interpretation of a database of long (in an all-the-year-round mode) seism geochemical monitoring (1979-2000) for the first time the important fact having huge scientific and practical value – **all strong and catastrophic earthquakes which have occurred in water area of Caspian sea has been established, in territories of Azerbaijan and the adjacent states (Russia-Dagestan, Georgia, Armenia, Turkey, Iran) were showed in anomalies fluid of the processes proceeding on objects of observation of Azerbaijan** [Gasanov, Keramova, 1997; Keramova, 2003, 2004, 2005] (fig.1.).

Scientific novelty of our seism geochemical researches consists that the first steps for the decision of questions of operative (for time – 1 ч 5 days) and short-term (till 16 days) forecasts have been made. The given period of time (16 days) has been established empirically, on the basis of interpretation of an actual material of seism geochemical monitoring of fluids during 1979-2001. In particular, it has been established that time of occurrence of geochemical anomalies in objects of all-the-year-round observation corresponds to the formation final stage focal zones of strong and catastrophic earthquakes. These technologies have been tested for the earthquakes which centers are not only in water area of Caspian sea and in territory of Azerbaijan, but – whole Anatoly-Iran-Caucasian tectonic block. Scientific novelty of our researches consists that following "know-how" for the first time are developed. In particular, new technologies are developed for interpretation of an actual seism geochemical material and an estimation of seismic conditions in real time [Keramova, 2004]. They are presented by express methods which include:

– formulas, algorithms and the software for recognition and revealing on the computer of anomalies in geochemical fields of fluids which arise at the closing stage of the period of preparation of earthquake;

– calculation formulas on the computer of "range" of magnitude for predicted earthquake for concrete seismic event (weak, average, strong);

– contouring of sites of the future seismic centre;

– specifying of a range of time (1 ч 16 days) during which realization of predicted earthquake is possible;

– for identification of the concrete seismic centers for the first time it was offered to make "Atlases of identification of the centers of strong and catastrophic earthquakes on geochemical fields of fluids".

These "Atlases of identification of the centers ..." represent geochemical "portraits" of the centers of earthquakes at the closing stage of the period of preparation of earthquakes (fig. 2-3) [Keramova, 2005]. They reflect combinations of informative parameters (elements-indicators) when before realization of seismic

Georgia – Rachin
(29.04.91)

Σ (Fe $^{2+}$,Fe^{3+})
mg/l

1150÷1200 мг/л

1991 - well «Geybulaq» - Sheki seismoactiv zone

Σ(Fe $^{2+}$,Fe^{3+})
mg/l

Iran - Chorasan

5,0 мг/л – 03.02.97г.
28.02.97г.

1997 - well «Surahani» - Absheron seismoactiv zone

Σ(Cl, Br, J)
mg/l

Azerbaijan – Lerik
– 09.07.98

1998 - well «Beyuk-Qamya» - Siazan seismoactiv zone

SO$_4^{2-}$
mg/l

Azerbaijan – Agdash
– 04.06.99

Turkey -Izmit (17.08.99)

1999 - well «Shikhov № 1» - Absheron seismoactiv zone

Figure 1. Anomalian variationts of the geochemical fields of Azerbaijan fluids

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Azerbaijan – Shamakha area (19.12.08; M_{PV}=5.3; К=11.5; h=13 km)
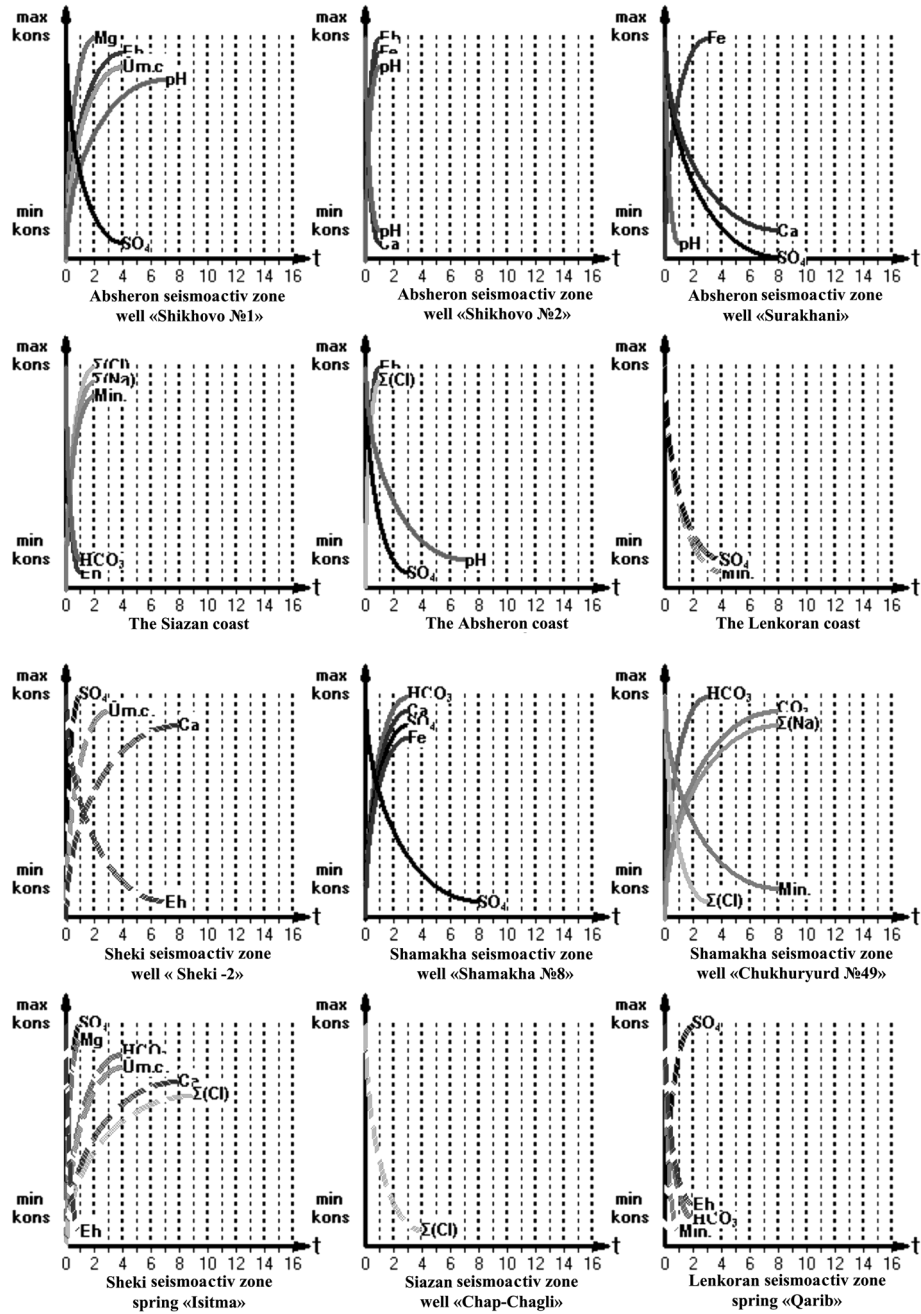
Figure 2. Identification figure – geochemical "portrait" of the seismic center

Southeastern Iran - Bam city

(26.12.03; M$_{LH}$=6.5; К=15.7; h=33 km)
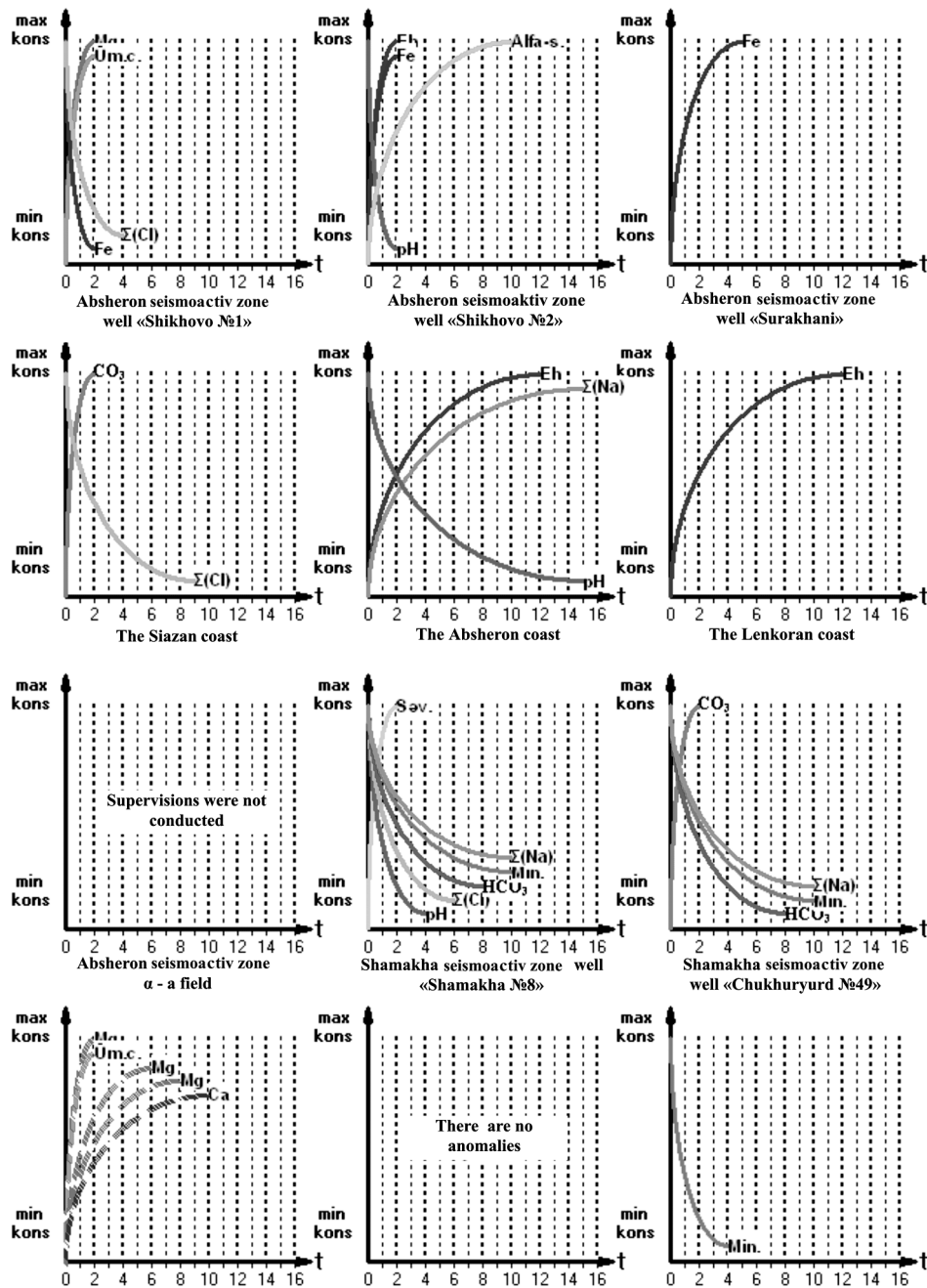
Figure 3. Identification figure – geochemical "portrait" of the seismic center

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event remains 1÷16 days. On identification "portrait" the axis of ordinates is presented by informative geochemical parameters (elements-indicators of the given earthquakes), and the axis of abscises is presented by time (1÷16 days) which remains before realization of predicted seismic event.

The developed express method of identification of the concrete seismic centers has been tested in the beginning retrospectively for all strong earthquakes which have been earlier realized (1979-2008) in water area of Caspian sea, limits of Azerbaijan and frontier territories of the adjacent states (Russia-Dagestan, Georgia, Armenia, Turkey, Iran). As it is known, for the specified period of time here there were strong and catastrophic earthquakes: Caspian sea – 1986, 1989, 2000; Armenia: Spitak – 1988; Iran: Rudbar – 1990, Bam – 2003, Luristan, 2006; Georgia: Rachin – 1991, 2004; Turkey: Izmit – 1999, etc.). Many of these centers have shown the activity repeatedly that have allowed to establish the following important laws:

– By preparation of earthquakes of various magnitudes abnormal indignation of a hydro geochemical field on time of display and in combinations of elements-indicators for the different seismic centers has individual geochemical "portrait".

– At repeated realization of earthquake in the same centre with similar seismic parameters (magnitude, depth), its geochemical "portrait" is stable.

It is necessary to notice that the result of work on operative data processing of geochemical monitoring consists in an operative estimation of seismic conditions of Caspian Sea and Azerbaijan in real time. Results of this work are faxed to a management of RSC ANAS in the form of report. Now, analyzing correctness of our forecasts about possibility of realization of earthquake in the concrete seismic centre of water area of Caspian sea and within the Anatoly-Iran-Caucasian tectonic block during time 2007-2008 it has been established that the statistics of a correct operative estimation of seismic activity of the region which is carried out in Branch of seism geochemistry of Seismological Center NAS of Azerbaijan high enough, and for separate regions of Azerbaijan in percentage expression it reaches 65 ÷ 70 %.

CONCLUSIONS

Results of all-the-year-round seism geochemical monitoring of fluids in Azerbaijan in connection with studying of physical and chemical processes and space-time dynamics in large focal zones of earthquakes have shown extreme informativity of these researches. They characterize the influence on fluid mode of seismic centers which were realized not only in water area of Caspian sea and in territory of Azerbaijan, but also on whole Anatoly-Iran-Caucasian tectonic block Alpine-Himalaya tectonic belt of the Earth. Thus, it has been established that fluid

dynamics environment is the sensitive indicator of a concrete seismic centre in concrete region, during all closing stage of the period of preparation of seismic event, with the maximum range of time equals 16 days.

This interval of time supervises such stages of earthquake, as "a shock – aftershock".

Results of testing of the developed formulas and identification "portraits" of the centers of earthquakes on anomalies in geochemical fields have shown that work in this direction is not ended. Errors at an estimation of seismic conditions in a real mode of time for today still take place. Considering complexity of solved questions, work in the area of operative forecast and short-term forecast of earthquakes by seism geochemical methods in Azerbaijan proceeds.

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THE RESEARCH OF ACID RAINS IN THE TERRITORY OF AZERBAIJAN

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(Produced by the Academician of IAS E.N. Khalilov)

One of the global problems of the modern world worrying the mankind is acid rains which appear in the results of influence of anthropogenic factors connected with the economy activity of men.

When we say acid rains, we mean the acid rains which in the result of their falling on cover (soil, plants, water resources, construction installations and so on) they reflect the free hydrogen ions into the environment.

In the formation of these acid rains the main role plays the chemical compounds, industrial sources and wastes thrown into the atmosphere by the motor transport are anthropogenic sulphur gas and nitrogen dioxide.

The acid rains are that rains which give the free hydrogen ions to the environment.

In the case of the distribution of sulphur gas into the atmosphere in the height of 100-300 m, there appears the distribution of azoth dioxide in the earth's surface. That is why the chance of entering of sulphur gas into the system of cloud than azoth dioxide is bigger.

The part of emission of sulphur and azoth compounds, near to the wastes sources, also increase in the regions which cover the sources.

Because of free oxygen in its composition, the atmosphere in itself is the system of oxidizing property. Only because the all reactions of sulphur and nitrogen compounds practically is carried in the direction of creation of sulphate and nitrate as the high form of oxidizing.

The washing off sulphur and nitrogen compounds by cloud and rain from the atmosphere firstly happen by transforming the particles or molecule into the drops. It works with mechanism of creation of drops in diffusion, brown diffusion, collision and occupation, gas solubility and condensation nucleus.

The main part of sulphur and nitrogen compounds entering the atmosphere

as an aerosol are H_2SO_4, $(NH_4)_2SO_4$, $(NH_4)_3$, NH_4HSO_4 and NH_4NO_3.

It is known, the estimation of balance of rain-water's ph is approximately 5-6 and it $2.5.10^{-6}$q/ion-l fits to the density of hydrogen ion. Adding of sulphur and nitric acids into the structure of such rain-water increases the density of free hydrogen ions and at the same time decrease the estimation of ph.

So, in the result of pollution of anthropogenic, the rainfalls falling from the atmosphere show the acid factor. The specialists think that in the case of the average velocity of sulphur and nitric oxides in the atmosphere is 20 km/h there can be rainfall which ph is equal to 3.8-4 in the distance of 600 km from the polluted sources.

As one of the factors of violence of ecological balance is acid rains which became the problem of the most countries and scientific community. So, when rainfall fall on the surface from the atmosphere in that case there happens the acidification of surface water, salt soil, the destruction of woods, acceleration of corrosion of construction and arrangements.

As an anthropogenic typed, the turning of gases in the atmosphere into the acids through transformation, in the form of acid rains, also there are widely described the dangerous influence on ecosystem in the literature [1, 2].

Generally, the acid rains are the global problems for ecosystem and its solution are in the consideration of leading countries, scientific communities , corresponding governmental powers, international organizations which deals with ecological problems.

As the evidence of it the World Meteorology Organization published the monograph "Global Acid Deposition Assessment" [3] in 1996. With the purpose of studying of factors of acid rains in some industrial developed countries there were generalized the results of researches on their chemical structure.

So, there exists a problem of acid rains and it creates some troubles. That is why it is advisable to research on acid rains. In the connection of speedily development of power engineering and motor transport in the country, there are continuously increased the wastes of chemical compounds-sulphur and nitric oxides into the atmosphere, also in the result of entering of polluting matters into the atmosphere by transboundary transportation and increasing of density of mineral matters in the structure of acid rains from 4-12t/km^2 to 17-18t/km^2 from north to south of the Republic increase the probability of acid rains in this territories.

The first researches on acid rains were held in the Scientific-Research Institute of Hydrometeorology of Azergovhydromet in 1994 by the author of these lines and their results were published in some works [4-7].

In the territory of Absheron, Baku, Sumgayit, Lenkoran, Ganja, Nakhchevan, Agstafa, Guba, Gabala, Mingechevir, Neftchala by the aim to hold scientific-trsearch works on accounting the average annual value of sulphat, nitrate, chloride ions, falling with rains there have been worked up a table.

In I, II, III columns of table there have been indicated the height of above-mentioned territories in accordance to sea level, multi-mean annual and annual value for five years numbers, took from inquiry materials of rains, falling on those territories.

Table 1.

N	Territories	The heigh in accordance to sea level	The value of rains, l/m^2		The annual value of anions for five years, q/m^2		
			Multi-meanan-nual	Annual for five years	SO$_4^{-2}$	Cl$^-$	NO$_{3-}$
1.	Nakhchivan	875	136	175.5	3	1.4	1.4
2.	Sumgayit	- 20	160	209	16.9	14.02	2.6
3.	Ganja	312	248	212	4.98	2.1	1.45
4.	Absheron	- 24	179	214	11.5	9.3	1.7
5.	Neftchala	- 28	294	216	6.3	4.6	1.4
6.	Baku	- 28	198	218	6	4.3	0.8
7.	Khachmaz	27	301	280	4.6	1.8	2.5
8.	Agstafa	331	359	281.3	6.72	3.6	4.0
9.	Mingechevir	93	309	322	3.4	1.74	1.1
10.	Guba	530	519	501	7.8	3.3	4.5
11.	Gabala	781	948	890	25	9.6	4.1
12.	Lenkoran	- 28	1280	1322	10.2	5.7	4.8

By the aim to hold scientific analyses there drew up graphics in accordance to that table.

The comparison of values of rains, falling on this territory and the sulphat ions, falling by these rains into the land shows that the great number of rains and sulphat ions are observed in Gabala's and Lenkoran's territory. But there is one exception in it. This exception consists of that despite of rains, falling Lenkorans territory mote than 1300 l/m^2, the quantity of sulphat ions in that territory's land is ~10-11 q/m^2, but in Gabala by rains on ~850-950 l/m^2, the number of sulphat ions is ~24-25 q/m^2.

The value of chloride and nitrate ions, falling into the land by the rains as with sulphat ions, depends on characteristics of zones and the pollution level of

atmosphere in the rain , falling into the territory, but not on the value of rains.

We can show that the following for the comparison: of the average annual value of nitrat ions in rains, falling on the territory of Lenkoran is equal to 1322 l/m^2 and 4,8 q/m^3 accordingly, then in Sumgayit it will be observed in 200 l/m^2 and 2,6 q/m^2.

Rains change the background of lands on the high level in Gabala's territory. In this territory the value of sulphat ions, falling with rains consists of 90% of sulphat ions of land composition.

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◄ **GLOBAL POSITIONING SYSTEM MEASUREMENTS
OF PRESENT-DAY CRUCTAL MOVEMENTS IN AZERBAIJAN**

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Abstract

Global Positioning System (GPS) observations in Azerbaijan and surrounding areas of the Caucasus region are providing quantitative constraints of the geometry of active fault systems, and rates of present-day deformation. West of 48° E longitude, the Main Caucasus Trust Fault (MCT) follows the sharp change in slope along the south side of the Greater Caucasus as is well known from prior seismic, geophysical, and geologic studies. However, east of this longitude the MCT turns sharply to the south, crossing the Kura Depression and extending along the western side of the Caspian Sea (here called the West Caspian Fault; WCF). While the MCT is predominantly a thrust fault west of 48°E longitude, the WCF is a pure right-lateral, strike slip fault with a slip rate of 11 ± 1 mm/yr south of the Absheron Peninsula. We also document shortening of 4 ± 1 mm/yr along the northern side of the Greater Caucasus in Dagestan on a roughly E-W striking fault that turns to the south inland of the north Caspian shoreline. This fault configuration implies that the Baku area is at the junction of four fault systems, the MCT, the West Caspian Fault, the North Caspian Fault, and the Central Caspian Seismic Zone. The rate of convergence on the MCT decreases from east to west from 10 ± 1 mm/yr at 48° E longitude to 4 ± 1 mm/yr in northwestern Azerbaijan (~46°E longitude). In eastern Azerbaijan, there is no evidence of active shortening in the Lesser Caucasus or Kura Depression, indicating that any deformation in this area is below present velocity uncertainties (± 0.5 mm/yr). The present-day pattern of horizontal motions in aggregate suggests that the Lesser Caucasus and Kura Depression are rotating coherently (i.e., little or no internal deformation) in a counterclockwise sense about a pole located near the NE corner of the Black Sea, resulting in the observed W to E increase in the rate of convergence along the MCT. These new, quantitative con-

straints on fault activity provide an improved physical basis for estimating earthquake and mud volcanoes hazards in Azerbaijan.

Introduction

Azerbaijan is caught in the active continent-continent collision of the Arabian plate with Eurasia (Mckenzie, 1972, Sengor et al., 1985, Philip et al., 1989). Plate tectonic reconstructions provide only broad constraints on the timing of the initial collision of the Arabian Plate with Eurasia of between 10 – 30 Ma BP (e.g., Robertson, 2000, Allen et al., 2004), and indicate that the rate of northward motion of Arabia relative to Eurasia has remained more or less constant at about 20 mm/yr since collision began (McQuarrie et al., 2003; Reilinger et al., 2006 a). These reconstructions imply that Arabia has progressed from 200 – 600 km "into" space formerly occupied by Eurasian continental lithosphere. This "intrusion" of Arabia into Eurasia continues to be accommodated by lithospheric shortening on roughly E-W striking thrust faults and lateral displacement of lithosphere out of the collision zone along right-lateral strike-slip faults (McKenzie, 1972, Sengor et al., 1985, Jackson, 1992, Kadirov, 2004, Reilinger et al., 2006b). These regional tectonic processes give rise to earthquakes that have devastated the Caucasus region throughout recorded history.

These cructal movements probably too responsible for the activation of mud volcanoes in this region in this paper we use Global Positioning System (GPS) observations in and around Azerbaijan to estimate present-day surface motions. The observed motions (site velocities) allow us to identify zones of rapid strain accumulation that we interpret as resulting from deep slip on faults that are presently locked at crustal depths and will likely give rise to future earthquakes. The GPS-derived surface motions allow estimation of fault geometry, slip rates, and locking depths (e.g., Okada, 1992), thereby providing an improved physical basis for estimating regional earthquake hazards. For example, the estimated rate of slip on the deep, freely sliding section of the Main Caucasus Thrust Fault (MCT) determined by GPS observations of surface motion, and estimates of slip in prior earthquakes (from study of historic and pre-historic earthquakes) allows estimation of the time required to accumulate sufficient strain to generate an earthquake, or equivalently, the earthquake recurrence time for individual fault segments (assuming the time-predictable earthquake model; Shimazaki, and Nakata, 1980). Furthermore, the total coseismic slip from prior earthquakes, together with estimates of the locking depth of the fault (from the wavelength of the GPS deformation field), and the length of fault segments (from geological and geophysical studies) allow estimation of the magnitude of future events. Thus, our GPS observations have the potential to constrain the timing and magnitude of future earthquakes.
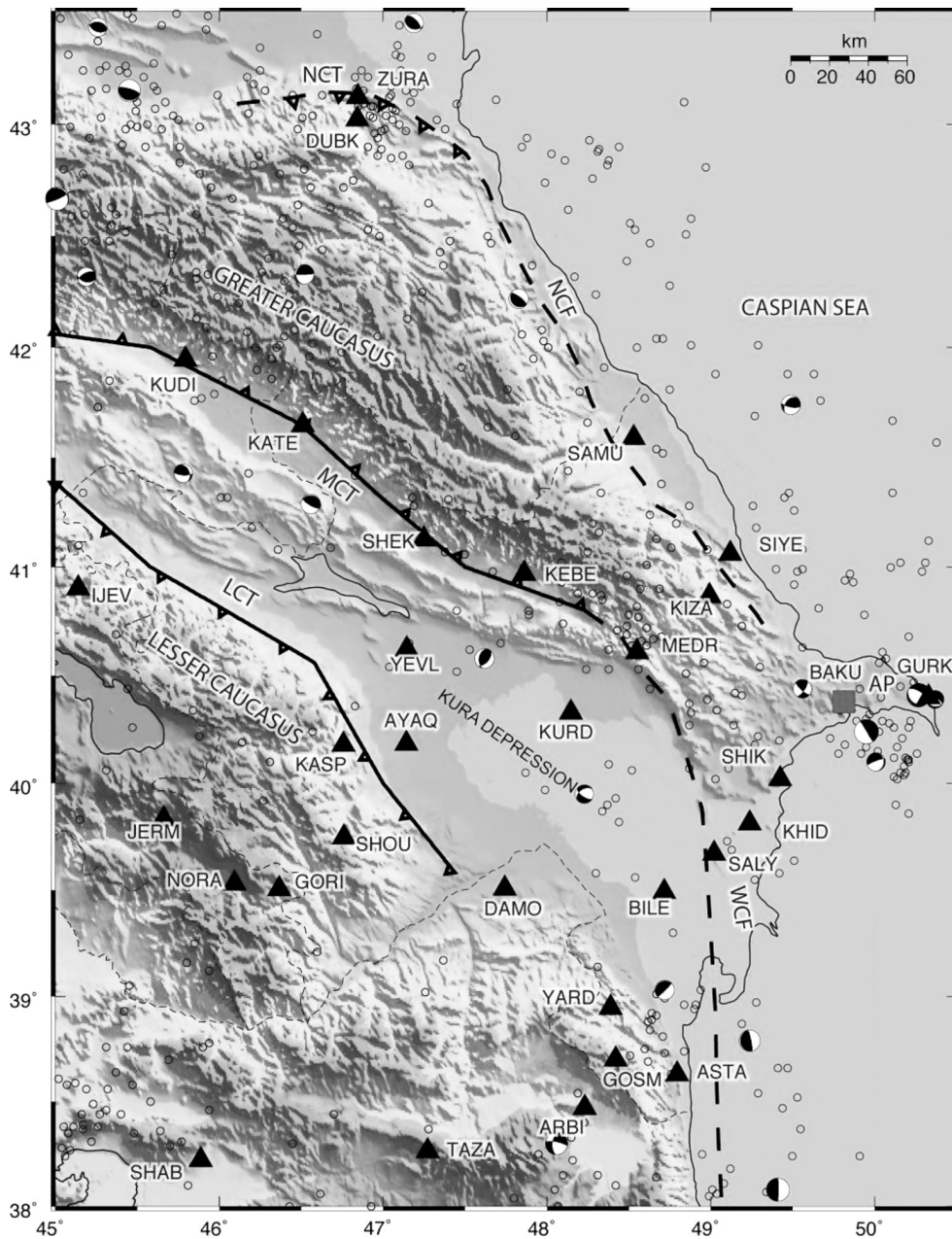
Figure 1. Azerbaijan GPS-Geodynamics Network. Triangles are survey sites and the square, the continuously recording GPS station at the Geology Institute, Baku (4-letter site names are shown and referred to in the text and Table 1). Base map shows topography, simplified tectonics, seismicity (National Earthquake Information Center Catalog, 1973 – 2007) and earthquake focal mechanisms (lower hemisphere projections, from Harvard Catalog, 1976 to 2007). Abbreviations: NCT = North Caucasus Thrust fault, MCT = Main Caucasus Thrust fault, LCT = Lesser Caucasus Thrust fault, WCF = West Caspian Fault, NCF = North Caspian fault, AP = Absheron Peninsula.

Table 1.

Azerbaijan GPS site locations, velocities, and 1-sigma uncertainties

Long. (deg)	Lat. (deg)	E&N Rate (mm/yr)		E&N + (mm/yr)		SITE
50.329	40.404					GURK
49.814	40.372					BAKU
49.426	40.025	5.20	2.17	0.52	0.51	SHIK
49.237	39.818	5.16	6.45	1.40	1.42	KHID
49.120	41.066	0.99	0.74	0.53	0.52	SIYE
49.020	39.676	6.87	6.14	1.35	1.37	SALY
48.993	40.870	1.27	2.47	0.79	0.75	KIZA
48.796	38.635					ASTA
48.717	39.497	6.06	12.28	0.53	0.52	BILE
48.551	40.614	2.67	4.78	0.52	0.51	MEDR
48.529	41.595	0.87	1.53	0.54	0.53	SAMU
48.419	38.706	5.33	12.42	0.57	0.55	GOSM
48.388	38.952	5.65	12.66	0.56	0.55	YARD
48.148	40.333	3.57	10.36	0.66	0.62	KURD
47.863	40.975	0.56	4.83	0.52	0.51	KEBE
47.250	41.132	0.74	5.86	0.51	0.51	SHEK
47.146	40.626	1.71	4.90	0.70	0.66	YEVL
47.143	40.190					AYAQ
46.511	41.652	0.19	5.31	0.51	0.51	KATE

GPS network and Data Processing

Figure 1 shows the present configuration of the GPS network, developed by the Geology Institute, Azerbaijan National Academy of Sciences in collaboration with Massachusetts Institute of Technology, superimposed on a simplified tectonic map. The network consists of 18 survey-mode sites and a continuously recording

GPS station at the Geology Institute in Baku. The network was established during the period 1998 – 2007 with most survey stations measured from 3-5 times.

The GPS data were processed, and uncertainties were estimated, using the GAMIT/GLOBK software (King and Bock, 2004, Herring, 2004) following procedures described in Reilinger et al. (2006 b). Briefly, the raw GPS observations were processed in a two step approach (Dong et al., 1998). In the first step, loosely constrained estimates of station coordinates, orbital and Earth orientation parameters, and atmospheric zenith delays were determined from dual frequency GPS carrier phase observations using GAMIT. Data from the Azerbaijan GPS network were analyzed along with raw GPS data from other continuously operating GPS stations in the region. In the second step, a global Kalman filter (GLOBK) was used to estimate a consistent set of station coordinates and velocities by combining the daily, loosely constrained solutions from step 1 and their associated covariances. As part of this second step, a 6 parameter transformation was estimated by minimizing the horizontal velocities of 49 globally distributed International GNSS Service (IGS) stations with respect to the IGS00 realization of the International Terrestrial Reference Frame 2000 (ITRF 2000) no-net-rotation reference frame. A random walk noise of 1 mm/vyr was also added to the velocity uncertainties for each site. Finally, the velocities were rotated into a Eurasian fixed frame to facilitate interpretation.

Figure 2 shows a map of GPS-derived site velocities within the territory of Azerbaijan (listed in Table 1) in the context of selected GPS velocities in surrounding areas. Velocities are shown in a Eurasia-fixed reference frame determined by minimizing motions for GPS stations that have been observed well and are broadly distributed across the Eurasian plate. No velocity was estimated for the Geology Institute, Baku station because of the short period of operation (established in 2007). Velocity uncertainties are mostly less than 0.6 mm/yr (1 sigma), allowing fairly precise estimates of convergence across the Caucasus mountain system (i.e., uncertainties are ~ 5% of the total convergence rate).

Figure 3 shows GPS velocities with respect to Eurasia with 1-sigma uncertainties plotted versus distance along the profile shown in Figure 2.

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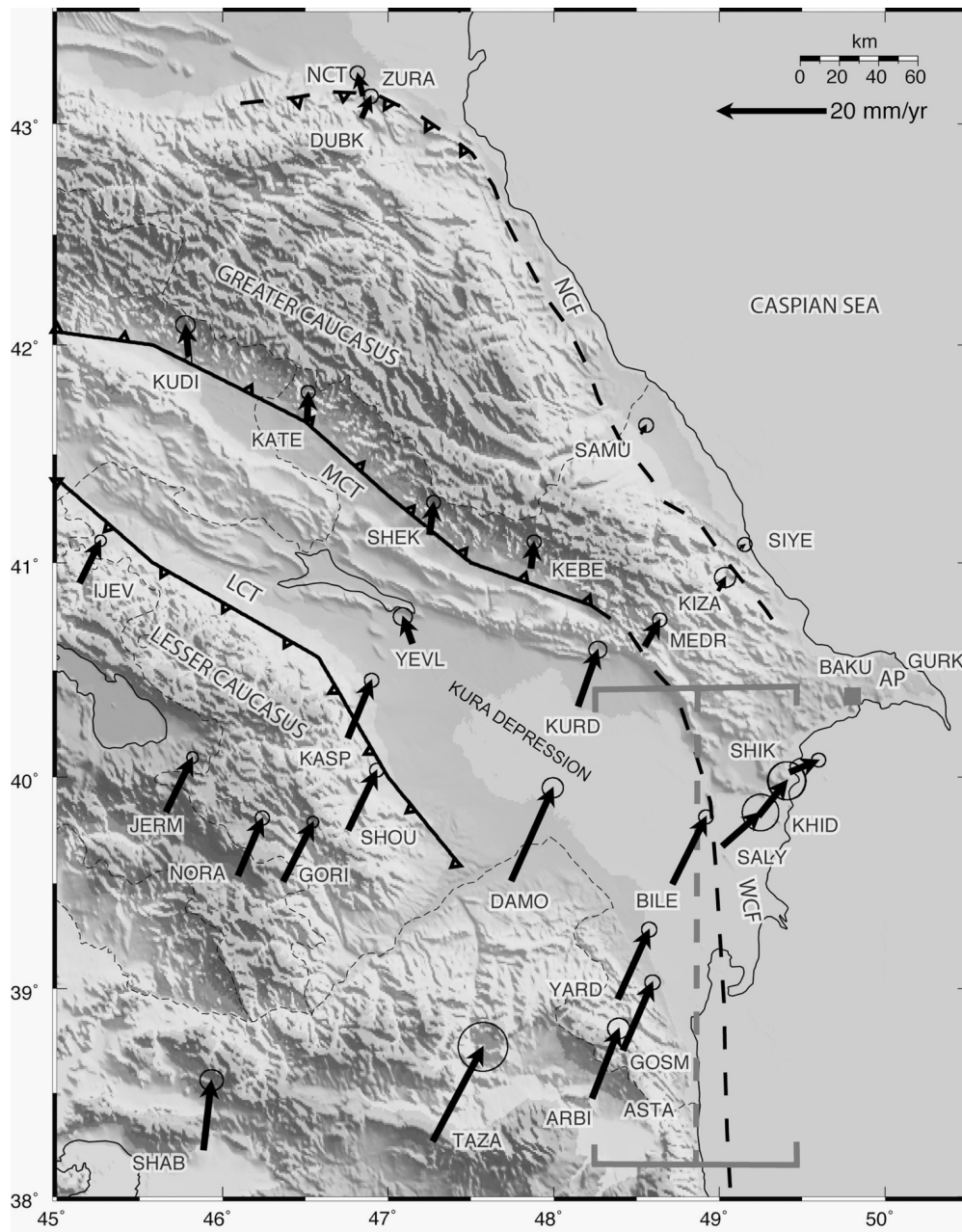
Figure 2. GPS-derived velocity field, and 95% confidence ellipses for Azerbaijan and surrounding areas of the Caucasus region shown with respect to Eurasia. Site velocities outside the territory of Azerbaijan are from Reilinger et al. (2006). The location and width (brackets) of the velocity profiles along (Figure 3A) and across (Figure 3B) the southern extension of the Main Caucasus Thrust Fault (West Caspian Fault) is also shown.
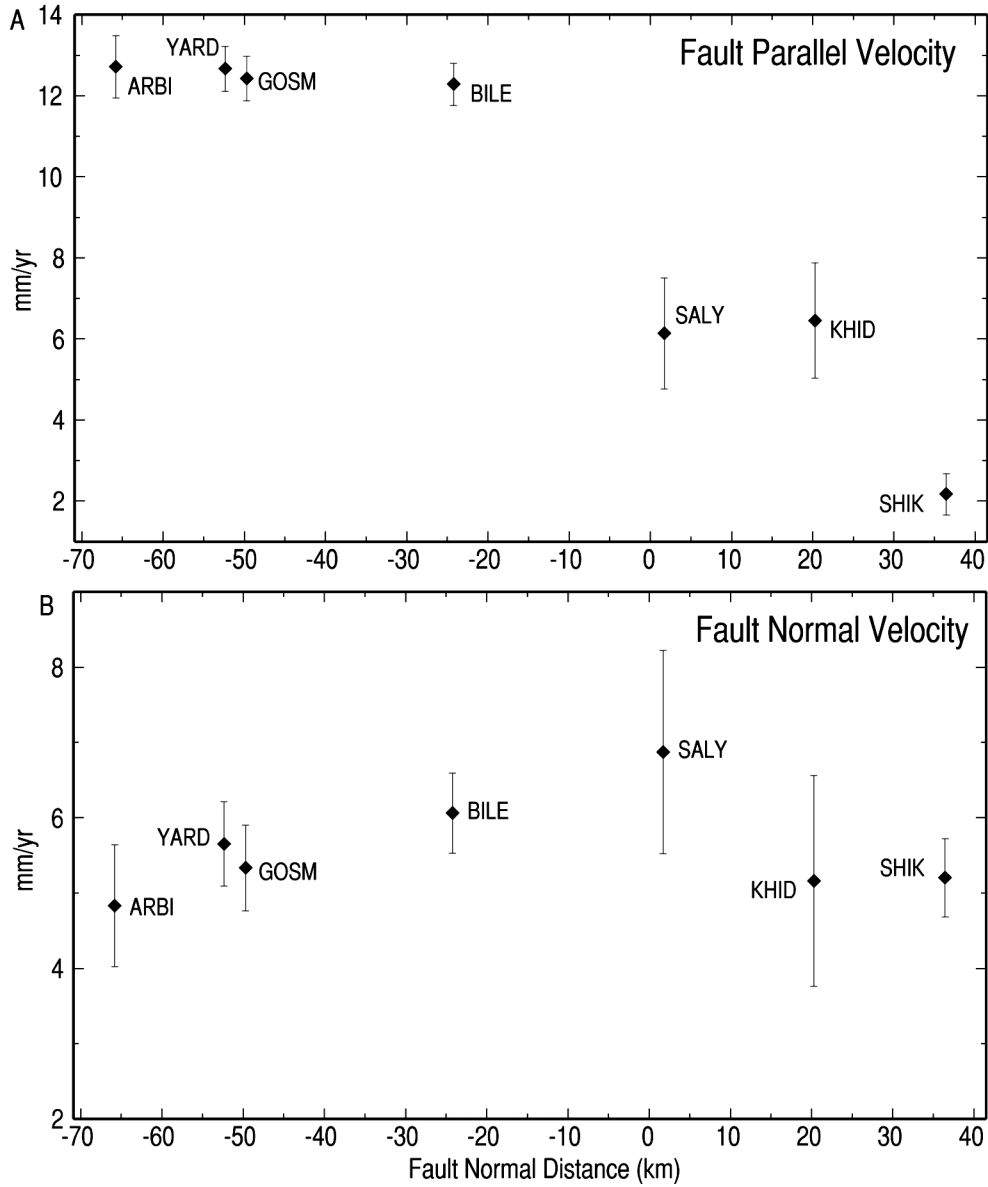
Figure 3. GPS velocities with respect to Eurasia with 1-sigma uncertainties plotted versus distance along the profile shown in Figure 2. (A) The component of motion parallel to the WCF (i.e., right-lateral strike slip). (B) The component of motion normal to the strike of the WCF. The profiles indicate predominantly right-lateral strike slip motion on the West Caspian Fault at 11 ± 1 mm/yr.

Discussion

On a broad scale, the GPS velocity field clearly illustrates the NNE motion of Azerbaijan and adjacent regions of the Lesser Caucasus with respect to Eurasia south of the MCT (Figure 2). In the Greater Caucasus, intense motions are registered at the KUDI, KATE, and SHEK stations. At the KATE (Belakan) station, a large velocity is also observed, but it deviates further to the northeast. At the SHEK station, the velocity is approximately 6 mm/yr, and the vector is oriented parallel to those at the stations in the southeastern Lesser Caucasus. In other words the Belakan–Sheki area is a mobile sector of the Greater Caucasus. Almost zero velocity vectors are observed at stations KEBE, SAMU, SIYE, and MEDR, suggesting that significant deformational energy is accumulated here along the northern boundary.

The most pronounced feature of the velocity field is the decrease in site velocities across the MCT (i.e., between KURD and MEDR, and BILE and SHIK). Sites along the MCT show reduced, but significant NE motion that we interpret as being due in part to strain accumulation on this thrust fault (i.e., the fault is locked at crustal levels). In addition, there is a tendency for motions south of the MCT within the Kura Depression and Lesser Caucasus to increase in rate from W to E along strike of the mountain range.

We estimate shortening across the eastern segment of the MCT from the velocity difference between site KURD in the Kura Depression and SIYA on the Caspian Sea coast north of the Absheron Peninsula (Figure 2). The total velocity difference is 10 ± 1 mm/yr, corresponding to the rate of shortening across the MCT at ~48° E longitude.

In western Azerbaijan shortening across the Greater Caucasus is distributed between the MCT and a south dipping thrust fault along the northern edge of the mountain range in Dagestan (North Caucasus Thrust; NCT). GPS sites ZURA and DUBK in Dagestan indicate northward motion at about 4 ± 1 mm/yr. Using GPS sites in the Lesser Caucasus, we estimate 4 ± 1 mm/yr shortening across both the MCT and the NCT at 46° E longitude.

An important result of this study is the sharp decrease in site velocities, and the clockwise rotation, between sites located in the Lesser Caucasus and Kura Depression in E Azerbaijan (GOSM, YARD, BILE) and site SHIK located near the Caspian Sea coast just south of the Absheron Peninsula (Figure 2). This decrease and rotation in velocity requires that the MCT turns to the south, east of 48° E longitude, and does not traverse the Absheron Peninsula. We here call this extension of the MCT the West Caspian Fault (WCF). This is best illustrated by the GPS velocity profiles shown in Figure 3A, and B. The location of the profile is shown on Figure 2. Figure 3A shows the component of site velocity parallel to the fault at
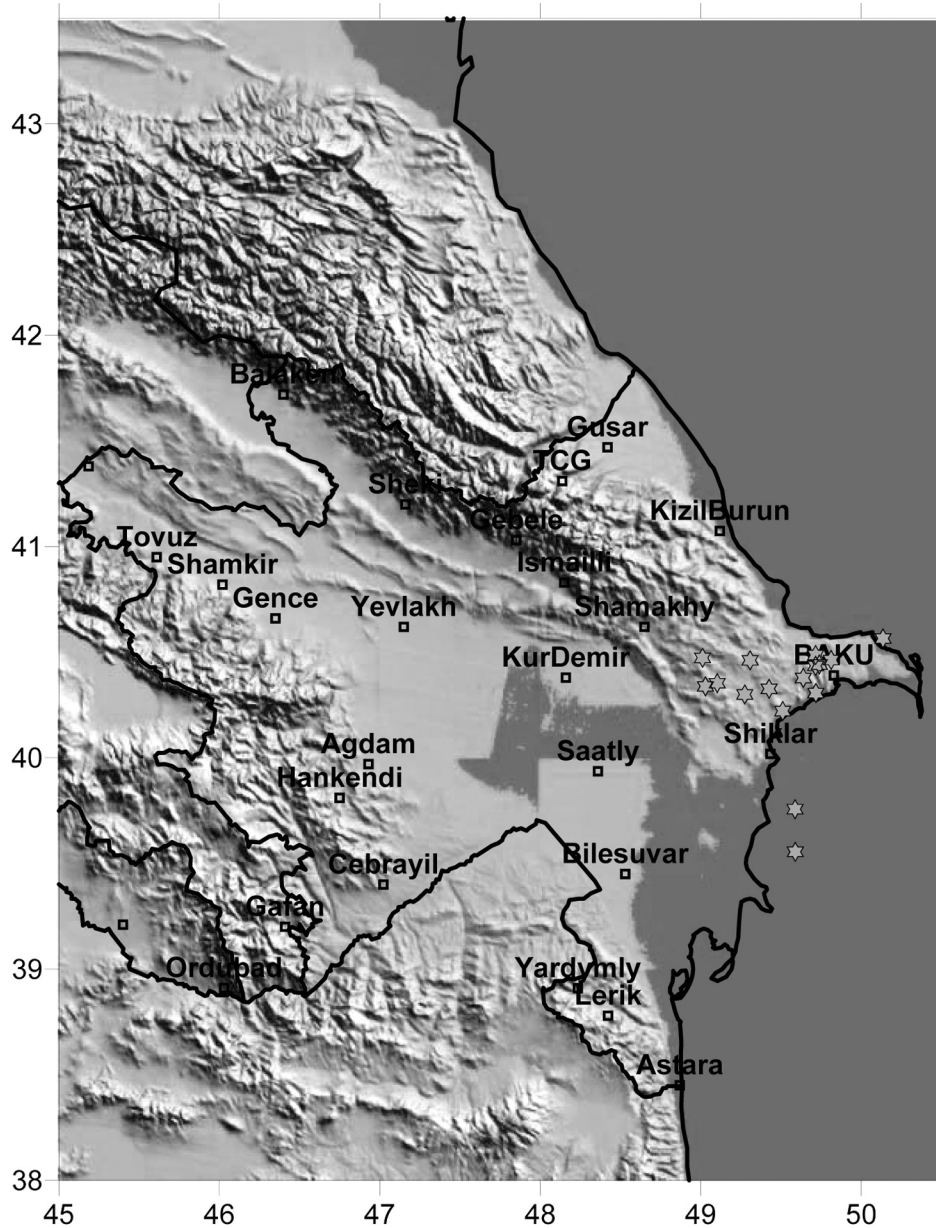
Figure 4. Mud volcanoes that erupted within the 1998–2008 period

this location (rate of right-lateral strike slip), and Figure 3B the component of site velocity normal to the fault (i.e., rate of fault-normal motion). Figure 3A indicates 11 ± 1 mm/yr right-lateral strike slip motion across the WCF, while Figure 3B indicates no significant fault-normal motion along the segment of the MCT/WCF south of the Absheron Peninsula.

As noted earlier, the small, but significant motion for sites in Dagestan (Figure 2) indicates N-S shortening on the NCT of about 4 ± 1 mm/yr. The absence of resolvable motion relative to Eurasia at the site on the Caspian coast north of the Absheron Peninsula in Azerbaijan (SIYA) requires that the NCT that accommodates this shortening turns to the south inland from the Caspian coast line, presumably transforming to right-lateral, strike slip motion (Figure 2). This geometry for the NCT is roughly consistent with some earlier interpretations of the regional tectonics (e.g., Philip et al., 1989), and indicates that the Baku area is located at a highly complex junction between four fault systems, the MCT, the Central Caspian Seismic Zone, the North Caspian Fault, and the West Caspian Fault.

A decrease in the velocity and a significant accumulation of elastic energy in the southern Apsheron Peninsula responsible for the activation of seismic events and of mud volcanoes in this region. Figure 4 presents a schematic map showing the distribution of mud volcanoes that erupted during the 1998–2008 period in the Apsheron and Shamakhy–Gobustan areas (area between GPS site MEDR-SHIK-KURD).

The strong earthquake in the Caspian Sea at the end of 2000 and its aftershocks probably represent a response to the deformational processes which continue in recent years, and the related stress accumulation at foothills of the Greater Caucasus and the Apsheron Peninsula and middle Caspian regions. It is impossible to exploit GPS stations within marine areas. Therefore, we cannot make unambiguous conclusions on the nature of this earthquake. However, the tendency of horizontal motions in the Azerbaijan territory suggests an activation of seismic processes in adjacent zones of elastic stress accumulation.

While the available GPS data provide fundamentally new constraints on fault geometry and rates of strain accumulation, spatial densification of the GPS observations is needed to better resolve localized deformation, and consequently the seismic hazard in the eastern Caucasus, Kura Depression, and Absheron area.

Conclusions

Repeat GPS measurements in Azerbaijan during the period 1998 – 2007 are providing direct observations of present-day surface motions. They clearly define active convergence between the Lesser Caucasus/Kura Depression and the Greater Caucasus with strain concentrated along the Main Caucasus Thrust Fault (MCT). Present-day slip rates on the MCT decrease from 10 ± 1 mm/yr in eastern Azerbaijan to 4 ± 1 mm/yr in western Azerbaijan. These new observations further indicate that the MCT turns sharply to the south, west of the Absheron Peninsula, transforming into a predominantly right lateral strike slip fault with a slip rate of 11 ± 1 mm/yr south of the Absheron Peninsula. We here name this south-striking

extension of the MCT the West Caspian Fault. GPS-derived motions in the North Caucasus of Dagestan and along the Caspian coast in Azerbaijan north of the Absheron Peninsula require that thrust faulting along the south-dipping North Caucasus Thrust in Dagestan turns to the south inland of the Caspian coast, presumably accommodating right-lateral strike slip motion on the "North Caspian Fault". These interpretations of the GPS velocity field place Baku at the junction of four active fault systems, the MCT, the North and West Caspian faults (likely right-lateral, strike slip), and the Central Caspian Seismic Zone. More focused geodetic monitoring of surface motions are needed in the Absheron region and Kura Depression, as well as in the immediate vicinity of other active faults and mud volcanoes.

Acknowledgments

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GLIMPSE AT GLOBAL PROBLEMS,
AS SOURCE OF EMERGENCY SITUATIONS

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Global problems, its definition, characteristic features, threats generated by them.

Global problems of humanity are defined, as universal problems, with complications of planetary scale and contradictions in relationship of nature with human being and within society just as well. These problems were partially or secretly existing, however, mainly, they became apparent in modern stage of civilization development, as a result of negative activity of human and natural processes.

These problems are called, as global, because their scale, by coverage, strength and intensiveness is compared with planetary events. These problems are global because, they are:

– specific for all or majority of countries of the planet and frequently relate not only to individual states, but to the planet, as a whole, or to its vast regions;

– generate hazards (challenges, threats, risks), endangering normal development of civilization, and, at times, to its existence;

– appear in different places, and rarely, with national or natural specific features;

– mainly, they can't be settled completely or partially with efforts of individual states;

– require joint efforts of world community for its effective settlement

Specific feature of state of affairs with global problems is growth of their number, appearance of new, recently generated threats and increase of scales of their influence on regions, arising of threats, not specific to individual regions by their natural, climatic and geological conditions.

Phenomena of "ozone holes", climatic changes, epidemics of AIDS, lack of potable water, ecological contamination of land, water and air, changes of biological structures at genetic level, etc. may be called, as new problems.

These threats arise in different areas of human life activity. Knowledge of their nature allows undertaking of preventive measures, directed to decrease of

potential hazard of global problem, prevent possible emergency situations. It may be achieved by settlement of problems completely or of its individual components, by prevention of specific disasters arising as a consequence of non-settled problems. As an example of successful settlement of global problems one may call basically solved problem of former epidemics (plague, smallpox), they were previously devastating whole countries and continents.

However, presently, the main bulk of global problems remains unsolved. This is the case due to colossal complication and huge scale of majority of global problems, absence of necessary resources and political will of individual states and, as a whole, of the world community, prevalence of actual demands of the moment over interests of prospects, contradictions between countries, indistinct representations or delusions concerning character of problems.

As a result, trends acknowledged by the world community, as very hazardous, appear to be neglected, reach critical state and appear, as different types of disasters, which form extreme situations of this or other scale.

It is rather difficult to classify global problems definitely, consistently due to its interaction, interdependence of some of them, appertaining of some problems simultaneously to several areas of life activity.

Global problems may be divided approximately and conventionally into:

– natural: natural calamities and changes of cyclic recurrence of the natural phenomena;

– ecological: land, hydrosphere and atmosphere pollution, exhaustion of ozone layer of atmosphere, removal of woods, desertification, disappearance of individual biological species, climatic change;

– social: demographic problems, inter-ethnic opposition, religious intolerance, health, education problems, problems of organized crime;

– Economic: problems stability of world economic, exhaustion of non-renewable energy sources;

– Social and economic: problems of poverty, employment, shortage of foodstuff, water, problems of natural- technogenous character;

– Social and political: problems of war and peace, disarmament, distribution of weapon of mass destruction, terrorism, information security;

– Socially and biological: generation of new diseases, genetic safety, drug addiction;

– Spiritual and moral: falling of general cultural level of population, distribution of cult of violence and pornography, unclaimed condition of high samples of art in the modern world, insufficient harmony in relations between generations.

Not claiming on exhaustive definition of contents of global problem, one should tell that their components in turn consist of many components, capable to burst into specific threats and challenges.

Thus, if we take energy problems, then it is possible to distinguish its following components: hydrocarbon (oil, gas), problems of nuclear energy, problems of provision of population by energy power etc.

Let us dwell more specifically on a number of indicated problems. Thus, problems, which may be sources of emergency situations, will be included into the considered list.

Basically, practically all abovementioned are connected with the Ministry of ES of the Republic of Kazakhstan, its territorial bodies, in respect of liquidation of consequences of the emergency situations generated by them.

Therefore, we will more specifically deal with problems, causing emergency situations of natural and technogenous character, because not only liquidation of consequences, but, first of all, their prevention are within activity area of the Ministry of Emergency situations and its territorial bodies.

Natural calamities are considered, as the most ancient global problem, because natural calamities since prehistoric times have always significantly and, sometimes, definitively influenced on destiny of peoples.

Even if one takes on trust a legend about Atlantis, the biblical story about Flood, which though indirectly, but nevertheless is proven by archaeological researches, then the facts of destruction of the whole civilizations from natural calamities took place in ancient history.

And afterwards, earthquakes, droughts, epidemics, strong cold snaps, disastrous floods, hurricanes destructed whole countries, frequently considerably changed life of whole nations.

Range of natural phenomena including their destructive forms- calamities, is very comprehensive. It is stretched from cosmic space up to terrestrial limits.

Catastrophes of space character influence essentially on vital processes on the earth, in particular, such ones, as falling of large meteorites. Presently, 170 large meteorite craters have been revealed, and this work is proceeding. The greatest crater with diameter about 180 km is considered in city Mexico. Falling of large cosmic bodies to the Earth in the foreseeable historical period has not occurred fortunately for humanity. As a result, the civilization was relieved of disasters of planetary scale and shocks caused by them. Due to the point that at significant weight of meteorites, high speed and big angle of incidence an explosion takes place at the point of its collision with the Earth, and by this from one gram of meteoric substance, energy is emitted by 1000 higher than from one gram of explosive, and this energy is emitted instantly, by 10 thousand times faster, than at catastrophic earthquakes. The substance is not only melted in zone of explosion, but it also evaporates, acquires the second space velocity and then it is emitted into open space.

Nevertheless, the majority of natural calamities are caused by terrestrial reasons. Actually, the most complicated physical, physical-chemical and biological-

chemical processes being energy source, reforming appearance of our planet, develop on the Earth surface, its entrails and atmosphere.

Phenomena, connected with endogenous, hydro-meteorological and exogenous processes are of the greatest distribution. Various tectonic phenomena, earthquakes, mountain bumps refer to the first ones (endogenous phenomena). Flood, hurricanes, tornadoes, typhoons, strong downpours, snowfalls, frosts are mostly distributed among the hydro-meteorological phenomena. Exogenous phenomena are connected with gravitational processes - landslides, mud flows, fallings, snow avalanches, influence of surface and underground waters.

The Earthquake is one of the most terrible natural phenomena. Just during the last century 69 earthquakes took place on the earth, and more than 1000 persons died in each of these earthquakes. 4 earthquakes from this number were accompanied by death of more than 100 000 persons, 18 earthquakes were fatal for 10-100 thousand persons and death toll in 47 cases was within range of 1- 10 thousand persons. Total death toll during the last century in the largest earthquakes exceeded 1,5 million persons.

The most horrible catastrophes took place in 1556 (Khuansyan earthquake, China, more than 800 thousand persons died), (200 thousand persons died in Ninghan earthquake, in China) in 1920, (242 thousand persons died in Tien Shan earthquake, China, in 1976), underground shocks destroyed city Kaito (Japan) in 1923, 142 thousand persons were buried under its wreckage, about 100 thousand townsmen died in Ashkhabad earthquake (Turkmenia) in 1948.

For the last years strong seismic phenomena in Armenia (Spitak, 1988), Iran (1990), Japan (1995), Pakistan (2005) caused death, accordingly, of 25, 40, 6,5 and 73 thousand persons, more than 100 thousand townsmen died in China (Sichuan 2008), more than 250 persons died in Italy (2009).

Seismic active belt of Kazakhstan occupies territory (17% from total territory of the republic) with area of about 2000 km, at average width of 150 km. For the last 140 years a number of destructive earthquakes shook this territory, three of which with magnitude of more than 8 (Vernen - 1887, Chilik - 1889 and Kemin - 1911). Level of seismic activity of the territory remains high and presently, seismic shocks of moderate force for the last years confirm this. Thus, about 30 strong and appreciable earthquakes with intensity in city 2-5 occurred at the territory, adjoining to city Almaty during 2003-2008.

Due to specific features of natural conditions main industrially developed and densely populated areas of the south and the south-east of Kazakhstan, with population of more than 6 million persons, 27 cities and 400 settlements and 40% of industrial potential of republic are located close to potentially hazardous zones with maximal magnitude of expected earthquakes from 6,0 up to 8,0 (in epicenter from 8 up to 10).

With high degree of probability it is possible to presume, that the strongest earthquakes in 1887-1911 removed stress in seismic hazardous region of the republic for certain period of time and level of seismic activity lowered up to average (background) values.

By estimates of experts after certain period of seismic "calm" in a long seismic tectonic cycle the seismic activity rises inevitably. The world statistics also confirms that large earthquakes occur after the period of seismic silence, which makes 80-200 years for earthquake with intensity 9.

Results of researches of leading scientists of the international level, which specify direct dependence of increase of seismic activity on increase of solar activity, serve as proof of increase of seismic activity on the planet for next years.

As a result of researches of about 2000 earthquakes taken place in various regions of the Earth during one cycle of solar activity from 1962 to 1973, these scientists concluded, that number of surface earthquakes increases, as solar activity strengthens and the number of deep-focused ones decreases during the epoch of maximum of solar activity. Seismic activity for all earthquakes, as during years of maximal, so minimal solar activity is higher by 10-30%, when the planet crosses projection of galactic magnetic field onto plane of ecliptic.

According to conducted researches 2012 is more distinguished year, its peak is the 24th year, especially, powerful 11-year cycle of solar activity and also 75-85-year cycle and, presumably, 300-year cycle of solar activity.

Taking into account the unusual power of solar activity during the specified period, by conclusions of scientists, activation of seismic processes has been predicted since 2009, its peak falls on 2012, their force is also expected to be extraordinary high.

Presently, the southern-eastern part of Kazakhstan is at successive stage of seismic activation, accompanied by increase of number of weak and strong earthquakes and actual hazard of occurrence of strong earthquake has increased.

Earthquakes strike not only with tragic consequences. The countries, located in vicinity of oceanic coasts, frequently suffer from destructive typhoons and hurricanes. Thus, as a result of a destructive typhoon in November of 1970 Bangladesh 300 thousand persons died and 3,6 million persons were left without shelter. After monsoon rains in India, Pakistan and Bangladesh more than 10 million persons were left without a shelter over their head in 2007.

Many examples of death of people and high material losses connected with floods, landslides, avalanches, mud flows and snowfalls are known.

According to UNESCO 9 million persons died for the last century as a result of floods. The most terrible tragedy fixed in history, occurred in 1882, in China, on banks of the river Hwang Ho, water level raised by 20 m. As a result, from 80 million population 1 million of persons, living in river glen, died and 2 million persons were left without a roof over the head.

As a rule, emergency situations of large scale generate secondary disasters, which form hundreds and even thousands hearths, representing additional direct hazard for population.

Thus, in 1980, raise of water level in the central part of China in several rivers initiated 180 thousand phenomena of various natural hazards, such as, avalanches, landslides, floods etc.

For the last decade the new phenomenon in dynamics of the earth crust, called induced or technogenous seismicity, was discovered. The jest of this phenomenon is that anthropogenic impacts may lead to formation of additional stress inside land and influence on development of natural processes: to accelerate accumulation of stress, by increasing of frequency of earthquakes, or, in contrary, to promote discharging of already accumulated stress. Most frequently induced seismicity is specific during construction of large water reservoirs in regions of large scale production of hydrocarbon raw materials at pumping of fillers into deep levels of the earth crust. The earthquake with intensiveness of 9, which took place in India in 1967 at construction of water reservoir during filling of water reservoir on the river Koyna is considered, as the strongest earthquake. The earthquake covered territory in radius of about 700 km.

Specific feature of induced earthquakes is their occurrence in regions, which were previously considered, as non-seismically hazardous ones.

This phenomenon is characteristic for Kazakhstan too, where earthquakes with intensity of 5-6 took place in Atyrau, West-Kazakhstan and Karaganda provinces.

Additionally, processes of lowering of surface, connected with technogenous factors considerably surpassing habitual to us tectonic movements by velocity and negative consequences, are observed at many territories of industrial and city formations, on background of natural movements of the Earth surface.

Specialists presume extraction of underground waters, as one of causes of lowering. Thus, in connection with intensive withdrawal of underground water, the territory of city Mexico lowered by more than 4m, and its northern-eastern part by 9m. Lowering of surface occurs also during extraction of liquid, gaseous and hard minerals. As a result of oil and gas production in vicinity of c.Long-Beach (the USA, California) subsidence reached 8,8m. Cases of subsidence of surface are relevant to city Karaganda too, when solid residential quarters became uninhabited due to hazard of destruction of buildings.

The above given short analysis of development of natural hazards allows making a number of generalizing conclusions about trends and causes of such fast increase of these problems.

1. Despite on scientific and technical progress, growth of economy and capacities of humanity, protection of people and material sphere from hazardous natural phenomena decreases steadily.

Proceeding from world statistic data, annual increase of victims from natural calamities on the surface of Earth is 4,3%, injured persons is 8,6% and size of material damage is 10,4%. Taking into account insignificant increase of the world gross product (3,6% per year), growth of natural hazards is of global process, which in many respects defines possibilities of steady development of society.

2. The greatest hazard for people's life are: droughts (50% from total number of victims all over the world); floods (36%), hurricanes, typhoons, storms (8%), earthquakes (2-3%). By size of economic losses the hazardous natural phenomena are distributed, as follows: hurricanes, typhoons, storm (43% from total number of losses), earthquakes (27%), floods (20%).

3. Intensive development of economy and sciences leads to occurrence of tehnogenous- natural hazards, which are essentially new natural processes (induced seismicity, land subsidence etc.).

4. Problem of natural hazards and connected social and material losses are defined not only by natural conditions of their territories but also by social and economic position of people living in those places. Biggest social losses are observed in under-developed countries, where high population and its weak protection is the main cause of mass mortality and huge suffering of people at occurrence of natural calamities. Fatal outcome in economically developed countries is much lower, however, development of hazardous phenomena in these countries is accompanied by huge material losses.

5. Swift growth of natural calamities is connected with two causes:

– Fast growth of the planet population and its concentration in large cities, these points promote increase of society's vulnerability;

– Degradation of environment, leading to decrease of protective functions of nature, ecological systems in relation to hazardous natural processes.

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PHYSICAL AND MATHEMATICAL SCIENCES

◀ **ABOUT ONE ANOMALY IN DISTRIBUTION
OF COMETARY PARAMETERS**

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Abstract

Distribution of perihelion of comets is considered on a new basis. Conclusion about the concentration of perihelion near the plane with parameters *I = 85⁰.84; = 272⁰.599* is confirmed. The statistical significance of this concentration is beyond of possible data errors. The problem of distribution of the distant nodes of comets in the plane is investigated. With this purpose intervals overlapping each other are investigated. Overpopulation of the interval 250 – 400 a.u. by nodes is confirmed. This fact can testify the presence of one or several large bodies – sources of comets.

INTRODUCTION

Investigation of perihelion's (or aphelion's) distribution of long-periodic comets has almost 200-years history. Interest to this theme is caused by its cosmogony roots. This question has also a big significance for study of a problem of comet hazard to the Earth. The fine structure of distribution of comet's perihelion should have a logic explanation in any theory of the origin of comets, otherwise such theory cannot be considered as a valuable one. We will remind position's essence in this question briefly introduced by one of authors of this paper. Calculations that have been made in [1] show that the distribution is characterized by concentration of points near the plane with parameters

$$I = 85^o.84; \quad \Omega = 272^o.599 \tag{1}$$

It should be mentioned that the principle of minimization has been used at mathematical calculations for definition of parameters of the plane. Besides, in [1] and other works of Guliyev, it is established that big quantity of cometary's crossings is concentrated within distance 250-401 a.u. in the plane and increases abrupt-

ly. Assumption of presence of a planetary body, moving in the plane at corresponding distances is made in the analysis of this feature.

Cometary data is continuously growing. Therefore from time to time it is necessary to come back to this question for acknowledgement of the recently appeared conclusions based on new material. In addition, the updated material allows applying new criteria for deeper studying of the question. In this paper, cometary data up to the mid of 2008 will be investigated. We will use data from the catalogue of cometary orbits [4] and circulars [5]. In this paper we consider 948 comets and our list is locked by comet C/2008 L3. Data of cometary groups of Marsden, Meyer and Kracht are not considered. Data of comets with the periods of more than 200 years are included in our study.

STATEMENT OF THE PROBLEM

On the basis of ecliptic coordinates of perihelion

$$x = \cos L \cos B; \quad y = \cos L \sin B; \quad z = \sin B$$

(where L and **B** are ecliptic coordinates of perihelion) planes with the minimal dispersions are calculated in the form of

$$z = ax + by; \quad x = az + by; \quad y = az + bx \tag{2}$$

Also we choose the equation which gives the smallest dispersion.

Level of determinacy of the equations has not been investigated in referenced papers. Root-mean-square error for each factor has not been found in these works also. Besides, taking into account of a new material requires their study in research of these questions. In this paper we will search for new regularity, using more profound analysis of data. In particular, we will use stepping moving intervals of heliocentric distances R for investigation of the population of cometary crossings. Intervals of distances cover each other at such analysis and the certain subjectivity concerning selection of borders of intervals disappears.

RESULTS OF SEARCH OF THE OPTIMAL PLANE

Calculations are done on the basis of operator LINEAR from EXCELL environment (WINDOWS). Residual dispersions, errors of each coefficient, parameters for application of F-distribution, etc. have been found simultaneously during carrying out of calculations. Coefficients for each empirical equation in (2) are calcu-

lated separately. Residual dispersions have been equal to 302.3; 272.4 and 375.0 accordingly. Hence, the second empirical equation corresponds better to a role of a plane with the minimal dispersion. Its coefficients are equal to:

$$a = 0.078; \quad b = 0.0397$$

Accordingly, their mean square errors are

$$\Delta a = 0.0315; \Delta b = 0.0278 \text{ ,}$$

It is easy to be convinced from definition of a triangle xyz that position of an optimum plane is defined by formulas

$$I = A\cos(a/\sqrt{1+a^2+b^2})$$
$$\Omega = A\tan(1+1/b)$$

The following plane has been obtained as a result of calculations

$$\Omega = 272°.37 \quad I = 85°.56 \tag{3}$$

It is possible to get limits in which position of a plane varies after taking into account the mean square errors of the equations (2):

$$83°.93 \le I \le 87°.21$$
$$270°.69 < \Omega < 274° \tag{4}$$

It is possible to approve that the plane (3) practically does not differ from (1). We have to remind that the plane (1) has been calculated on the basis of data of 1998 when the quantity of comets was for 25% less than now. Hence position of an optimum plane in due course does not practically change and is quite possible that parameters Ω and I vary around of any constant values.

F-distribution of Student has been used for definition of a level of determinacy of the obtained empirical expression. Its confidential probability is more than 0.95 at a significance value of 0.05. Therefore there do not appear doubts about the existence of a plane near which the point of perihelion has statistically significant concentration.

DISTRIBUTION N(R) OF LONG-PERIODIC COMETS

Distribution of cometary crossings in a plane (1), in particular at distances of $250 - 401$ a.u. will be considered in this section of paper. There has been paid a special attention to this research area in [1]. But we will, first of all, try to answer to

question what properties should possess distribution N(R) irrespective of a choice of a plane.

The distance of the remote nodes of long-periodic comets in some approximation could be presented in the form of

$$R = 2q /(1 - |\cos \omega |)$$

(5)

where q and ω are elements of cometary orbits. Graphics of distribution function N(R) in the form of the histogram at casual distribution of these two parameters have to possess following property: to each interval R in comparison with the previous interval will correspond smaller value of N. In other words, the histogram should remind function of type e^{-x}. The harshness from this rule should obtain a corresponding explanation. We have conducted some modeling calculations on the basis of the formula (5) for an illustration of this thesis. Thus the parameter cos ω have been chosen to vary from 0 up to 1 with step of 0.0333 meanwhile q – from 0.2 up to 3 a.u. with step of 0.2 a.u. Then the total number of modeling values R will make 930 which are comparable to number of real data. The histogram constructed on the basis of these data is represented in Fig.1.
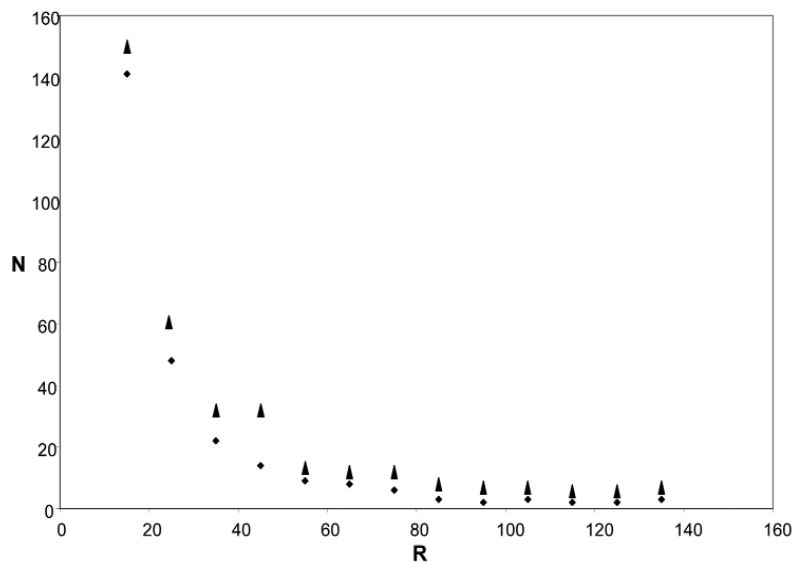
Figure.1. Distribution N(R) for long-periodic comets within 20 – 140 a.u. Triangles correspond to real comets in a plane of ecliptic and rhombs – to model values of the formula (5).

The figure displays the distribution in the area of 20 – 140 a.u. Triangles correspond to real comets in a plane of ecliptic, and rhombs – to model values of R

form the formula (5). Values for the first interval (642 and 470) and for area more than 140 a.u. are omitted because of limited scale of the figure. It is evident that both distributions are quite close and they confirm in general the above-stated idea.

Now we will analyze the structure of distribution N(R) in a plane (1). A number of works of Guliyev [1-3] is devoted to the study of this question. He has paid an attention to the fact that above-stated feature in the interval 250 – 400 a.u. was failed obviously – the quantity of crossings is obviously increased. This phenomenon is traced in any configuration (ω, I) inside of intervals (4). As development of ideas of Guliyev, in this article we are going to apply another method. We choose an interval of R from 100 up to 500 a.u. and define an interval in length of 51 a.u. by rule of Sterjes. Then we consider overlapping each other intervals to analyze a density of population of crossings. Then the deviation noted by us will be visible more distinctly. For example, distribution of N(R) for the case $\omega = 274^o$ and I = $84^0.5$ is displayed in Fig.2.
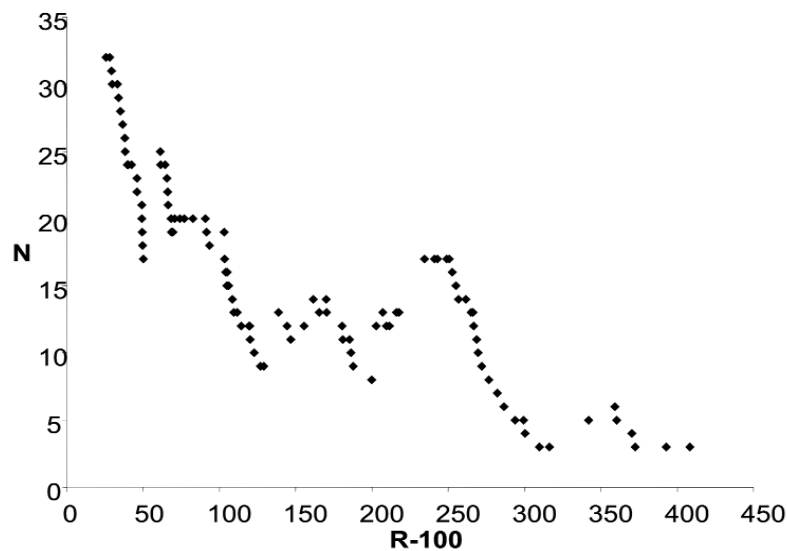
Figure 2. Distribution of N(R) for long-period comets in the plane (2740; 840.5).

As it is evident from the Fig.2, the most appreciable deviation is observed near the distance of 350 a.u. Calculations show that similar "anomaly" exists in case of any selection of pairs of values of Ω and I inside of intervals (4).

SPATIAL DISTRIBUTION of N(R) IN SELECTED INTERVAL

There is another method to check above-stated "anomaly" of cometary system which was developed and used by Guliyev in a number of papers [1, 3]. It con-

sists of the following. Interval R of concentration of cometary's crossings is fixed and parameters of plane I and Ω are varied definitely.

Table 1.

Distribution N (Ω, I) for the interval R from 250 up to 404 a.u.

I(degree)	Ω (degree)											
	0	30	60	90	120	150	180	210	240	270	300	330
0	28											
9.59	13	15	23	17	22	19	**32**	23	24	**29**	29	20
19.47	**11**	**18**	18	17	14	19	18	29	20	19	**28**	**19**
30	12	14	15	19	20	14	18	19	30	25	33	23
41.81	26	18	10	21	18	26	17	14	14	32	21	22
56.44	21	14	24	24	14	17	13	8	21	17	27	26
90	12	9	**14**	25	29	19						

.

In other words the interval of 250 – 404 a.u. on the plane (1) is compared to other planes for quantity of cometary's crossings (37). Comparison shows that the plane dominates over all other 68 ones by quantity of crossings. In other considered planes number of nodes varies from 8 up to 33, their average is 20, and its standard deviation is 6.0. Applying criterion of Student it is possible to be convinced easily that the confidential probability of prevalence of value 37 above 20 makes more than 0.99. Hence considered "anomaly" of comet system is quite real. Thus this feature of comet system is not ephemeral. It existed during all time of comet's observation, and for last years become more and more appreciable.

CONCLUSION

The feature of long-periodic comet's system which has been found almost 10 years ago – increasing cometary crossings on distances 250 – 400 a.u., is kept till now. Moreover, it became more appreciable due to new comets. Interpretation of one of authors of this paper about an opportunity of existence of the large planetary body at this distance receives new arguments. It is not excluded that there is one or several planetary bodies in the plane (1) and on distances 250 – 400 a.u. being sources of cometary groups.

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THE UNSUPERVISED CLASSIFICATION ALGORITM FOR IMAGE ANALYSIS REMOTE SENSING DATA

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ABSTRACT

Information regarding the natural resources, such as agricultural, hydrological, and mineral, forest, geological resources, etc., can be extracted based on remotely sensed image analysis. For remotely sensed scene analysis, images of the earth's surface are captured by sensors in remote sensing satellites or by a multispectral scanner housed in an aircraft and then transmitted to the Earth Station for further processing.

Digital processing of remotely sensed image data has been of great importance in recent times [1]. The availability of digital pictures of earth's surface from various sources, such as LANDSAT multispectral imageries, IKONOS high-resolution multiband and panchromatic data, IRS (Indian Remote Sensing) Satellite, and etc., have enabled researchers to pursue extensive low-level and high-level processing tasks on these satellite borne images of the earth's terrain.

Pattern recognition is the research area that studies the operation and design of systems that recognize patterns in data.

In this paper pattern recognition methods are explored in detail as they apply to multispectral remote sensing data. Particular attention is given to matters that limit performance in terms of accuracy of classification. Both supervised and unsupervised classifications are discussed, as well as means for measuring and for projecting the accuracy of results.

INTRODUCTION

Since there are various analyzing methods of optical satellite imagery in these days, many kinds of techniques have been developed to extract the new information, which were not expressed in the imagery.

A multitude of research efforts is concentrated on dealing with segmentation, more specific aspects of it, like edge detection. The mainstream of current research attempts in edge detection considers it as a linear filtering problem.

Segmentation of remote sensing imagery for various applications (e.g. agriculture, geological survey, military and security, weather forecast, terrain classification, astronomy, the detection of changes and anomalies, etc.) is challenging task due to huge amounts of data measured by satellite or airborne sensors. Large remote sensing images suffer not only with geometric and radiometric distortions problems but also with various challenges due to the high heterogeneity both within and across classes. The within class heterogeneity is due to the difference of acquisition process, orientation, and intrinsic appearance.

ALGORITHM OF UNSUPERVISED CLASSIFICATION

A number of pattern classification techniques have been used for the recognition of patterns. Some of these techniques are known as decision theoretic techniques, in which the classification of an unknown pattern is decided based on some deterministic or statistical or even fuzzy set theoretic principles.

The decision theoretic pattern recognition techniques are mainly of two types:

1. Classification methods based on supervised learning
2. Classification methods using unsupervised techniques.

The supervised classification algorithms can further be classified as

- Parametric classifiers
- Nonparametric classifiers

In parametric supervised classification, the classifier is trained with a large set of labeled training pattern samples in order to estimate the statistical parameters of each class of patterns such as mean, variance, etc. The input feature vectors obtained during the training phase of the supervised classification are assumed to be Gaussian in nature.

The minimum distance classifier and the maximum likelihood classifier are some of the frequently used supervised algorithms.

On the other hand, the parameters are not taken into consideration in the nonparametric supervised classification techniques. Some of the nonparametric techniques are K – nearest neighbor, Parzen window technique, etc.

Another type of classification is called unsupervised classification, or simply clustering. It is referred to as unsupervised because it does not use training samples, only an arbitrarily number of initial "cluster centers" which may be user-specified or may be quite arbitrarily selected. During the processing, each pixel is associated with one of the cluster centers based upon a similarity criterion.

Clustering algorithms are most commonly used as an aid to selecting a class list and training samples for the classes in that list.

Fundamentally, to be optimally useful, a classification must have classes that are (simultaneously):

1. of information value;
2. exhaustive;
3. separable.

The training samples generally are selected with emphasis on the former one. Clustering is a useful tool of the training process to achieve the latter two. Rarely in remote sensing are classes so separable that an unsupervised algorithm will lead to an acceptable final classification by itself. It can be a useful procedure, though, in defining spectral classes and training for them by breaking up the distribution of pixels in feature space into subunits so that one can observe what is likely to be separable from what. It allows one to locate the prevailing modes in the feature space, if any prevalence exists.

Clustering is closely related to feature combination. In this case we are not necessarily interested in reducing the dimensionality of the data. Rather we wish to identify whether the data form natural groups in feature space, thus organizing themselves into classes, which may not have been identified beforehand. We can consider this as a form of unsupervised training, where we seek clusters of similar data, which we can label as classes to which new feature vectors can be assigned, by any of the means already described.

There are many clustering methods, but here we are describing two commonly used methods, $K-$ means and its extension ISODATA.

It is a popular clustering method that minimizes the clustering error criterium. However, the $K-$ means algorithm is a local search procedure with one serious drawback, in that its performance depends heavily on the initial starting conditions. Here follows the $K-$ means algorithm:

1. Initialization.

Choose K vectors from the training vectors, x, at random. These vectors will be the centroids M_K.

2. Recursion.

For each vector in the training set, $n = 1, 2, ..., N$, let every vector belong to a cluster K. This is done by choosing the cluster closet to the vector

$$K_n^* = \arg\min_K \left[d\left(x_n, \mu_K\right) \right]$$

where $d(x_n, M_K)$ is the distance measure. The Euclidian distance measure is used (in vector notation)

$$d(x_n, \mu_K) = \sqrt{(x_n - \mu_K)^T (x_n - \mu_K)}$$

3. Test.

Recomputed the centroids M_K by taking the mean of the vectors that belongs to this centroid. This is done for every M_K. If no vectors belong to M_K – create new M_K by choosing a random vector from x. If there has not been any change of centroids from the previous step, go to step 4, otherwise go back to step 2.

4. Termination.

From this clustering, the following parameters can be found:

c_K– number of vectors classified in cluster K divided by the total number of vectors,

M_K – sample mean of vectors classified in cluster K,

Σ_K - sample covariance matrix of the vectors classified in cluster K,

E_{mse} – clustering mean square error. The Mean Square Error is one of the more commonly used criterion for clustering. It computers the square distance for each point from the corresponding cluster center, in addition to the mean of distances for all points in the data set according to

$$E_{mse} = \frac{1}{N} \sum_{n=1}^{N} d\left(x_n - \mu_{\arg\min_K [d(x_n, \mu_K)]}, x_n - \mu_{\arg\min_K [d(x_n, \mu_K)]} \right)^2$$

The output from the clustering algorithm is basically a statistical description of the cluster centroids and indices telling what cluster each data point belongs to.

K_n^* – Index that indicates which center each data vector belongs to

The major problem is the selection of initial cluster configurations. It is possible either to select the first k samples as the initial cluster centers or to randomly select K samples from the pool of patterns as the cluster centers. A rough partition in K clusters may, however, yield a better set of initial cluster centers.

Problems with the initial selected centers imply that the final result may end up in a local, instead of the desired global, minimum.

The K – means algorithm may be used to find the initial parameters of the Gaussian mixture. However, keep in mind that the result may end up at a local minimum.

PRELIMINARY RESULTS

Our case study is some territory of Azerbaijan Republic.

A few results showing a part of the IKONOS imagery as tested with above mentioned method. We illustrate the analysis of a multispectral data set using algorithms discussed so far (Fig.1 and Fig. 2).

CONCLUSION AND FUTURE WORK

In this paper we have evaluated unsupervised classification methods for pattern recognition objects on high resolution remote sensing imagines. The algorithm used in this research is a simple as well as an effective method. Results indicate that the best classification performance for IKONOS images is obtained with unsupervised classification algorithms.
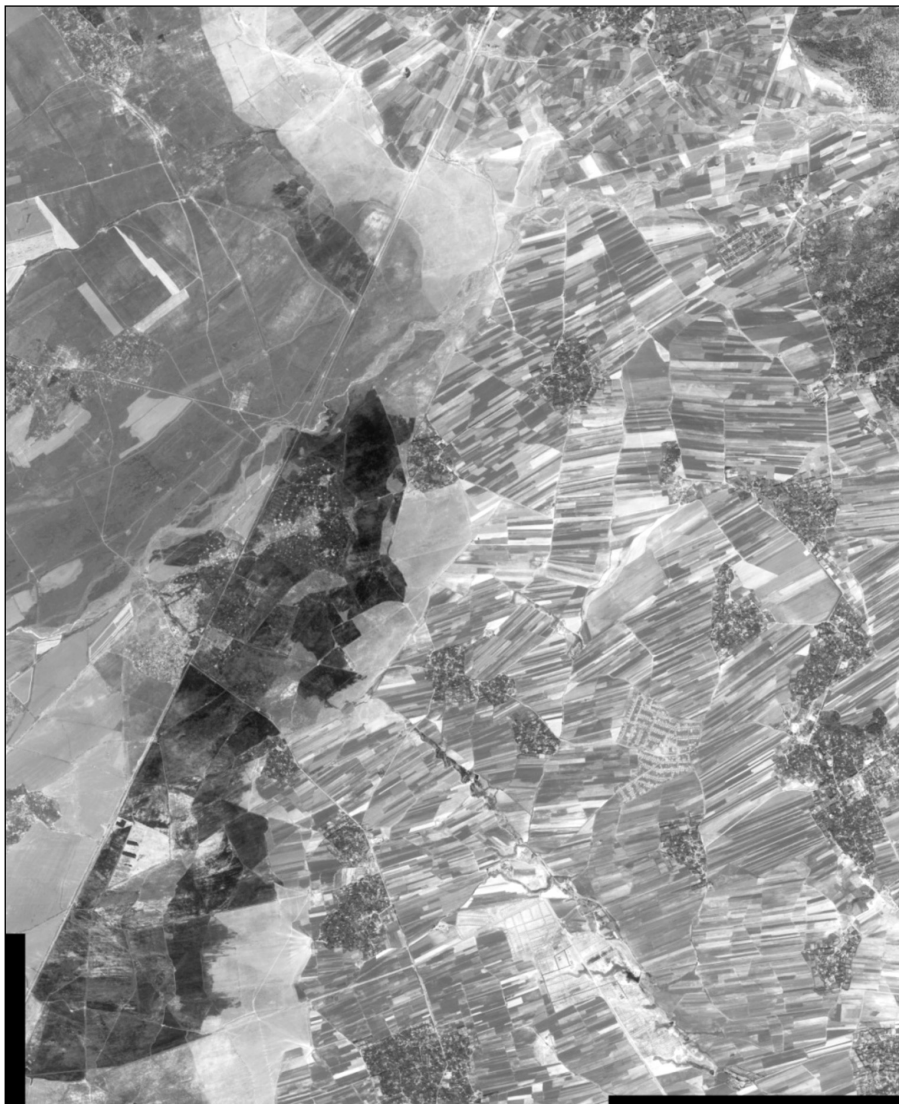
Figure 1. Satellite image from IKONOS. Area of fire.
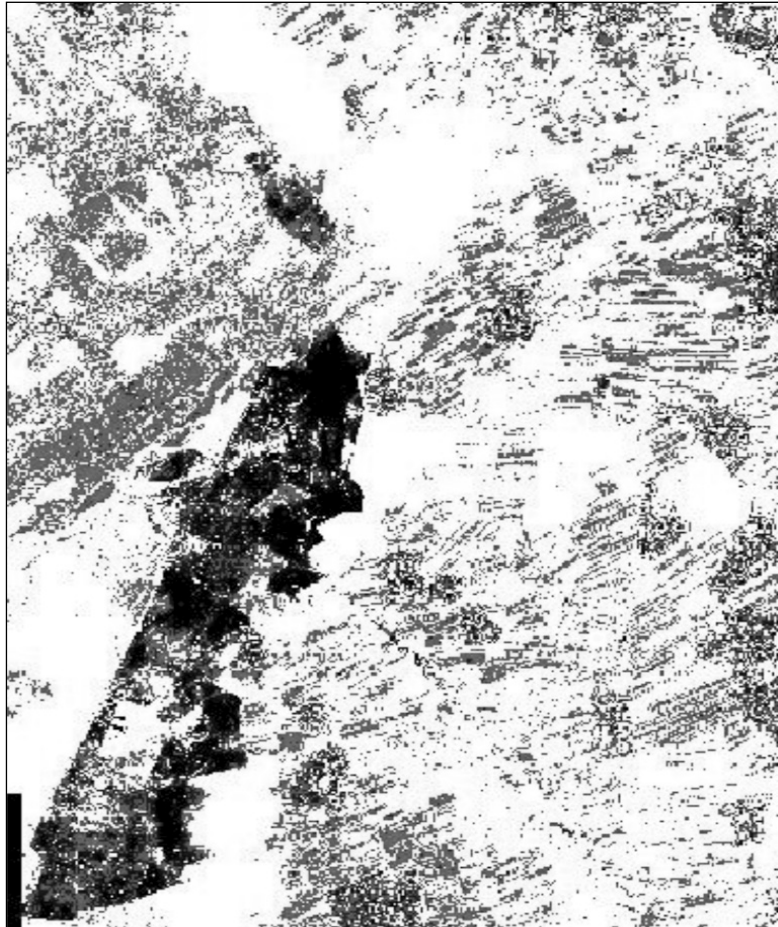
Figure 2. Unsupervised classification (black zone – area of fire).

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ELECTRON TRANSFER IN PHOTOSYSTEM I EMBEDDED IN TREHALOSE GLASS

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INTRODUCTION

Temperature and dehydration parameters play important role in electron transfer reactions within proteins. It was found that protein conformational fluctuations can have a significant effect on electron transfer within bacterial photosynthetic reaction centers [1]. At low temperatures, protein-specific motions are slowed down and a heterogeneity of protein molecules frozen at different substates are observed leading to inhomogeneous reaction kinetics that can not described by simple exponential functions [2, 3]. Photosystem I protein complex (PS I) is no exception to this rule.

In itself, PS I mediates electron transfer in photosynthetic organisms between cytochrome b_6/f and soluble ferredoxin / flavodoxin thus enabling efficient electron transfer to the NADP oxido-reductase thereby converting light to useful chemical energy for the cell. PS I in *Thermosynechococcus elongates* species of cyanobacteria consists of 12 protein subunits, primary among them are PsaA, PsaB and PsaC [4]. These subunits harbor co-factors that are involved in the process of electron transfer. The co-factors that mediate electron transfer comprises of a chlorophyll *a/a'* primary donor pair (P700), a chlorophyll *a* primary acceptor dimer (A_0), two vitamin K_1 molecules (A_1) which act as intermediate electron acceptors and three [4Fe-4S] clusters F_X, F_A and F_B. All the co-factors, except the three iron-sulfur clusters, are arranged in a pseudo – C_2 symmetry [4]. Terminal cofactors, F_A and F_B clusters placed in PsaC polypeptide anchored with its C-terminus loop to core proteins complex formed by PsaA and PsaB polypeptides and minor proteins. When electron transfer occurs via PS I, it creates a series of charge-separated states that are stabilized by these co-factors. In the absence of an electron acceptor from

the terminal iron-sulfur cluster – F_B this charge separated states re-combines to the ground state [5, 6]. This process is called charge recombination or back reaction. It is believed, based on temperature dependence studies on pre-reduced iron-sulfur clusters, that charge recombination occurs via a thermal re-population of A_1 and subsequently recombines directly to P700 instead of the route forward electron transfer takes i.e., via A_1-A_0 pair [7]. In addition, the activation energy calculated by temperature dependence studies on pre-reduced clusters containing intact PS I suggest that the activation energy is equal to the potential difference between the terminal electron acceptors and A_1. There are however contradictory reports of the activation energy [8, 9].

In the present work I have performed experiments in order to separate the dehydration and temperature effect on electron transfer back reactions within PS I complexes purified from cyanobacterial cells. Embedding of PS I protein complex into the solid glass transparent for optical studies formed by trehalose sugar at room temperature gives unique method to imitate the rigid matrix formed under the cryogenic temperature by water – glycerol mixture.

MATERIALS AND METHODS

PS I trimeric complexes were purified from cyanobacteria *Synechocystis* sp. PCC 6803 according to [10]. Incorporation of PS I particles into the trehalose glass were achieved by drying mixture on the optical flat glass plates under the argon atmosphere in desiccators in the dark. Water content in the samples was determined by Near-IR absorption band around 1980 nm and values in the samples were about 3% of weight. Kinetics of back reactions from acceptors to $P700^+$ induced by laser flash were monitored at 820 nm on the instrument with time resolution 1 мs as described in [6]. Temperature dependence measurements were carried out using He–flow cryostat. Data were treated with Igor Pro software package using least square algorithm.

RESULTS AND DISCUSSION

Fig.1 represents comparison of laser flash induced kinetic traces detected at 820 nm for PS I samples in solution (trace 1) as well as incorporated in trehalose glass (trace 2) at room temperature. Trace 1 could be fitted with sum of two exponents and life-times for these processes are 82 ms (55% of total amplitude) and 1.2 s (45% of total amplitude). Trace 2 hard to fit with exponential functions type

$A(t) = \Sigma A_1 \exp(-t/\tau_i)$ and sum of three stretch exponents type **$A(t) = A_0 \exp((-t/\phi)^B)$**

(Kohlraush function) [11] were used. Life times were – 350 μs (34% of total

amplitude) with stretch factor $\beta = 0.53$, 17 ms (50% of total amplitude) with в = 0.5 and 360 ms (16 % of total amplitude) with $\beta = 0.87$.
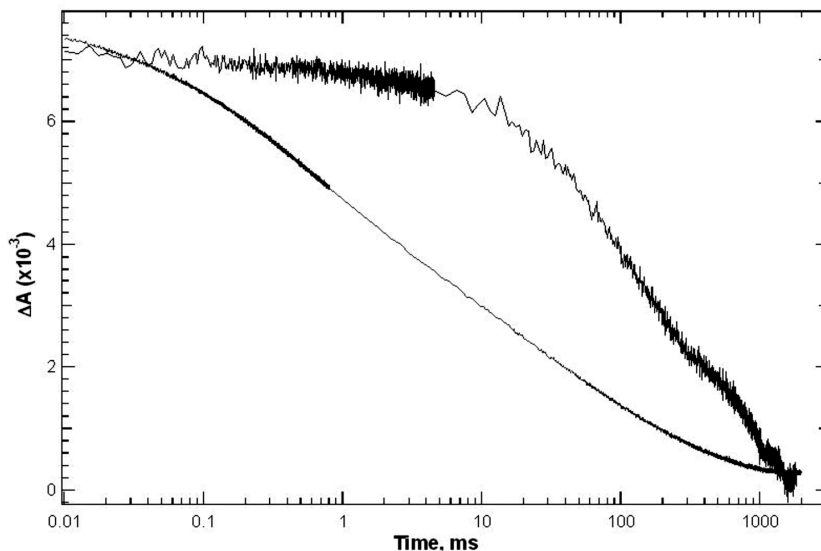
Figure 1. Flash induced absorbance changes of PS I at 820 nm attributed to the formation and decay of P700+. Trace [1] belongs to Photosystem I preparation in 50 mM Tris-HCl buffer (pH 8). Conditions 60 мM Chl a, 5 μ M DPIP, 5 mM Na-Ascorbate. Trace [2] belongs to Photosystem I preparation dried in trehalose glass. In both measurements T = 290 K.
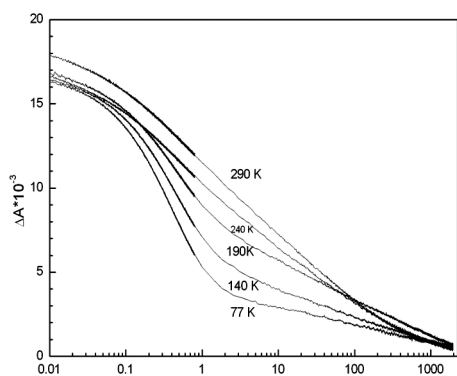
Figure 2a. Flash induced absorbance changes of PS I in trehalose glass detected at 820 nm attributed to the formation and decay of P700+ at selected temperatures. Conditions as in fig.1 for trace 2.
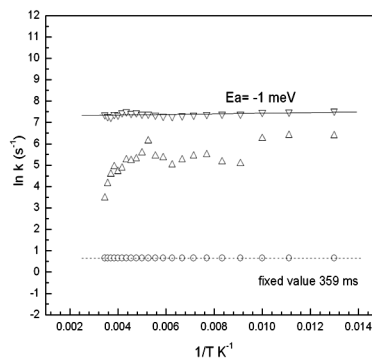
Figure 2b. Arrhenius plot of the rate constant attributed to the formation and decay of P700+. Details in text.

Fig.2a represents behavior laser flash induced back reaction kinetics of PS I particles embedded into the trehalose matrix and recorded at temperature range from 290 K to 77 K. Fig. 2b is the Arrhenius plot of the rate constants attributed to the back reaction electron transfer described by three phases.

Fixed value of slowest phase with life time 360 ms simplify fitting analysis for whole temperature range and yields good fit. It is seen from fig.2b that only intermediate phase significantly dependent upon temperature and cannot describe by linear dependence while fastest phase virtually temperature independent. Control experiments with PS I dried without trehalose shown no photochemical activity in such preparations. In liquid state with trehalose concentration 80% (w/w) there is no difference in kinetic behavior compare to PS I in buffer solution. Reconstitution experiment has shown that after dilution of dry PSI/trehalose glass in buffer the PS I kinetic exhibit normal bi-exponenial decay as it would be without treatment (data not shown) indicating that trehalose treatment doesn't change integrity of PS I.

These primary data should be considered in terms of structure – functional relations of cofactors and polypeptide subunits of PS I. First interesting effect is that embedding PS I complex into the trehalose solid glass leads to significant changes in back reaction kinetics and appearance of three phases distinctive by their life times τ. The fast phase with $\tau = 350$ μs could be attributed to the back reaction from intermediate acceptor A_1 as described before [6], the 17 ms as well as unchangeable 360 ms phases would be attributed to back reaction of electron from terminal acceptors [F_A, F_B] to P700$^+$. Impossibility to use simple exponential function for fitting procedure of kinetic traces and usage stretch exponents is indication that the certain level of system disordering is present. For comparison, such a disordering doesn't observe for PS I samples in buffer solution where kinetics represents mainly by bi-exponential decay components with $\tau = 80$ ms attributed to back reaction of electron from terminal acceptors [F_A, F_B] to P700$^+$ and component with $\tau = 1.2$ s which is slow donation of electrons from artificial electron donors DPIP/ Na-Ascorbate to P700$^+$ [6].

Second effect observed with PS I particles embedded in trehalose glass is that the kinetic behavior of fast and slow components independent upon temperature indicating electron transfer reactions without any activation barrier. Compare to PS I in solution back reaction from terminal acceptors is temperature activated and activation energy about 220 meV was estimated [12]. Only intermediate phase activates but has nonlinear dependence. Behavior of intermediate phase rate constant looks like repeating the temperature dependence of dielectric relaxation rate constant for water/protein system [13]. In latter case, back reaction with life-time 17 ms smoothly accelerate and reach steady state rate constant with life time 1-3 milliseconds at 200-210 K. Such life time is characteristic for electron transfer back

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reaction from F_X cluster. The fluctuation modes of PsaC polypeptide related by bound (structural) water in the interface between PsaC polypeptide and PS I core protein formed by PsaA/PsaB polypeptide are freezing out and electron reach only F_X. That leads to non activated back reaction from F_X instead further electron transfer to terminal acceptors [F_A, F_B]. This fact indicates that some water molecules are still bound to PS I despite drying in trehalose. As it was mentioned earlier complete drying of PS I without trehalose leads to dehydration and lost of all photochemical activity of PS I.

Mechanism of charge stabilization on terminal acceptors [F_A,F_B] is basing on relaxation properties of these cofactors as well as fluctuation modes of protein matrix where these cofactors embedded [1]. Note that the terminal acceptors [F_A,F_B] responsible for kinetics with tenth of ms life times placed in PsaC subunit which is anchored to PsaA/PsaB core complex only with C-terminus of its polypeptide chain [14]. Such a structural feature of this subunit assume some fluctuations relative to the core complex of PS I and changes of the distance between cofactor F_X and [F_A, F_B]. On the other hand changes according to semi – empirical equation derived by Dutton with co-workers [15] the change of distance between donor and acceptor only for 1 E enough to slow down electron transfer rate factor of 4.

Following hypothesis put into the explanation of observed effects. Embedding of PS I trimer particles into the trehalose rigid glass leads to freezing PsaC polypeptide in the different conformational sub-states at room temperature differing by distances between electron acceptor F_X in PsaA/PsaB core polypeptide and [F_A,F_B] clusters in PsaC polypeptide. One can assume that observed heterogeneity of kinetic properties of PS I in trehalose glass can be produced by such conformational sub – states of PsaC polypeptide. The similar multi component kinetics effect observed with PS I samples under the cryogenic temperatures in water-glycerol glass where three main sub-states explain heterogeneity of PS I [8]. Probably because of very fast fluctuation's rate of PsaC polypeptide around its average position relative to core polypeptide complex at room temperature detection represents integrated life times of electron transfer back reaction having maximum around tens of milliseconds.

Acknowledgments

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SOME ASPECTS OF APPLICATION WAVELET ANALYSIS FOR IDENTIFYING NATURE AND TECHNICAL OBJECTS FROM HIGH RESOLUTION REMOTE SENSING IMAGIES

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ABSTRACT

Remote sensing technology has shown its merits in identifying nature and technical objects on high resolution space images. This paper describes a method for technical objects detection by multi-resolution analysis based on wavelet transform.

For wavelet transform, a family of different mother functions (Daubechies mother wavelet with different orders) have been used and evaluated in this research. Based on the frequency characteristics of the images and the root mean square radius of each scaled mother functions, object areas can be assessed.

After image registration phase, mother functions have been evaluated, As a result, each data has been decomposed into four independent images with four different scales (multiresolution).

A window (3 by 3 pixels) has been applied to compensate for miss registration errors on high frequency component in each resulted image. A threshold value has been assigned to identify the pixels with high before after differences (i.e. changes).

In the higher resolution component for the Daubechies of order 1 (Haar function), computational results are impressive and show more than 85% precision as compared with individual counting of the object area from the image manually.

However, this component lacks the visual perception (but statistically more accurate). But, lower resolution components visualize effectively the map at proper dimensions with the expense of loosing fine details.

INTRODUCTION

Since there are various analyzing methods of optical satellite imagery in these days, many kinds of techniques have been developed to extract the new infor-

mation, which were not expressed in the imagery.

A multitude of research efforts is concentrated on dealing with segmentation, more specific aspects of it, like edge detection. The mainstream of current research attempts in edge detection considers it as a linear filtering problem. Recent developments in multiresolution analysis such as wavelet transforms help overcome this difficulty. Many methods share one common weakness. They primarily focus on coupling between image pixels on a single scale. The Canny edge detector uses the thresholding method by which the noise is reduced and only the wanted edges are picked by setting the thresholds.

Buildings are the most relevant man made structures. Their detection is valuable because of the strategic human activity occurs in a building of some sort. The in urbanized city, for example in Baku, detecting individual buildings is a problem, due to the proximity of the buildings to each other and heights of the buildings which causes relief displacement (Fig.1).
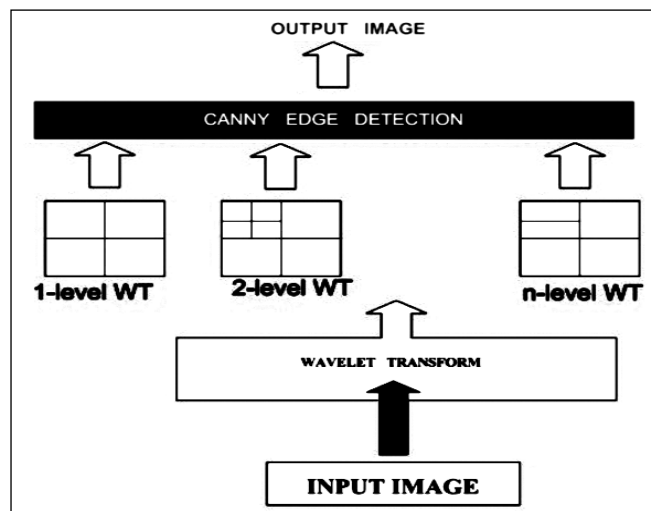
In this study, IKONOS satellite imagery with a resolution 1 m, of the Baku city is used. The wavelet analysis is first applied on the input imagery.

All the computations involving wavelet transform and edge detections are implemented using Mathcad v.12 and Matlab v.2007. Application of the wavelet transform takes very less time. This quick response is mainly due to the property of wavelet decomposition that has fast algorithm, which is based on convolutions with a bank of filters.

MULTIRESOLUTION ANALYSIS

Wavelet analysis represents a windowing technique with variable-sized regions. Wavelet analysis allows the use of long time or space intervals where we

want more precise low frequency information, and shorter regions (time or space) where we want high frequency information.

The discrete wavelet transform (DWT) is known to one of the most useful techniques for multiresolution image analysis. The wavelet scheme provides a powerful and flexible set of tools for handling problems in noise removal, signal or image compression, object detection, image enhancement and etc. The DWT has been used. Discrete Wavelet Transforms are fast algorithms implemented via digital filter banks.

The wavelet approach effectively reduced the contrast of the image. By only scaling the high frequency components of the decomposed image, the contrast of the small-scale features of the image is reduced, while the contrast of the large-scale objects is preserved.

One major advantage afforded by wavelets is the ability to perform local analysis. That is to analyze a sub image area of a larger image. Wavelet analysis is capable of revealing aspects of data that other signal analysis techniques usually miss, like trends, breakdown points, discontinuities in higher derivatives, and signal component similarities. A wavelet is, as the name suggests, a small wave. The theory of wavelet reconstruction helps to localize and identify the superposition of small waves and helps to better understand these phenomena. Many statistical phenomena have wavelet structure. The wavelet transform can be considered as representation of a function in terms of some building blocks, which are scaled and placed at different positions.

These blocks are actually a family of wavelet functions (or wavelet bases) generated from a prototype wavelet, called a mother function.

The superposition of the translation and scaling of these blocks is producing the given function. A function is called a wavelet, if it fulfills the admissibility condition (Daubechies, 1992),

$$0 < c_\psi = 2\pi \int_{-\infty}^{\infty} \frac{\left|\hat{\psi}(\omega)\right|^2}{|\omega|} d\omega < \infty$$

Where $\hat{\psi}$ is the Fourier transform of ψ. The wavelet function $\psi(x) \in L^2(R)$ has two characteristic parameters called dilation (or scale) *(a)* and translation *(b)*, which vary continuously. A set of wavelet basis function $\psi_{ab}(x)$ maybe given as,

$$\psi_{ab}(x) = \frac{1}{\sqrt{a}} \psi\left[\frac{x-b}{a}\right], \quad a,b \in R, a \neq 0$$

(1)

The wavelet transforms of a function $f \in L^2(R)$ with respect to this wavelet is given by,

$$W\{f\}(a,b) = \frac{1}{\sqrt{c_\psi}} |a|^{-\frac{1}{2}} \int\limits_{-\infty}^{\infty} f(u)\psi\left[\frac{u-b}{a}\right]$$

(2)

Wavelets are functions satisfying a linear combination of different scaling and translation of wave function. In this process, wavelet is used as a basis function in representing target functions, like sinusoidal functions in Fourier analysis. The basic of the wavelet scheme is to represent an arbitrary function or image as a superposition of wavelet. By this superposition process, it can be decomposed the given function into different quad-scale levels.

The multiresolution analysis (MRA) is the key for the fast decomposition of a signal into disjoint frequency components. The MRA of $L^2(R)$ consist of successive approximations of the space V_j of $L^2(R)$. Now we define W_j as a complementary space of V_j in V_{j+1}, such that $V_{j+1} = V_j \oplus W_j$ and $\bigoplus\limits_{-\infty}^{\infty} W_j = L^2(R)$.

The original function $f(x) \in V_0$ can be rewritten as (Mallat, 1989),

$$f(x) = \sum_k c_{j,k}\phi_{j,k}(x) + \sum_{J}^{J-1}\sum_k d_{j,k}\psi_{j,k}(x), \quad J > j_0$$

Where $c_{j-1,k} = \sqrt{2}\sum_i h_{i-2k}c_{j,k}, \quad d_{j,k} = \sqrt{2}\sum_j g_{j-2k}c_{j,k}$ such that scaling function $\varphi(x) \in V_0$. So if $\varphi(x)$ be the orthogonal scaling function and $\psi(x)$ the corresponding mother wavelet, then the two dimensional scaling function is

$$\varphi(x,y) = \varphi(x) \cdot \varphi(y)$$

And two dimensional wavelet functions are

$$\psi^H(x,y) = \psi(x)\psi(y)$$
$$\psi^V(x,y) = \varphi(x)\psi(y)$$
$$\psi^D(x,y) = \psi(x)\psi(y)$$

If $f \in L^2\left(R^2\right)$ is a two dimensional signal after n-level decomposition, then

$$f = A_n + \sum_{i=1}^{n}\left(H_i + V_i + D_i\right)$$

(3)

Where A_n is the low frequency component in sale n and H_i, V_i, D_i are high frequency components concluded from ψ^H, ψ^V and ψ^D.

The wavelet decomposition can be implemented by using two channel filter banks composed of a low-pass and high-pass filter and each filter bank is then sampled at a half rate of the previous frequency.

By repeating this method, it is possible to obtain wavelet transform of any order. The down-sampling method preserves wavelet transform so that it enables a relatively simple computing. In the case of a given image, the filtering is implemented by filtering the line-direction and column-direction, separately. As a consequence, an original image can be decomposed into four sub-images. In this study, Db4, as the wavelet basis, was applied (Fig. 2).
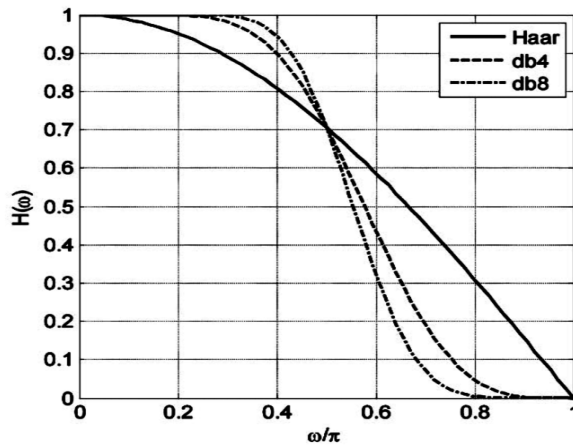
PRELIMINARY RESULTS

Our case study is the city of Baku in Azerbaijan because of the good knowledge of the site and the availability of high quality optical data.

A few results showing a part of the IKONOS imagery as tested with above mentioned method. Wavelet analysis is one of the most popular methods that can be used to detect objects from satellite images.

The wavelet analysis method coupled with the Canny edge detection, which has the double threshold technique and is less fooled by noise, forms a very strong

tool in detection of man-made features. The above mentioned methods are applied on 1-meter IKONOS imagery of the urbanized Baku city, to detect the building and other technical objects edges within that scene (Fig. 3).
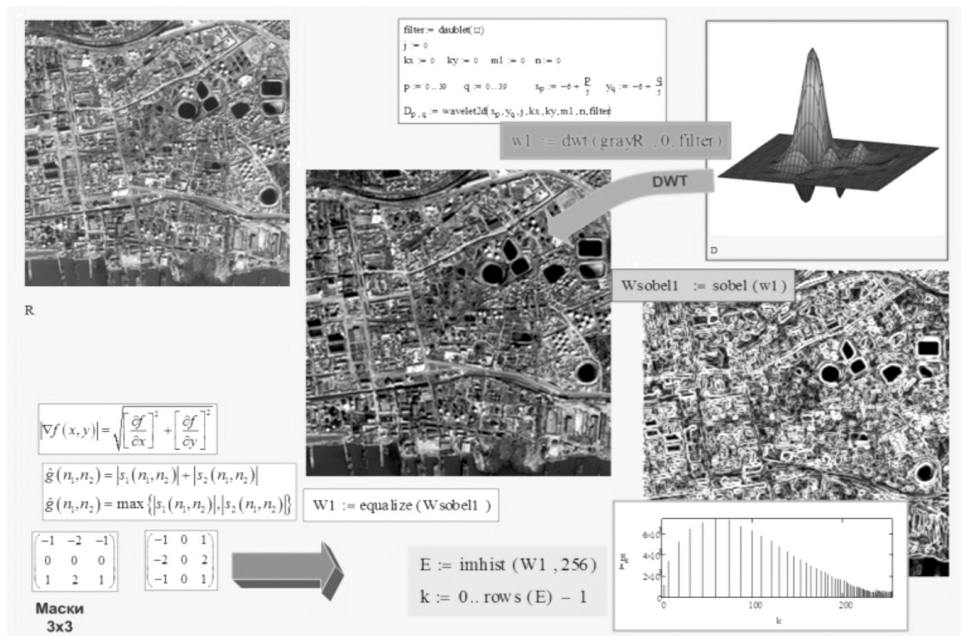
CONCLUSION AND FUTURE WORK

In this paper we have evaluated multiresolution wavelet transform methods for detection objects on high resolution remote sensing imagines. The analysis has been done in scale 1 and 4 of the transform.

The algorithm used in this research is a simple as well as an effective method. Wavelet analysis is a growing area in the field of remote sensing, though its impact is already very strong in other engineering areas.

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OIL INDUSTRY AND CHEMISTRY

INHIBITION OF ACID CORROSION
OF METALS BY PRORARGYL COMPOUNDS

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The problem of acid corrosion inhibitors deserves an intent attention because the rate of corrosive destruction of metals and material damage related with it are particularly big in their contact with acid mediums.

Therefore, it is not surprising that already the first report about suppression of iron corrosion in acids solution by propargyl alcohol[1] then more than once confirmed by many researchers[2-4], became stimuls for extensive study of inhibitory properties of propargyl derivatives of the different classes of organic compounds with purpose of discovery of effective corrosion inhibitors.

Facts, gained to present time, testify that many propargyl compounds are effective means for protection of metals from corrosion in mineral mediums*. Anticorrosion action of these compounds particularly contrastingly manifest itself at high temperatures that favorably distinguish them from industrial nitrogen-containing inhibitors[2]. It is also noteworthy that the latters by addition of small amounts of some heteroatomic propargyl compounds display an effect of synergism in their action [3,6,7].

By degree of protection of metal from acid corrosion the propargyl compounds noticeably exceed the corresponding hydrogenated (allyl and propyl) analogs[4,8].

The offered mechanisms of inhibitor action of propargyl compounds at metal corrosion in acids, are still far from perfection[9,12]. The essential shortcoming of them is disregard of stereochemical approach. However, at present time relatively substantiated and acceptable is adsorptional-polymerizational mechanism of corrosion inhibition by propargyl compounds, according to which latters undergo

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* As a rule, all propargyl compounds in sulphuric acid are less effective than in hydrochloric acid. Exception to the rule makis dipropargylsulphide[4]. As contact inhibitors of atmosphere corrosion of metals propargyl compounds are, probably, ineffective (compare with[5]).

consecutive acts of adsorption, chemisorption and polymerization on metal surface. The polymer film, formed as a result of that screens the metal surface from aggressive medium.

In final consideration the task of elucidating the reason of inhibiting action of propargyl compounds is mostly connected with practical requirement for synthesis of molecules of given structure effectively inhibiting corrosion process at elevated temperatures. From this point of view the experimental data, connecting protective action of propargyl compounds with their electron and spatial structure and also physical-chemical properties are adequate by significance and more convincing by reliability.

There is not be a doubt, that ethynyl group of propargyl compounds plays an important part in anticorrosion action[9,10]. Though, existence in their structure of heteroatoms with «free» electrons (or unfilled external orbitals)[11,12], additional groups with p-bonds capable to local interaction with metal surface[13] and also to physical and chemical interaction with corrosive medium, exercise a perceptible influence on a degree of inhibitor protection.

Propargylalkanes are weak corrosion inhibitors in hydrochloric and sulphuric acids[14], moreover, their protective action of moderate temperatures becomes lowered with increase of molecular mass[3]. It is explained by the fact that propargylalkane are not dissolved* and dispersed in acid, therefore adsorption of triple bonds on metal turn out to be hindered.

Anticorrosive influence of propargyl haloides[15] $HC{\equiv}CCH_2X$ (X=Cl, Br, I) in hydrochloric acid (in 100°C) increases with rise of atom number of halogen that is in accord with symbate change of temperature of phase transfer of these compounds. The reverse dependence correlating with comparative thermal stability has been observed in series of halogen derivatives of propargyl alcohol of the type $XC{\equiv}CCH_2OH$[16].

The propargyl alcohol in temperature interval 25-60°C retards steel corrosion in HCl solution twice stronger as compared with homolog-propargyl-carbinol[17]. Decrease of protective effect in the last case is probably connected with breach of linearity of carbon skeleton of molecule[4], which prevents uniform covering of metal surface.

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* The factor of inhibitor solubility in aggressive medium is important for an extent of metal protection from corrosive destruction[12]. Therefore, the inhibitors of propargyl series are frequently in the mixture with different water-soluble organic solvents[2]. The alternative approach is base on design of propargyl molecules, having in their structure the functional groups, contributing to solubility of compounds in solution of acids. For example, the synthesized by us propargyl substituted 1,4-dioxanes[14], owing to good solubility in water, effectively retard corrosion of steel hydrochloric acid, surpassing in that attitude the mechanical mixtures of 1,4-dioxane with acetylene compounds, which have been recommended as anticorrosion compositions[2].

The results of the investigation[18]* in the aggregate with the data of article [26], testify that in propargylcarbinol $HC{\equiv}CCH_2CRR^1OH$ series effectiveness of protective action is diminishing in the order:

secondary>primary>tertiary**

Very poor corrosion inhibition by tertiary alcohol is apparently a result of spatial screening of hydroxyl oxygen atom (influence of hydrogen atom of hydroxyl group is less essential). Thus, substitution of hydrogen atom of hydroxyl group of secondary propargyl carbinols by unsaturated grouping (в-cyanethyl, propargyloxymethyl)[18] leads to growth of inhibitory effect value (г).

Still more precisely marked regularity is shown by substitution of hydroxyl hydrogen atom of propargyl alcohol (compare with[25]). The intensive search of highly effective inhibitors of acid corrosion among different compounds containing propargyloxygroup has been determined by that, as the latters are more effective and relatively easier accessible than these with homopropargylxygroup.

The protective effect of compounds containing propargyloxygroup has been predetermined in the first place by existence of terminal triple bond and oxygen atom, apparently performing the role of peculiar double absorption centre. Any structural «interference» capable to distort synchronization action of this «tandem» sharply reduces a degree of inhibitory protection. The steric screening of its components by means of substitution of hydrogen atoms of methylene group leads to rise of corrosion rate. So, it has been determined by us (Table 1) that introduction of hydrocarbon constituents into structure of cyclohexylpropargylformal is accompanied by decrease of inhibitor effect value.

The inhibitory effect has been still stronger suppressed by substitution of acetylene hydrogen of propargyl fragment by any grouping.

It is evident from comparison of values of inhibitory effect of propargyl ether of m-methylbenzyl alcohol and its C_{sp}-dimethylcarbinol derivative (Table 2).

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* Considerable part of research's of propargyl compounds has been realized together with workers of general and analytical chemistry department and problem laboratory of inhibitors of corrosion of MSPU (joint publications18-25)

** Similar regularity has been observed in series of ethynylcarbinols and propargyl amines[4]. It is particularly clearly shown by substitution of acetylene hydrogen atom (in propargyl ethers) by aminomethyl groups. These, because of arising (between nitrogen atom and propaygyloxygroup) intermolecular competition in adsorptional interaction with metal surface, even mechanism of inhibitory hydrophobizing action changes[25].

Influence of substituents (R and R^1) on protective properties of formals HC+CCRR^{1}OCH$_2$C$_6$H$_{11}$-cycloadditives (10^{-2} mol/litre) on steel corrosion (10KP) in 4 N HCl, 80°C

R	R^1	Corrosion rate, ρ gram/m^2 -hour	Inhibitory effect γ
H	H	10.2	86.6
CH$_3$	C$_4$H$_9$	14.0	61.3
$-$ (CH$_2$)$_4$ $-$		163.8	5.4
Control (without additives)		883.6	$-$

Protective properties of ethers RC≡CCH$_2$OCH$_2$C$_6$H$_4$CH$_3$-m on steel corrosion (ST-10) in 4M HCl (T=60° C, τ = 2 hours)

R	Corrosion rate, ρ gram/m^2 -hour	Inhibitory effect γ
H	1.6	56.3
C(CH$_3$)OH	22.0	4.1
Control (without additives)	90.1	-

All these reveal that in condition of structural invariability of propargyl oxy-group, the protection degree of metal from corrosion by propargyl ether must essentially depend from corrosive behavior of R residue. The importance of this proposition for prognosis is evident from following examples.

The propargyl ethers of carboxylic acids at temperature above 70 °C do not show effective anticorrosion properties[26] that is stipulated by their acid hydrolysis. Confirmation of the abovementioned is fall in protective action of propargyl ether of sorbic acid[27] at HCl concentration >15% and temperature 60°C .

In that case propargyloxysilans easily subjected to acid-hydrolytic spliting[28,29] must not differed by high value of inhibitory effect. Really, as follows from the data (Table 3), obtained by us during study of protective properties of diorganylbenzyl propargyloxysilanes, the latters are unfit for use as high-temperature corrosion inhibitors.

Table 3

Protective action of propargyloxysilanes $HC \equiv CCH_2OSiRR'CH_2C_6H_5$ in steel corrosion (ST-3) additives (0.03 mol/litre) in 4 N HCl (τ =2 hours)

R	R^1	Corrosion rate, ρ gram/m^2 hour at temperature, °C		Inhibitory effect, γ at temperature, °C	
		80	100	80	100
H	CH$_3$	25.3	117.4	34.4	26.7
CH$_3$	CH$_3$	23.2	40.0	37.5	78.5
C$_3$H$_3$	C$_2$H$_5$	17.5	34.8	49.7	90.2
Control (without additives)		870	3739	–	–

Their protective effect is mainly stipulated, by products of acid hydrolysis and first of all-by propagyl alcohol (compare with[30]). Fall in rate of corrosion with raise of volume of substituent at silicon atom –is an additional testimony that the less the tendency of compound to hydrolysis, the higher the inhibition effect (compare with [31]).

Since withdrawal of silicon atom from oxygen increases the acid-hydrolytic resistance of compounds[4], it should be expected that propargyl ethers of siliconorganic alcohols will be more effective as corrosion inhibitors than propargyloxysilanes. According to the data on relative hydrolytic resistance[4], the propargyl ethers of б-siliconorganic alcohols must show more effective anticorrosion properties

than β-analogs. Comparison of protective of properties both types of ethers (Table 4) clearly confirms the stated supposition[19,32].

Table 4

Protective action of propargyl ethers of triorganysilylalkanols
HC≡CCH$_2$OCH(CH$_3$)–(CH$_2$)$_n$SiCH3RR^1 addition (0.01 mole/liter)
on steel corrosion (10 KP) in 4 N HCl (τ =1 hour)

N	R	R^1	Corrosion rate, ρ gram/m^2 hour at temperature, ^{o}C		Inhibitory effect, γ at temperature, ^{o}C	
			80	100	80	100
1	C$_2$H$_5$	C$_2$H$_5$	9.3	19.5	35.8	100.5
1	C$_3$H$_7$	C$_3$H$_7$	9.4	17.2	35.4	113.9
zero	CH$_3$	CH$_3$	9.3	16.8	35.8	116.6
zero	C$_6$H$_5$	C$_6$H$_5$	6.5	14.1	51.2	138.9
Control (without additives)			332.6	1959	–	–

Further, as is known, existence of ring conjugate system of p-bonds in aromatic compounds stipulates their ability to flatly adsorb on metal surface. In consequence at that it is logical to except high anticorrosion properties of compounds containing propargyloxygroup and benzene ring. Indeed, propargyloxybenzene actively inhibits steel corrosion in hydrochloric acid[8]. However, introduction of saturated hydrocarbon substituents in to the aromatic ring of the latter exercises a negative influence on inhibitory effect[8]. To single-meaningly connect this fact with decrease of triple bond polarization under on influence of electronodonor substituent in aromatic ring seems to us incorrect because, otherwise, introduction of substations with–I-effect into aromatic ring would increase metal protection degree that is not observed in reality[31]. In our opinion[33], the indicated phenomenon is stipulated by antagonism between substituent and metal surface in electron interaction with aromatic ring. In this competition the substituent gains the upper hand, of course because its bond with ring is more stable. Here the substituent creates spatial barriers for adsorption of benzene ring on metal surface. If these arguments are right, their confirmation should be expected in series of propargyl ethers of arilalkanols, in which the conjugate effect between aromatic ring and propargyloxygroup is excluded, because they have been firmly isolated by «buffer» hydrocarbon fragment.

The results of investigations carried out by us[18,34] (Table 5) testify that the degree of protective action of propargyl ethers of arylalkanols mainly depend on

existence or absence of substituents (of any nature) in aromatic ring. The degree is maximum in their absence.

So, propargyl ethers of α- and β-methylbenzyl and also α- and β-phenylethyl alcohols (Table 5), having the same chemical composition ($C_{11}H_{12}O$), essentially differ by value of inhibitory effect. In this case ethers with monosubstituted benzene ring have an overt advantage. This regularity is typical for homological by composition ($C_{12}H_{14}O$) propargyl ethers of б-para-tolyl- and benzylethanols.

From comparison of anticorrosion indices of propargyl ethers of isomeric o- and p- methylbenzyl alcohols it is evident that at ortho-position substituent the rate of corrosion at temperatures 60 and 100^0 C is twice more[18]. It is an obvious testimony of spatial impediments by substituent («ortho-effect») for adsorption of flat aromatic ring on metal surface.

The visible influence on corrosion inhibition degree is exercise by the nature of substituent in aromatic ring. So, at 100^0 C the inhibitory effect of alkyl-substituted (in ring) ether is five times more than that of bromosubstituted analog[34].

The stated facts allow to admit that in similar type compounds the less the contribution of aromatic group to total inhibition degree the stronger the «disturbing» ability of substituent by means of polar interaction with p-electron at the ring is expressed. The confirmation of above-mentioned is that even introduction of additional adsorption centre ($C\equiv C$) in to the structure of aralkylpropargyl ethers leads to weakening of protective action. So, from comparison of inhibitor properties of two compounds described by general formula $C_6H_5(CC)_4CH(CH_3)$-OCH_2CH (n=0,1) one can see that efficiency of ether, containing one triple bond (n=0) in three times bigger than in the case of ether with two triple bounds (n=1).

Among non-aromatic ethers, vice versa the increase of efficiency of anti-corrosion action should be expected with increase of a number of triple bond $C\equiv C$, especially if the latters are a part of propargyloxygroups. The correctness of this proposition is illustrated by comparative data (Table 6) obtained by us during investigation of protective properties of mono-and dipropargyl ethers of acyclic C_2-C_4 glycols in steel corrosion in hydrochloric acid. The most efficiency here is exhibited by symmetrical dipropargyl ethers of ethane- and 1,3-propanediols, the inhibitor effect of which progressively increases with increase of aggressive medium temperature. The degree of metal protection from corrosion by these compounds of temperature 100ºC reaches 99,9%. It is an extremely important advantage of created inhibitors, since known industrial inhibitors of acid corrosion, many of which are the nitrogen containing organic compounds (PB-5, Katapin-A, Katapin-K, ets) lose their protective properties of temperature $>70^0C$[38,40].

Thus as a result of study of interrelation between heteroatomic propargyl compounds structure and their anticorrosion properties conducted by us, there have

been revealed general regularities lying in the base of inhibition process, which allow to predict the inhibiting activity of substances of similar structure in acid corrosion of metal. Some highly effective, high-temperature inhibitors of steel corrosion in solution of hydrochloric acid have been created including the propargyl ethers of α- and β-phenylethanol and β-phenylisopropanol as well as dipropargyl ethers of ethylene glycol and 1,3-propandiol, which can be recommended for a wide use in conditions connected with production, transpor and application of hydrochloric acid.

At present time there are documentary confirmations of efficiency of use of the corrosion inhibitors created by us in semi-industrial and industrial scale.

Table 5

Protective action of propargyl ethers of arylalkanols
HC≡CCH$_2$OCH(R)H$_2$ additives (0,03 mol/litre) in steel corrosion (ST-10)
in 4 N hydrochloric acid (τ = 1 hour)

Ar	R	Corrosion rate, ρ, gram/m^2 hour t^0 C			Protection degree Z (%) at temperature, ^{0}C			Inhibitory effect γ at temperature, ^{0} C		
		25	60	100	25	60	100	25	60	100
n-CH$_3$C$_6$H$_4$	H	0,32	1,6	75,3	95,9	98,2	96,5	24,5	56,3	28,9
o-CH$_3$C$_6$H$_4$	H	0,29	3,2	144,0	96,3	96,4	93,4	27,0	28,1	15,1
C$_6$H$_5$CH$_2$	H	-	3,5	10,4	-	96,1	99,5	-	25,7	209,1
C$_6$H$_5$	CH$_3$	0,17	1.8	7,18	97,8	98,0	99,7	46,2	50,0	302,9
n-CH$_3$C$_6$H$_4$	CH$_3$	-	2,2	73,5	-	97,5	96,6	-	40,9	29,6
C$_6$H$_5$CH$_2$	CH$_3$	-	2.5	5,9	-	97,2	99,7	-	36,0	368,6
n· BrC$_6$H$_4$	CH$_3$	-	21,2	367,3	-	76,5	83,1	-	4,25	5,9
n· BrC$_6$H$_4$	H	-	21,0	-	-	76,7	-	-	4,3	-
C$_6$H$_5$C≡C	H	0,41	1,3	23,4	94,8	98,5	98,9	-	69,3	92,9
C$_6$H$_5$C≡C	CH$_3$	-	4,9	22,4	-	94,6	99,0	-	18,4	97,1
Control (without additives)		7,85	90,1	2175,0	-	-	-	-	-	-

For example, the dipropargyl ether of ethylene glycol[21,35] successfully endured the pilot semi-industrial tests as inhibitor of corrosion during hydrochloric acid pickling of steel articles(covered by technological scale and rust), preceding application zinc coating on them. The performed tests by us testify that the given inhibitor:

– eliminates the irritation of surface of the products and improves their outward appearance;

– reduces the metal losses during pickling (in comparison with pickling in HCl without inhibitor):

– inhibits hydrogenation and preserves the initial mechanical characteristics

(strength, plasticity, ets) of steel;

– does not worsen the strength of coupling of base with zinc cover and the outward appearance of the latter.

These qualities allowed to recommend dipropargyl ether of ethylene glycol as corrosion inhibitor during pickling of steel articles in hydrochloric acid of electroplating plants.

Propargyl ether of 2-phenylisopropanol[36] has been applied as inhibitor in corrosion tests of different kinds of steel in solution of calcium chloride (which is used for crystallizer cooling of plant for production of potassium ferro-cyanide of Chernorechensk industrial association «Corund» city of Dzerjinsk). The tests testified that additions of this inhibitor effectively stop corrosion of carbon steels and stainless steels in hot (90⁰ C) solution of calcium chloride. During a long time (>5 days) the inhibitor preserves its protective properties.

Table 6

Protective action of additives (0, 01 mole/litre) mono- and dipropargyl ethers of glycols $HC{\equiv}CCH_2O\text{-}X\text{-}OR$ in steel corrosion (10 KP) in 4 N hydrochloric acid (τ =2 hour)

№	-X-	R	Corrosion rate, ρ gram/m^2 hour t^0 C			Protection degree, Z (%) at temperature, ^{0}C			Inhibitors effect γ at temperature, ^{0}C		
			20	80	100	20	80	100	20	80	100
I	- (CH$_2$)$_2$-	H	0,34	5,80	10,20	97,6	99,3	99,5	41,8	152,3	192,0
II	- (CH$_2$)$_3$-	H	0,39	5,99	9,57	97,2	99,3	99,5	36,4	147,5	204,7
III	- (CHCH$_3$)$_2$-	H	0,65	6,39	11,0	95,4	99,2	99,4	21,8	138,3	178,1
IV	- (CH$_2$)$_2$-	HC≡CH$_2$	0,28	3,02	2,44	98,0	99,6	99,9	50,7	292,6	802,9
V	- (CH$_2$)$_3$-	HC≡CH$_2$	0,21	1,73	2,15	98,5	99,8	99,9	67,6	510,7	911,2
VI	- (CHCH$_3$)$_2$-	HC≡CH$_2$	0,50	2,86	4,3	96,5	99,7	99,8	28,4	308,9	455,6
Control (without additives)			14,2	883,6	1959,0	-	-	-	-	-	-

The propargyl ether of α-phenyl ethanol has been used as inhibitor in multi-tonnage processes of hydrochloric acid production and also production of phosphorus fertilizers and sulphuric acid with purpose of protecting metal equipment and pipelines from corrosion. It has been determined that application of inhibitor additions allows to essentially extend a service life of a steel equipment of industrial plants at the expense of their effective protection from acid corrosion. According to preliminary calculations the total effect of implementation of the corrosion inhibitor at the indicated plants makes up ~0,5 million manat a year. The same inhibitor has been subjected to industrial tests at thermal power stations

«Mosenergo» with the aim to decrease of hydrogenation of steel pipes during scale removal. As a result it has been determined that the inhibitor improves the quality surface and decreases hydrogenation twice in comparison with the industrial corrosion inhibitor PB-5. The expected economical effect from inhibitor introduction makes up 10 thousand $ per one thermoelectric powerlant.

Taking into consideration the above-mentioned as well as easiness of industrial realization the extra ordinary simple and easy method for production of propargyl ether of α-phenyl ethanol from industrial (trade) initial products[37], it is possible to imagine the perspectives and scales of profits which are promised by its wide implementation in national economy.

Thus, the expounded material together with the last publications on this important problem[41-43] visually demonstrates the perspectives of application of propargyl compounds for protection of metals from corrosion.

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ROLE OF TOPOLOGICAL INDICES IN DESCRIPTION OF DEPENDENCES "STRUCTURE-PROPERTY"

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One of main problems of organic chemistry is the establishment of interrelation between structure of molecules of organic substances and their properties /1, 2/. As a rule, the properties of molecules are characterized by physical values and all physical values are characterized by numerous values. For considering a structure of organic molecules in numerous views a method of topological indices is existing /3/. This method allows describing the wide circle of molecular properties and establishing the correlation dependences between properties and values of topological indices (TI) /4/. Now there are some dozens of TI which are used for codification of information, in planning of chemical experiment, in establishment of reactivity of molecules, for quantitative description of structures of molecules, in analysis of bond of "structure-property" /3/.

In the frame of decision of problems "structure-property" we have carried out the investigation of correlation capacity of Winer (W), Khosoy (Z), Randich (ч) indices and also theoretical-information indices: index of information content of graph relatively environs of k order (IC_k) in calculation for one apex (top), complete information content (TIC_k), structural information content (SIC_k), information content of binding (BIC_K) and complementary information content (CIC_k) /5, 7, 8/ with physical-chemical properties of some hydrocarbons and their derivatives.

In the first stage we have established the dependence of TI of Winer and Khosoy on boiling temperature of isomers of C_6-C_8 hydrocarbons of paraffin series /5/.

Winer index was calculated as half-sum of all bonds between atom pairs in molecular graph with N apexes /6/:

$$W = \frac{1}{2}\sum_{i=1}^{N}\sum_{j=1}^{N}Dij$$

(1)

where D_{ij} – ij element of matrix of distances which shows the shortest distance between apexes i and j in graph.

Khosoy index was calculated on formulae /4/:

$$Z = \sum_{k=0}^{[n/2]} p(G,k)$$

(2)

where $p(G,k)$ – number of methods by means of which к ribs of graph G can be chosen so that any 2 would not adjacent, [n/2] means the great whole number not exceeding actual value of number n/2.

The well correlation between b.p. and TI of Winer and Khosoy for isomers of C_6-C_8 hydrocarbons of paraffin series has been prepared (fig.1 a,b).
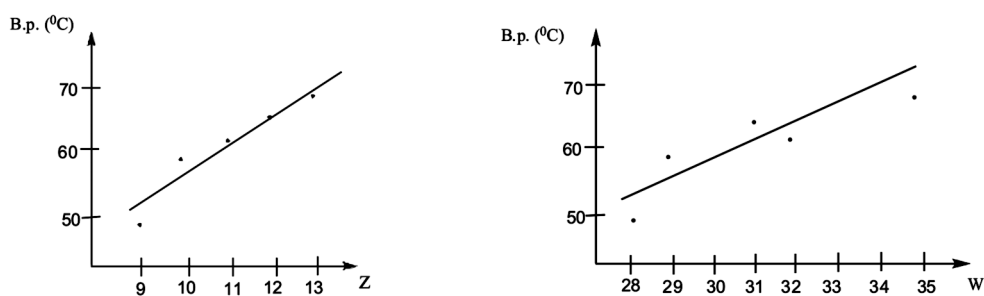
Figure 1a. Dependence TI of Khosoy on b.p.
of isomers of C_6-C_8 hydrocarbons
of paraffin series

Figure 1b. Dependence TI of Winer on b.p.
of isomers of C_6-C_8 hydrocarbons
of paraffin series

In continuing of investigations on reactivity we have calculated the theoretical-information indices of information content of graph relatively environs of k order (IC_k), complete information content (TIC_k), structural information content (SIC_k), complementary information content (CIC_k) and information content of binding (BIC_K) and (BIC_k) for molecule of anhydride of bicyclo [2.2.1]-hept-5-ene-2,3-dicarboxylic acid (BHDA) (fig.2) /7/, and also for graph of anhydrides of tetrahydrophthalic and methylsubstituted acids (I-IV) /8/ which have been calculated on known ratios (3-7) /4/ for k = 0-2:

$$ICk = -\sum_{i=1}^{h} p_i \log_2 p_i$$

$$\tag{3}$$

$$TICk = n \times k \tag{4}$$

$$SIC_k = IC_k / \log_2 n \tag{5}$$

$$CIC_k = \log_2 n - IC_k \tag{6}$$

$$BIC_k = IC_k/\log_2 N \tag{7}$$

where $p_i = n_i/n$ $(i=1,2,\ldots,h)$, n-quantity of atoms in molecule, n_i – quantity of elements of multitude i, N-number of bonds in molecule.
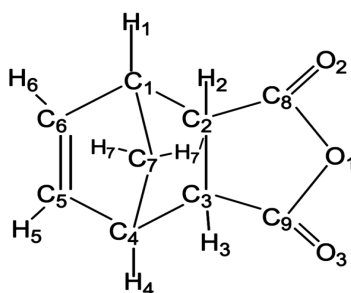
Figure 2. Molecule of anhydride BHDA

(I)   (II)   (III)   (IV)
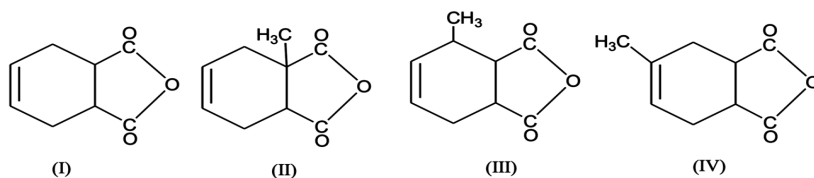
In the frames of works on decision of problems "structure-property" for establishment of interrelation between chemical structure of monocarboxylic acids of C_1-C_{12} of paraffin series with their ionization constant, boiling temperature and refraction index we have used TI IC_k, TIC_k, CIC_k and SIC_k (k = 0-2) .

Our calculations showed that TI IC_k, TIC_k, SIC_k and CIC_k depending on their order variously correlate with physical-chemical properties of monocarboxylic acids of C_1-C_{12} of paraffin series. It was found that topological indices of IC_0, IC_1, CIC_0, CIC_1, CIC_2, TIC_0, TIC_1, TIC_2 sufficiently well correlate with boiling temperature (fig.3,5,6) and refraction index (fig.4).
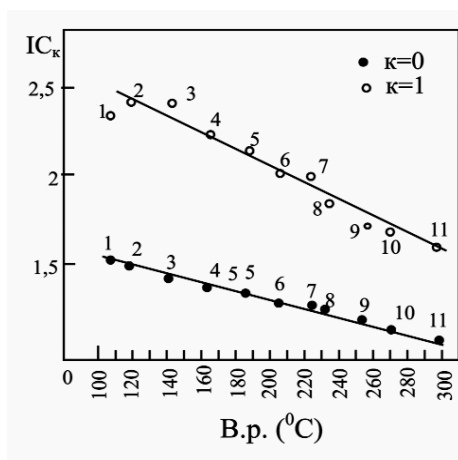
Figure 3. Dependence of change of index IC_k (k = 0,1) on B.p. (°C) of monocarboxylic acids of C_1-C_{12} of paraffin series
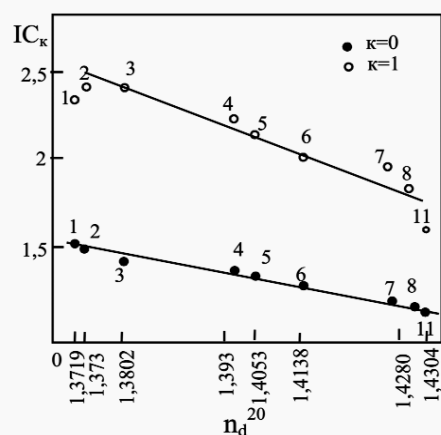
Figure 4. Dependence of change of index IC_k (k = 0,1) on refraction index (n_d^{20}) of monocarboxylic acids of C_1-C_{12} of paraffin series
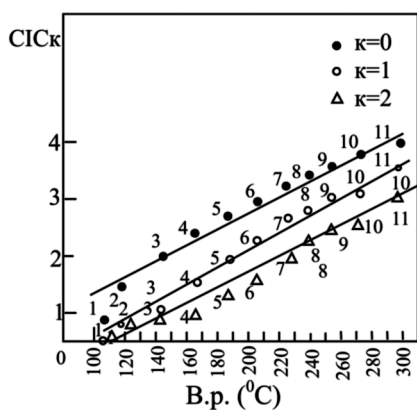
Figure 5. Dependence of change of index CIC_k (k = 0-2) on B.p. (°C) of monocarboxylic acids C_1-C_{12} of paraffin series
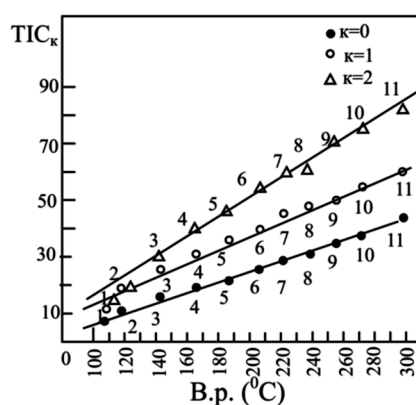
Figure 6. Dependence of change of index TIC_k (k = 0-2) on B.p. (°C) of monocarboxylic acids C_1-C_{12} of paraffin series

     Whereas for monocarboxylic acids of C_1-C_{12} of paraffin series a linear correlation of dependence of TI IC_k, TIC_k, SIC_k and CIC_k (k = 0-2) of above mentioned carboxylic acids on ionization constant pK_a is absent.

     Based on our earlier investigations on comparative reactivity of hexachlorocyclopentadiene (V) [1,2], 5,5-dimethoxy-(VI), 5,5-diethoxy-(VII) and

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5,5-dipropoxy-(VIII) tetrachlorocyclopentadienes /9-11/ in the Diels-Alder reaction with anhydrides and imides of 4-cyclohexene-1,2-dicarboxylic acids (CHDC) we have also carried out the correlation analysis of dependence of reactivity of compounds (V-XI) and their physical properties onTI of IC_k, TIC_k, SIC_k and CIC_k.

where R=Cl,OCH_3,OC_2H_5 и OC_3H_7

V-XI
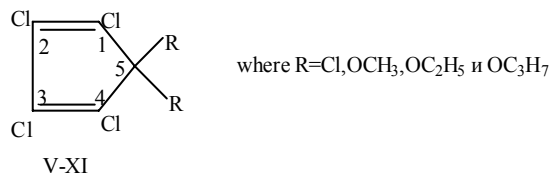
The results of calculations of values of topological indices of IC_K and TIC_k for compounds (V-VIII) are well correlated with B.p. n_D^{20},d_4^{20} and rate constant (K) of reaction of these compounds which gives a possibility to predict a reactivity (K), B.p, n_D^{20} and d_4^{20} for compounds (IX-XI).

Since at k=0 it is impossible to differ isomer forms then corresponding values of topological indices of IC_0, TIC_0 , SIC_0 and CIC_0 for compounds (IX-XI) are equal. Nevertheless, even at k=0 (fig.7) it can be observed that reaction rate of isomers of 5,5-dibutoxytetrachlorocyclopentadiene is equal to zero. It is seen in consideration of more high breaking order that they don't possess reactivity (fig.7).

It has been established that at k=0 in all isomers of 5,5-dibutoxytetrachlorocyclopentadiene the same values of b.p., n_D^{20} and d_4^{20} are expected (fig.8-10). In passing to more high breaking order for classes of equivalence k=2 the various values of b.p., n_D^{20} and d_4^{20} for compounds (IX-XI) were obtained (fig.8-10).
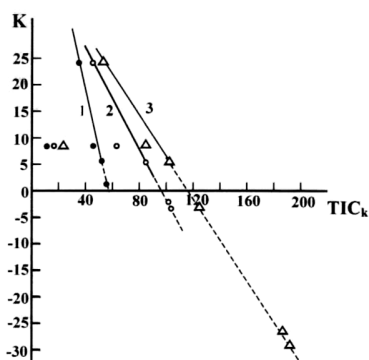
Figure 7. Dependence of values TIC_k (k=0-2) on reaction rate constant (K) for 5,5-dialkoxy-tetrachlorocyclopentadienes 1) k=0, 2) k=1, 3) k=2.
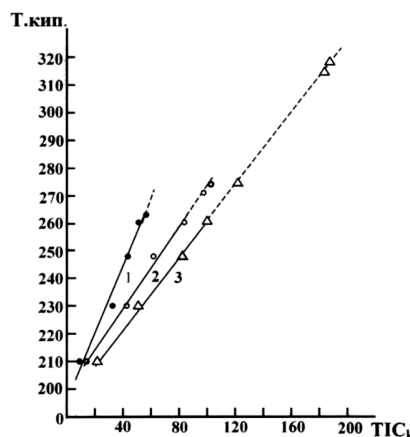
Figure 8. Dependence of values TIC_k (k=0-2) on b.p. for 5,5-dialkoxytetrachlorocyclopentadienes 1) k=0, 2) k=1, 3) k=2. 1) k=0, 2) k=1, 3) k=2.

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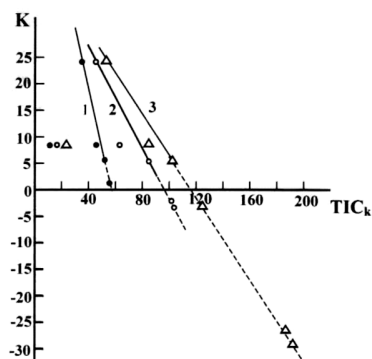
Figure 9. Dependence of values
TIC_k (k=0-2) on n_D^{20} for 5,5-dialkoxytetra-
chlorocyclopentadienes
1) k=0, 2) k=1, 3) k=2.
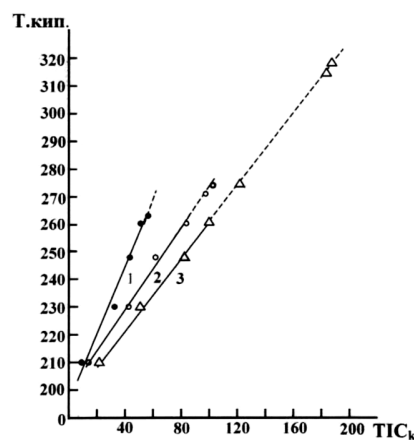
Figure 10. Dependence of values
of TIC_k (k=0-2) on d_4^{20}
5,5-dialkoxytetrachlorocyclopentadienes
1) k=0, 2) k=1, 3) k=2.

The expecting values of b.p. for R=O(nC$_4$H$_9$), R=O(i.C$_4$H$_9$) and R=O(tret.C$_4$H$_9$) are more higher and values n_D^{20} and d_4^{20} are more lower than in compounds (V-VIII).

In literature the data on synthesis of 5,5-dibutoxy(IX),5,5-diisobutoxy-(X) and 5,5-diteriarybu-toxytetrachlorocyclopenta-dienes(XI) and their diene condensation with anhydride 4-cyclohexene-1,2-dicarboxylic acid are not detected. However, assuming a possibility of blocking of formation of intermediate $4\pi+2\pi$ complex due to large volume of alkyl radicals, preparation of negative values of constant (K) for these systems based upon using correlation analysis would be considered as logical since negative and diminishing value of reaction rate constant in a series of R=O(n.C$_4$H$_9$)>O(i.C$_4$H$_9$)>O(tret.C$_4$H$_9$) are in accordance with decrease of possibility of orientation of diene with dienophile for overlapping of $4\pi+2\pi$ orbitals in intermediate complex which is confirmed in model consideration (A).
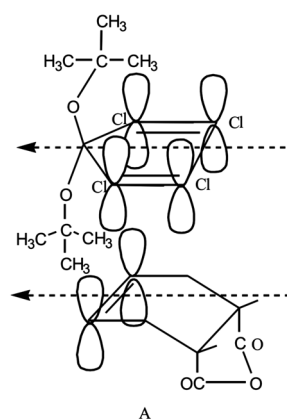
We have also showed the possibility of use of method of symmetry of environs for norbornyl- and alkylnorbornylpropionates (XII-XVII), which are characterized as fragrant substances /12/, character of odors of which depends on C$_1$-C$_4$-alkyl radicals in position 2 of norbornene ring.

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R—O–$\overset{\overset{O}{\|}}{C}$–CH$_2$–CH$_3$ гдеR=H,CH$_3$,C$_2$H$_5$,C$_3$H$_7$,C$_4$H$_9$

(XII–XVII)
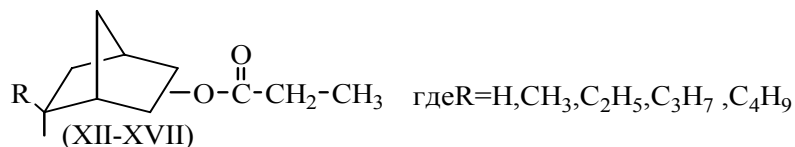
We have firstly calculated the indices of IC$_k$, TIC$_k$, SIC$_k$, and CIC$_k$ (k = 0-2), and Randich index $\chi^{(1)}$ for investigated compounds characterizing molecular coherence and calculated on formula /6/:

$$\chi^{(1)} = \Sigma (v_i v_j)^{-1/2} \qquad (8)$$

where v_i and v_j – degrees of apexes of graph (corresponding quantity of bonds of apexes i and j).

It has been prepared that topological indices TIC$_2$ and $\chi^{(1)}$ show the best correlation relatively molecular mass, boiling temperature and refraction index of compounds (XII-XVII). The more weak correlation for these compounds has been expressed between specific weight and indices TIC$_2$ and $\chi^{(1)}$. Indices TIC$_2$ and $\chi^{(1)}$ well differ isomers (XV-XVI).

The linear correlation analysis between indices TIC$_2$ and $\chi^{(1)}$ and values MR, B.p. and n$_D^{20}$ for compounds (XII-XVII) has been carried out. The coefficients of correlation equations are presented in Table 1.

Table 1.

Parameters of correlation dependence y = ax + b between MR, B.p., n$_D^{20}$ and topological indices TIC$_2$ and $\chi^{(1)}$ for compounds of series (XII-XVII).

Correlating parameters		a	b
y	x		
B.p.	TIC$_2$	2,211	- 107,720
B.p.	ч$^{(1)}$	37,736	- 89,586
MR	TIC$_2$	1,711	-0,957
MR	ч$^{(1)}$	26,032	39,706
n$_D^{20}$	TIC$_2$	0,000175	1,4433
n$_D^{20}$	ч$^{(1)}$	0,00298	1,4454

The topological indices TIC_2 and $\chi^{(1)}$ for 5(6)-n.-amyl–2-norbornylpropionate (VVIII a,b): $TIC_2 = 140{,}653$, $\chi^{(1)} = 7{,}798$ have been calculated.

(XVIIIa)   (XVIIIb)
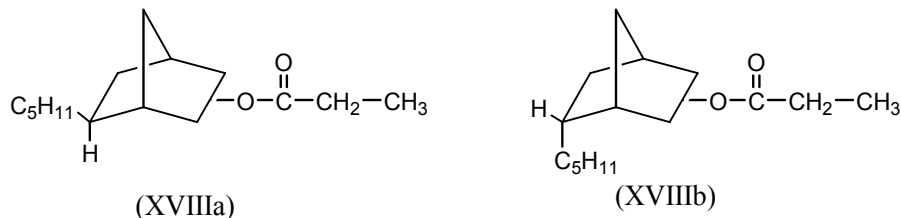
Since for calculation of these indices stereochemical peculiarities is not considered then one molecular graph will correspond to molecule of 5(6)-n.- amyl-2-norbornylpropionate both with endo- and with exo- group C_5H_{11} (XVIIIa,b). Based upon taken correlation dependences (Table 1) the supposed values B.p., MR and n_D^{20} for 5(6)-н.-amyl-2-norbornylpropionate (XVIII a,b) have been found (Table 2).

Table 2.

Supposed values of B.p., MR and n_D^{20} for 5(6)-n.- amyl-2-norbornylpropionate

Topological index	Supposed values		
	B.p.	MR	n_D^{20}
TIC_2	203,4	239,7	1,4679
ч$^{(1)}$	204,7	242,7	1,4686

Relative mistake of supposed values of MR, calculated by means of correlation dependences (Table 1) and theoretical value of $MR = 238{,}4$ is respectively $-0{,}0054$ and 0,018.

On the base of prepared data it can be made a conclusion that for norbornyl- and alkylnorbornylpropionates a topological index TIC_2 gives better correlation with MR, than $\chi^{(1)}$.

Thus, it can be concluded on the base of results prepared by us on investigation of dependence structure-property of some hydrocarbons and their derivatives that theoretical-information indices can be used as instrument for estimation of influence of spatial structure of molecule on physical-chemical properties.

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HUMANITIES

◄ **PROBLEMS OF MODERN CIVILIZATION
AND NATURAL CATACLYSMS**

A.A.Aliyev
Chairman of the State Customs Committee of Azerbaijan

Role of Customs authorities in liquidation of the results of emergency events:

It is common knowledge that the factors causing emergency situations are related to natural and man-caused occurrences and in most cases natural cataclysms lead to emergency situations.

Considering that the scale of emergency situations caused by natural cataclysms and man-caused occurrences events is of dangerous character, a number of coordinated necessary measures are required to be taken in terms of identifying the causes of it and realizing preventive actions. Along with other specialized agencies on environmental protection, customs service also considers special contributions to the prevention, as well as liquidation ofaddressing the consequences of emergency eventssituations in its activity.

First of all, it should be noted that multidimensional functions of customs service also covers tasks related to protection of human life and health, animal and plants, environment and the provisions on the mentioned are envisaged in the Customs Code.

In this regard, customs service carries out the following actions:

−Combats against illegal transportation of goods that might cause natural cataclysms and other disasters, through the borders;

−Realizes customs clearance of goods transported through the borders for liquidation ofaddressing the consequences of natural disasters and emergency eventssituations.

While effectively realizing combating measures, in terms of preventing illegal transportation of goods that might cause natural disasters and cataclysms, customs authorities implement procedural actions envisaged within the international Conventions that the Republic of Azerbaijan has joined.

Ozone-depleting substances, dangerous wastes and persistent organic pollutants may impact the occurrence of emergency situations and therefore, considering that Azerbaijan has joined "Vienna Convention for the Protection of the Ozone

Layer", "Montreal Protocol on Substances that Deplete the Ozone Layer" (1987), "Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal" and "Stockholm Convention on Persistent Organic Pollutants" (2003), international instruments are used while such goods are transported over the border.

Customs authorities ensure control over the implementation of the provisions of the Conventions within its jurisdiction (acquiring respective licenses (permission), proper registration of substances).

Moreover, relevant customs checkpoints of the Republic have been equipped with necessary technical-control equipments for the timely and proper identification of hazardous substances. Customs authorities also use internal automated database network to transfer and insert the data for prompt acquisition of information on controlled substances.

The next activity of customs authorities falling within the issues being discussed at symposium concerns liquidation addressingof consequences of natural disasters and emergency eventssituations.

Issues concerning the arrangement of customs operations for taking timely and urgent measures in order to liquidate address the consequences of emergency situations resulted from natural disasters, calamity and accidents are reflected in the Customs Code.

Customs clearance of goods intended for prevention of emergency situations is regulated based on internal normative documents and simplified procedures are being applied.

"Rules on customs clearance of goods designated for addressing liquidation the consequences of emergency situations, through customs border of the Republic of Azerbaijan" may serve as an example of it.

The above mentioned document outlines the conditions under which goods might be imported into and exported from the territory of the Republic of Azerbaijan with the purpose of addressing liquidation the consequences of emergency eventssituations resulted or might result in loss of human lives due to dangerous natural disaster, accident, calamity and catastrophe, damaging health of people and environment, leading to mass material loss and affecting living conditions of people. In such cases, we consider to apply preferential and simplified customs clearance rules to goods and vehicles at the borders.

Considering the major role of export of oil and oil products in the economy of the Republic, a "Guideline on customs clearance of goods transported through the Customs Borders of Azerbaijan intended for liquidation ofaddressing the consequences of emergency situationsevents at export pipelines" was approved by the State Customs Committee. The same rules are applied for export of goods from the territory of the Republic of Azerbaijan.

A special emphasis is made on increasing the qualifications of customs officers up to a required level. Therefore, several trainings are regularly organized and conducted by local and international experts at the Baku Regional Training Centre of the World Customs Organization.

As was already noted, coordinated actions with the concerned structures are essential for combating illegal transportation of goods that would contribute to natural cataclysms and other disasters, through the borders, as well as addressing liquidation the consequences of natural disasters and emergency situations.

Therefore, for ensuring efficient and prompt realization of the above-mentioned tasks, customs authorities have arranged their activity in a coordinated manner with the state structures.

Legal instrumentsNormative documents outlining mutual cooperation with the Ministry of Emergency Situations, Ministry of Ecology and Natural Resources, Ministry of Health of the Republic of Azerbaijan were developed and information exchange on several controlled goods are being realized based on these documents.

◄ HOW TO DEAL WITH DISASTERS:
A CASE FOR INTERNATIONAL COLLABORATION

Dr. Rudolf Koll

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Mr. President,

Ladies and Gentlemen,

my talk discusses the following topic: „are independent countries obliged to support other countries if these are in need when hit by a disaster?" Let me start off with some newspaper headlines from August this year which reported tragedies reaching across borders.

Hurricane Dean hits Mexico. It is the same storm that around August 20 destroys parts of Haiti, the Dominican Republic, Belize and the Yucatan peninsula in Mexico. At the same time a strong earthquake in Peru caused many deaths and huge damage. The typhoon Sepat destroys parts of China and causes major floodings. Just before, monsoon rains cause thousands of fatalities in Bangladesh, China, Nepal and North Korea. Some 30 million people were affected, twenty thousand square miles of agricultural land destroyed. At the same time in other countries, foreigners are captured by terrorists to blackmail the domestic government or that of other countries. In Germany, six Italians were executed in the middle of a city, most likely by a powerful Mafia organisation from Italy. Not too long ago we remember the effect of a huge tsunami leaving hundred thousands dead.

These reports show that many calamities affect multiple countries and that often a single country cannot handle the situation alone. Ladies and gentlemen, this is an issue that is relatively new for mankind. In earlier times the earth appeared much larger, distances took more time to cover and frequently news in other parts of the world went unnoticed. Thousands of years ago self-sufficient villages dominated social life, with hardly any need and interest to establish contact with others. Population numbers were low, space was not a scarce resource, environmental problems nonexistent, and humans did not live in high concentration in high-risk coastal areas. Therefore the human toll caused by environmental disasters was much lower and without the news industry information about such disasters was

unlikely to spread widely and quickly. Later, when streets, vehicles and population growth forced human communities to become more interconnected, many villages agreed to help each other in case of fire, natural disasters or when under attack. The same occurred between sovereign nations that started to become less autonomous, and started cooperation in economic and military matters. In many instances, such cooperation was necessary for survival. In the end, many formerly independent nations decided to establish much closer ties. Think of the United States of America, Australia, the Soviet Union or the European Union.

The example of the European Union shows how sovereign states aim to build much closer ties and collaborate in a number of areas. Let me mention the treaty of Prьm which has really started to be implemented this year: Several countries have agreed to allow foreign police officers to operate in their own countries. These officers may support the other country's forces if they think this is necessary without the country officially asking for support. However, once they cross the border, these officers are under command of the receiving country. During the past months more countries entered this agreement. I expect that soon police forces from all EU member states have the right and the obligation to support each other. Such developments are not limited to

Europe. On the twenty first of December in 1991, the Community of Independent States was established in the Kazakhstan capital Alma Ata. Allow me to recite some parts of the declaration:

The commonwealth of independent states, Azerbaijan, Armenia, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan, shall build their relations in accordance with the following interconnected and equal principles:

• the territorial integrity of states and the rejection of any actions directed towards breaking up alien territory;

• rejection of force or the threat of force against the political independence of a member state;

• resolution of disputes by peaceful means in such a way that international peace, security and fairness are not threatened;

• account of each other's interests and the Commonwealth as a whole, rendering of assistance on the basis of mutual consent in all spheres of their relations;

• uniting of efforts and rendering of assisting to each other for the purposes of establishing peaceful conditions for the life of the peoples of the member states of the Commonwealth, ensuring their political, economic and social progress;

Besides these examples there are numerous other treaties between countries promising mutual support. Consider for example, the United Nations, founded in 1945, which today encompasses 192 members. The objective then was to overcome the egotistic interests of nations and to provide an instrument to further their

peaceful coexistence. Clearly, there is still a long way to cover before this goal is reached. Still, a lot of progress has been made, nations have moved much closer: A large number of organizations were formed to guarantee help quickly and without bureaucratic hurdles. Humanitarian aid has become one of the success stories of the United nations in the past 60 years, billions of dollars are spent to reduce the impact of disasters. This clearly is a step towards a „oneworld- mindset".

We also know of many other forms of support which function without formal agreements. For example, an endangered ship can count on the help of ships in the area, an astronaut in need can trust that other nations capable of helping will put his safety above their own (research) interests. In summary, one can conclude that many forms of cross-border support are the result of treaties that make such support obligatory.

But let's ignore these treaties for a minute, ladies and gentlemen and turn towards another major international concern: Mankind has changed this planet in many ways, and the destruction of large parts of our environment is incontestable. But we feel the results. Because of the destruction of forests in large parts of the world the soil is not capable to absorb the rain. At the same time, rivers that we have changed often do not manage to contain the water flowing through. We know that industries pour huge amounts of carbo-dioxide and other toxic gases into the air. This contributes to changes in our climate and global warming. If the melting of the polar caps causes the water level of our oceans to rise by half a meter only, millions of people would lose their homes. Global warming will also cause glaciers to melt and mountains currently stabilized by glaciers will crumble and destroy huge areas. Ocean streams are affected possibly leading to an increase in the number and intensity of tropical storms. Such results are by definition not limited to single countries.

Social issues also reach across borders, for example: Crime gangs do not count ten or hundred persons like they did before, but often consist of thousands of well-armed and professionally organized members that are often based and operating in a number of countries. These are just a few examples that disasters ignore national borders and nations will not be able to manage their effects without outside help. Often nations will be helpless in the face of such problems. This is why countries need to continue moving closer together.

This involves several steps:

Solidarity is the **first** Step to move closer. It is the mutual understanding between humans or organizations that „we depend on each other and we need each other to reach our goals". Che Guevara, Latin American revolutionary and thinker even said: solidarity is the tenderness of nations.

The **second step** is cooperation. Cooperation is the deliberate collaboration of multiple humans or nations. Cooperation should be beneficial for all parties

involved, and is possible without formal rules. But effective cooperation only works if each partner trusts the other to act in the expected way.

As a **final step,** positive experience in such cooperation will then often result in contracts with formal rights and obligations. The world has become smaller, we can reach any point within a matter of days, single states cannot exist self-sufficiently anymore. The dangers we face from natural disasters or organized crime are big enough to endanger the existence or at least the well-being of a nation. Only through collaboration and mutual support are we strong enough to master the dangers and problems we are to face.

If we strive to survive, we need others – on our own we are too weak. I would like to conclude with an answer to the question I posed in the beginning: If nations want to survive, self-interest alone should be enough to support each other when facing a disaster.

◄PERSONAL LIFE EVENTS AS INDIVIDUAL CATACLYSMS AND OUR NEED FOR VARIABLE LOOP CONTROL MECHANISMS

Dr. David Schnaiter
International Academy of Science H&E,
Medical University of Innsbruck, Austria [1]

Dear distinguished auditory …

In my contribution I want to try to point out how the constant and increasing need for adaptive readjustments caused by life events and chronic hassles is directly connected and in dependency of our variable use of open and closed loop control mechanisms on different physical, psychic and social levels – and what happens when the total capacity for task organisation is overused for a longer time period.

After 30 years of scientific research and despite the necessary critique the general massive health impact of life events is nowadays more than proven and in psychology, medicine and also sociology a wide range of explanations, factor analysis and studies have been made to analyse quantities, qualities and effects of life events as health relevant stressors.

Life events in general can be of diverse nature, can have exogenous causes as in the case of natural cataclysms like earthquakes, floods, fire, hurricanes, or human caused origins like crime, war etc. But as we know since Holmes and Rahe published their famous "Life Stress Inventory" also personal life events followed by a need for social readjustment have a major impact on our individual health. Yet there is still an explanation gap between physical stress mechanisms and their on one side protective, on the other side harmful basic functions and the psychological and social reactions to cope with life events and their effect on our personal health.

What does really happen to a person and its physical health status when e.g. his/her spouse dies after 40 years of marriage and why is it more probable that this person will suffer a major health breakdown after a marriage and becoming a mother/father than when getting divorced?

Holmes and Rahe have developed in the late 60ties their so called "Holmes-Rahe Social Readjustment Rating Scale" (1) and hundreds of epidemiologic studies followed, proving, discussing and refining their scale up to nowadays[1]. "Despite criticism, the Social Readjustment Rating Scale (SRRS) is one of the most widely cited measurement instruments in the stress literature."

Examining thousands of patients they and their successors developed rated scales and assessment centers for different life events according to the significance of the life events health impact. Life Event Scales are nowadays especially used to assess[2] health-relevant connections to: depression, myocardial infarction patients and coronary heart diseases, health-level differences between social classes, cancer patients, mental disorder patients and psychopathologies, elder people, stroke, suicide risk, posttraumatic stress, cultural influences, working surroundings and others more.

It has been shown that the probability to suffer a major health breakdown within the next two years is raised up to 80% if during a one year period different life events occur accumulated to one person and reach a critical score. When assessing people still active in the working process, five of the top 10 most frequently occurring life-events are usually directly related to work .

One of the first things always mentioned by students when looking at the scale is that quite a lot of the investigated life events e.g. on the original scale of Holmes and Rahe are "positive" life events, like being promoted in your job, outstanding personal achievements, earning more money, vacations and so on. So why can these events be harmful to our health?

– We are still used to think within the basic concepts of eustress and distress, but – without taking into doubt this very important differentiation – this stress concept is not the only one and does not explain all the findings sufficiently. In quite a lot of cases it may be of minor importance than commonly thought.

Let's take the other way round: Depression, grief and fear have a far-reaching health impact that very often can be observed after a couple gets separated through the death of one partner and "death of spouse" is also the highest rated life event within the classical social readjustment rating scale.

But quite a huge part of negative health effects after such a life event is not caused by negative feelings or psychic consequences of the loss itself.

It is caused by the need to adjust and re-regulate a large part of our most basic living circumstances and daily routines (e.g. relocation in a new apartment, sudden

need to fulfil tasks formally done by the partner like cooking, washing etc., taking care of the children, finances etc. alone …). So this might be an explanation why a divorce raises the risk for a major health breakdown nearly the same way a marriage together with a honeymoon-vacancy does. – Both life events cause a cascade of changes and one has to invest a lot of energy to adjust to these changes.

Daily life situations demand a large variety of control and organisation. If additional tasks claim our attention, our total acting and reacting capacity can reach its limit and might signal us a system overload – we are stressed.

Kofler's "Extended View" does not speak about stress, but about limited organisation, coordination and discrimination potentials claimed by every task we, our body, our mind has/or wants to fulfil to survive or simply to reach personal goals. The capacity to control and coordinate these numerous conscious and unconscious tasks is limited and when we reach these limits, we lack potential to cover the needs of the whole system.

Let's have a look at the basics: Self-regulation (homeostasis) is a fundamental principle of all living organisms. Our human body has numerous self-regulating circles – closed loop control mechanisms – that are constantly in function: When for example physically active, respiration rhythms are altered to assure a sufficient oxygenation and blood pressure and pulse rise. Our organism self-regulates the measured differences between the desired nominal value and the actual value given of, in this case, required oxygen supply. It works like a thermostat that constantly measures the current temperature and controls the heater's valve setting to increase or decrease the room temperature according to the user-defined setting.

This kind of self-regulation or closed loop control works with little energy, has a very simple feedback circle integrated and does not consume much organisation potential that therefore can be used for other tasks.

On a sociological level we call these self-regulating mechanisms Habitualization: Conscious actions connected with constant attention and decision-making can be led into adaptive (automatic) control mechanisms. This could be called and is very closely associated with some kind of "learning".

Think of learning to drive a car: When you first drove a car all your attention had to be paid to the different tasks you had to fulfill moving the vehicle (steering,

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using the panels, pay attention to traffic etc.). There was no possibility for you to do anything else; all your potential to fulfill actions was dedicated uniquely to the task of driving the car. But after some time driving a car gets an automatic action. You will still pay some attention to your driving (hopefully) but now you have potential left to talk, listen to music, make a phone-call, smoke, think about other things etc. contemporaneously – your potential is not fully absorbed by the driving process any more. It has become an automatic, controlled, "regulated" mechanism how the steering wheel, the pedals etc. are to be handled – it became a habitualized– a self-regulated activity sparing you a lot of energy and organization potential.

But the simplicity of closed loop controls has also disadvantages: If the nominal or the actual value is incorrect, if the information is not transported and the feedback loop doesn't function anymore, or if one peace of the chain does not work any longer, it collapses.

So, if we use our thermostat and tell him to regulate the room temperature constantly to 20 degrees Celsius and then open up the window, the thermostat will switch the heater on and after we close the window again, we will have an overshoot and it gets too hot. – Our external and immediate changing of the conditions has caused the self-regulatory system to produce an overreaction. The closed loop control is not able to handle the situation correctly and we have to turn off the heater's valve manually. This conscious act means a directed influencing of the systems mechanisms and causes an additional cost: we have to pay attention to the changed parameters, get the information that it became too hot, we have to evaluate this information, take a decision, move to the valve, maybe get angry why our expensive heating system does not work on its own correctly etc. – a whole bunch of additional considerations and actions have to be set to handle the situation. Thing that would not have been necessary, if the self-regulating system was not irritated by the changed parameters. So there is a difference between closed and open loop control, between self-regulation and external interference.

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[1] E.g. Antonovsky *(2, 3)*, Costello *(4)*, Dobson *(5)*, Dohrenwend *(2, 6, 7)*, Geyer *(8)*, Harmon *(9)*, Hobson *(10, 11)*, Lichtenstein *(12)*, McLean *(13)*, Murillo *(14)*, Paykel *(15-19)*, Wilkinson *(20)* etc.

[2] The following studies are listed only exemplarily

Advantages and disadvantages of open and closed loop control:

Closed loop control mechanisms – Self-regulation:

Advantages:
−Assures the efficiency of basic functions
−Saves energy and discrimination/ organisation potential optimal use of resources
−Simple and "learned" everyday tasks can be handled best
−No constant attention devotion necessary
−Absolutely necessary to free resources (energy and organisation potential) for conscious "luxury" actings

Disadvantages:
−Adaptation and Readjustment only slightly possible (within the range of measured actual value and control input)
−Only "simple" feedback loops integrated
−Wrong control inputs can cause permanent errors (that often don't get recognized in time)
−Changes of daily life situations caused by life events cause a breakdown of whole cascades of self-regulating mechanisms followed by a need for readjustment

Open loop control mechanisms – Conscious Intervention:

Advantages:
– Conscious adaptation and rearrangement possible
– Anytime available (when potential left)
– Huge amount of energy and discrimination/organisation potential can be directed to one single goal (attention devotion/magnifying effect)
– Lots of different possibilities and directions for decisions possible

Disadvantages:
−Costs a lot of energy and discrimination/ organisation potential other important processes can get undersupplied and therefore cause a breakdown (worst case)
−Only very few tasks can be handled at the same time wasteful use of resources

Events in general, no matter if desired or unwanted, conscious or unconscious, on a physical or on a social level, force us and our body additionally to our daily life tasks to react, to accept and fulfil new tasks, to adapt habits, to change

our daily routines, our life-style etc.

Let's consider the case of a marriage and its consequences for the individual health status:

A young couple, beneath all the preparations for the wedding, has to take hundreds of decisions to adapt to their new daily life situation. They have to e.g. move to a new apartment, arrange their new common household, change habits they used to have for years to adapt to the new joint living situation and so on. All these changes cause conscious re-adaptations that consume a lot of energy and organisation/discrimination potential.

Self-regulated circles get lost and have to be replaced by open loop control – at least at the beginning till they get again automated and are brought back into self-regulation without the necessity to spend attention, take decisions and invest energy and organisation/discrimination potential.

In general the same procedures have also a large influence on our daily life and in consequence on our health status. Hearing the contribution of Christoph Tasch later on we will get to know how on a physical level this principle of getting on the edge of our capacities – of being stressed – is directly relevant for myocardial infarction, sudden cardiac death and other acute occurrences.

So how can we try to handle self-regulation and conscious intervention mechanisms in a healthy way, how can we cope better with daily life and life events of all kind?

Check our (controllable) self-regulating systems:

❖ Are there closed loop controls I have lost recently through a life event? Do I have to substitute them? E.g.: Can I ask my mother to do the laundry my girl-friend has done until we split up?

❖ Do I have the possibility to train certain self-regulating systems? E.g. on a physical level

❖ Are there needs for adaptations/readjustments?

❖ Are there feedback loops integrated and do I recognize their signals? E.g.: Early signals for a burn-out syndrome

❖ Are the nominal and target values set correctly? E.g.: Is my nutrition adequate when snacking between two working meetings?

❖ Which additional self-regulating systems can I establish to reduce my personal stress level (my lacks of energy, time and organisation potential) and raise my quality of life or health level by using the won potentials? E.g.: Should I employ a babysitter once a week?

Check our conscious interventions – our open loop controls mechanisms:

❖ How am I using my energies and potentials? Can I optimize something?

❖   To which important and unimportant general and personal life events do I have to adapt my daily life? – Which self-regulating systems have to be substituted?

❖   Are there possibilities to substitute some conscious interventions by additional self-regulating systems for processes I don't need to control all the time? E.g.: Is it necessary to think over daily if my secretary is doing a good job or would it be sufficient to do co-workers evaluations once a month?

❖   Which kind of actions do I want to accomplish? How would I like to use my energies and potentials?

All these thoughts are to be seen in a very close relationship with the immense diversity of coping strategies, social support mechanisms, risk and protective life style factors, chronic hassles and recreation in general.

Hundreds of positive and negative life events, from summer vacancies to personal cataclysms, are to be handled during our life time and it may be important to ask us from time to time how we deal with them.

If we do so and can make it to sometimes readjust a gap, the massive impact of life events on our physical health and their role as triggers – especially for acute coronary occurrences, depression and burn-out syndromes – could be diminished.

Thank you very much for your attention!

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THE GREAT SILK (CARAVAN) WAY

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The territory of the People's Republic of China is 9597 thou sq. kilometers. The territory of China on its size stands in the third place in the word after Russia and Canada. The length o its land border is about 20 thou kilometers. The population of China is more than 1,5 milliards. At present China is one of the most powerful states. China has had glorious remote past: the roots of its science, culture and art go back to the depth of centuries and are developed highly now as well. The state of China has been the only state that for the first time organized and realized the Great Silk Way or Great Caravan Way.

The state of China before our era and in the first centuries of our era. In the first centuries of its operation of the Great Silk Way there was going on a life and death struggle between Parphia and Roman Empire. The Parfhians did not want that the Chinese had direct trade contact with Romans and in this way they tried to preserve their dominating mediator role in silk trade.

The China silk was carried out through the Silk Way and sold mainly in Middle Asia, Fore Asia and Europe. The Great Silk way is the synonym of Caravan Way.

The science has been developing highly within the three thousand years in China. So that 2300 years ago compass and speedometer, 2200 years ago seismoscope, 2100 years ago powder, 1200-1400 years ago book printing were invented in China. The mathematics (particularly 2200 years ago) was developed highly. Information about the comets and plants was known to Chinese astronauts. They had defined the circle of solar eclipse, compiled the star catalogue, made geographical discoveries while sea travels, and examined the countries of Middle Asia.

As within the 1366-1644s the science of geography developed speeded up they studied the countries located between India and Africa (See: ASE, v. X, p. 355).

The book of "Songs" ("Shitezin") published 3600 years ago confirms once more that the China musical culture is the most ancient one in the world.

The most ancient book on medicine ("Neytzin") published 2600 years ago played a great role in development of the science of medicine. The first book in the

world called "Pharmacology" was published 2220 years ago. As long ago as the XVIII century the number of drugs known to the China medicine was about 62 thou. The bronzemelting, production of white ceramics and pottery were developed in the XVI-XI centuries B.C. in China. For the first time in the world the chinaware was invented and produced in China in 1500-1700s.

The construction of the Great Canal connecting Peking with Khanchzhaun was begun 2600 years ago. Famous Great Wall of China was mainly built within the 221-207s B.C. Everyone is wondered by the achievements of building technologies of the Great Wall of China even now (ASE, v. X, p. 355).

One branch of the Great Silk Way stretched to the coast of the Red Sea – Mecca. His Highness prophet Mohammed because of this trade way knowing the highly development of science in China had said: "Go in for science, even it is in China".

The science is boundless. It is the prophet's advice that in order to acquire the boundless science one must go too remote corner of the world.

In the V-VI centuries the China silk was in monopoly of Iran state and Sogdians, but beginning from the VII century it was gained by Arabian traders. This factor permitted the Arabian Moslems to spread widely the Islam religion along the Caravan ways. As to my belief, the Great Silk Way is the core part of the territories where the Islam religion was spread.

It is interesting that the Great Silk Way was directed from East to West, and the Arabians spread the new forming Islam religion from West to East. And beginning from Mecca it reached up to the Great Silk Wall of China covering more than ten thousand kilometers.

The putting into operation of the Great Silk Way begun as far as 150 years ago than the foundation of Christian religion and nine centuries ago than the foundation of Islam religion.

In the II and I centuries B.C. the state of China having highly developed science, culture, art, economy and military force could not live isolated and achieve new successes. As far as 2200 years ago China began to search for new markets. For this reason the geographical location, population, occupation and market needs of the territories situated in the west from China were to be studied. Just because of this the state of China sent an especial expedition to Middle Asia in 138-126s B.C.

The representatives of China 12 years explored the states of Middle Asia and then decided to establish the trade relations with them. So, as far as more than one and half centuries ago was laid the foundation of the Great Silk Way. The trade way was called as silk way because of breeding silkworm in China. In Middle Asia and Transcaucasia the breeding of silkworm was begun 1500 years later than in China.

There were all conditions for breeding the silkworm in Azerbaijan. It is to be said that China kept in secret the breeding technology of silkworm. For this reason the breeding of silkworm was been enough later than China in Azerbaijan.

The natural silk is the best one among all the textile. The people love the silk for its beauty, softness and color taking quality. That's why buyer always admired and looks for silk. In the past the fathers sharpen their daggers to cut hair into two pieces hanged in the air. The fathers told that the dagger could not cut the silk as it was too soft. In order word, they could not cut the silk hung in the air. A simple, obedient, humane man is compared with the silk. It is told: "he or she is as soft as silk".

The silk has never gone out of fashion. It has been highly esteems by people and that's why they have not allowed making a donkey-cloth from it.

Silk Way and Turkic world. Beginning from the II century B.C. and up to the XVI century A.D. the Great Silk Way played a great role in economic, cultural, political and military development of Turkic peoples. This was the main means in establishing of diplomatic relations between themselves and with other foreign countries.

The first direction of the Great Silk Way beginning from the coasts of the East China Sea – Sivan city passed through Lanchzhou and stretched up to Dunkhuan. It this territory where lived Turkic peoples – Uigurs the Great Silk Way divided into two branches. The southern branch of this way passing through the foothills of mountains adjoining the Turfan depression from south crossed the Pamirs mountains and after entering the Fergana valley directed towards Samarkand, Bukhara and Khorazm cities.

One branch of this direction turned to Iran and from there entered India, but another branch through the north foothills of Kopetdag passing the south part of the Caspian Sea entered Azerbaijan.

The second direction of the Great Silk Way begun from Dunkhuan city of the China state extending along the north shores of Lobnor lake passed through the north part of Takla-Makan desert and entered the territory of Kazakhstan. The Great Silk Way after Kazakhstan passing the north shore of the Caspian Sea turned to the west shore and extended to Darband, Shamakhy, Ganja, Batumi, Istanbul and then crossing the Balkan Peninsula directed to the centre of the Apennines.

One of the ways passed through Ganja took direction to Goyja-Nakhichevan-Tabriz, Nakhichevan-Istanbul. One branch of the Great Silk Way crossing Astrakhan, North Caucasus and Crimea reached to the Balkan Peninsula.

Thus, one direction of the Great Silk Way stretching to the west and passing through the Red Sea joined with the sea route in the Indian Ocean and directed towards the Eastern China Sea. The marine direction of the Great Silk Way entered the territory of China again. So, the Great Silk Way passed the land joining sea ways made a great trade way in the eastern half of the globe.

In connection with the development of navigation and sea trade in the world, especially in Europe in the XIV century the significance of the Great Silk Way began to decrease and in the XVI century it became regressed completely.

About 20 thousand kilometers of different directions of the Great Silk Way operated approx. one thousand eight hundred years had passed through the territories where the Turkic peoples lived. Therefore, the Turkic peoples played an important role in formation and expansion of economic relations with the peoples of China, Caucasus, Russia, India and Arabia. Besides, the Great Silk Way exerted a great influence on settling of the Turkic peoples in new territories and mutual scientific and cultural development between them.

As one of the main directions of the Great Silk Way passed through the territory of Azerbaijan it exerted a great influence on development of silkworm breeding in Darband, Shirvan, Sheki, Beylagan, Ganja, Gabala, Tabriz and they in a certain degree became the trade centers on sericulture.

At the same time, the Great Silk Way was the way by means of which prospecting of natural resources and military reconnaissance was carried out.

A communicative language in the territories of Chinese Turkistan, Middle Asia, Kazakhstan, Caucasus, Asia Minor, and North Iran that passed the Great Silk Way was the Turkic language. It is to be said that, except partially the Turkic speaking Yakuts almost all the Turkic peoples took an active part in the Great Silk Way. All spheres of trade, including silkworm breeding (sericulture and silk weaving), processing of precious stones (for example, nephrite), pottery, production of chinaware and glassware become developed because of building of the Great Silk Way. The silk ways gave a powerful incentive to building of new caravan ways, defining of passes, construction of guard-houses, bridges, caravanserais for caravans and traders.

The guard-houses, white roofing, mercy houses were constructed in order to ensure the security of traders, carters, cameleers.

The trade carried out in old time stipulated the increase of trade correspondences, writing of memories, defining of distances between cities and countries, appearing of traveling records of travelers, in sport, the creation of a lot of geographical and historical works which now are used as scientific sources.

The trade, at the same time, reasoned to be builds the military fortifications (centers warning the population, and hill, peak and other points communicating the alarm call) within the different administrative territories.

There are many fortresses (Gyz fortress, Koroghlu fortress, Gelersen-Gorersen fortress, Javanshir fortress, Alinja fortress) in different zone of Azerbaijan. In the territory where the east part of Major Caucasus gradually lowering joins with coast plains of the Caspian Sea were constructed defensive walls (Beshbarmag, Gilgil river, Samur, etc.), fortresses ("Beshbarmag", "Chirag gala" fortress, "Torpag gala" fortress, Darband fortress and so on). According to the information of researchers some caravanserais were building there as well.

11-15 arched Khudafarin bridges (V century), that was a successful fruit of Azerbaijan engineers and architects, while being constructed on the Araz river was

first of all intended for trade and military purposes. So, the development of trade ways created a real ground for constructing the fortifications and walls, enrichment of their architectural style from one side, the development of cultural and economic relations, broadening of their mutual contacts, perfection, spreading and mutual enrichment of Turkic culture of the Turkic peoples from another side.

The share of the Great Silk Way in broadening of scientific and cultural relations, carrying of manuscripts from one country to another one, if we say in modern language, in development of book trade was of great. The works of Azerbaijan thinkers written in the Arabian, Persian and Turkic languages dated from the VII-XI centuries were widely spread in the East countries. It is just the result of book trade that famous Nizami's "Khamsa" had been widely spread. Undoubtedly, if there were not works brought from the abroad on different spheres of science, and customs and traditions of the peoples great Nizami Ganjavi could not know the natural conditions of Europe and Asia well, understand the differences of races of the peoples deeply, describe the image of Alexander Great in his poem "Alexandername" sometimes in the open air of subtropical, sometimes in steppe, sometimes in forest landscapes.

It's the result of using of brought manuscripts to Azerbaijan from different countries of the world that Nizami Ganjavi had become one of the most famous poets. Now this genius, majestic, titanic thinker is called the prophet, sometimes even the god of poetry. The works of genius medical figure Ibn Sina (X century), historian-ethnographer, geographer, naturalist, mathematician, astronaut, physicist, mineralogist A. Biruni (913-1048), eastern philosopher and encyclopedic scientist Abu Farabi (870-950), scientist of Middle Asia philologist and folklorist Makhmud Kashgari (XI century), Uzbek poet, thinker and statesman Alisher Navai (1422-1501) had been carried to the markets of different cities by caravans through the Great Silk Way. As to us, in the XI century the works of Ibn Sina on medicine were carried to Europe by the Great Silk Way and used as textbook in the medical universities of Europe during seven centuries.

The Turkic peoples for many years had kept close contact with friendly Chinese, Mongols, Arabians, Indians, Persians, Slaves, especially with the peoples of Caucasus, taken part positively in ethnogenetic processes of these peoples.

Side by side with popularization of historical relation of the Turkic peoples with earth other, one of the urgent problems of our days is to investigate the historical relations of the Turkic peoples with other ancient peoples. The roots of relations of the Turkic peoples with the Slavs peoples (including Russians and Ukrainians) go back to the depth of the history. The works "Az i Ya" and " Polin Poleveskogo Polya" written correspondingly by talented son of the Kazakh people Olzhas Suleymanov and Murad Adzhi concern to this problem and both of these books are worthy to be approved.

New Great Silk Way. Why is the Great Silk Way reestablished again losing its importance after four centuries? There are many reasons. At the end of the XX century and beginning of the XXI century the former USSR collapsed, appeared new states. And some of them opposed each other on military, economic and political spheres, some of them were united in the form of a group. New situation formed in the world exerted influence to be changed the tactics and strategy of the foreign countries against them.

The Russian Federation after gaining the independent status declared itself the legatee of the former USSR and did not hide its intention to keep all former republics within the circle of its interest. For this purpose the Independent Commonwealth States were organized. As a result, some of these states (e.g., Armenia) were accepted as native and some of these (e.g., Azerbaijan, Georgia, Ukraine, Moldova, etc.) strange ones. This strange treatment resulted in initial serious military intervention and economic pressure. A number of member states of the ICS, including the Azerbaijan Republic were blockaded economically. The Azerbaijan Republic, living in a heavy economic situation, began to search or new, more rational ways out. The idea of reestablishment of the Great Silk Way was a good chance for way out. "The idea of TRACECA for the first time was recommended by the European Commission in 1993, May".

According to this idea, the Great Silk Way must take its start from London and pass though Paris, Rome, Istanbul, Tbilisi, Baku, Ashgabat, Alma-Ata, Peking and end in Tokyo.

The Great Silk Way passing through the central part of Europe and Asia and uniting more than 41 states will have an immeasurable importance from the economic, political and social standpoint at present.

"…The participant countries of the project called Transport-Communication and Trade-Economic Perspectives (TRACECA) embrace more than 2/3 parts of economic potential of our planet, more than 2 milliards people live in these countries (it means 1/3 part of the population of the globe), the total territory of these countries makes 48,7 million sq.km. or about 1/3 part of land territory of the globe" (K. Heydarov, Azerbaijan Customs in stable development way. Baku, 2005, p. 37-38).

The Great Silk Way, somehow, supports Georgia and Azerbaijan to go out of economic blockade and to meet economic development of a group of states. The Great Silk Way passes through the territories both of these states (between the Black Sea and Caspian Sea) and this part of the way unites the corresponding stares of Europe and Asia. For this reason the motor roads, railway stations, airports will be reconstructed over again in order to meet the international needs. The sea ports of Georgia and Azerbaijan in the Black Sea and Caspian Sea will be rebuilt on the bases of new requirements. The new ferries will be constructed for trucking indus-

try in the Black and Caspian seas. The tourism will be developed in a high level. In short, a new economic development will take place in the Azerbaijan and Georgian republics.

The city of Baku situated on the Great Silk Way is becoming the official connecting centre in solution of this problem.

"The holding of international conference devoted to reestablishment of the Great Silk Way was realized just because of constructive stand of the President of Azerbaijan Heydar Aliyev and President of Georgia Edward Shevardnadze to this question. It's also to be mentioned that it was ever-living President of our country Heydar Aliyev's international authority that the conference was held in the capital of Azerbaijan and headquarter of Permanent Secretariat controlling the development of European-Caucasian-Asian Transport Corridor was placed in Baku" (K. Heydarov, Azerbaijan Customs in stable development way. Baku, 2005, p. 41).

In short, the Great Silk Way will be a new factor in development of Azerbaijan economy. The Russian state remained in the north from the Great Silk Way will be one of the states that takes part only in exploiting of these ways.

The Baikal-Amur main line being constructed by the Russian Federation in the time of the former USSR will lose its significance because of using of the Great Silk Way.

The restoration of the Great Silk Way for the second time will help the British, the French, Spaniards, Italians, Greeks, Romanian, Moldavians, Hungarians, Ukrainians, Turks, Georgians, Azerbaijanian, Turkmen, Uzbeks, Kirghiz, Kazakhs, Uigurian, Mongols, the Chinese, Koreans, the Japanese and a number of other nations take part in mutual economic integration, extend the artistic and cultural relations, complex development of scientific and technical progress, opening of new working places.

8-9 September, 1998 on President Heydar Aliyev's initiative an international conference devoted to the reestablishment of the Great Silk Way was held. It was a great event for the authority of Azerbaijan. The project of TRACECA was signed by about 30 states. 9 presidents from different countries took part in the work of this conference. The thoughts "fight a war", "make ready" for war will be forgotten by the peoples of Eurasia because of the Great Silk Way.

The Great Silk Way will bring to the humanity new intercourse, warm breath, rise of standard of living, increase of friendship and fraternity. There is no doubt that the share of the Azerbaijan Republic will be enough great in this way.

◄ "HOLISTICS, HUMANISTICS, REALISTICS" – THREE MAIN COSMOLOGICAL SPHERES OF INVESTIGATIVE WORK

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Summary

Author firstly substantiated the modern challenge to a cosmological analysis of the present-day foundations of modern philosophy and science. Further, he discloses *metanaturalistic* (positive, but of a high extent of generalization) foundations for the sought-for analysis. The next basic element of the proposed conceptual framework is the advancement of a "global macro-evolutionary spiral of the world culture". On this basis, author proposes his own vision of the three main (substantive) cosmological spheres: of *Holistics* (of Monistic or Transcendent cosmology); *Humanistics* (Idealistic or Transcendental cosmology) and *Realistics* (Biocosmology). Correspondingly, these cosmological spheres might be reduced ultimately to the rational philosophies of Plato, Kant and Aristotle. Further, author justifies the world significance of Russian philosophy and science (of true Aristotelian realistic essence) that has returned (on the current cycle of the world cultural evolution) and rehabilitated the fundamental principles of Aristotle's philosophy – for their substantive use in the current and future wellbeing development of the global world.

Challenge to a cosmological analysis
of the present-day philosophy and science

First of all, we need to elucidate the notion of "cosmology". It has been orig-inated from Greek $ko'\sigma\mu o\varsigma$ (*kosmos*) and – $\lambda o\gamma i\alpha$ (-*logia*). Initially "cosmology" signifies a study of the Universe in its totality and of the person's (humanity's) place in it. In all respects, cosmological explorations deal with the issue of active (driving, determinative) forces of the given (for study) actual Universe. The term "cosmology" was coined in the 1730 by Christian Wolff (in his *Cosmologia Generalis*) and, since then (rather, from the very origination of the world culture), – cosmology has a long history involving philosophy, science, religion, esoteri-cism, and other spheres of culture. Substantially, C. Wolff's creativity is character-ized as thoroughly eclectic, influenced by Leibniz and Descartes, however, as it is well known, he nevertheless continued fundamental themes of Aristotle. In turn, Aristotle's philosophy is a unique sample (and basis) of a truly universal (realistic) world-viewing system that integrates physical and metaphysical (scientific and philosophical) knowledge, hence, – integrates rational and empirical knowledge, noumena and phenomena, *a posteriori* and *a priori* data.

At the present time, however, "cosmology" means "physical cosmology" (and the respective philosophical reflections), inasmuch as currently physics and astrophysics have come to play a central role in shaping the understanding of the universe through scientific observation and experiment. In other words, physical cosmology of-today, actively using the means of modern mathematics and high technologies of astrophysical observation), – this discipline focuses on the physi-cal universe on the largest scale, generally considering the beginning of the Universe from the Big Bang – the cosmic inflation and expansion of space (some 14 billions of years ago). However, in fact, modern physical cosmology is an arti-ficial separation (and replacement), as well as termination of the whole world cos-mology (which is originally a cultural process of general cosmological knowledge) by modern Western science. At least, Aristotelian cosmology has the same (full rights) to realize a basis for a philosophical and scientific (any other cultural) con-sideration of the world.

Indeed, modern science has overthrown the astrophysical elements of Aristotelian cosmological system, but it has done nothing (just passed over in silence) the other conceptual constructions of Aristotle's cosmology, especially the biological ('CosmoBiological')[1] underpinning of Aristotle's philosophical system. Actually, Aristotle's "cosmos" (precisely in metaphysical meaning) is substantially more than a planetary model and is quite distinct from the modern concept of Universe (infinite, quantitative and homogeneous, where space, time, matter, and cause are absolute and uniform). On the contrary, Aristotle's Cosmos is finite, qualitative, and hierarchical-

ly differentiated. In this Cosmos there is no space (only place), and everything is ever the combination of matter and form (hylomorphism), while any change (movement and development in Cosmos) is based on the Four Causes (material, formal, efficient, final). In this order, *causa finalis* has the decisive significance – all entities in the world are basically moved and are (self)evolving due to their inner immanent (natural) goals. Thus, Aristotle has made teleological explanation the most fundamental of the four complementary ways of explaining nature. In contradistinction, at the present time, however, *causa finalis* (as the inner universal essence) has been deleted from the sphere of modern science, philosophy and (bio)ethics. Our actual task (and this is a natural goal, in the course the world cosmology's cultural evolution) is to return Aristotle's philosophy back (but in its true sense, precisely on the basis of Aristotelian original metaphysics), thus paving the way for the universal (realistic) understanding and interrelation with the world.

Essentially, "cosmology", from the realistic standpoint, – is ever Biocosmology. There are direct and indirect arguments for this thesis. The former one comes from the evident truth that planet Earth (and all the Earth's processes, including life evolutionary processes) are at all times the product (and the inseparable part) of the one whole Cosmic evolution. Therefore, our modern separation of Earth from Cosmos (Nature-natural from Cosmos-cosmic) is one more artificial construction and artificial termination (of the one whole evolution of the world culture) by modern Western (global) philosophy and science. As a matter of fact, every process (every process of life) on Earth is essentially Cosmic process (independently of an ontological or cosmological standpoint we prefer: astrophysical or theological, or mystical, or any other – of panspermia, or self-origination, etc., – every process on Earth originates from Cosmic matter and energy), i.e. – every process of life on Earth (including a human ontogenesis) is essentially the Biocosmological process.

In turn, the indirect argument comes from author's logical reasoning and his original model of (macro)evolutionary Spiral of the development of world culture (for instance, as it is exposed in the EJAIB 18, 2008, as well as given in the modified form hereafter). Substantially, this line of author's reasoning bring about the understanding of unique and vital significance of Russian Biocosmology (Russian philosophy and science of the XIX–XX-th centuries, which were and are badly suppressed or passed over in silence during nearly the last century) for the wellbeing evolution of the whole world culture and the life itself on the planet Earth. In the main, the essence of BioCosmology is the rehabilitation of Aristotelian "bio-" (organic, whole, hierarchical) cosmos, in which every (living) entity has its inherent place and destination in the one whole organic self-evolving cosmic world.

Aristotle has created (as well as his successors – Russian thinkers, on the new (re)cycle of the Spiral of world cultural evolution, having developed his bases in

the due modern forms) – they have elaborated a philosophy as the science of the universal essence of that which is real or actual. Therefore, Aristotelian (and Russian) philosophy and science have the irreplaceable significance and urgently are called in the modern (of current mainstream philosophy and science) inability to treat the issues of evident universality of natural (Earth's, Cosmic) processes, from an organic molecule to the personality and the entire global world of mankind's evolution. That is to say, the challenge lay in the evident universality of the world of our living – i.e. in the "evidence based" reality – which is long ago *a posteriori* truth, i.e., which is confirmed (at least since the discovery of DNA by Watson and Crick) and not rejected by natural sciences data. On the contrary, in the present "scientific reality", we are witnessing the situation, that "reflections on the meaning of the complex dynamical nature of living systems show an overwhelming multiplicity in approaches, descriptions, definitions and methodologies" (Van de Vijver 2003:101).

Metanaturalistic foundations for the sought-for cosmological analysis

Author discovered a main reason for the present (paradoxical) juncture of things – in our incapability to deal with the issues of evident universality of the life processes on Earth. Therefore, at present, a decisive point of reference is a construction of the generic foundation for a cosmological relation and world-viewing, as well as elucidation of the cosmological standpoint in every serious exploratory (philosophical and scientific, first of all) activity. Otherwise, when philosophers and scientists leave out of account the cosmological standpoints, – they find themselves in a full inability to understand their essentially different conceptions but which are situated (their exploratory positions and research outputs) within the one whole (global) cultural process (within the one common and evidently universal evolution of the life on Earth).

In fact, the time has come long ago to recognize the evident cosmic origin and organic wholeness of the evolutionary process of life on Earth (without a "man-made" explanation of its genesis and "man-made" determination of the "port of registration" of the Evolutionary Process[2]). In other words, Evolutionary Process of the life on Earth evidently is ('IS') and evidently is Universal in its (Cosmic) 'Input', 'Historical Evolution' and the given 'Outputs – the Current state of world affairs', as well as in the Future (emergent) stages of its independent Self-

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[1] The type of '...'-brackets or writing with a capital letter is used for the designation of author's own terms, metaphors, expressions, etc., whereas "..."-type – for citing and the use of generally accepted words.

[2] Evolutionary Process and author's abbreviation – EvoProcess – designates the *a posteriori* evident one common whole cosmic evolutionary process of the life on Earth

Evolution (i.e. independent from Human Reason, which is a crucial Means, but never is (will be) the End of world EvoProcess). Likewise, besides its evident Cosmic origin, Self-evolving essence and Universal substance, – EvoProcess might be primarily perceived (in our cognition) in its evident attributes (principles, laws), or *metanaturalistic* truths that cannot be logically derived from a single research data, but which might be intuitively grasped (exactly by Aristotle's *realist* gnoseological method) within the entire (arrayed) data: of above-mentioned *fundamental cosmism* and *universalism*, definitive (of 'essence- descriptive' character) notion of the self-dependent and all-embracing *EvoProcess*, as well as (at least):

– *fundamental self-(macro)evolutionism* – every subject of life (its/her/his ontogenesis) is the self-(macro)evolutionary (emergent evolutionary) process (including the entire biological evolution and social history);

– *fundamental macro-evolutionary cyclic reappearance of life processes* (a kind of triadicity), which essence is that diametrically opposed, but successive cycles-stages – like Systole–Diastole–NewSystole, or Awake–Sleep–NewAwake, etc. – substantively realize the ontogenesis of every living subject (biological, ecological, personalist, sociological), overruling each other by turns;

– the *special evolutionary status of a person*: since the biospheric emergence of human being – species Homo sapiens – the further self-development of Evolutionary Process is realized by the intentional, constructive, creative intermediation of Man (her/his) in developmental processes: biological, ecological, personalist, sociological. Undoubtedly, modern person defines and regulates all processes of current evolutionary development of the Earth. Substantially, herein, Man in EvoProcess is a basic and equal constituting element in relation to Nature (Biosphere) and Society;

– *fundamental evolutionary anthropologism* – *'universal personalist law of the evolution'*. This principle (law) states that from the very evolutionary emergence of a human being (Homo sapiens) – the climax of biological evolution – the essence of the Cosmic evolutionary process on Earth consists in the increase of the degree of human free creative life activity, during her/his entire ontogenesis;

– the *"cephalization" of EvoProcess* – a realistic truth proved by natural sciences, that includes the progressive increase of the so-called «index of cephalization» during biological evolution and the further progressive development and complexification of conscious human (civilizational, cultural) activity during the ontogenesis of every conscious subject of life (of a person, society, civilization, mankind, etc.);

– *functionalist self-identity of every subject of life* – that is a direct rational conclusion from the fact of the cosmic origin and integrated essence of every process of the life on Earth; this truth is confirmed by biological data – every molecule, cell, biological organ, organism has the predetermined functionalist destina-

tion (i.e., realized by the subject it/her/himself; as well as, herein, – sociological and psychological investigations (the main psychological theories: by Freud, Pavlov, Watson, Jung, Ukhtomsky, Maslow, etc.,) – disclose the *internal* determinacy (driving forces) of vital activity of a person;

– etc.

A global macro-evolutionary spiral of the world culture

However, a metanaturalistic substantiation is not the main topic (but a necessary condition) of this paper. In his short message, author initially strives to disclose (advance) and define the three real autonomous – *cosmological* – exploratory realms within the one whole sphere of modern culture. They are:

1. Transcendent *Holistics* – which is characterized by a *monistic* (realistic, but irrational[1]) world outlook. *Holistics*, in its any philosophical (ethical) or scientific form, – ultimately is reduced to the *transcendent – supersensible* – essence that organizes and rules the world (like God – in theological conceptions; or Matter – in marxism, for instance; or Information – in modern complex sciences; or the other products of scientific speculation, like "Noosphere" by Vladimir Vernadsky (1945), or "Gaia" – by James Lovelock (1979), or "Informational principle" by Konstantin Sudakov (1999), or "Akasic Field" by E. Laszlo (2004), or "Non-Space-Temporal Archetypal Universe" by C. Guja (2008), etc.; or a mystical force (Hegelian Spirit, for instance), or theosophical constructions, etc.

Substantially, *Holistics,* as a "monistic-ontological perspective"[2], can be realized either in *explicit* (as in the aforementioned cases) or in *implicit* forms. For example, Walter Kofler uses his methodological approach of "considering man as a social being from an extended point of view", i.e. integrating (in a holistic approach) a person's "material characteristics with the immaterial ones" and, thereby, reflecting the evidence of "an interwined material/immaterial evolution" and taking into account "the reality existing independently of man"[3].

Thus, Prof. Kofler unambiguously gives the understanding of the existence of 'higher – supersensible – organizing levels or basis' that produces the wholeness and wellbeing of the real ascending (in complexification) evolution (biological, social, ecological, personalist) of the life on Earth. Essentially, herein, the higher point of reference comes 'from the future' – that "the lowest forms of life have to be ascribed more future-oriented intentional behavior and correspondingly greater

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[1] Herein, 'irrational' means that the fundamental (ultimate) principles of Holistics do not have a weighty (well-founded) basis, i.e. are not justified by serious *a posteriori* (positive) facts.

[2] Herein, I am citing Walter Kofler's paper "Sexuality and Evolution – from an extended point of view", acceptable at the site: http://www.rolf-gindorf.de/abstract2004/kofler-e.htm

[3] Ibid.

understanding"[1]. In rational expression, *Holistics* ultimately can be reduced to the philosophy of Plato, first of all, – to the existence of a transcendent (*supersensible*) essence that universally directs and develops the actual world.

2. Transcendental *Humanistics* – which is characterized by an *idealistic* (rational, but unrealistic[2]) world outlook. *Humanistics* ultimately is reduced, in its any philosophical (ethical) or scientific form, to the *transcendental* – anthropocentric – conscious essences which are rooted in the basic ontological principle of dualism. This principle signifies the fundamental separation of a human's reason (i.e., her/his idealistic psychological properties) from the constituting (human body) physiological components and the surrounding tangible world (nature, cosmos). It is appropriate to mention here that some psychodynamic approached in psychology (like Jungian "archetypes", or Freudian "libido", or Maslow's "hierarchy of needs", etc.) which theoretically hold the primary significance of unconscious mind (in its turn, the product of the history of Earth's life evolution) – these conceptions are usually treated as "organismic" and "integral" approaches. However, in the light of the realized cosmological analysis, – all these conceptions are either biocentric or sociocentric (and always – anthropocentric, and are referred ultimately to a Human Reason), and never are cosmos-centric, as it is in the true realistic philosophy of Aristotle. In contradistinction, *Humanistics* ultimately can be reduced in rational relation firstly to the philosophy of Kant – to the transcendental (*a priori*, universal) properties of a human reason which are able of rational cognition and construction of the surrounding material world. However, any other Western philosophical or scientific conception (that essentially support the priority and the separation of a human reason from the surrounding world) is quite applicable as the basis for *Humanistic* philosophical or scientific explorations.

3. Biocosmological or anthropocosmist *Realistics* – which is characterized by both realistic and rational world outlook. As already said above, *Realistics* ultimately is reduced, in its any philosophical (ethical) or scientific form, to the fundamental Aristotelian principle of *immanent essentialism* (or fundamental *teleological* functionalism), i.e. *intrinsic* (*inherent universal*) driving forces of a subject of the life on Earth, which (these driving forces, like Aristotelian *causa finalis*) are opened up before the subject due to (and in the course of) its/her/his *self-dependent purposeful active-evolutionary life activity*. Ultimately, the functionalist effects of this activity (and, hence, a person her/himself) are integrated *in the way of attraction* (absorption, assimilation, but not through a management or guidance by

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[1] Ibid.

[2] Inasmuch as, in cosmological relation, – *Humanistics* rejects the evidence of the unity of a human being with the world of her/his existence, which is a real (*a posteriori*, proved by natural sciences) truth.

a Transcendent Cosmic center – Absolute). In other words, we have herein the selection (precisely, 'from the Future') of a subject's (person's – *'from within'*) self-dependently realized – *functionalist* – effects for their utilization (absorption) on the higher organic evolutionary level (for its future wellbeing evolution), but not the guiding direction of a subject's development *"from without",* as it is in a Transcendent holism. Herein, the most typical example (and the metaphor) is the entire life (ontogenesis) of a cell (any organ) in the human (biological) organism. In rational relation, *Realistics* (Biocosmology, RealCosmism) carries on and develops further the basic principles of Aristotelian original philosophy – its realization in contemporary and future forms.

Substantially, author's BioCosmological conception (Khroutski, 2004–2009) is originated and developed precisely in the cosmological sphere of anthropocosmist *Realistics*. Hence, author basically relies in his constructive framing on the fundamental principles of Aristotle's philosophy and, likewise, – on the achievements of Russian philosophy and science (of XIX–XX-th centuries). Herein, the key-point is that analogously, as Aristotle has transformed (within 2–3 decades) Plato's universal idealism (and transcendent essentialism) into his *universal realism* (*immanent essentialism* or *fundamental teleological functionalism*), – in much the same way Russian philosophy and science has transformed (but within 2–3 centuries) the achievements of Western (objective and subjective) idealism and positive objective science into the contemporary realistic forms of consideration (and rational exploration of) the issues. Therefore, the evolutionary emergence of Russian philosophy and science (after nearly 25 centuries) has recommenced the fundamental principles of Aristotle's philosophy and, thus, – the cosmological integrity (identity) of philosophy and science (metaphysics and physics), as well as resumed the integrity of rational knowledge.

In fact, Aristotle's realism and Russian universalism are identical in metaphysical and gnoseological relations, but are distinct in axiological relation. Their common metaphysical fundamentals are: a) the principle of real *cosmist universality* (pan-unity) of the world; and b) the *immanent essentialism* (*fundamental teleological functionalism*) – the inherent (*functionalist*) universal inclusion of a living subject (microcosm) into the one whole self-evolving world (macrocosm). In turn, the common gnoseological principle is that of the *unity of rational knowledge* – the unity of empirical (initial), intuitive or intellectual (constitutive, determinative, definitive) and rational (constructive logical) cognition and knowledge.

At the same time, Greek (Aristotle's) universalism and Russian cosmism (as the cycles of the one world cultural development) clearly have the opposite axiological directions – of "theocosmism" or "cosmobiology" (paving the way ultimately for the sphere of modern anthropocentrism or AntiCosmism) and, in turn, –

A global macro-evolutionary *spiral* of the world culture

PC(BC)R

TI(CS)H

AntiC(ID)Hum

TM(OT)H

AC(FF)R

Designations:

AC(FF)*R* – Ancient Cosmist Realistics, with its climax in the achievements of ancient Greek rational philosophy, especially in the philosophy of Aristotelian immanent essentialism (Fundamental Functionalism).

TM(OT)*H* – Transcendent Monistic Holistics, mainly realized in OntoTheology of the Middle Ages culture.

AntiC(ID)*Hum* – AntiCosmist (Idealistic, Dualistic) Humanistics – of the priority of an individual human reason in the world organization.

TI(CS)*H* – Transcendent Integrativist[1] Holistics, realized at present chiefly on the basis of a system approach in the domain of modern Complex Sciences

PC(BC)*R* – PersonCosmist (BioCosmological) Realistics

of "Biocosmology", naturally required for the future anthropocosmism (decisive significance of a person's inherent goal-directed creative activity for the future universal evolutionary well-being) – the essential foundation of the sphere and era of realistic PersonCosmism. Roughly speaking, while Aristotle is basically a particularist, but who realizes his particularism in the rational universal knowledge, – Russian philosophy and science (Solovyov and Ukhtomsky, for instance) are pursuing the ultimate aim of realistic and rational universalism, but by means of 'functionalist particularism' (anthropocosmism). In the issue, the fundamental

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[1] Herein, the term 'Intergativist' means the relation to Integrative philosophy and Integral science as the main mean in the realization of Holistic directivity in the development of modern culture aimed at the further liberation of a human's nature. Substantially, modern 'Integrativist' studies integrate both the achievements of Humanistics and Realistics (but strictly on the *Transcendent Monistic* basis) for the realization of a transitional trajectory (breakthrough) from current Humanistics to a future Realistics (the world of PersonCosmism).

Biocosmological principle (that unite the entire Russian philosophy and science) also is the *active-evolutionary anthropocosmism (cosmist personalism)*.

Herein is represented a "global macro-evolution spiral of the world culture" (Khroutski, 2008), now in the modified form:

Conclusion

A crucial point, in the aforesaid reasoning, is that all the three singled out (macro)spheres are universal in their substance. However, their universality is related to the position on a macro-evolutionary spiral of the world cultural development (Khroutski, 2008). This spiral evolutionary model includes the poles of Cosmism or *Realistics* (of the unity of Man with Cosmos) and the opposite AntiCosmism or *Humanistics* (of the separate existence of Human's reason and material Universe). Essentially, the transition from one pole to another (within the one sphere of Earth's life evolution and the one spiral ascendance of the world culture) is realized every time through the transitional (intermediate, 'interhemispheric') cultural era. Thus, due to author's (BioCosmological) view, the transition from AC (Ancient Cosmism) to modern AntiCosmism was realized through the theocosmism (Cosmobiology[1]) of Aristotle – the basis (in the world cultural development) for the emergence of mediaeval scholastic *ontotheology* (philosophy of the Middle Ages), which, in its turn, has carried out the facilities (built the foundation) – for the further self- formation of the levels and epochs of Renaissance *ontoanthropology* and the *deism* and *mechanicism* of Enlightenment, of all – for the eventual emergence of modern anthropocentrism (humanism) and scientism, i.e. of current *Humanistics* – AntiCosmist fundamental rejection both of God and Cosmos, and, thus, – of the total rejection of a holistic world outlook.

On the basis of aforesaid, author claims that the evolutionary vector of present-day cultural evolution is directed to the realization of an ascending era of *Holistics* (necessarily of Transcendent cosmology, i.e. of true Holistic essence, wherein "a whole is more than the sum of its parts"), and which now realizes its evolution (in contradistinction to Medieval culture and the eras of Renaissance and Enlightenment precisely in the opposite direction – from AntiCosmism (Dualism, Idealism, Anthropocentrism) – to a new (in the world cultural evolution) cycle of PersonCosmism (Realism, *active-evolutionary* AnthropoCosmism). Therefore, the afore-mentioned achievements (of Vernadsky, Lovelock, Sudakov, Laszlo, Kofler, Guja), as well as many other outstanding philosophical and scientific advances in

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[1] Author orthographically distinguishes Aristotelian Cosmobiology and Russian *organic* Biocosmology (and his own conception of BioCosmology) from the entire (*non-organic*) contemporary (dominating astrophysical) biocosmology that is chiefly occupied with the search of extraterrestrial life.

the spheres of true *Holistics*, – all they take on today a special (vital) value for the wellbeing current and further evolution as much of the whole life (civilization, culture) on Earth, as of any subject's well-being (of a person's ontogenetic, first of all). *A fortiori*, this conclusion has a vital significance for the development of modern Russia which survives a complex cultural crisis.

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ABOUT THE NATURE OF PRIMARY MATTER (THE PROCESS ASPECT OF THE CONCEPT OF ELEMENTARITY)

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The concept of elementarity belongs to those essential problems of physical knowledge that are of fundamental philosophical importance. It's analysis pertains to the investigation into the nature of the matter and it's intrinsic laws at the most profound level, that is, into the problem which has always been crucial for the principal ideas as to the way our universe functions. Also, the problem of elementarity is related to the analysis of the inner structure of the major theoretical systems of physics. In a sense, the conceptions of elementarily worked out appear to reflect the existing level of the development of physical science as well as the most characteristic peculiarities of the style of physical thinking.

In the development of physical knowledge an essential place is taken by the period of intensive development when the generally accepted "pictorial" representations of the physical reality are replaced by principally new concepts of the nature of the phenomena studied. It is of a special historical and methodological interest to investigate the origin of main concepts of modern physics.

The foundations of modern physical theories include the assumptions of a discrete (quantum) and statistical character of physical quantities that are describing microprocesses and of a structureness of the atom. The subject of our investigation was the analysis of the inclusion and foundation of these assumptions in the physical knowledge (statistical concepts – the line Clausius-Maxwell-Boltzmann; quantum properties of microprocesses – the Cine Plank-Einstein; the structureness of the abom – the line Lorentz-Bohr).

In the end of the XIX the century a definite system of understanding the essence of the phenomena studies (a picture of the physical reality) has been formed in physics. Two alternative concepts of this reality – the atomistic (discon-

tinuous) structure of substances and the non-structural continuous ether have been united in a model affording to explain from a general point of view phenomena in different branches of physics. The concept of a common essence of different physical phenomena have been realized in the theories among which the most important in the end of the XIX-th and in the beginning of the XX-th centuries were: the molecular-kinetic theory, the electron theory, the theory of radiation. Each of these theories reflected the processes of integration in physics: the electron theory generalizing the results of the physical and the chemical atomistics development, the theory of radiation generalizing the results of development of thermodynamics and electrodynamics; in the molecular-kinetic theory were generalized different aspects of description and explanation of thermal processes in substances (in different aggregate states). These classical theories originated the formation of modern concepts of the physical reality. This process will be considered in more detail on the base of original papers in which these concepts have been formulated for the first time.

With the evolution of physics it's notions of elementarily undergo changes which are, above all, manifested and studied in the development of the conceptions of physical atomism.

Now, there is one fact that seems to be of great epistemological importance for the analysis of the development of concepts of elementarity in physical science. The thing is that in classical physics the concept of elementarity was generally related to the idea of a material object (a particle or an atom) as the prime simplest constituent of all physical objects in the universe. However, in modern physics, namely in the theory of relativity and in quantum physics, elementarity shows itself as some simplest "irreducible" event.

This transition from the "language of objects" to the "language of events" (processes) marks the emergence of the "process approach" to the concept of elementarity and is essential for the adequate understanding of the modern treatment of the problem of elementarity in physics.

The analysis of the "language of events" and it's role in the structure of physical knowledge seems to be the more important for the fact that it is this language – the language of events – that is made use of in the leading modern physical theories, namely, the theory of relativity and quantum mechanics.

The theory of relativity is the modern physical theory of space and time. Spatial and temporal relations are believed to be determined by the character of material links between objects and process. However, the general theory of space and time abstracts itself from specific properties of physical objects and systems, for it is the only way to reveal precisely general laws and characteristics of spatiotemporal relations. Therefore, the theory of relativity describes the laws and characteristics of the general structure of material link between objects and systems. Event, thus, is the prime simplest element of this structure.

In the analysis of the structure of the quantum theory elementarity appears as a single act which involves a microobject. These acts can be registered and in them find expression some properties of the microobject. Such simple acts of interaction we call elementary quantum events. They are of a point-like nature: they do not have any components, buy they may be characterized by probability. The important things, however, is that there are certain regularities observed in the world of quantum events. These regularities in the system of event are determined by some more fundamental properties of microobjects, which, above all, are the subject of quantum mechanics. This orderliness and regularity in the world of quantum objects implies that the "language of objects", too, is essential in the structure of quantum mechanics.

The nature of elementary particles is inseparable from their interactions and transmutations. Therefore, the notion of event is applied here in some special way, too. In this context event denotes an act of transmutation of elementary particles which may be registered with the help of experimental tools. It is analysing these reactions that we theoretically reconstruct the properties of elementary particles.

Modern physics is far from conceiving elementarity as pertaining to some simple, structureless physical objects of particles. The traditional interpretations of elementarity as of something simplest, irreducible and structureless, and at the same time as of a whole, have been transferred into the concept of event.

Atomary event (process) is conceived as the prime and simplest element in theoretical systems of modern physics. The notion of elementarity is related here not to the material object (thing) alone, but to it's properties and to the interrelations between these objects as well.

Thus, conceptions in physics new in principle are formed in the process of intergration of physical knowledge as a mathematical corollary from conceptions already available. The status of novelty these conceptions acquire in the process of physical foundation in the case when the possibility to find the logical relation of the conception considered with conceptions available has failed. Then, if the new conception in confirmed experimentally, the physical foundation is realized by the transformation of old conceptions (the establishment of applicability limits of the theories). The availability of a physical foundation is a deciding argument for the inclusion of new conceptions into the picture of the physical reality/

The analysis of the content of physical theories reveals that principal physical statements are based on the analysis of certain systems of events, while a single event becomes of interest only due to it's structural links and those specific conditions which make it part of these systems. Elementarity, in this context, appears as a certain property of the system rather than some prime object.

The existence of structure and stability in systems of events reflects the nature of inner properties of the objects under study.

In other words, the investigation into the inner properties and the structure of material objects proceeds from the analysis of the spectrum of their possible and various external manifestations and it is in this context that the concept of elementarity is now seen.

In conclusion we find it necessary to note that the concepts of events were introduced into the physical science when the field of research was extended, first of all, with transition to the analysis of continual media (or fields) and atomic processes. This transition signified the becoming of modern physics whose philosophical interpretation has led to the development of dialectics in the conceptions of matter and physical reality, of space and time, of causality and determinism at large. And this application and development of dialectical categories in the course of the formation of modern physics is in many ways dependent on the elaboration of the language of events in the analysis of the nature of physical knowledge.

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◄ LEADERSHIP STYLE IN THE DISASTER MANAGEMENT: A NOTE FROM THE FIELD

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Introductory

A disaster which is encountered unexpectedly causes unpreventable damages. These damages require rapid management which is precisely and accurate. The management is conducted in abnormal situation and is full of technical psychological and ethical problems (Neira & Lic, 2004).

In the recent years, Indonesia was shocked by catastrophic disasters like; tsunami and several earthquakes that occurred consecutively. Tsunami in Aceh (2004) and Earthquake in Jogjakarta (2006) are the most prominent disaster taken place in Indonesia besides any other disasters which have caused many casualties. It has been announced that Indonesia is located in the ring of fire.

The conditions were mostly a copy. In a highly uncertain situation it can be happened that the institution and the helping staffs (for example: health staff in health center, hospital or health office) in the reality also become the victim. Though at the time of disaster happened it needs a systematic and inwrought initiative for the management movement. Theoretically, the nature of reachable ideal management is if there is a leader owning sense of leadership; he or she can show leadership attribute and apply the proper leadership style in the field operation.

How is the leadership style which matches with the steps of disaster management and who will become the leader in the effort of such complex disaster management mobilization? Both questions always emerge at the time when disaster management operation is "being planned". This paper out will elaborate various leadership styles and each style application corresponding with the steps of disaster management.

Discussion is based on the notes from the field (contextual) in which the academic approach would be framed the analysis. Following studies should be made to strengthen the hypothetical finding.

Leadership

Leadership is the ability of a leader to recognize the time and requirement to make a change, to identify change direction, to communicate the change strategy to people who are in the organization- especially those supporting the change-, and empower them to make a change and to facilitate the effort of attaining the target of change (Podsakoff et al. 1990).

Sir Kenneth Calman (England Chief of Medical Officer, 1991-1998) practically formulates leadership in simple and understandable words (Calman, 1998), that is: " Leadership requires knowing where you want to go, taking people with you, and giving sufficient time and energy to make it happen."

Through the understanding of the concept there arise some important reasons, why leadership become the main pillar in the disaster management (Carter, 1992), that is:

1. At the time of disaster it needed [by] a leader who holds leadership skill and character is required, not simply a formal leader

2. A disaster situation invites various parties to be able to become the resources and play major roles, on that account a leader needs to strengthen the position of each resource.

3. The situation at the time of disaster changes rapidly, so a leader who comprehends the change direction and has the ability to manage every changing process and result is required.

The main breath of leadership at the time of disaster is to give clear picture regarding the direction and target of the disaster management. On the other side, a leader is very expected to dedicate his/her ability in giving clarity on the importance of management rapidly, precisely and accurately. In the context of disaster, therefore, leader should describe clearly his vision regarding his decision to conduct certain action.

The major variables in leadership are vision and commitment building (Steers, 1996). These variables do not change either in normal situation or in disaster context. The vision of a leader in managing disaster will be communicated to the entire stakeholders and the vision will be communicated to build commitment among various parties to jointly realize it.

Clear vision and objective of the leader would lead the follower to desire direction. Experiences from the field showed that failures happened in disaster response caused by the unclear vision of the leader. Mobilization process was stranded since none of the follower believed in what they were going to do.

A vision represents the aspiration and ideality of a leader. To a leader, owning vision is a compulsion. Seeing far forwards and believing that his/ her view will bring the kindness for the world represent some special attributes of a leader which

are often perceived. Besides vision, another important variable is the ability to build commitment. The vision of a leader is absolutely to be realized by his/ her followers. First step taken by a leader is to communicate his/ her vision to all followers. The purpose is to build the commitment of all followers, so that the followers are willing to provide the time and involve themselves in the effort of realizing the vision. Discussing vision without addressing strategy and activity is possibly a dream. However, addressing the activity and strategy without considering the vision is also just wasting energy unknowingly where the direction will lead to.

The effort to build the commitment can be done through the transformational, transactional and also non- transactional approaches (laissez-faire). The approaches have the same effectiveness in different situation (Rubin et al. 2005). Becoming a role-model, giving promise and also using power is the practical forms of the three approaches.

Foreign hospitals in Aceh were able to mobilize local health workforce since they could apply transactional leadership within short period of time and in a good manner. While local hospital had difficulties to redeploy its own staff since unclear command was launched including its purpose and benefit.

Effective leadership (Avolio, 1999 in Rubin et al. 2005) claims the existence of ability to develop vision which provides added value to the environment and also the efficacy of building the followers. Thereby, the effectiveness indicator of a leader is his/ her ability to create and operate his/ her vision through follower mobilization .

Modern-leadership (Calman, 1998) suggests someone to reach the leadership effectiveness through carefully choosing people (followers), sorting their suggestion in determining policy and designing the strategy to reach the trusted vision and also applying varied leadership style. This conception becomes very relevant to be applied at the time of managing disaster. This concept is often conceived of *contextual leadership* (Vail, 1989).

Especially in the disaster management process, the style of leadership and its application are the utmost important thing to achieve and to apply. It was observed that leader could be more effective since they know what style to be taken and when to apply it.

Qualities of Leadership

A leader has a lot of criteria, as does the leader him/ herself, but there are basic criteria to be agreed on in defining the features of a leader in a disaster management (Pencheon & Koh, 2000), those are:

1. having systematic and clear vision regarding the future of the service and organization

2. owning plenty of spirit and energy to carry out leadership process

3. owning self confidence and ability to trust others in the effort of:

a. communicating the vision to people in the organization

b. making the people in organization self- confident and willing to realize the vision

c. empowering the people for operating the vision through logical and applicative strategy.

Those criteria represent the empirical criteria found in some leaders in health service. Through the study the way of forming the leader model is also found, in which there are three models of school of thought (stream), they are:

1. leadership is a magical strength, for some people are truly born to become a leader

2. leadership is a skilled which can be learned and applied

3. leadership is a set of skills which can be trained through several analysis phases. The effectiveness of these skills is not solely determined by the quality of the leadership but also by the time accuracy of its usage and approach in an organization.

A belief that a leadership is a magical strength is rejected by many organization experts, including those who are considered to be leaders, This is because the emergence of the magical power is not consistent and there is not any supra natural element in it.

A belief that a leadership is a skill which can be learned and applied also represents a belief that underestimates the problem. Many people agree that a leader has to have the vision and spirit. Nevertheless, those abilities are also owned by people who are not competent as leaders. Owning vision and spirit truly can be trained, but for the application in an organization, it is insufficient only with vision and spirit.

Some recent studies lead to a belief that leadership represent a package of skill and has certain specification. There is one unique matter, i.e. successful leader can carry out his/ her leadership process by performing specific approach to every situation. One approach should be applied for one condition. Developing skill to lead and exploit it in proper situation and time are the characteristic of leadership which is presently well accepted.

Seemingly effective leaders who are wedded to only one style may become rapidly unseated when circumstances demand another. Margaret Thatcher, the epitome of conviction leadership, rapidly lost the thread (and her position) when consensus leadership may have been more appropriate (Pencheon & Koh, 2000).

Therefore, in terms of disaster management, it would be wise if leader is willing to recognize the style of leadership to be applied in certain phase of disaster management. Example from the filed expressed that only a few of the leader

could do the right manner in leading people since they have known what they were facing and how to handle the situation by using their various leadership style.

Type of Leadership Style

Some studies have declared that efficacy of a leader lay in his/ her expertise in applying certain leadership style or type proper time in specific condition. It has been identified that effective leaders are those who succeed in developing some leadership style and apply it at each proper time, place and situation (Goleman, 2000).

Understanding leadership model is likely not too complicated, because the following table depicted some leadership styles commonly met. The most difficult part might be in finding the accurate momentum to apply each style in each phase of disaster management which continues to change dynamically.

Tables of Leadership Style

Style	Application
Coercive leaders demand immediate compliance	useful to lead people out of a sinking ship
Authoritative leaders mobilize people towards a vision	useful when an important change is required
Affiliative leaders create emotional bonds and harmony	useful to bind teams in difficult times
Democratic leaders build consensus through participation	useful to encourage input from valuable team members
Pace setting leaders expect excellence and self direction	useful to get quick results from a good team
Coaching leaders develop people for the future	useful for long term development of key members of a team

Some studies have also identified that an effective leader retains 4 main leadership styles, they are: authoritative, democratic, affiliative, and coaching. Coercive and authoritarian styles are possibly suited for certain situation (for example, at one time a hospital is working on fundamental change), but they may cause a rumpus if applied at everyday routine situation because in a routine situation, human resource will not be comfortable working under a situation full of pressure and work load. On that account, again, it is necessary for a leader to develop leadership skill, but what it is more important again to develop sensitivities in applying certain leadership style in certain situation.

Disaster Management and Leadership Style

Carter (1992) declares the "disaster management cycle". This management cycle identifies some phases of disaster management with different target and characteristics but each phase is the sequential following the other.

Each phase in disaster management demands different outcome. The concept of the resource mobilization and network utilization differ in each phase. Disaster Management cycle covers: Disaster Impact; Response; Recovery; Development; Prevention; Mitigation; Preparedness

The disaster management cycle is often modified in the development part into Disaster Impact; Recovery & Development (which covers: Response, Rehabilitation, Reconstruction, Prevention); Mitigation, Preparedness.

The Figure of Disaster Management Cycle

A leader is expected to have vision and different method of building commitment in each phase of the disaster management. Therefore, the leadership type applied in each phase is different. The objective of leadership type change is to improve the leadership effectiveness, where in the end the effectiveness of each phase of disaster management will be obtained.

The ability to apply the concept of contextual leadership (Vail, 1989) along with the change in each phase of disaster management becomes the applying base of various variation of leadership style. However, the objection of this idea is the limited ability of someone to well master each leadership type in such chaotic situation; and usually, there is no opportunity to prepare oneself optimally.

The following table describes the characteristic of each leadership type, in which the characteristic can identify its operation modus, utilized phrase, when its use and impact. Through this identification, it can be analyzed its application possibility in each phase of disaster management which demands the variation of leadership type. The requirement of different leadership type is not forced by the avail-

ability of leader with certain style, but is forced by the need for the target attainment (mission-driven) in each specific disaster management phase.

Table of Leadership Type Characteristics

Variable	Coercive	Authoritative	Affiliative	Democratic	Pacesetting	Coaching
Operation Modus	Claiming to immediately to fulfill the request	Mobilizing people to reach the vision	Creating harmony and building emotional connection	Encouraging consensus through participation	Setting high standard for the performance	Developing human resource to support the future
The style in a phrase	"Do as I command"	" Join with us"	Prioritize others	"What do you think?"	"Do as I am doing it right away"	"try that first"
When the style work best	At the time of crisis or when starting a new break-through	When the change requires new vision or clear direction	To bridge the gap between groups or to motivate others during the critical situation	In the effort of building up concensus or seeking input	To gain immediate result from high- motivated and competent group	To assist in improving the performance or developing long- term power
Phase of Disaster Management	Disaster Impact/Emergency Phase	Response Phase	Recovery Phase	Development Phase	Prevention & Mitigation Phase	Preparedness Phase

During the disaster impact phase, when everybody is in panic situation, including the staff who should handle the disaster, when the system breaks down, lack of human resource and others, the phase requires a coercive leadership type. The application of this leadership type will require the followers to realize the leader's demand in realizing his/ her vision. In such critical situation, everybody demands clear direction in the effort of getting rid of the situation.

In the next phase, when response is being carried out, the phase requires an authoritative leadership type. Such type will accommodate the mobilization process and convince other parties to join in the process of disaster management.

The recovery phase requires affiliative leadership type. In this type, a leader is able to create harmony and build emotional connection among parties being involved in the recovery process. Based on the observation, there are so many par-

ties being involved directly and indirectly in the recovery phase. Each phase establishes their own mission, therefore, conflict is very likely to happen. However, each party obtains the proper resource required to attain some positive matter in this phase. For that reason, the phase requires leadership which is able to create harmony among the assisting parties, although each party has their own mission and significance.

The development phase requires democratic leadership type. Such phase requires contribution from numerous parties but with similar objective, namely turning the situation into the normal one. This phase requires consensus from different stakeholders, in which during the effort of consensus building different opinion may emerge. A leader who holds such democratic type will accommodate every opinion and be able to conclude it into an agreement satisfying those numerous parties.

Prevention and mitigation phase is the phase aiming at establishing standard in managing disaster and attempting to reduce the unavoidable disaster impact (unpreventable). This phase requires pace setting leadership type which will set up high standard for certain performance. Such type is applicable to gain immediate result from a certain high- motivated and competent group.

Preparedness phase is the phase which requires coaching leadership type. The preparedness phase requires long- term vision and ability to convince everybody that a disaster may happen in every moment, whenever and wherever and damage whosever. To keep the phase effective, the phase requires high energy from the leader to be consistent and sure that the built vision is the best one for everybody. Through some coaching approach, a leader is able to share his/ her burden with numerous parties, and as result his/ her stamina is kept in shape and his/ her commitment is kept consistent.

Collective Leadership

Those various leadership types are not always owned by one person or a leader might not have such complete leadership style. Each type has different attribute and requires emotional intelligence (Goleman, 2000) with wide range.

Thereby, it is necessary to develop a collective leadership system which will accommodate those various leadership types from numerous individuals. Each individual will complete each other according to his/ her strength, so that he/she will improve the effectiveness of each disaster management phase which has been planned. A collective leadership system requires shared-vision from each individual representing the stakeholder. The more stakeholders, the more varied visions possibly arise. On that account, this type of leadership requires many conditions for its development.

Conclusion

Leadership at the disaster impact is absolutely required to support the effectiveness and attainment of the disaster management. Such critical resource, progressively demands an effective leadership.

Disaster management is divided into several phases, in which each phase has its own specific characteristic but supports each other in sequence. Every disaster management phase will involve numerous parties which may also involve in other phases, not just one, or even in all phases. The parties being involved also hold various mission and competence which may be different.

The types of leadership at the disaster impact may be adjusted to the phases of disaster management. The purpose of the adjustment is to improve the effectiveness of the leadership which in the end will improve the effectiveness of each management phase. A collective leadership is required in order to apply the leadership types in every phase of the disaster management.

Systematic and regular training is required to develop the leadership ability of the actors who directly involve in the disaster management. The training program is packaged to improve the primary leadership ability up to the extensive one in order to master varied leadership styles as the foothold in applying the concept of contextual leadership in the filed.

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◀ FROM OUR HUMAN SOCIAL "MATRIX" TO THE PERCEPTION OF SOCIAL STRUCTURES AND CORPORATE ACTORS

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KEYWORDS:

association, company, corporate actor, corporate identity, corporation, evolution, extended view, habitualization, institution, institutionalization, intention, legal person, matrix, NGO, para-autonomous actors, potential, reality, regulation, social order, social science, social structure, socialization, society, sociology, task distribution, task specialization, Wirklichkeit

ABSTRACT:

Corporate actors like institutions, corporations, governments, companies, organizations, political parties, universities, NGOs, states, interest groups, associations and all other supra-individual collectives play a key-role for the socialization of human beings and for the creation of the reality we believe in and live with. The creation of these realities within our socialization leads to different matrices forging our self-understanding and influencing our behavior, lifestyle, ideals, goals and conducts. "Wirklichkeit" – actualitas – as a term going beyond the significance of reality, is a creation/invention of the human brain and also the most important building block of our world-views base their existence only on agreements between individual human actors: Corporate actors are considered as legal persons within our juridical systems, seem to be acting as independent entities, outlast the single actors steering them from within and have a vast impact on our lives, but in the end they only persist due to the fact that there is a common consent about their necessary existence.

Different theories, mostly within sociologic frames, approach the role supra-individual entities fill out in our societies but do hardly take into account the gap

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between individual und corporate actors. The "Extended View" as "real theory" in the sense of Einstein's logics classifies corporate actors as para-autonomous actors with clearly defined abilities and structures. On behalf of this theory a step to understand in an emergent way the creation of social structures as human social matrices and the characterization of supra-individual collectives within and in constant relation with these matrices is tried to be made.

INTRODUCTION:

Based on the assumptions proposed within the so-far published explanations about the supposed nature of basic entities/actors by W.Kofler's "Extended View" we learnt about the abilities and symbol-intentions attributed to restricted autonomous actors, about their emergent creation and about the theory of matrix-worlds on the level of quanta until life.

But also every human being fits into this description/attribution of a restricted autonomous actor as well as the mentioned somatic cells or slime molds (myxomyceta) do. Although on the level of mankind we face new possibilities and structures that have to be taken in consideration. – What about all the supra-individual entities we humans created? Why and how are they created? How do they fit into the "Extended View"? Which potential do they have and are they really real?

Following the "Extended View" we call these supra-individual entities like corporations, governments, political parties, organizations, universities, NGOs etc.: PAAs – which means "para-autonomous actors" .

One of the basic principles of the "Extended View" is to attribute – beneath energetic and discrimination potential – (symbol-) intentions and a certain kind of individuality or autonomy to every actor within the realms of its possibilities and in dependency of the actors evolutionary level as well as its surrounding given environment. Para-autonomous actors – PAAs – are structures built up by humans that only exist because there is a common agreement about their meaning.

In contradiction to autonomous or restricted autonomous actors, para-autonomous actors only seem to have intentions, potentials and abilities, but we will see that this is only an appearance – one part of our human social matrix.

CORPORATE ACTORS – PARA-AUTONOMOUS ACTORS:

At a first glance we would say PAAs are socio-structural media through which the goals or even the values of individuals are expressed. Individual personalities steer them, give them direction, shape them etc. – So far nobody would say PAAs are autonomous entities.

But because all organizations, companies, authorities, NGOs, states, interest groups, associations, institutions and all other supra-individual collectives seem to be acting like an independent entity we automatically ascribe "intentions", "goals"

or "attitudes" to these PAAs and soon nobody doubts their ability to have them. The circumstance that the energetic potential, its intentions and the abilities to discriminate and systemize are brought in by its anonymous human restricted actors from within the PAA is not visible any more and so the PAA itself seems to become a fully autonomous actor.

Today PAAs or "corporate actors", as they are usually called in modern sociology, are considered as actors sui generis and they are even defined in this way by the legislator. They have to act within legal norms and are legally independent of their members and even owners. We also do perceive lots of PAAs in this way:

E.g. "Corporate Identities" have to respond to lots of different even social expectations of individual humans like consumers, shareholders, creditors and also other PAAs. Organizations need to present themselves always as fully competent actors in order to acquire public trust and reputation. Individual humans may fail or claiming a status of tiredness, sickness, diminished responsibility etc. – PAAs cannot do so. Every single action of a PAA is considered as a conscious act of the whole corporate actor – even if the action has been undertaken by one single member of the PAA or the consequences of the action have not been foreseen – are unintended.

Publicity, marketing, sponsoring and advertising play a key-role in the identification of companies as PAAs nowadays and Corporate Identity in the perception of the consumers, customers or members is created to a high amount through these public actions. Globalization and "Global playing" institutions also contribute to the idea of PAAs as independent entities – the matrix creates itself.

CORPORATE ACTORS AS FINALITY-RELATED "LEGAL PERSONS"

The climax of the acknowledgement of corporate actors – PAAs (para-autonomous actors) – consists in their recognition as "legal persons" within our juridical systems. PAAs can conclude contracts, pay their taxes, have hardly any individual human right including the right to the protection of property, freedom of contract, speech etc. Due to their very often given financial background PAAs are frequently even privileged compared to individual humans – not to talk of animals. The influence of lots of these corporate actors – following terms of sociology – or para-autonomous actors – following the "Extended View" – is a lot more far-reaching than the influence any human being can have.

Strange legal situations can arise if a stock corporation re-purchases a majority of its own shares and no precautious laws are in function that deal with that situation – so happened in Japan some decades ago: In this case an incorporated company as a legal person owns itself as a legal person – a circumstance that leads to inter-organizational re-structuring and actions that do not fit in the concept of stock corporations any more.

One of the most important features PAAs show in comparison to human beings is, that they (normally) don't have to "die". Big companies, institutions, states, associations etc. have a longevity or persistence far beyond centuries. Comparing single-cellular in multi-cellular like myxomyceta (slime molds) who give up their immortality for another purpose, we can now define a big distinction to PAAs in human society. PAAs are assemblies/associations of human actors that because of their essential form of existence outlast the single actors more or less steering them from within.

So there is a kind of throwback to be stated and that is why PAAs are considered in our agreements as entities with some kind of a higher level meaning – not to say, as entities connected with finality.

Think of legal matters again and the frequency with which courts convict organizations with severe sentences because of their responsibility e.g. for our environment.

PAAs like governments, the UN, the WHO, NGOs or the NATO have to assure and realize the highest human goals and values like global peace, welfare, health etc. and there is a large world-wide agreement that these institutions are entrusted with these duties.

All of us are members – restricted autonomous actors – in lots of different corporate actors and in our matrix these PAAs take over two extremely important roles for us:

– They take over quite a large part of our personal responsibility and define in a vast way the idealistic and ideational perception of our given world;

– They produce and assure the existence of (different) social orders we can live in as individuals and assure the absence of anarchy = the absence of a matrix = one of the most essential human fears.

SOCIAL ORDERS – SOCIAL STRUCTURES: THE MATRIX AND ITS PAAS

"Social order is not part of the 'nature of things' and it cannot be derived from the 'laws of nature'. Social order exists *only* as a product of human activity" .

Social order is the most basic prerequisite for human existence and in constant production. The biological equipment – in terminology of the "Extended View" we would speak of one of the arches of the bridge-layer-model – forced us to specialize from the early beginning to assure our survival. Therefore consents within the first groups of humans had to be found to allow a common win-win-situation or the most basic possibilities for survival. "*Homo sapiens* is always, and in the same measure, *homo socius*" .

To free and gain potential for additional actions – following the "Extended View" in its two basic forms of energy and discrimination potential – humans have two major possibilities:

– Habitualization: conscious actions connected with constant attention and decision-making can be led into adaptive (automatic) control mechanisms. This could be called and is very closely associated with some kind of "learning".

E.g. When you first drove a car all your attention had to be paid to the different tasks you had to fulfill moving the vehicle (steering, using the panels, pay attention to traffic etc.). There was no possibility for you to do anything else; all your potential to fulfill actions was dedicated uniquely to the task of driving the car. But after some time driving a car gets an automatic action. You still will pay some attention to your driving (hopefully) but now you have potential left to talk, listen to music, make a phone-call, smoke, think about other things etc. contemporaneously – your potential is not fully absorbed by the driving process any more. It has become an automatic, controlled, "regulated" mechanism how the steering wheel, the pedals etc. are to be handled – it became a habitualized activity.

– Task specialization and task distribution: Even in its most rudimentary form as a prerequisite for survival, task specialization and task distribution lead to different role allocations and directly to the establishment of social orders.

In both cases additional energy/potential for deliberation, realization and innovation has been won. Humans can reach the absolute highest level in habitualization and specialization among all entities on this planet. This is one of the most important attribute and reason for development, innovation and the so called progress of mankind. Based on these two principles humans create a multi-dimensional (social, economic, political etc.) system to live in and are building up institutions as supra-individual actors that manifest agreements concerning the system. Predefined patterns of control and conduct for every member of the particular social group find their setup in institutionalization. Monogamous couple building and its institutionalization as 'marriage' as one of the most common and fundamental basis of our social order demonstrates the significance and far-reaching impact of the most basic idealistic agreements, as to say para-autonomous actors, our human matrix consists of.

Following Durkheim these principles seem to be indisputably coherent and empirically proven from the first final-oriented societies up to nowadays . Even if he and with him sociologists like Luhmann leave little or no space for individual actors within their conception of a social system and are therefore to criticize .

Human beings are consent-oriented by their nature and our subjective world view gets created through socialization. Already in our earliest socialization our involvement in and knowledge about institutions and social textures is structuring our everyday life. Roles, traditions and norms get internalized and are representing the social order we live in. The social structures surrounding every one of us are constantly legitimized by institutions, by PAAs of symbolic and also of material nature and define our societies final- and sense-oriented purpose .

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Time hardens the objectivity of institutions as PAAs and lots of them get part of the apparently given world that is not taken in question any more. Especially children accept the built up social matrix of their parents, their relatives etc. as structures that form their reality/actuality, and the consensus initially voluntarily given to recognize an institution gets an indisputable part of their world view comparable to the realities of their natural world surrounding them.

THE MATRIX AS INDIVIDUAL "WIRKLICHKEIT"

This individual world view – this unintended created matrix – in contradiction to the (misleading) use of the term "reality" – can be designated as "Wirklichkeit", a term Master Eckhart introduced already in the 13th century as a translation of the Latin word "actualitas" into German language. There is no real English terminology for "Wirklichkeit" existing – in philosophy "actuality" is used as English translation. Following Kant it can be defined as existing individual reality that goes beyond physical existence and includes everything that merely seems (compare also Yolton 2000).

If we have a look at quantum mechanics it gets clear that "reality" can't be defined properly within the physicists dogmatic systems of natural laws (think of the particle-wave nature of light and Schr?dingers cat). Einstein, Podolsky and Rosen tried to solve this problem for natural sciences by defining the criterion of physical reality in 1935:

"In a complete theory there is an element corresponding to each element of reality. A sufficient condition for the reality of a physical quantity is the possibility of predicting it with certainty, without disturbing the system. This is not possible" (Einstein, Podolsky, & Rosen 1935).

They decided that the description of the wave-nature and/or the description of the particle-nature of light were not complete and that simultaneously given realities of the same entity cannot be possible[1].

Following the model of Kofler different consents are observable on different evolutionary levels but from the position of the observer the connectivity of the observer to his subject is not reached (yet) and in many cases not to be reached at all. The reference has always to be the observer himself. Not because of an idealistic or human-centered basic philosophy but because of the fact that the abilities of alignment are decisive for any judgment about the observed and the therefore following actions.

So we lack objectively correct answers about the Wirklichkeit of any restrict-

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[1] Attempts to prove the multi-universe or multi-dimensional superstring theories are not taken in consideration; for interesting new theoretical approached compare e.g. Deutsch: The fabric of reality (Deutsch 1997)

ed autonomous actor if we do not share the same consent – and are therefore lacking connectivity. We can only try to describe images of facts we observe and suppose symbol-intentions and -potentials, like the "Extended View" supposes, to deal with the given[1] – thing most of the non-natural sciences have already accepted and integrated in their scientific self-understanding (compare e.g. the use of Max Weber's "ideal type" within historical sciences). This is exactly the crucial point why on every evolutionary stage as well as on the level of human societies and therefore also in our sectoral sciences massive differences between given realities/ Wirklichkeiten do exist.

"Philosophy is asking those questions, which not to have asked was the success condition of the scientific procedure. Thus it is stated that science owes its success among other things to the renouncement of placing certain questions".

However, the understanding that Wirklichkeit differs from one person/one actor to the next is the point to comprehend the idea, the creation and the acceptance of human matrix-worlds and the role PAAs play for our socialization. "… [The] most valuable attribute [of a theory] is that it explains the fabric of reality itself." – PAAs are free inventions of the human brain, ideas with far-reaching consequences based on the agreement to accept them as quasi-physical entities. Ideas don't die if they are thought again and again – their inventors do. Therefore PAAs can persist until the agreement of their existence gets lost.

They represent images of the matrix we live in, are constructed objectivities and persist until we decide to change our Wirklichkeit, or circumstances outside our restricted control force our reality/actuality to be modified.

Para-autonomous actors with vast influence in their time have "died" or were altered/overformed fundamentally and are nowadays perceived as history: e.g. the Roman Empire, the East India Company, the Holy Alliance and the USSR. – And so will most of our actual PAAs be gone when the consent about their necessary existence gets lost. The conscious perception that we live in constant relations to PAAs that are in reality only inventions within our matrix may be a big advantage in very many daily-life situations. – Who are the "real" conductors, the clockmakers, the helmsmen, the steering parts of these social matrix-worlds remains the question that continuously has to be asked – although, as within the evolutionary process, most of the matrices that form our Wirklichkeit are unintended consequences of intended actions and do not have a master-brain behind that consciously steers them.

Also this in good accordance to state-of-the-art knowledge within science: Watzlawick states: "… any so-called reality is – in the most immediate and concrete sense – the construction of those who believe they have discovered and inves-

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[1] This view is also in accordance with lots of modern sociologists and philosophers. Compare e.g. Watzlawick (Watzlawick 1995; Watzlawick 2005)

tigated it. In other words, what is found is an invention whose inventor is unaware of his act of invention, who considers it as something that exists independently of him …"

The "Extended View" is not to be classified as part of idealistic, constructivist or cybernetic scientific frames but offers an integrative approach to different sectoral sciences and different schools within those sciences. The concept presented by the "Extended View" seems to be compelling and is certainly applicable and useful also to social sciences. The understanding how matrix-worlds are created on different evolutionary levels up to humans, how para-autonomous actors are to be considered, how relevant the individual intentions and valuations every one of us implements constantly are and how realization-luxury can be won by deceleration and regulation, are extremely important for every inter-sectoral scientific exchange and collaboration.

– But also for the handling of questions/problems exaggerating the capacity of particular cultural views, scientific frames or local policies – problems like health and sustainability.

"Verum ipsum factum"
(Giambattista de Vico: *De Antiquissima*)

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◄ SYSTEMIC EVOLUTION

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Evolution encompasses the development of biological as well as non-biological systems. The evolution of life determines the phylogenese of living beings, including those belonging to the homo sapien species and the ontogenese of the development of individual exemplars of a species. Moreover, the emergence of social systems and societies can be explained with the application of evolution[1].

In Evolution there is just *one* evolutionary process. For the purpose of analysis we divide this process into physical, chemical, biological and socio-cultural evolution.

A good model for the different steps of evolution from the Big Bang of the physical-chemical world with the development of a discrimination ability over the quants and molecules, the emergence of live, primates and homo-sapiens and the co-evolution of social structures and cultures can be found in the diagram of 'Evolution as an Autopoietic Process' by Walter Kofler[2].

Evolutionary theory contains the only description, which can be taken seriously, of the development of the world and its life.

Time	Occurance
15 billion years ago	The Big Bang – Beginning of the Universe.
4.7 billion years ago	Earth originates.
3.7 billion years ago	First life forms originate.
1.2 billion years ago	Sexual reproduction develops.
500 – 450 million years ago	The first vertebrates appear.
365 million years ago	Fish develop lungs and move on land.

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DRAFT OF A PATTERN FOR AN EVOLUTION AS AN AUTOPOIETIC PROCESS OF THE FIRST BASIC ACTORS UNTIL TODAY
AS BASIS FOR A UNIFORM ACCESS TO HUMAN HEALTH
(Proposal for discussion for Convergence Project IAS - MUI)

If there is no successful intervention,
the newer/younger one gets priority

The usability of not intended consequences
for new possibilities opens an
enhancement - together with new
not intended consequences

The idea "dies" instead of its inventor

Para-autonomous actors are effective as

long as the rAAs are using their resources

BASIC ACTOR 5

No competition makes sense because of inefficacy
Frontier for the dominance of implementing-referred aligning - priority for meaning-relation

Postdarwinistic Evolution
Affiliation as persistence reason

Including "social" insects as organisms

(renouncement of "outer coverings")
BASIS ACTOR 4 HIGH INTENTION
Network formation "Individual species"
Species-preserving and -determining within morphological coverings
Additionally sense-relation to individuals
Partner selection
Kind comrade as a competitor

Extended view: productive with the assumption of WIN WIN
Darwinistic Evolution
Struggle for survival
Trial and error
Epigenetic and Proteomic get more important
BASIC ACTOR 4 LOW INTENTION
Network formation through pretendence

Co-operation for tasks of purpose
Deficiency as selection reason
Reproduction as persistence reason
Gen. adaptation as persistence reason
Intention to survive of the rAAs
Food

Predarwinistic Evolution
ATP, Phosphates
selection only caused by deficiency

High Tech- BASIS ACTOR 3 (Single-) Cell
Hierarchization by the invisible Watch-Maker
3. Main principle Caloric Theory

Predarwinistic Evolution

Low tech- BASIC ACTOR 3

our hope:

intended networking in competence

Progress:
not intended consequence e.g. applied economics
recognized → intended e.g. applied economics
CULTURE   Law
Economy

Religion ← → Social Structure
Belief ← → Immortality

Division of Roles

Acceptance of a mystical Essential-Reason

Termites, ants, bees

Over forming of
the Matrix-functions
DISTINCTION BETWEEN (SIGNIFICANCE) AND PURPOSE (FUNCTIONALITY)
species-preserving and -determining

Specialization, Division of Roles

permanent division of responsibilities

Pseudo-autonomous Actors
"Co-operations"

heterotroph

single-cellular

organic
Catalysts

Hyper-cycle
Dissipative Structure

Energy flow as regulation flow ?

Network consensus

Homo Sapiens oecosociofinalis ??

ecosociocultural sustainability

Para-autonomous actors
Individual - collective goals
Arrow of expectation Politics

HS sociofinalis

Para-autonomous actors
e.g. state

Zoon politicon

Person

H.S. finalis

A NEW QUALITY IS COMING TO PURPOSE AND SENSE   FINALITY - ORIENTATION TO NOT TEMPORAL ..... LOCALLY CHARACTERISABLE THINGS

Homo Sapiens Linee

- higher animals

Primates

"Organism"-species

MATRIX-World for the "Coalition of parasitic Specialists"

low level animals

Functional / temporary multi-cellular organisms
sehr   niedere **TIERE**

Co-operation for everyday problems

Eucaryonts   autotroph
Prokaryonts

Life 2

Crystal

Life 1

Limit of the implementing capacity AND the construction capacity reached
Symbol-Intention REMAINS: Maximizing of self-determined variety of motion in consensus + Observing

virtual
tools

→

Para-auton. networks

Ecological systems intended

intends agriculture ...
Para-auton netzworks
Ecological systems not intended

tools
e.g. sence
Reality with virtual expectation arrow and reality-relation

knowledge bringing process dominates evolution

Individual - species
Brain stem, Rhinencephalon, Limbic system

Neural- /sensory system
Differentiation

Reproduction
Division

autotroph   DNA
PLANTS
Structural drawing

Blue algae
Guidance to   Problem solution

Para-auton. networks
not intended ecosystems

climate
etc

Low/High

Predecessor sensory cell and neuron

248 – 208 million years ago	The first small mammals and dinosaures appear.
208 – 65 million years ago	Age of the dinosaurs.
114 million years ago	Placentariens develop.
85 million years ago	The first primates develop.
65 million years ago	Dinosaurs die out. The number and variation of mammals increase.
35 million years ago	The first monkeys develop.
6 – 8 million years ago	Common ancestors of humans and African monkeys appear.
4.4 million years ago	First primates walk upright.
3.0 million years ago	The Australopithecines develop in the African steppe.
2.5 million years ago	First stone tools emerge – (found in Ethiopia, Kenya, Africa); they were used to cut up and off meat from an animal carcass and to remove the bone marrow from the bones; connection to *Homo habilis*.
1.8 million years ago	Hominides (*Homo erectus*) spread throughout Africa and Asia – the first great migration.
1.6 million years ago	Evidence of fire, probable fire-pits / fire places; connections with the African *Homo erectus*.
1.5 million years ago	Invention of the handax; connections with *Homo ergaster* – large stature, long limbs.
1.2 million years ago	Beginning of the enlargement of the brain in the *homo*-line.
1.0 million years ago	Hominides migrate as far as Europe.
800 000 years ago	Crude stone tools – found in Spain; connections with *Homo ergaster.*
600 000 – 400 000 years ago	Long spears carved of wood and early fire-pits / fire places; connections with *Homo heidelbergensis* found in Germany.
500 000 – 100 000 years ago	Period of fastest brain development in the *homo*-line.
200 000 – 30 000 years ago	Height of the Neanderthals in Europe and west Asia.
150 000 – 120 000 years ago	Common forefathers of all modern man (Africa).
100 000 – 50 000 years ago	Move out of Africa – second great migration („Out of Africa").
50 000 – 35 000 years ago	Emergence of several stone, bone and metal tools, highly developed fire places, elaborate art works; finds only for *Homo sapiens*, not for Neanderthals.
40 000 – 35 000 years ago	*Homo sapiens* (Cro-Magnon) reach Europe.
30 000 years ago	Neanderthals die out.

27 000 years ago   *Homo sapiens* settle the entire earth; all other Hominide-species have died out[1].

For the social sciences the analysis of socio-cultural evolution is central, but it is indicated, that this late evolution is grounded in the physical, chemical and biological evolution.

Biological human evolution proceeds at an extremely slow rate. This is why there has been no significant genetic change in humans since the neolithic revolution 7000 years ago[2]. Socio-cultural evolution[3] progresses more quickly and can, thus, change a society in a relatively short time.

The development of life can be based on the evolutionary theory laid down by Charles Darwin[4] in the 19th century. This approach was further developed by Neodarwinists. Evolutionary theory emphasises that evolution is constantly taking place, it is non-reversable and non-specific. It also points out that evolution occures at all levels of the world, especially in the living world. The theory of evolution explains the emergence and transformation of life with its individual variations[5].

The *Neodarwinistic Evolutionary Theory* includes the steps of mutation, selection and stabilisation. Phylogenetic evolution changes the organism and the species. This takes place by means of various mechanisms:

1. Mutation, by means of genetic variation, creates new characteristics;

2. Selection either eliminates these new characteristics or passes them on;

3. Stabilisation of the new characteristics is based on reproductive isolation, for example, geographical seclusion.

These factors, which are valid for all forms of life, also determine the development of mankind. The theory of evolution includes several sub-categories.

1. The *Inclusive Fitness Theory*, which goes back to Hamilton[6], states that altruististic actions can be explained by the fact that related genes are supported if the altruististic actions apply to blood relations or if the chances of survival are increased. In addition, the *Theory of Reciprocal Altruism* shows that it is advanta-

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[1] Buss, David M., Evolutionдге Psychologie (English: Evolutionary Psychology), 2nd Ed.., Мьnchen 2004, p. 47-48

[2] Smith, John Maynard, The Theory of Evolution, 7th Ed., Cambridge 2000, p. 330

[3] Runkel, Gunter, The Theory of Socio-Cultural Evolution, in: International Council for Scientific Development. International Academy of Science H&E (Ed.), Science without Borders, Volume 2, Innsbruck 2006

[4] Darwin, Charles, The Origin of Species, Harmondsworth 1968 (Original 1859)

[5] Keller, Evelyn Fox, The Century of the Gene, Cambridge, Mass. and London 2000

[6] Hamilton, William D., The genetical evolution of social behaviour, Vol. I and II, Journal of Theoretical Biology, 7, 1964, p. 1-52

geous for self-oriented creatures to cooperate, if the other player cooperates also[1].

2. For the evolution of a living being, thus, also for humans, the *Theory of Sexual Selection* is meaningful. Evolution is influenced by the advantages of mating: potential rivals try to outdo one another, are then chosen more often by the members of the opposite sex and are, as a result, in possession of greater mating chances in comparison with their contenders. Only successful mating will produce offspring, which has to survive in a changeable and unpredictable environment.

The choice of a particular male partner by women and the reverse is sexual selection among humans. Fundamental differences exist between the strategies of partner choice among women and among men. It is also improbable that both men and women "experience the same sexuality – unless the cultural program deforms their experience"[2].

The development of sexuality is a part of the evolution of mankind.

Sexual reproduction is superior to asexual reproduction because each parent can care for the offspring, increasing the potential variation in the population[3] and making it possible to build new genotypes with greaty rapitidity[4]. The human species, like other mamals, has developed the ability to create male-female bonds.

Rivalry dominates among the members of a population, especially conserning mating partners. Here the goal is to be more present in the next generation as the other[5]. This genetically fixed program still determines sexual behaviour (courtship, partner searches, etc.)[6], even when the program is superimposed, caused by the development of new cultural factors in modern society.

Modern evolutionary theory discusses whether the acquired characteristics can be passed on. This can be misunderstood as "Lamarckism"[7]. However, it is increasingly the discussion that changes in the environment and learning processes can be based on a transformation in the DNA of germ cells. After these changes

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[1] Axelrod, Robert, The Evolution of Cooperation, New York 1984

[2] Luhmann, Niklas, Wahrnehmung und Kommunikation sexueller Interessen (English: Perception and Communication of Sexual Interests), in: Rolf Gindorf und Erwin J. Haeberle (Ed.), Sexualitдten in unserer Gesellschaft (English: Sexualities in Our Society), Berlin/New York 1989, pp. 132

[3] Smith, John Maynard, The Theory of Evolution, 7th Ed., Cambridge 2000, pp. 200 Dagg, Joachim L. Could sex be maintained through harmful males? OIKOS 112:1, 2006 Ibid, What is the evolutionary advantage of sexual reproduction?, upcoming

[4] Wilson, Edward O., Sociobiology, 25th Ed., Cambridge, Mass. and London 2000, p. 315

[5] Buss, David, Evolutionary Psychology, Boston, Mass. 1999, especially part 3

[6] Buss, David, The Evolution of Desire, New York 1994. Grammer, Karl, Signale der Liebe. Die biologischen Gesetze der Partnerschaft (English: Signals of Love. Biological Laws of Partnerships), Mьnchen 1995

[7] Jean Baptiste de Lamarck, (1774 - 1824) postulated in his book: Philosophie zoologique, Paris 1809 (English: Zoological Philosophy 1904) the thesis that evolution transfered physical changes of an individual via reproduction to the next generation.

are transformed into *nucleic acids* they can be passed on to the next generation[1].

The synthetic theory of Neodarwinism is often criticised by representatives of the systemic evolutionary theory[2]. They point out that the core point of evolution, especially for the development of higher life forms like humans, cannot only be effected through the mutative changes in given genes, but through the effect of feedback cycles. For this I use the term "*Systemic Evolution*".

Pyotr Kuzmich Anokhin described this transformation of individual elements in system entities[3] in 1935 long before Norbert Wiener and Ludwig von Bertalanfy. Anokhin founded the Russian school of System Theory. Here the "functional systems are dynamic, self-organizing and auto-regulating organizations whose activity is aimed at achieving adaptive results useful to the system and the organism as a whole"[4]. The use of the term *Systemic Evolution* has the advantage that it can be connected with social scientific Evolutionary Theory and System Theory. But System Theory also has to be connected with elements of the Action Theory, so that you can describe unintended effects of intended actions.

A connection between System and Action Theory is fruitful for sociology because one can combine structure and the rules of creating structure as values and norms, as orientation aids for one's actions. Actors' actions can produce systems, which then develop their own dynamic. On the other side of the coin, pre-existing systems present a framework for individual cost-performance ratio with subsequent actions.

Luhmann's System Theory and the Rational Choice Theory are based on different basic assumptions. While Luhmann's System Theory argues in a strongly constructive way, other theories like the Rational Choice Theory build on the assumption of a reality.

Social reality is the result of social constructions, which express themselves in things such as money and marriage, for example, although they are based on raw facts, such as, for example, earth and humans. The source of human knowledge is a result of interaction between the actors and the external world. Actors cannot

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[1] Smith, John Maynard, The Theory of Evolution, 7th Ed., Cambridge 2000, p. 80

[2] Schmidt, Ferdinand, Grundlagen der Theorie der kybernetischen Evolution (English: The Foundation of the Theory of cybernetic Evolution), in: Ferdinand Schmidt (Ed.), Neodarwinistische oder kybernetische Evolution?, 4th Ed., Heidelberg 1990

[3] Anokhin, Pyotr Kuzmich, Biology and neurophysiology of the conditioned reflex and its role in adaptive behavior. New York 1974

[4] Sudakov, Konstantin V. and Oleg S. Glazachev, Functional Systems Theory Development in Anokhin's Scientific School: Applied Aspects for Health Diagnostics and Health Recreation, in: International Council for Scientific Development. International Academy of Science H&E (Ed.), Science without Borders, Volume 2, Innsbruck 2006, p. 43. The term 'functional systems' is used differently by Sudakev und Glazachev than in the system theory of Niklas Luhmann, in which it means 'sub-systems of a society'.

recognise things as they are, but they can develop a schema, which serves to overcome the external structures and to secure the survival of the species. Human mental capacities are organised in such a way as to facilitate survival. It can be assumed that feedback processes take place between the 'ego' (the ' I ') and the 'world'[1].

The developmental process of humans is only then comprehensible when one perceives the acquisition process of individuals in an exchange with an already existing reality; in other words, when one comprehends human constructs of reality as realistic constructs. This does not mean that an ontological depiction theory of reality is correct; but rather, that consciousness and communication can only develop in an adjustment with an outer reality.

Humans interact with the external world. They make the external world manageable. In this way, it can be assumed that humans incorporate schemas from the external world into their inner worlds. This is called 'constructivistic realism'[2].

Humans are constructors in this social process, which they create by means of communication in particular. Because humans live in societal associations, they have always communicated with each other[3]. Communication relies on social fabrication, which means that communication is action. Societies are not made up of people, but of actions. Therefore, I, unlike Niklas Luhmann, do not regard communication as the basic element of social systems, but rather action[4].

The basic principles of *Systemic Evolutionary Theory* are the following:

1. Around 3.7 billion years ago evolution was central for the genesis of life.

2. With the increasingly further development of life, the continued effective factors of variation (mutation), selection and stabilisation along with systemic control mechanisms are appearing, which are identified by *feedback cycles* or *feedback loops*.

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[1] Searle, John R., Die Konstruktion der gesellschaftlichen Wirklichkeit (English: The Construction of Social Reality, Free Press), Reinbeck bei Hamburg 1997, p. 162

[2] Dux, G?nter, Historisch-genetische Theorie der Kultur (English: Historical-genetic Theory of Culture), Weilerswist 2000, pp.195

[3] The opposing thesis from Niklas Luhmann, that communication is improbable (among others in: Luhmann, Niklas, Die Gesellschaft der Gesellschaft (English: The Society of Society), Frankfurt am Main 1997, pp. 190) is founded on the idea that communication is only internal, without contact to the external world.

[4] Runkel, Gunter, Allgemeine Soziologie. Gesellschaftstheorie, Sozialstruktur und Semantik (English: General Sociology. Social Theory, Social Structure and Semantics), 2nd Ed. M?nchen, Wien 2005, p. 209. The lecture of David Schnaiter about the 'Perception of Social Structures as Para-Autonomous Actors' on the symposium 'Extended View and Sustainability' of the International Conference 'Environment : Survival and Sustainability', Nicosia 19th - 24th February works on this problem too.

3. Evolutionary theory builds elements of play theory with the dichotomy of chance and necessity into its conception[1].

4. Evolutionary theory can show that the human brain has grown over the last million years.

Diagram, Edward O. Wilson[2]
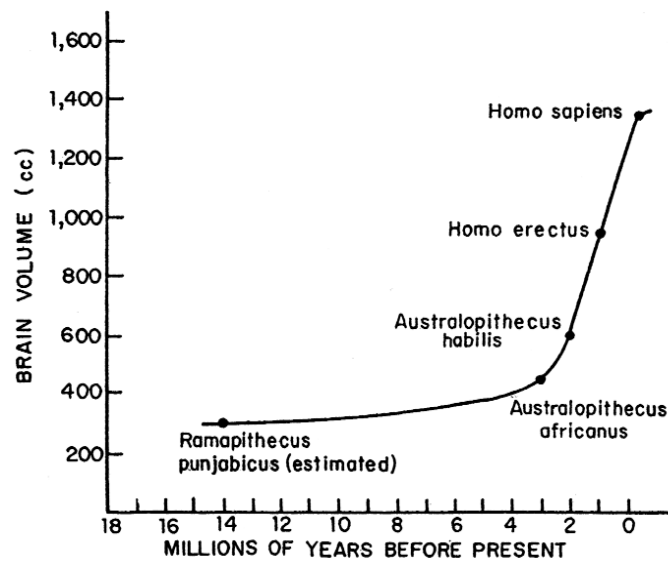
Figure 27-1. The icrease in brain siza during himan evolution (redrawn from Pilbeam, 1972).

Hence the development of the human mind, consciousness and self-awareness progresses forward.

5. There is a correspondence of the patterns of evolution and human thought[3], and patterns of nature become copied in the mind. This results from the continuity of evolution, which reaches from the evolution of the quantums and molecules to that of civilisations[4].

Evolution is effective on all levels of the real world.

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[1] Monod, Jacques, Chance and necessity: an essay on the natural philosophy of modern biology, New York 1972. Runkel, Gunter, Das Spiel in der Gesellschaft (English: Play and Game in Society), Mьnster 2003

[2] Wilson, Edward O., Sociobiology. The New Synthesis, 25th Ed., Cambridge, Mass. and London 2000, p. 548

[3] Riedl, Rupert, The System Theory of Evolution, see above, p. 12

[4] Riedl, Rupert, Biologie der Erkenntnis (English: Biology of Knowledge), M?nchen 1981, p. 12

The real world constructed of strata

Age of strata in years

10^{10} 10^9 10^8 10^6 10^3

10^2

10^{32}

10^{16} 10^{10}

10^8

10^4

10^2 10^{30}

10^{80}

Complexity of
representatives expressed by
number of quantums involved

Number of Representatives

Main Topics

(Cultures)
Civilizations
Men's Societies
Animal Societies, Groups
Individual, Human, Consciousness
Organs, Organic Animals, Instincts
Tissues, Tissue-Animals, Taxes
Cells, Protists, Phobia
Ultra-Structures, Protocells
Bio-Molecules
Molecules, Compounds
Atoms, Elements
Quantums
(Quarks)

Scientific disciplines
Involved

Cultural Sciences
Sociology
Psychology
Ecology
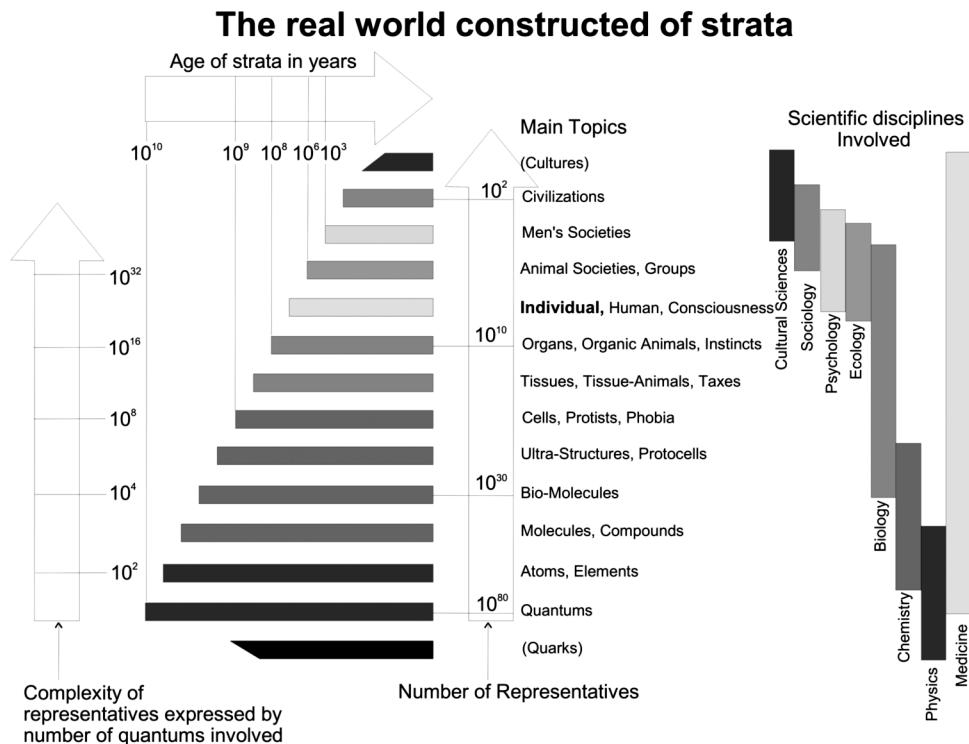Biology
Chemistry
Physics
Medicine

Diagram from Rupert Riedl[1]

From the demands of life follow:

1. Individual Fitness. Optimising the individual physical condition.

2. Ecological Fitness. Optimising the ecosystem and ecological adaption of the individual.

3. Reproductive Fitness. Optimising the reproduction and adaption in the gene pool.

4. Socio-cultural Fitness. Adaption in and changes of values and norms in society toward increasing the survival of mankind.

New elements of system theory, self-organisation and autopoiesis are being integrated into contemporary evolutionary and systemic theory. Autopoiesis is a made-up word and means self-making, self-creating and self-producing.

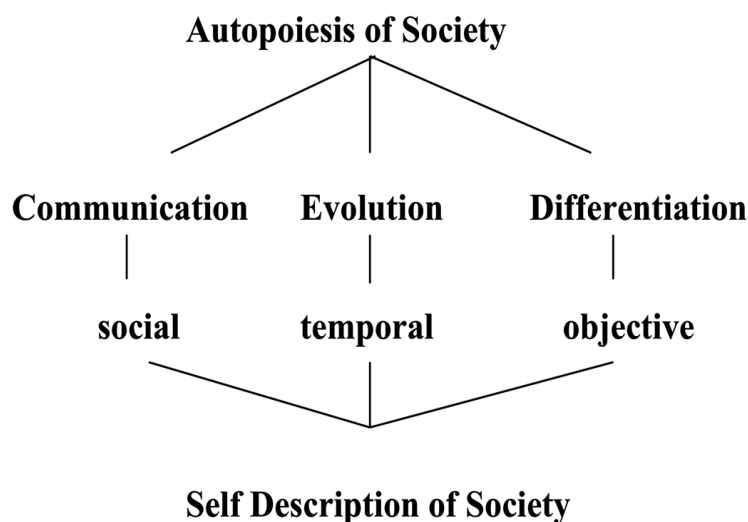Autopoietic means:

– self-referential,

– homeostatic,

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[1] Riedl, Rupert, Biologie der Erkenntnis, (English: Biology of Knowledge), M?nchen 1981, p. 210є I use this diagram in the slightly altered version from Walter Kofler.

– autonomous,

– structurally determined and

– operationally closed.

The autopoiesis concept posits a self-referential connection of self-organising processes. In system theory terms of self-organisation, self-reference and autopoiesis have gained more and more importance during the course of the theory's development[1]. System theory is constructed on the basis of difference between system and environment, while, at the same time, drifting away from a concept of an open system that maintains through selective direction from an exchange process with the environment. Niklas Luhmann uses the concept of 'autopoiesis' from the biologists Humberto Maturana and Fransisco J. Varela, which had been reserved for the analysis of living systems, and uses this as the basis for his new conception of system theory. According to Maturana and Varela living systems are made up according to their internal structural determinates[2]. If they are connate, irritations for a living system change the areas of possibility. In order for this to occur, a structural connection between the autopoietic system and its environment is necessary. Autopoiesis means self-reproduction on the basis of its own elements.

Behaviour in social systems can be divided into the dimensions objective, temporal and social. These dimensions each form the basis of another theory, which together make up Luhmann's newer System Theory.

Autopoiesis of Society

Communication	**Evolution**	**Differentiation**
social	temporal	objective

Self Description of Society

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[1] Luhmann, Niklas, Social Systems, Palo Alto 1995. Ibid., Theories of Distinction, Palo Alto 2002

[2] Maturana, Humberto R. and Fransisco J. Varela, Der Baum der Erkenntnis (English: The Tree of Knowledge), Munchen 1992

System-theoretical Evolutionary Theory[1] describes the differentiated species of various societies.

1. Archaic society is characterised by its *segmentary differentiation*.

2. Intermediary societies (high cultures) are characterised by their *stratified differentiation*.

3. Modern society is characterised by its *functional differentiation*.

Specific mechanisms for structural change have developed in evolution. Evolution transforms low probabilities of origin into high probabilities of maintenance. Variations of elements, selection of structures and restabilisation of systems are present in evolution. Furthermore, circular processes are going on, which are autopoietically arranged. Successful restabilisation then becomes the starting point for new variations. In this way, more and more improbable structures may emerge and complexity increases. This is unlikely how a society, such as a society of today, was created at the beginning of human development. Today, however, it is probable that society maintains even when a partial system collapses.

Systems must increasingly act according to self-referential considerations and factors, in order to be able to increase their complexity. Thus, the subsystems of society create consistency and unity within societies[2], that means, through differentiation.

Society is self-sufficient and the most enclosed social system: all possible interactions and communications are arranged between human beings; thus, p. e. in the field of politics, economy, law, science, education, intimate relationships, health, mass media, sports, art and religion. They maintain society with special system-environmental perspectives[3].

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[1] Luhmann, Niklas, Die Gesellschaft der Gesellschaft (English: The Society of Society), Frankfurt am Main 1997. Ibid, Sinn, Selbstreferenz und soziokulturelle Evolution (English: Mind, Self-Reference and Socio-Cultural Evolution) in: Burkart, Gunter und Gunter Runkel (Ed.), Luhmann und die Kulturtheorie (English: Luhmann and Culture Theory), Frankfurt am Main 2004

[2] Runkel, Gunter und Gunter Burkart (Ed.), Funktionssysteme der Gesellschaft: Beitruge zur Systemtheorie von Niklas Luhmann (English: Functional Systems of Society: Articles on the System Theory from Niklas Luhmann), Wiesbaden 2005

[3] Runkel, Gunter, Society and their Functional Systems in: International Conference on Environment: Survival and Sustainability, Abstracts, Nicosia 2007, p.781

◄FUTURE AS A RESULT OF EVOLUTION AND PLANNING

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In the following essay I will illustrate that future is always a result of evolution and planning.

Future

The utopia of the past (Thomas Moore, Tommaso Campanella, Claude-Henri de Saint-Simon, Charles Fourier, Robert Owen and others) enlightens the past future and throws an early view on the growing meaning of future.

Peoples and nations respectively weigh past, present and future differently. For this reason there was, for example, in post-war German history an oscillation of orientations between the past, present and future. The West Germans of the 1950s were busy with reconstruction and the economic miracle associated with reconstruction and were also occupied with creating a better life in that present time[1]. After reconstruction in the course of the Youth and Cultural Revolution of 1968 the focus changed to a utopian future that had to do with a classless society, antiauthoritative education and child rearing, orgiastic perpetual gratification and the elimination of all gender differences. As it became clear that this future was impossible to achieve, the prevailing discourse turned to the past, with special focus on the crimes of the National Socialists (Nazis).

Only recently a reality-based and forward-thinking discussion about the future of Germany has appeared in addition to the engagement with the past years from 1933 until 1945.

A look at past prognoses is wise when trying to illustrate the future. Prognoses are difficult because they refere to a condition or state which lies in the future. "The future cannot begin"[2]. The closest one can get to this phenomenon is

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[1] Runkel, Gunter, Past and Present Germany, Lecture at the Central Connecticut State University, in: Arbeitsbericht No. 204 of the Fachbereich fьr Wirtschafts- und Sozialwissenschaften of the University of Lueneburg, Lьneburg 1998

[2] Luhmann, Niclas, The Future Cannot Begin: Temporal Structures in Modern Society, in: Social Research, 43, 1976

when one views prognoses that were formulated in earlier times, previous years and then observed their realisation as a reminder for the present.

In the 1970s the demographer Paul Ehrlich predicted the starvation for half of humanity in the 1980s, the "Club of Rome"1972, famine with millions of deaths until the year 2000; other researchers predicted "forest death" when the forest withes away – non of which came to pass.

Therefore, one should be careful with prognoses and definitely base them on a solid foundation.

The growing importance of the meaning of *future* is a result of evolution. Systems are being adapted from past into future[1]. The future is increasingly not representative of a salvation, but rather of variation. Until the 16th century it was assumed that the old was better than the new and this view culminated in the attempts toward the recreation of the ancient forms, as in the Renaissance. Politics and religion continued to dismiss any innovations in the 16th century because they were seen as demonic. After the 16th century, in the course of rising optimism toward advancement, people tried to legitimise their opposition based on religion. God does not show himself directly or offer signs, his 'invisible hand'[2] does not gradually create the world, but rather, it is little by little that these advancements arise, for example, both Americas, the printing press and the artillery[3].

The general outbreak of the engagement with the past into that with the future occurred in the 18th century. The printing press strengthened the orientation toward the future with its temporalisation of utopias and made communication about a pre-conceived future possible.

The tempo of evolution increases in modern society because the mechanisms of variation, selection and stablisation are institutionalised independently from one another. The time horizons of past and future separate and the respective possiblities of the present are simulated, which, if even possible, can be realised in the future. The new receives a worth itself and is viewed as an ultimate chance and not as a danger.

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[1] Kosselleck, Reinhart, Vergangene Zukunft. Zur Semantik geschichtlicher Zeiten (English: Past Future – On the Semantic of Historical Times), Frankfurt am Main, 1997.

Runkel, Gunter, Evolution, Planung und Zukunft (English: Evolution, Planning and Future), in: Bouncken, Ricarda and Thorsten Jochims (Ed.), Steuerung versus Emergenz. Entwicklung und Wachstum von Unternehmen (English: Control versus Emergence. Developement and Grown of Coampanies), Festschrift fьr Egbert Kahle, 2007.

[2] The invisible hand of the market from Adam Smith was originally the invisible hand of God. See Ottow, Raimund, Modelle der unsichtbaren Hand vor Adam Smith (English: Models of the invisible hand before Adam Smith), in: Leviathan, Issue 19, 1991

[3] Luhmann, Niklas, Die Gesellschaft der Gesellschaft (English: The Society of Society), Frankfurt am Main 1997, p. 420.

Modern society transforms time conception and the past is divided into eras. The present should develop improvements, although this is then either greeted as a novelty or rejected as a deviation[1]. This leads to new presents creating their own suitable pasts and futures. Each present constructs a new unknown future and this guaranties that the world stays open for innovations[2].

Society oscillates between positively and negatively assessed operations and between self-reference and foreign-reference and is confronted with an uncertain future. Social Functional Systems[3] put themselves in the state of self-created uncertainty and align themselves with an unknown future by the use of communication media, like money, power, love, commitment etc.

Future has to do with a virtual reality whose chances of being realised are unclear. Future remains evolutionarily indefinite and unpredictable even if trends and developments can be anticipated, and an attempt is made to make the future's certainty a present reality.
Future is based on evolution and is founded on the 'auto- formation of life'[4]

Evolution

Evolution can be summed up as a process of variation, selection and stabilisation. An evolutionary theory inspects structural modification as a result of differentiation. In social development higher system complexities have been achieved and stabilised, and from there can be further processed. Here, not only material, but also cultural factors have an effect on the social developmental surges and open up new possibilities by differentiation and recombination of evolutionary mechanisms. Thus, evolutions can begin with a material change of social systems and, therefore, their *structure* or, in idea evolution, with the relevant *semantic*[5].

Reflexivity through the means of speech having become institutionalised in the process of development from animal to human being, this became a continual theme of variation. At this stage speech became a fundamental evolutionary univer-

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[1] Luhmann, Niklas, Die Behandlung von Irritationen: Abweichung oder Neuheit? (English: The Treatement of Irritations: Deviation or Innovation?), in: ibid, Gesellschaftstruktur und Semantik (English: Social Structure and Semantic), Vol. 4, Frankfurt am Main 1995, p. 63.

[2] Luhmann, Niklas, Die Gesellschaft der Gesellschaft , Frankfurt am Main 1997, p. 1007.

[3] Runkel, Gunter and G?nter Burkart (Ed.), Funktionssysteme der Gesellschaft. Beitr?ge zur Systemtheorie von Niklas Luhmann (English: Functional Systems of Society: Articles on the System Theory from Niklas Luhmann), Wiesbaden 200.

[4] Kofler, Walter, David Schnaiter and Ronald Weinberger, Non- local Realism and Evolution up to Human Health, in: International Academy of Science, H&E (Ed.), Natural Cataclysms and Global Problems of the Modern Civilization, Baku. Innsbruck 2007.

[5] See the subtitle of my book: Allgemeine Soziologie. Gesellschaftstheorie, Sozialstruktur und Semantik (English: General Sociology. Societal Theory, Social Structure and Semantics), 2nd Edition, Munich. Vienna 2005 .

sal, without which there could be no human society. Selection followed in the course of evolution by means of universals developed by society with new means of interaction, which made possible a reduction of complexity for processes relevant to society. Stabilisation is achieved through system differentiation. A partial differentiation took place in the archaic stage. In the early advanced civilisations a vertical stratum evolved with stratified differentiation of society, replacing the former equality of rank. The next evolutionary stage saw a functional differentiation of society accompanied by the related assertion of universal norms.

The evolutionary process is based on the emergence of the world and the resulting development of human beings.

Modern evolutionary theory discusses whether the acquired characteristics can be passed on. This can be misunderstood as "Lamarckism"[1]. However, it is increasingly the discussion that changes in the environment and learning processes can be based on a transformation in the DNA of germ cells. After these changes are transformed into *nucleic acids* they can be passed on to the next generation[2].

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[1] Jean Baptiste de Lamarck, (1774 - 1824) postulated in his book: Philosophie zoologique, Paris 1809 (English: Zoological Philosophy 1904) the thesis that evolution transfered physical changes of an individual via reproduction to the next generation.

[2] Smith, John Maynard, The Theory of Evolution, 7th Ed., Cambridge 2000, p. 80.

[3] Schmidt, Ferdinand, Grundlagen der Theorie der kybernetischen Evolution (English: The Foundation of the Theory of Cybernetic Evolution), in: Ferdinand Schmidt (Ed.), Neodarwinistische oder kybernetische Evolution?, 4th Ed., Heidelberg 1990.

[4] Anokhin, Pyotr Kuzmich, Biology and neurophysiology of the conditioned reflex and its role in adaptive behavior. New York 1974.

[5] Sudakov, Konstantin V. and Oleg S. Glazachev, Functional Systems Theory Development in Anokhin's Scientific School: Applied Aspects for Health Diagnostics and Health Recreation, in: International Council for Scientific Development. International Academy of Science H&E (Ed.), Science without Borders, Volume 2, Innsbruck 2006, p. 43.

The term 'functional systems' is used differently by Sudakov und Glazachev than in the system theory of Niklas Luhmann, in which it means "sub-systems of a society".

tage that it can be connected with social scientific Evolutionary Theory and System Theory. But System Theory also has to be connected with elements of the Action Theory, so that you can describe unintended effects of intended actions.

A connection between System and Action Theory is fruitful for sociology because one can combine structure and the rules of creating structure as values and norms, as orientation aids for one's actions. Actors' actions can produce systems, which then develop their own dynamic. On the other side of the coin, pre-existing systems present a framework for individual cost-performance ratio with subsequent actions.

Social reality is the result of social constructions, which express themselves in things such as money and marriage, for example, although they are based on raw facts, such as, for example, earth and humans. The source of human knowledge is a result of interaction between the actors and the external world. Actors cannot recognise things as they are, but they can develop a schema, which serves to overcome the external structures and to secure the survival of the species. Human mental capacities are organised in such a way as to facilitate survival. It can be assumed that feedback processes take place between the "ego" (the "I") and the "world"[1].

The developmental process of humans is only then comprehensible when one perceives the acquisition process of individuals in an exchange with an already existing reality; in other words, when one comprehends human constructs of reality as realistic constructs. This does not mean that an ontological depiction theory of reality is correct; but rather, that consciousness and communication can only develop in an adjustment with an outer reality.

Humans interact with the external world. They make the external world manageable. In this way, it can be assumed that humans incorporate schemas from the external world into their inner worlds. This is called "constructivistic realism"[2].

Humans are constructors in this social process, which they create by means of communication in particular. Because humans live in societal associations, they have always communicated with each other[3]. Communication relies on social fabrication, which means that communication is action. Societies are not made up of

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[1] Searle, John R., Die Konstruktion der gesellschaftlichen Wirklichkeit (English: The Construction of Social Reality, Free Press), Reinbeck bei Hamburg 1997, p. 162.

[2] Dux, Gunter, Historisch-genetische Theorie der Kultur (English: Historical-genetic Theory of Culture), Weilerswist 2000, pp.195.

[3] The opposing thesis from Niklas Luhmann, that communication is improbable (among others in: Luhmann, Niklas, Die Gesellschaft der Gesellschaft (English: The Society of Society), Frankfurt am Main 1997, pp. 190) is founded on the idea that communication is only internal, without contact to the external world.

[4] Runkel, Gunter, Allgemeine Soziologie. Gesellschaftstheorie, Sozialstruktur und Semantik (English: General Sociology. Social Theory, Social Structure and Semantics), 2nd Ed. Mьnchen, Wien 2005, p. 209. The lecture of David Schnaiter about the "Perception of Social Structures as Para-Autonomous Actors" on the symposium "Extended View and Sustainability" of the International Conference "Environment : Survival and Sustainability", Nicosia 19th - 24th February works on this problem too.

people, but of actions. Therefore, I, unlike Niklas Luhmann, do not regard communication as the basic element of social systems, but rather action[4].

The basic principles of *Systemic Evolutionary Theory* are the following:

1. Around 3.7 billion years ago evolution was central for the genesis of life.

2. With the increasingly further development of life, the continued effective factors of variation (mutation), selection and stabilisation along with systemic control mechanisms are appearing, which are identified by *feedback cycles* or *feedback loops*.

3. Evolutionary theory builds elements of play theory with the dichotomy of chance and necessity into its conception[1].

4. Evolutionary theory can show that the human brain has grown over the last million years.

Hence the development of the human mind, consciousness and self-awareness progresses forward.

5. There is a correspondence of the patterns of evolution and human thought[2], and patterns of nature become copied in the mind. This results from the continuity of evolution, which reaches from the evolution of the quantums and molecules to that of civilisations[3].

Evolution is effective on all levels of the real world.

In my article "*The Theory of Socio-Cultural Evolution*"[4] I examine the societal and cultural transition in society from its beginning until the present and look at the growing meaning of the standpoint toward the future, laying down the foundation for a sociological evolutionary theory.

Along with the steps of variation, for example, mutation, selection and stabilisation, evolution is also determined by the development of humans. Human beings are interwoven with the developmental process. They are self-referential systems. Within a body, which is divided by physical boundaries, there exists a dynamic system that is self-regulating. Internal processes regulate the metabolic process with the outer world.

Planning

It is often attempted to realise the future by planning it. However, instructions for actions are only sensible in respective functional systems.

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[1] Monod, Jacques, Chance and necessity: An Essay on the Natural Philosophy of Modern Biology, New York 1972. Runkel, Gunter, Das Spiel in der Gesellschaft (English: Play and Game in Society), Manster 2003.

[2] Riedl, Rupert, The System Theory of Evolution, in: Ferdinand Schmidt (Ed.), Neodarwinistische oder kybernetische Evolution?, 4th Ed., Heidelberg 1990.

[3] Riedl, Rupert, Biologie der Erkenntnis (English: Biology of Knowledge), Mьnchen 1981, p. 12.

[4] Runkel, Gunter, The Theory of the Socio-Cultural Evolution, in: International Council for Scientific Development, International Academy of Science (Ed.), Science without Borders, Vol. 2, Innsbruck 2005/2006.

The Planning Theory considers structural changes and an intentional anticipation of the future. These intentions often encompass deviations from the routine. Planning cannot be determined as the structure of system changes and, in this respect, planning is a result of evolution. Because the future is not determinate, one must underlie the evolutionary theory with the problems which come out of the principle unpredictability in evolution and not with a causal schema.

Therefore, one postulates the foundation for planning and decision theory as only limited rationality and attempts to get by with a mitigation of requirements for reason.

Planning and control lead to a limitation in the capacity of dealing with changes in respective areas, or organisations, and, therefore, advantages of enhancement are diminished.

When something functions, this is misunderstood as a result of planning (for instance the football game of the Champion-League-Winners); when something does not function as well as before (for instance the education system in Germany), it is understood as a result of too much or too little planning or modified conditions that are constantly changing.

When one comprehends 'Future as a Result of Evolution and Planning', one can recognise that one can have an influence on the future without falling for a determinate of planning.

Society can not plan its own future; it is dependent on evolution. In other words, it is not planning reason that decides the future, but evolution. Planning and Utopia can be vanishing points in an uncertain future.

An equitable evolutionary theory does not lead to reticence in all practical questions, but rather, one can be more considerate in what actions to take.

Unanticipated Consequences of Intentional Actions

This leads to an old topic in sociology: 'The unanticipated consequences of intentional actions'[1], which can be studied in different scientific areas; thus, for example, the contrary effects in developmental aid, in German school reform or in the creation of terrorists by the Iraq war.

Evolution occurs principally openly, so that one cannot determine it through planning, but only influence it, although the intended results do not always arise.

In society, with its collective and individual actors and societal structures,

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[1] Max Webers thesis of unintentional arise of modern capitalism from the conversion of religion to calvinistic religion in some regions of Europe, Weber, Max, Gesammelte Aufsutze zur Religionssoziologie (English: Collected Essays on Religion Sociology), Tubingen 1920/21

Merton, Robert K., The Unanticipated Consequences of Purposive Social Action, in: American Sociological Review, Vol. 1, 1936.

aspired goals are often not achieved because the explanation of action is referential, on the one hand, to the actor, the "logic of the situation" and, on the other hand, to the societal structures and action situations[1]. The situation includes not only the objective attitude of the actor but also the interpretation of the situation, which can be divergent. Differences between "logic of the situation" and "situation analysis" can cause failure and the opposite of the projected result of actions and intentions. In both areas rationality and congruence are difficult.

An important task of social science lies in analysing the unintended results of intentional human actions.

An illustration of non-intended results can be found in a word from the most significant German speaking poet Johann Wolfgang von Goethe who, through the figure of Faust, asks the devil:

"Who art thou, then?"

And he answered under the name of Mephistopheles:

"Part of that Power, not understood,
which always wills the Bad, and always works the Good"[2].

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[1] Schmid, Michael, Rationaliatsprinzip und Hanglungserklarung (English: Rationality Priciple and Action Explanation), in: Lenk, Hans (Ed.), Hanglungstheorien interdiziplinur II (English: Interdiciplinary Action Theory II), 2nd sub volume, Munich 1979, pp. 494.

[2] Goethe, Johann Wolfgang von, Faust, part 1, in: Goethe Werke (English: Goethe's Works), 3rd Ed., Frankfurt am Main 1965, p. 43 (English: Translation from Bayard Taylor, see http://www.gutenberg.org/files/14591/14591-h/14591-h.htm).

◄ GEOPOLITICS OF THE CAUCASUS
AND THE BAKU-TBILISI-CEYHAN PIPELINE

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May 25, 2005 40 kilometers from the Azerbaijani capital Baku at the terminal "Sangachal" technical began filling oil export pipeline Baku-Tbilisi-Ceyhan (BTC). At the opening ceremony of the pipeline was attended by the presidents of Azerbaijan, Turkey, Georgia, Kazakhstan, as well as senior representatives of the U.S., UK, heads of oil companies in the international consortium (AIOK), has been developing oil fields Azeri shelf and is the operator of the BTC. The Russian representative in activities shall not take part.

The total length of the pipeline, which paved the territory of the three countries is 1770 kilometers. Construction of the BTC cost of 3.6 billion dollars, and together with interest on loans to its cost to date has exceeded 4 billion dollars. The length of the Azerbaijani section – 443 kilometers, the value – 1 billion 50 million dollars, Georgian – 250 kilometers, the value – 1 billion 50 million dollars. The length of a Turkish plot was 1077 kilometers, the value – 1.5 billion dollars.

The term of the pipeline, capacity of which 1 million barrels a day, 20 years. It is anticipated that the maximum power pipeline would go through four years of profit, according to the BP-Azerbaijan president David Woodward, the BTC will bring in 2013-2014 he worked.

In AIOC British company British Petroleum with a 30.1% – but shares took a leading position. Together with the consortium includes BP State Oil Company of Azerbaijan (SOCAR – 25%) as well as the company Amerada Hess – 2,36%, Conoco Phillips – 2,5%, Eni – 5%, Inpex – 2,5%, Itochu — 3,4%, Statoil – 8,71%,, Total – 5%, Unocal – 8,9% and Turkish TPAO – 6,53%. At the state level in the project brought together the U.S., Azerbaijan, Turkey, Britain, Norway, Italy, France and Japan. Washington to demonstrate the strategic importance of the project even introduced a special adviser to the administration office on the Caspian region.

The decision to build an oil pipeline was adopted 10 years ago but delayed because of low oil prices that have been doing economically unprofitable project, environmentalists protest, as well as for security reasons: because the pipeline passes through the region, which has not yet been resolved and the Karabakh conflict Standoff in Georgia. Regarding the Turkish section, he laid in the zone of active militants of Kurdistan Workers' Party, which is also worried and continues to alarm investors in the project. Do not give optimism and reports that Azerbaijani oil reserves in the Caspian shelf is not so much as previously thought.

However, the strategic significance of the pipeline was, first and foremost political aspect. In Baku today are increasingly saying: "Which side is transported oil, and there is a policy". The implementation of the project not only allows the transfer Caspian oil to the West, bypassing Russia, but also, importantly, reduce energy-dependence U.S. and Western Europe of Russian oil pipes and the Middle East region. Washington managed to convince foreign investors to invest in this project.

Uploading the oil in the pipe started with a deposit "Azeri-Chirag-Guneshli" in the Caspian Sea. The process of gradual and will take more than half a year. Just to fill the pipeline would require 10 million barrels of oil.

No less active participants in the consortium, primarily the U.S., the security problem is solved and the BTC and related infrastructure. Washington intends to spend more than a hundred million dollars under the program Caspian Guard (Protection of the Caspian Sea) for the establishment of special forces in the Caspian Sea region to protect the pipeline and all its related facilities. Education Georgian special forces instructors from the U.S. suggests its use in the protection of the pipeline.

Developments in the situation in Transcaucasia said that the issue of providing security allows BTC to talk not only about political, but also on the military significance of the project. From a geopolitical point of view it is clear that the BTC, despite the economic costs, is an ideal tool for the realization by Washington of its new concept of military-political security and protect its interests in the post-Soviet space. In this sense, protection of vital transportation routes for U.S. energy a strong and legally justifiable excuse for increasing military strength in the territory of South Caucasus and Central Asia. The more so that the governing document will be signed by the United States, Turkey, Georgia and Azerbaijan Baku Declaration, in which the present military-political component. This military presence will be a good tool and leverage for change of power in the region and to create there if necessary so-called democratic regimes.

In Azerbaijan the pipeline laid in the immediate vicinity of the famous complex Kobustan where preserved rock inscriptions relating to prehistory. This place, which in its time Tour visited Heyerdal. Proof of the validity of alarm environmen-

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talists and became an address at the end of May group of Azerbaijani non-governmental organizations, who said that the construction of the BTC was accompanied by violations of the rights of the population and led to serious environmental problems. The authors of monitoring the construction of the BTC allege that will seek solutions to all problems related to the pipeline, and are ready to appeal to this end to the European Court of Human Rights.

The flow of petro-dollar actually can be a problem in terms of its reasonable use. Indeed, Azerbaijan's total revenue in 2030 is estimated at 160 billion dollars. An impressive figure, if it is considered that this year's state budget revenues are expected at the level of 2 billion dollars. Will Azerbaijan be able to establish whether the maximum transparency movement of huge sums of petro-dollar? After all, it's just a case of spending money more difficult than to earn.

Today, globalization is declared major, irreversible and almost the only system-reforming trend in world politics. It is believed that it is based on objective laws of economic, technological and communication as well as socio-political and socio-cultural development of the world. Many assume that all countries and regions, sooner or later will be forced to join a post-unitary "standard", and eventually it will become a contributor to the formation of a united and harmonious world.

The issues of globalization trends are hampered by a reflection on the involvement in this process is relatively new countries and regional inter-state association, established in Central Eurasia. Features of their geographical location, socio-economic and domestic political development as well as the level of maturity of relations with neighboring powers raise several issues relating to their place and role in global processes. In this work as the object of assessing the post-Soviet Caucasus chosen, by the example which we will try to show how strong tradition of classical Eurasian geopolitics in the turbulent era of globalization.

The geopolitical relations in the Caucasus is directly linked to the highest in the region of Eurasia that prejudge the activity of Eurasian centers of power and influence in shaping the contours of historical friendly / ethno-political hostility between units of the Caucasus. As noted by S. Kornel: "Strategic freezing, concentrated in the Caucasus, can not be fully realized without assessing its role in the broader strategic freeze on the scale of Eurasia"[7].

The warring Eurasian powers for control of the Caucasus occurred in the absence of the region consolidating internal forces, in the presence of ethnic and religious diversity, fragmentation, permanent strife, which visibly weakened region, thereby expanding the opportunities for external influence, because, in the words of Robert Veyrinena, fragmented and heterogeneous regions remain at the mercy of external geopolitical interests[8].

Periodic worsening struggle between the powers "outside the traditional tri-

angle" (Russia, Turkey and Iran) for dominance over the Caucasus reflect the current balance of power between them, and with it affect the degree of stability within the region. In post-Soviet geopolitical rivalries continued to be a key determinant of regional political relations. The most frequently used means in this war remain the cultural and ideological propaganda, election (partial) military and economic support, involvement on their side and creating a de facto alliances with one against the other, manipulation of ethnic separatism.

In the post-Soviet period could have been talking not only about preserving the traditional attributes, characterized peremptory Caucasus in the geopolitics of Eurasia, but to supplement them with new ones, no less stimulating activity greatly interested geopolitical actors. Highlight attributes such easy-stimulators.

Thus, communication Caucasus should be evaluated on the basis of two fundamental aspects: a) geo-economic and b) the geopolitical. Of course, they are inextricably linked, even the question of what kind of them is more a priority, not legality. It is close geopolitical and geoeconomic interlocking components determines the general nature of the ongoing inter-state relations in the Eurasian space.

Geo-economic aspect of the problem is related primarily to the already partially affected by the energy potential of the Caspian Sea and Central Asia. The existence of large stockpiles of highly energy efficient system updates the establishment of communications for the transportation of hydrocarbons to world markets.

In the Caucasus, already projects to build multiple pipeline system. Note that considered several lines of the main pipeline. The first of these (northern) route consisted of Baku–Novorossiysk. The second (west) provides for laying a pipeline on the route Baku–Tbilisi–Ceyhan, and proved the most acceptable.

The decision to establish a system of pipelines that pass through the Caucasus, initially concerned transporting Azerbaijani oil. Since 1994, Azerbaijan has concluded with foreign corporations a number of agreements on the exploitation of its oil fields in the Caspian. Connecting to the system oil-gas pipelines Central Asia, including through the Trans-laying a pipeline to cope with the delivery of hydrocarbons to world markets. Consequently, it is not difficult to determine that one of the biggest challenges of Atlantic powers in post-Soviet Central Eurasia has been the prevention of monopoly control by external any regional forces here over the emerging system of oil and gas pipelines. As noted by S. Kornel, "oil pipeline via Turkey was actively supported by the U.S. administration, as well as leaders of Azerbaijan, Georgia, Turkey, Kazakhstan and Uzbekistan. This stems from the fact that these states for the pipeline, not passing either through Iran or through the territory of Russia, provides a vital link with the western world, while avoiding situations depending on these two allies.

Based on the number of unique features, including geographical, most of all to the role of such a regional force suited Russia, and this is reflected in its attempt

to oppose the adoption of the western route as the main lines of transportation of Azerbaijani energy supplies. As writes A. Utkin, "disputed American and Russian firms, eventually the U.S. and Russia, becomes the way the transportation of oil. We are talking about huge material values and on the degree of control over the Caspian republics of Russia".

In the long run, Trans-communication (including oil and gas), passing through the Caucasus to the Black Sea, remain the most acceptable, primarily for themselves the countries of Central Asia and the Caucasus, Central. Eurasian communications system connecting the western industrialized countries experiencing difficult stages of its economic development in Central Eurasia States, will create opportunities for cooperation not only in energy but, without doubt, in other equally important economic, and subsequently also socio-cultural fields. As noted by A. Nursha, "exactly as an attempt to overcome their isolation should be considered participation of Central Asian and Caucasus in the various transport communication projects, including the creation of transcontinental road and rail, and sea lanes, which connect the Caspian Sea coast. Realization of such projects will allow these countries to compensate for disadvantage geopolitical situation and engage more actively in the global economy. Their desire to support the integration of major geopolitical centers who wish to gain access to the region and control of transcontinental traffic. " Only the establishment of the communications system in accordance with the basic line of the West–East, passing through the Caucasus, can contribute to these goals. "Dozens of transnational corporations, statement of oil and gas industry, investing huge investment into the region, and rapidly expanding transport and communication network, encourage the European Union to establish a transport corridor East–West, promises to strengthen ties between countries Caspian region and the outside world"[20].

Communication potential inherent in the Caucasus and pronounced classical geopolitical characteristics. You will notice the role of the region in the geopolitical relationship, defining the relevant situation in Eurasia.

The importance of communications in geopolitics. An effective system of linkages have been throughout history a prerequisite for the viability of interstate geopolitical alliances and blocs. Your primary interest is paid to Atlantic powers traditionally maritime communications, and as a consequence, they established an effective system of communication within the Atlantic bloc, as well as substantial control over external maritime communications were a key factor in the triumph of the Atlantic bloc during the Cold War.

One of the major geopolitical consequences of the collapse of the USSR was that the arena of geopolitical rivalry has shifted from a global scale within the framework of the Eurasian continent. However, despite the change in scale confrontation, the general geopolitical nature of the last to the end of the cold war has

not changed fundamentally. Started trying to build new geopolitical blocks on the site of the former Continental giant. In the post-Soviet period of one of the most popular among the Russian establishment was a so-called "Primakov Doctrine" (1996) to establish a strategic triangle "Moscow–Beijing–Tehran", whose goal as Z. Brzezinski writes, was "to bring together leading Slavic state in the world, most bellicose Islamic state in the world and the largest in the world population and strong Asian States, thus creating a powerful coalition of"[22]. But most seemed realistic model that presupposes as its geopolitical framework blocking between Russia, Iran and Armenia. S. Kornel, describing vectors Eurasian geopolitical block in the post-Soviet period, passing through the Caucasus, said the existence of two opposing axes. The first of them – about North – South, made the above three countries, second – about the West–East, "…starting with the United States, passing through Turkey and Georgia, Azerbaijan, with the expansion to Uzbekistan in Central Asia"[23].

Historical relationships, common regional opponents, the impressive foundation for mutually beneficial cooperation in the military, political and economic spheres – all of this, of course, extremely important factors contributing to freeze Russia, Iran and Armenia. The activity of Russia and Iran as the main power centers and connecting with the projected functions of Armenia, from the end of the cold war (with the exception of a slight period of stay in power in Russia liberal politicians in early 1990 – ies) was aimed at preventing the Atlantic momentum and stimulate appropriate continental alternatives. According to A. Dugina, the formation of geopolitical alliance between Russia, Iran and Armenia is a necessary element for the development and spread of Eurasian (continental) impuls[24].

The new geopolitical situation entailed the spread of influence of the Atlantic bloc to inner regions of Eurasia and, most importantly, exercise effective control over land communications linking these regions. As noted by A. Nursha, "if during the cold war" forces Sushi "and" Sea of force "collaborated in the coastal sectors of Eurasia, after the collapse of the USSR" zone of interaction "come closer to the southern borders of Russia. Henceforth, geopolitical rivalries leading centres unfolding not for control of the coastal belt areas, and over the strategically important inland spaces Eurasia"[27].

The last two geo-strategic options being considered Z. Brzezinski, began to be implemented in a mutually supportive manner that, of course, presupposes the development of the Eurasian continental two-vectors momentum to the prospects of consolidation within the CIS and the accession of other Eurasian geopolitical points and actors. In any case, as the continental blocking geopolitical activity in order to control the peremptory Eurasian space was increased.

Today is not a secret that the successful involvement of the state in the processes of globalization is impossible without a sufficient level of openness to

the outside world. The same could be attributed to the regions. With reference to openness primarily comes to mind geopolitical aspect of the state. How would the country (region) or tried to open peace, it can not integrate into the commercial and financial, communications, socio-cultural and other areas at the international level, if the "closed" geopolitically.

With all the desire of supporters of globalization to provide modern world as Managed economies, it is difficult to ignore the fact that such a picture, at least not be "applied" to all countries and regions. Of course, modern geopolitics is very different from that which saw Makkinder, Mehen and Spaykmen. However, it is far from being abrogate fundamental parameters such as territory, the geographical environment, land and sea communications – all this continues to have significant, and in some cases determining the degree of influence and shape the involvement of the State (region) in the processes globalization.

The impact of global trends on the overall development of post-Soviet world vectors leaves fewer opportunities easily circumvent them. The unprecedented integration of economic, technological, communications, environmental, socio-cultural and other areas of the planet, called "globalization", requires a departure from traditional forms and methods of interstate cooperation. However, perhaps it is natural for unevenly globalizing world, the trend towards departure from the classic forms of geopolitics manifested in different States and in different regions to varying degrees.

Central Eurasia and its surroundings was difficult among the earliest regions to succeeding in redefining the traditional geopolitical paradigm. Moreover, the practice of post-Soviet geopolitics in Central Eurasia indicate the contrary, as was said, inter alia, an analysis of geopolitical processes in the post-Soviet Caucasus. Accept that even today, after more than 15 years with the "end of history", to explain the processes running in the Caucasus on the basis of theoretical perspectives globalistskoy much more difficult than in terms of the paradigm of political realism and the principles of classical geopolitics. The region continues to operate with the clear dominance of military and political factors. Trends institutionalizing military-political sphere have occurred, but they are not in themselves integrated, but rather sharing the regional actors and adjacent quality: the desire to create a single institutional mechanism of collective security is clearly inferior to already running processes of forming alliances and contra-alliances. The economy, development of which would, according to the logic of globalization to dominate the traditional spheres of relations, plays mainly a subordinate role. The strategy of economic security is built not on the liberal principles that characterize globalization, and on customary mercantilism.

Despite its rhetoric of globalization, Central Eurasia is still something of a polygon geopolitical confrontation between the mainland and the Atlantic trends.

Implemented "painfully familiar" tools – starting with the "divide et impera" to the propaganda of the cold war. Russia and Iran almost peremptory bring everything that makes the United States in Afghanistan and Iraq, in the same classical-geopolitical shades, as the West presents a policy against Russia separatist groups on the Central Caucasus, "gas" pressure on Ukraine and Georgia, buying for debts Armenia's industrial capacity, etc. In such a scenario, the fate of countries and regions, geography, which favours the realization of political interests Powers, can not naturally inspire much optimism.

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ARCHITECTURE AND CONSTRUCTION

TO A QUESTION ON POLLUTION OF TERRITORY
OF AZERBAIJAN AND THE CASPIAN SEA AT POSSIBLE
REALIZATION OF DESTRUCTION OF DAMS OF HYDRAULIC
ENGINEERING CONSTRUCTIONS IN THE BOTTOM WATERCOURSE
OF THE HEN, CONNECTED TO EXTREME SITUATIONS TERRORIST,
TECHNICAL AND NATURAL CHARACTERS

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Introduction

The present ecologic crisis threatens the possibility of steady development of the human being civilization. The further degradation of natural systems leads to the biosphere destabilization, loose of its integrity and ability to support the quantities of the environment necessary for life. In the world level the main factors of the environmental degradation include the increase of ecologic damage from the natural disasters and man-caused catastrophes as well as the continuing military conflicts and terrorist activity.

The Caucasian region is a polygon where the lines of international policy and economy cross. The Caspian oil and ways of its transportation are the objects of not only the companies' competition but the political rivalry of great states. The formation of new independent states – Azerbaijan, Georgia and Armenia – is a difficult process. There are still armed conflict in Abkhazia, South Osetia and Nagorniy Qarabagh. Instability in the international security makes these countries leaders to spend a considerable part of the budget for military needs. In many republics of the North Caucasus the power and economy are in family clans' hands. As a result there is a wide base for soldiers support, the number of which practical-

ly doesn't depend upon effectiveness of military operations from the direction of force structures of Russian Federation. All these significantly worsen the total state and make it dangerous for all countries of the Caspian region. To the present there is a penetration of international terrorism and religious extremism to the Caucasus from the adjacent Middle East.

Terrorist acts represent a direct challenge to the total security of democratic values as well as basic rights and freedoms of human beings. No reasons can justify such actions and there is a necessity to join the actions of the international community in struggle against this guileful threat. The struggle against all kinds of terrorism must be carried out in accordance with UNO Charter, human rights international conventions and international humanitarian right, as well as other existing liabilities (resolution 1368, 1373, 1540, 1566 and all other corresponding resolutions of Security Council).

One of the most dangerous kinds of terrorism is the ecologic terrorism because the violent acts take place by the influence upon the environment and directed to its pollution, irreversible degradation or destruction. It is obvious, that possibility for terrorists to achieve their purposes for destabilization of situation in the Caucasian region, including the destruction of hundreds and thousands people as well as great ecologic and economic damage, is high enough. Ecologic terrorism requires much more attention than now because it is a serious threat to the environment security on the whole as a one of the main component of the regional, national and international security [1]. This kind of terrorism includes two main forms of terrorism:

• It is simultaneously violation on the life and health of nationals through a partial or complete destruction of the habitat;

• A direct violation on the structures of the state and national economy creating not only local but a global ecologic hazard.

Proceeding from the above mentioned the hazardous objects include, first of all, the structures of energy cycle such as nuclear power plants, electric power stations, dams of hydroelectric power stations and their reservoirs, chemical, petrochemical and petroleum refinery, metallurgical, biotechnical plants, raw material and production storage facilities, oil- and gas pipelines, as well as military objects using and producing radioactive and toxic agents, their storages and disposals [2].

In Azerbaijan there is a clear tendency of damages grow as a result of the emergencies of natural and man-caused character. Recently, the risk of dam's destruction of large hydraulic structures, located in the lower stream of Kura River, had grown. Due to long-term operation and practical absence of recovery works the state of these dams is extremely unsatisfactory. A high seismic activity of the territory where these objects locate as well as a considerable hazard of their possible directed destruction form the periodically arising unliquidated armed conflicts with adjacent states and rises of terrorist acts aggravate the situation significantly.

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There is a multiple problem of analysis of consequences of dam's destruction on large hydraulic structures of Azerbaijan and corresponding economic and ecologic damages for its territory, including such a unique transboundary reservoir as the Caspian Sea. For its successful realization there is a necessity of integral systematic approach. It will include the account, assessment of current state of the dams' and risk of their destruction from the influence of natural and man-caused factors. Thereby the task of territorial risks management, including the development of counter-measures and mitigation of possible negative consequences, will be solved partially.

The assessment of consequences of dams' destruction of large hydraulic structures of Azerbaijan, the assessment of ecologic damage for territories and such a unique transboundary reservoir as the Caspian Sea propose the accounting of ecologically hazardous objects and their spatial distribution in zone of possible flooding [3]. Another one main factor is the accounting of degree of water and bottom sediments pollution of Kura River and its main tributaries.

Sources of the natural and man-caused hazards in Azerbaijan territory

Azerbaijan has a great diversity of geological, climatic, and landscape conditions where over 15 kinds of hazardous natural phenomena are observed. The most destructive are flooding, underflooding, earthquakes, landslides, mudflows, storm winds, etc. These phenomena can also stimulate great man-caused damages and catastrophes. Annually in Azerbaijan Republic there are 15 to 30 hazardous events of natural character. Only for the recent 5 years there had occurred over 10 strong earthquakes, two of them were the strongest and brought to emergencies (Fig. 1). Azerbaijan has great losses due to rise of the Caspian Sea water level to 2,5-2,8 m; the coastline is 785 km [4]. This natural phenomena had caused a considerable flooding of the coastline of republic, including 7 cities (Baku, Sumgayit, Astara, Lenkoran, etc.), 35 settlements, 120 objects of industry and agriculture, railroads and high ways, etc. The rise of groundwater level had promoted the flooding of underground communications, petroleum-chemical plants located in coastal zone of the Caspian Sea and initiated their increased corrosion and possible damage as a consequence. The consequences of such industrial damages can be accompanied by ingress of strong toxic agents into the environment, forming the centers of chemical pollution similar to analogous use of means of mass destruction and will cripple the Caspian Sea ecology when ingress into the sea.

The hazard for population and environment (Fig. 2) is caused by presence of great amount (about 100) of big radiation-, chemical, biological and fire-rise manufacturing. The possibility of damages occurring here is intensified by deterioration of main production funds, incomplete performance of appropriate repair
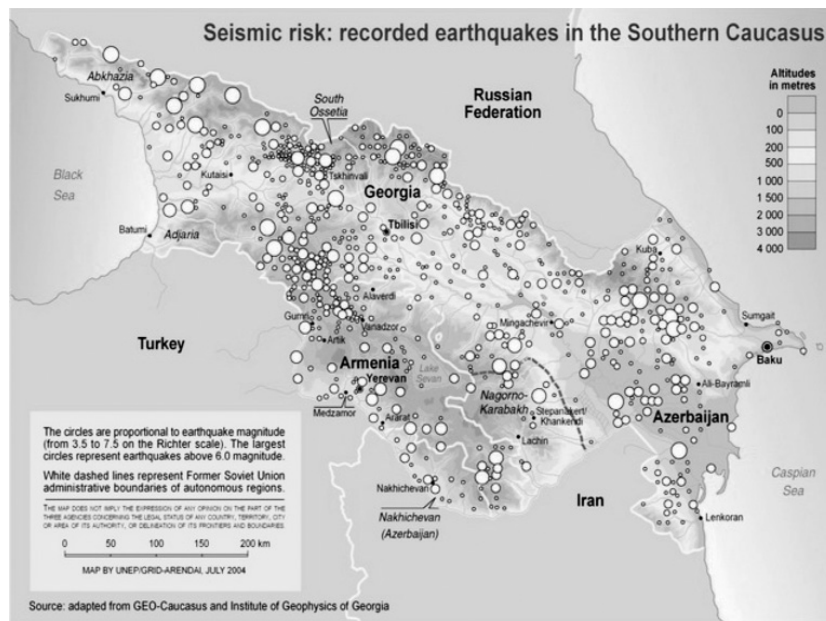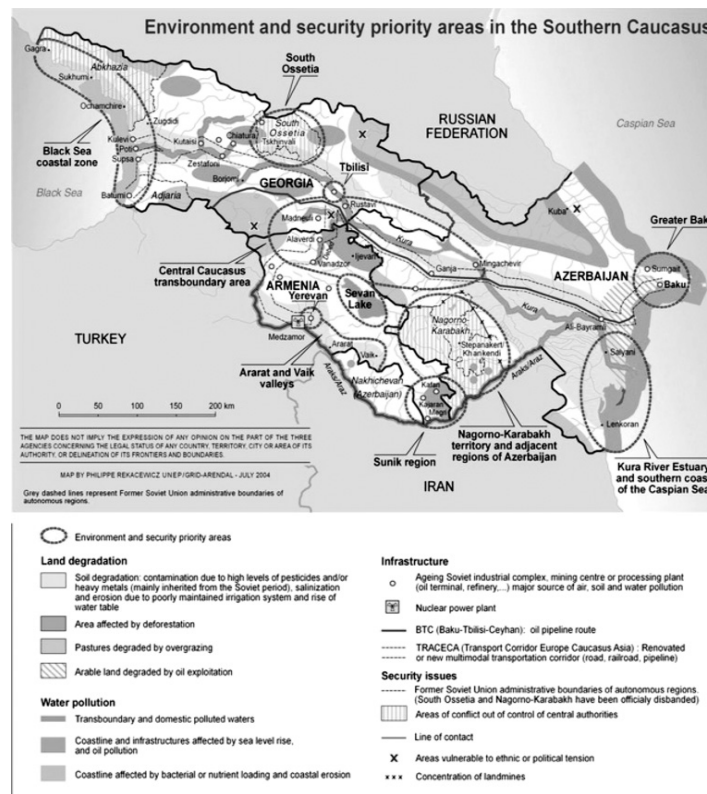
Figure 1.

Figure 2.

and preventive works, reduction of production and technologic discipline. According to available data just in the period from 1992 to 1998 about 100 emergencies of man-caused character had been recorded in Azerbaijan. Over 70 objects of economy contain considerable reserves of hazardous chemical agents. About 50% of them contain chlorine, 35% – ammonia, 5% – hydrochloric acid, etc. At the same time in some objects there can be from some hundred to some thousand tons of virulent toxic agents, which express a serious hazard for all living beings in case of emergencies realization.

During the operation of main oil- and gas pipelines, compressor and oil-transfer stations, tank battery in the territory of republic the emergencies with leakage and ignition of transported raw material occurred more than once in the republic territory. At present about 3800 km of oil pipelines, over 10 thousand km of field pipelines, tens of compressor and oil-transfer stations locate within enterprises of oil and gas industry of the republic. The operation of main pipelines Baku–Novorossiysk and Baku–Supsa (Fig. 1, solid lines) give a special concern. If we don't investigate their state and assess the risk degree from their operation then in the nearest future we'll face with rise of great regional ecologic catastrophe.

Area of polluted zones just in oil fields of Absheron peninsula is over 30 000 ha. In affected zones the radiation level amounts to 400 to 1200 microroentgen/hour under the allowable standard 10-15 microroentgen/hour. The great oil pipelines existing in Azerbaijan cross big and small rivers in 13 points, zone of tectonic faults, mud volcanoes and landslides as well as territories with seismic activity of intensity 6–9, where the threat of their destruction is still high if emergency of natural and man-caused character occurs.

It is known [5], that extents of damages from the possible emergencies in large hydraulic structures are related with grow of settlement of river valleys of below the hydrotechnical constructions and development of the agricultural activity. There had been established a definite tendency of the losses grow under the damages with increase of the dams height and reservoir volumes. At the same time the indirect losses could be significant enough: they are related with forced reorientation of activity of the economy objects, breach of water- and energy supply. But the basic losses will be related with income to the vast territories including the Caspian Sea of polluted waters and various deposits accumulated on the reservoirs bottom and containing toxic compounds, heavy metals, radioactive substances, pesticides, oil and other types of pollutants. At the same time the bottom sediments sorb the pollutants to degrees much exceeding their content in water. Sediments with concentration of pollutants exceeding maximum allowable concentration concentrate in stagnant and poor-flowing zones of reservoirs, and any influence on them can lead to the ecologic catastrophe [6].

Now the observed strict rigid regulation of the Kura River as a result of cas-

cade of the acting hydroelectric power stations – Mingechaur (dam height is 83 m, water volume is 16 milliard m^3), Shamkir (dam height is 70 m, water volume is 2,7 milliard m^3) and Enikend (dam height is 36 m, water volume is 158 million m^3) [7], had led to sharp decrease of passing of the natural waters and discharge of the flood, disturbance of natural cycles of river life, that reflected negatively on ecology of its water basin and the Caspian Sea. The situations aggravated by the consequence that for the last years the reservoir dams on Kura River reached the predamage state. Taking into account the high level of seismic activity on Azerbaijan territory and that such objects are very attractive for potential terrorist acts with use of explosives, the probability of catastrophe under their destruction is high enough. In this case the strong water stream forms that will destroy nearly all buildings in zone of probably flooding, and this process will be accompanied by great victims among the population. The numerous products of all industries and their wastes will be spread by flood weave over the vats territory including their transfer to the Caspian Sea. It should be also added that as a result of origin of such emergency the pollutants accumulated for the long period of time in bottom sediments and soil will be raised from the flooded territory and the Kura River bottom (including the tributaries) and moved for long distances. The hazard of flooding will threaten to such cities as Salyan and Neftchala near of which there are oil fields. The radioactive elements and toxic substances accumulated during ten years in soil, near wells, in pipelines and other elements of the petroleum industry directly touching with oil and formation waters. In the latter case, besides the mass death of population and great material damage, there will be irreversible changes in the environment including the distribution and ingress of radioactive and toxic elements from the mentioned fields into the vast territories and the Caspian Sea.

Ecologic state of rivers in Azerbaijan territory.

More than a half of territory of the South Caucasian countries have an inclination towards the Caspian Sea and all the negative man-caused influences on the adjacent countries upon the basins of those rivers reflect in Azerbaijan, and further in the Caspian Sea. Water resources of Azerbaijan are 30,9 km^3 per year, from them 20,6 km^3 comes with transit rivers from the neighbor countries.

Kura river is the largest water-way not only in Azerbaijan but of the whole South Caucasus. [8]. The basic part of the source is formed in Georgia (37,7%), Armenia (23,4%) and Azerbaijan (21,5%) as well as 13,6% in Turkey and 3,8% in Iran. Over 74% of the Kura River balance is formed beyond Azerbaijan, and the river's ecological state significantly depends upon the ecological state of Georgia and Armenia. Concentration of oil products exceeding maximum permissible concentration in 5-220 times and phenols – in 2-30 times are observed in Kura river

waters, on Georgia and Azerbaijan boundary. Water is so polluted that expresses a hazard for the republic people health, 75% of them uses this water [9]. It is necessary to mention that both in Georgia and Azerbaijan over 35% of settlements have no sewage disposal plants, the present facilities are mechanical, old and morally outmoded. [10]. The cities of Gazakh. Agstafa, Dashkesan, Shamkir, Tauz, Ganja, Mingachevir, etc are located in Ganja-Gazakh zone; their sewage disposal plants don't meet the modern requirements. From 60-65 thousand m^3/day of water runoff of Ganja only 50% proceed the mechanical clearing, and from 50 thousand m^3/day of water runoff of Mingechavir only 18 thousand m^3/day proceed accordingly. The rest ones are throw down Kura river tributaries without purification. Paragachai River (Nakhchivan Autonomous Republic) is polluted by various wastes near molybdenum mines, Gashgarchai River – polluted by the iron-ore mines near Dashkesan city. The right tributary of the Kura River – Agstafachai river, the basin upper part of which locates in Armenia – is strongly polluted by chemical colorants, oil products, phenols, ammonium nitrogen and other toxic and chemical hazardous substances, coming here as sewage (over 1 million m^3 per year) from Armenia cities (Ijevan, Dilijan, etc.). [11]. Alazan and Iori rivers being the left tributaries of the Kura River are polluted in Georgia and come to the republic with nitrogen and nitrates content exceeding sanitary norms in 4 times, oil products – in 2-6 times, copper and phenol – in 20 times. [9]. In low-flow period these numbers increase in some times. It is necessary to mention that Kura river basin is subjected to all kinds and types of pollution – physical, chemical, biological, radiation, etc. At territory of Georgia and Armenia the tributaries of the Kura River are polluted till the "dead" state, for some settlements these tributaries are the places of disposal tips and sewage. The constant pollution of the Kura River waters with pesticides, detergents, especially organic substrate, heavy metals salts, and other pollutants had significantly changed the physical-chemical properties and sanitary-hygienic state of waters in reservoirs. [11].

The second large waterway of the republic is the Araks River, it is also the main tributary of Kura River. According to official data for 1990 annually 2,6 million m^3 of wastes are thrown down the Araks River basin (Kura river main tributary) on Armenia territory; 4,6 million m^3 – into Kura river basin in Georgia. In these waters the enumeration of hazardous pollutants, matters and chemical elements exceeds 150 items. [9]. The average annual concentration of water pollution exceeds maximum permissible concentration in some times, in emergency – in hundred times. [11]. Its left tributaries – Razdan, Arpachai, Ohchuchai rivers, etc. bring oil, phenols, ammonium and nitrite nitrogen, heavy metals from Armenia in concentrations exceeding sanitary norms in tens and hundreds times. Waters of Okhchuchai river are especially strongly polluted, here the sewage of Armenian Kajar ore mining and processing enterprise and Kafan copper-ore enterprises are

throw down, the waste discharge is over 150 million m³ per year. In the period of volley discharges the water in river turns into the nearly black muddy stream with objectionable odor. According to turbidity the Araks River takes one of the first places among the rivers over the world: on average it brings 2,5 g/l of suspended substances, exceeding even Nil river. Along with Kura river the Araks River is also distinguished by value of "solid" discharge among the world river: the river brings nearly 18 million tons of suspended substances per year; totally with Kura river this number reaches to 44-46 million tons.

Conclusions

Now it is obvious that ecologic safety of Azerbaijan territory, transboundary Kura River and such a unique reservoir like Caspian Sea cannot be provided completely by efforts of only one country. Its firm guarantees can be realized within the international system. At the same time the security of the whole consists of security of the components. The fundamental basis of ecologic safety must be established just on the level of individual countries. From the above-mentioned one can conclude that catastrophes prediction and assessment of damages caused by them, as well as a development of appropriate counter-measures and mitigation of their consequences is the actual and complex problem.

The main tasks of the scientific provision in the field of environment protection are the development of scientific knowledge on ecologic bases of stable development, revealing of new ecologic risks generated by the society evolution and its technogenic activity, as well as the various natural processes and phenomena.

For these purposes it is necessary to carry out:

• The modeling of origination and evolution of the possible emergencies on the technogenic objects in case of act of the terrorist, military or natural factors of initiation of the emergency and catastrophic events or under their potential treats;

• The in-time forecast and revealing of possible ecologic threats;

Development and performance of measurements on mitigation of negative consequences upon the environment and population under realization of the emergencies.

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IMPACT OF POLYARYLSULPHONOSULPHONIC SUPERPLASTICIZER ON HYDRATION AND HARDENING OF CEMENTS

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During hydration and hardening process of clinker minerals plasticizing additives change the behavior of interfacial surface, also micro and macrostructures of disperse phase and as a result, behavior of cement test and durability of concrete changes.

During stable plasticity super plasticizer reduces water requirement of cement grout and concrete mix till 25–30 % and raises durability of examples 2–3 times for daily and 40–50 % in 28 day growth of solidification. Super plasticizers based on melamine and naphthalene formaldehyde oligomer and their modifications are used more broadly (1, 2, 11).

Super plasticizers are characterized with linear structure of molecules, with their mass and with presence of salts of sulfonic acids with cyclic and heterocyclic compound in every elementary level. Presence of hydrophilic groups, their number and chemical form determine surface and volume properties of molecules, type of adsorption and order of adsorption layers on the surface of cement, also changes during this size of charge on adsorption layers of disperse phase (3). Except this, hydrophilic group changes ionic power of the environment, especially in the adsorption layer, that accelerates dissolution of silicate phases (4).

That's why growth possibilities of effectiveness of super plasticizers are to be searched in growth of number of hydrophilic groups in hydrophilic – lipophilic balance of molecules.

We have synthesized new polyarylsulphonosulphonate super plasticizer CAC with the methodic described in work (5). Generally, synthesis product is written under this formula:

$$\begin{pmatrix} -R - SO_2 \\ (SO_3Na)_X \end{pmatrix}_n$$
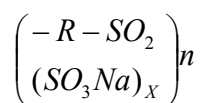
Here: x = 2-3; n = 2-6; R – by-, tri- and polycyclic carbohydrates, which are included in the structure of fraction of coal gum with sublimation temperature of more than 300° C.

Synthesis is performed in two stages during 3–4 hours using three components: mixture of aromatic carbohydrates, sulfuric acid and caustic soda.

Studies of changes in scope of surface tension of water mixtures of well-known super plasticizers in the border of "water-air" proved that in contrast to alkyl benzene sulfonate these preparations practically does not impact on surface tension – $\sigma_0 \approx \sigma m$ (see on table 1).

Table 1

Substances	Surface tension in J m^2 10^{-3} during concentration of the mixture, g/l					
	1	5	10	20	30	50
Plasticizers:						
Naphthalene formaldehyde	72.0	71.8	71.5	71.3	71.2	70.9
Melamine formaldehyde	72.0	71.9	71.5	71.1	71.0	71.0
Poly aryl sulfonic sulfate	72.2	71.9	71.8	71.5	71.5	71.0
Alkyl benzene	33.1	29.5	28.8	25.9	24.8	24.5

According to work (5), surface tension is determined by this formula:

$$G_m = (\sigma_0 - \sigma_m)/G_m$$

Super plasticizers in the border of "water-air" practically do not have surface tension activity, so that $\sigma_m > 0$. Value of surface tension of super plasticizers determined by us is explained with present representation of molecules with high polarity. According to the work (7), number approaches to zero with the growth of polarity of molecules from border layer in water phase. If hydrophilic and hydrophobic groups are balanced, then molecules are oriented in the border layer, which is reflected in growth of surface activity. Correlation of the two opposite groups of hydrophilic and hydrophobic (lipophilic) molecules is reflected in hydrophilic – lipophilic balance (HLB). But, present system of numbers of HLB is effective only for develop-

ment of emulsifier and is not enhanced in the additives of cement. Except this, system of HLB has some shortages and requires its development (3, 6, 7).

Because of stoichiometric composition, but not taking into account the activity of polar and lipophilic groups, geometrical characteristics of molecular structure, also, number of hydrophilic groups in the first and last elementary stages, approximate hydrophilic balance of super plasticizers is determined. It's shown that, structure of hydrophilic group (SO_3Na) in comparison with hydrophobic part of super plasticizers based on damp anthracene, naphthalene and melamine is correspondingly 100, 74 and 55%, but for traditional surface acoustic waves (SAW) – 35 %.

High polarity of molecules of super plasticizers changes their character of adsorption depending on structure of disperse phase. On "water-air" border hydration activity of hydrophilic group pulls up molecules in water phase, but on the "water-cement" border, because of electrostatic mutual activity, orientation of molecules happen more polar surface of cement minerals. Because of this, carbohydrate chain in adsorbent layers which are near to saturation, directs to the water environment and mono adsorbent layer hyrofobs the surface. In the same time order of polar macromolecules of super plasticizers happens. As a result, surface tension on the "water-cement" border and electro kinetic potential of disperse phase changes. Decrease of interfacial surface tension brings to dispersion of cement particles, but decrease of surface potential – to their fluidifying and stabilization.

Changes in the scope of measures of zeta-potential depending on structure of CAC in suspension (T/B = 1:10) happens as following:

Concentration of CAC from mass of cement, %	Size of zeta-potential, mB
0	+ 7.2(8)
0.5	– 20.1
1.0	– 30.3
1.5	– 37.8
2.0	– 42.0

As a result of change in zeta-potential during approaching particles, power of electro static repulsion of double electric layers, shown in theory of DLFO

Impact of CAC on hydration and hardening of cement and its main mineral – tricalcium silicate has been studied (see on table 2 and 3). Preparation and test of examples has been carried out according to methodic of work (9).

Results of determination of kinetics of hydration according to diffraction maximum of alit – tricalcium silicate (d=1.761A) and according to chemically mixed water witnesses that super plasticizer CAC practically does not impact on hydration Portland cement in 28 day growth of hardening of examples in the same V/S as it's done in daily period (see table 2).

Table 2

Structure of CAC in matrix, %	V/S	Plasticity	Level of hydration (%) in the age (day) (d=1.761A)		General loss of mass in ignition (%) and age (day)		Limit of durability while pressing (MPa) of examples with size 2x2x2 in age (day)	
			1	28	1	28	1	28
–	0.26	Normal density	27.9	70.3	10.5	20.5	6.2	85.8
1	0.26	Cast	24.0	70.4	9.6	22.8	6.2	98.5
1	0.20	Normal density	26.8	67.4	10.4	18.3	20.1	140.8

Little delay of hydration in the system with decreased V/S happens because of less structure of water.

Addition CAC in the amount of 1% in the system with decreased V/S enables increase for 1.6 times of durability after 28 days of hardening (see table 2).

Impact of additive CAC in well-known super plasticizers on kinetics of hydration and hardening of tricalcium silicate is shown on table 3.

In contrast to well-known super plasticizers under condition of decrease B/C and normal density of test 1:10 CAC accelerates the process of hardening of hydrates of tricalcium silicate. Durability of examples with addition of CAC in daily age compared with the examples without additions increases 2.7 times.

Effect of using super plasticizer CAC is explained with increase in number of SO_3Na groups in general balance of molecules.

Table 3

SP	Structure of addi-tion, %	V/S	Level of hydration (%) in the age of (day) (d=1.761A)		Limit of durability (MPa) in age of (day)			
					During pressing		During bending	
			1	28	1	28	1	28
CAC	-1.0	0.42	38.7	71.3	16.5	52.3	2.5	6.7
		0.30	39.6	70.2	42.1	115.6	5.7	11.4
MMC	− 0.75	042	34.5	73.0	16.0	49.2	1.8	5.1
		0.31	6.0	60.1	0	102.0	0	6.3
C-3 (1)	− 1.0	0.42	36.0	65.0	17.3	47.1	3.4	6.7
		0.27	20.5	50.0	0	51.3	0	6.4
H-1 (1)	− 1.0	0.40	36.0	65.0	17.3	47.1	3.4	6.7
		0.28	20.4	51.4	0	66.5	0	8.2

Hydration of SO_3^{-2} and Na^+ is accompanied with combination of water and great water keeping ability of ions in adsorbent layer creates conditions for acceleration of hydration of cement minerals (10). Growth in scope of hydrate neoplasms under adsorbent cover as a result of hydration of parent phases calls periodic interruption of adsorbent cover of super plasticizers which is accompanied with acceleration of hydration of cement.

Conclusion

Increase of impact of hydrophilic group in balance of molecules of super plasticizers change their bulk and surface properties and allows purposeful regulation of hydration and hardening processes of cement.

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THE IMPROVING DIRECTIONS OF THE SAFETY
OF THE LIFE ACTIVITY IN CONSTRUCTION

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As the construction section is improving, the problems arising here is getting to a worrying level. As in all areas, also in the construction area, it is natural that first of all it must be taken into account the human factor and the guarantee of the normal life activity. Recently, the increasing of the natural and technogen character events that has turned to a danger source for the people's life, requires the qlobal sollution of this problem noted above. So, the dangerious situations arising during the construction works, in the certain sense, though it it must be solved in a micro level, the problems observing during the explotation of the ready buildings cause more danger for the people's life and has more qlobal character. Here as the main reasons we can note the people's profession level who are working in the construction area, the ability of seeing the events in advance, the opportunity of warning about them and etc.

Providing the safety of the life activity in construction, reducing the observation of an extraordinary events, the most important measures carrying out in the informing of the people in advance about the events is the building marketing. Being the special kind of the production marketing the building marketing, it serves for the safe and reliable activity of the construction. One of the important characters of this marketing is that the right choosed strategy carrying out in the marketing allows to see the events in advance. So this creates the opprtunity to prevent the supposing unpleasent cases. Namely, from this point of view it would be expedient to improve the building marketing now.

It is known that, the one of the dangerous reasons which causes the disorder of the normal life activity in construction is earthquake. To prevent the destroying influence of the earthquakes it is developing and carrying out some scientific and technical measures now. The investigations shows that it is creating the along and diametrical waves during the earthquake. The along seismic waves begins from the

hypocenter and spreads as the sound waves that spreads in the air which arises in the spread directions of the waves, with the pressing and thinning of the enviorement. Namely profiting by this sound waves, that is by assembling the apparatuses which doing this sounds in corresponding areas it is possible to get information in advance about this dangerous case. The investigations shows that using by this method it is possible to get information in advance not only about the earthquakes simultaneously about the other dangerous cases arose in the building object.

The submitted monitoring system based on the information parameters about the wave reflection of the object which technical situation is controling. During the monitoring it is used from the statistical parameters D_g about $g(i\Delta t)$ sound waves spreading, $(\varepsilon^o(i\Delta t))$ wave spreading price D_e, the useful sound signal $(\chi^o(i\Delta t))$ and price $R_x...(\mu)$ of the the mutual correlation function of wave $(\varepsilon^o(i\Delta t))$, the mathematical waiting m_x of the sound signal, $\chi(i\Delta t)$, the D_x spreading price of the sound $\chi(i\Delta t)$ and they are counting as below:

$$D_g = \frac{1}{N}\sum_{i=1}^{N} g^2(i\Delta t), \tag{1}$$

$$D_\varepsilon \approx \frac{1}{N}\sum_{i=1}^{N}\left\{ \mathring{g}(i\Delta t)\left[\mathring{g}(i\Delta t)+\mathring{g}((i+2)\Delta t)-2\mathring{g}((i+1)\Delta t)\right] - \mathring{g}(i\Delta t)\left[\mathring{g}((i+1)\Delta t)+\mathring{g}((i+3)\Delta t)-2\mathring{g}((i+2)\Delta t)\right] \right\}, \tag{2}$$

$$R_{x\varepsilon}..(\mu) \approx \frac{1}{N}\sum_{i=1}^{N}\left[\mathring{g}(i\Delta t)-\text{sgn}[\varepsilon'(i\Delta t)-\varepsilon''(i\Delta t)]\left\{\left|\mathring{g}(i\Delta t)\left[\mathring{g}(i\Delta t)+\mathring{g}((i+2)\Delta t)-2\mathring{g}((i+1)\Delta t)\right]\right. \right.\right.$$
$$\left. \left. - \mathring{g}(i\Delta t)\left[\mathring{g}((i+1)\Delta t)+\mathring{g}((i+3)\Delta t)-2\mathring{g}((i+2)\Delta t)\right]\right\}^{\frac{1}{2}}\right] *$$

$$* \text{sgn}[\varepsilon'(i\Delta t)-\varepsilon''(i\Delta t)]\left\{\left|\mathring{g}(i\Delta t)\left[\mathring{g}(i\Delta t)+\mathring{g}((i+2)\Delta t)-2\mathring{g}((i+1)\Delta t)\right]\right. \right.$$
$$\left. - \mathring{g}(i\Delta t)\left[\mathring{g}((i+1)\Delta t)+\mathring{g}((i+3)\Delta t)-2\mathring{g}((i+2)\Delta t)\right]\right\}^{\frac{1}{2}}, \tag{3}$$

$$m_x \approx \frac{1}{N}\sum_{i=1}^{N}\left[\mathring{g}(i\Delta t)-\text{sgn}[\varepsilon'(i\Delta t)-\varepsilon''(i\Delta t)]\left\{\left|\mathring{g}(i\Delta t)\left[\mathring{g}(i\Delta t)+\mathring{g}((i+2)\Delta t)-2\mathring{g}((i+1)\Delta t)\right]\right. \right.\right.$$
$$\left. \left. - \mathring{g}(i\Delta t)\left[\mathring{g}((i+1)\Delta t)+\mathring{g}((i+3)\Delta t)-2\mathring{g}((i+2)\Delta t)\right]\right\}^{\frac{1}{2}}\right], \tag{4}$$

$$D_x \approx \frac{1}{N}\sum_{i=1}^{N}\left[\mathring{g}(i\Delta t)-\text{sgn}[\varepsilon'(i\Delta t)-\varepsilon''(i\Delta t)]\left\{\left|\mathring{g}(i\Delta t)\left[\mathring{g}(i\Delta t)+\mathring{g}((i+2)\Delta t)-2\mathring{g}((i+1)\Delta t)\right]\right. \right.\right.$$
$$\left. \left. - \mathring{g}(i\Delta t)\left[\mathring{g}((i+1)\Delta t)+\mathring{g}((i+3)\Delta t)-2\mathring{g}((i+2)\Delta t)\right]\right\}^{\frac{1}{2}}\right]^{2}, \tag{5}$$

here; $\quad \varepsilon'(i\Delta t) = \overset{\circ}{g}{}^2(i\Delta t) + \overset{\circ}{g}(i\Delta t)\overset{\circ}{g}((i+2)\Delta t) - 2\overset{\circ}{g}(i\Delta t)\overset{\circ}{g}((i+1)\Delta t),$ (6)

$\varepsilon''(i\Delta t) = \overset{\circ}{g}(i\Delta t)\overset{\circ}{g}((i+1)\Delta t) + \overset{\circ}{g}(i\Delta t)\overset{\circ}{g}((i+3)\Delta t) - 2\overset{\circ}{g}(i\Delta t)\overset{\circ}{g}((i+2)\Delta t).$ (7)

It is natural that, for carrying out the monitoring of the happening changes in the technical situation of the building it must be got in advance the parameters D_g, D_e... and $R_{xe}(\mu)$. It is clear that, during the passing of the continuous signals it will be observed the two proper degrees as the $g(i\Delta t)$ and $g(t)$ of the q_k waves, so they can be appointed by the below formula:

$$q_k(i\Delta t) = \begin{cases} 1 & olduqda \quad g_{rem(k)}(i\Delta t) \geq \Delta x 2^k \\ 0 & olduqda \quad g_{rem(k)}(i\Delta t) < \Delta x 2^k \end{cases},$$ (8)

$$g_{rem(k)}(i\Delta t) = x_k(i\Delta t) - \left[q_{k+1}(i\Delta t) + q_{k+2}(i\Delta t) + ... + q_{(n-1)}(i\Delta t)\right],$$ (9)

here

$$g(i\Delta t) > 2^n \ ; \quad g_{rem(n-1)}(i\Delta t) = x(i\Delta t) \ ; \quad n \geq \log\frac{x_{\max}}{\Delta x} \ ;$$

$$k = n-1, \ n-2, \ ..., \ 1, \ 0 \ .$$

According to this algorithm at the beginning for each step of the $(i\Delta t)$ discretization it is received $g_{rem}(n\text{-}1)\ (i\Delta t) = g(i\Delta t)$ and determined $q_k\ (i\Delta t) = 0$ according to the term (8). So at the end the last prices of the entered signals:

$$g(i\Delta t) \approx q_{n-1}(i\Delta t) + q_{n-2}(i\Delta t) + ... + q_1(i\Delta t) + q_0(i\Delta t)$$ (10)

Being depended on the counting volume of the $g\ (i\Delta t)$ or $q_k\ (i\Delta t)$ signals it is possible to appoint the T time interval that repeats many times during the cycle. This interval can be counted so:

$$T_{k1} = \frac{1}{\gamma}\sum_{j=1}^{\gamma} T_{k1_j},$$ (11)

$$T_{k0} = \frac{1}{\gamma}\sum_{j=1}^{\gamma} T_{k0_j},$$ (12)

$$T_k = T_{k1} + T_{k0},$$ (13)

Y – is the number of the zero degree halftimecycles that met few during the observation and this j – is the row number of the sound waves in the q_k situation.

$T_{kl\,1}, T_{kl\,2}, T_{kl3}, T_{kl4}, \ldots$ is the proper time breakes where is q_k $(i\Delta t) = 2^k$ $(\Delta x = 1)$;

$T_{k01}, T_{k0,2}, T_{k03}, T_{k04}, \ldots,$ is the interval period according to the q_k $(i\Delta t) = 2^k$ $(\Delta x - 0)$. It is clear from the noted that, the T middle price of the interval for the observation will be in an unexpectable accidental level in $T_{k\,1}, T_{k0}$ etc. periods. Nevertheless at the beginning of the technical situation of the object it is creating some combination changes in its middle intervals that they can be used as the information indicators for the monitoring. Besides this, the influence of arisen dynamics of the different factors and q_{ek} $(i\Delta t)$ position rows, created by the formation of q_k $(i\Delta t)$ dc position waves appears as the short sound waves. This time the required proper parameters can be counted so:

$$q_{ek}(i\Delta t) = \begin{cases} 1, & \overline{q_k((i-1)\Delta t)} \wedge q_k(i\Delta t) \wedge \overline{q_k((i+1)\Delta t)} \vee q_k((i-1)\Delta t) \wedge \overline{q_k(i\Delta t)} \wedge q_k((i+1)\Delta t) \\ 0, & q_k((i-1)\Delta t) \wedge q_k(i\Delta t) \wedge \overline{q_k((i+1)\Delta t)} \vee q_k((i-1)\Delta t) \wedge q_k(i\Delta t) \wedge q_k((i+1)\Delta t) \vee \\ & q_k((i-1)\Delta t) \wedge \overline{q_k(i\Delta t)} \wedge \overline{q_k((i+1)\Delta t)} \vee \overline{q_k((i-1)\Delta t)} \wedge q_k(i\Delta t) \wedge q_k((i+1)\Delta t) \end{cases} \tag{14}$$

At the time the investigations show that, if the technical situation of the object (building) is stable (if it is not changing) then, in T time period the mutual relation between the numbers of the $K_{q0}, K_{q1\ldots}, K_{qm-1}$ coefficients and q_{ek} *(iДt)*, waves and the N_{qk} of the N_{ek} and q_{ek} *(iДt)*, position-impulse waves numbers will

be so:
$$K_{q_0} = \frac{N_{\varepsilon_0}}{N_{q_0 k}}, \quad K_{q_1} = \frac{N_{\varepsilon_1}}{N_{q_1 k}}, \ldots, \quad K_{q_{m-1}} = \frac{N_{\varepsilon(m-1)}}{N_{q_{(m-1)}k}} \tag{15}$$

The microchanges happening in the situation of the building, also the settling and seismic prosesses will be caused for the change of the coefficients noted above.

As noted before the one of the often being met extraordinary events in construction that cause for reason of the ruin of the normal life activity is earthquake. The investigations show that, it is possible to determine in advance the happen time of the earthquake by the assistant device in monitoring. Because to determine the happen time can allow the prevention of the minimum number of the economical loses and the human death so this is an important problem. For the acquaintance of the monitoring mechanism of the extraordinary seismic prosesses arising in the construction object let apply to the scheme below: (Figure 1).
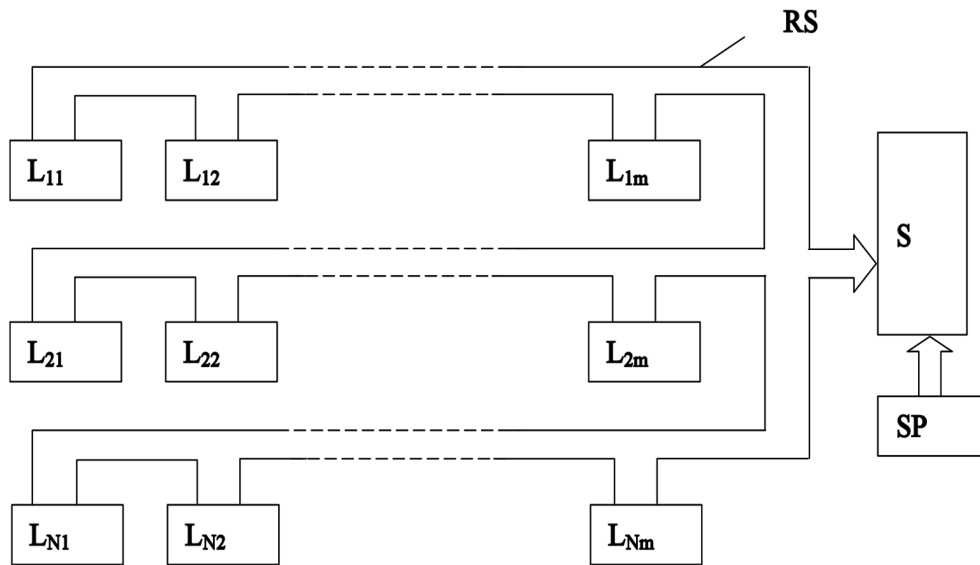
Figure 1. The monitoring of the observed changes during
the extraordinary seismic prosesses in the technical situation of the object.

For the organizing of the monitoring system each O_1, O_2, ... O_m object is yoked to the L_{11}, L_{12},...L_{lm} net system.

The q_1 $(i\Delta t) = 2^k$ (Δx) ,... q_m $(i\Delta t)$ signals received from the each object is analising by getting from local net and the results is passing to the S central modem that assembled in the system by the radio contact. Also the results of the moniroring and the short-term prognostication of the earthquake is passing to the central system by the SP device. In order to solve the monitoring problems of the technical situation of the object in the S server system ot the city-wide and the information of the control-size devices for short-time prognosication of the earthquakes it is possible to compile the below algorithms:

$$R_{\underset{g\,g}{0\,0}}(\mu)=\frac{1}{N}\sum_{i=1}^{N}\overset{0}{g}(i\Delta t)\overset{0}{g}((i+\mu)\Delta t)\,,\qquad(16)$$

$$R_{\underset{g\,g}{R}}(\mu)=\begin{cases}R_{\underset{g\,g}{\circ\,\circ}}(\mu)-\left[\lambda_{\underset{x\,x}{\circ\,\circ}}^{R}(\mu)+D_{\varepsilon}\right] & npu\quad\mu=0,\\[2mm]R_{\underset{g\,g}{\circ\,\circ}}(\mu)-\lambda_{\underset{x\,x}{\circ\,\circ}}^{R}(\mu) & npu\quad\mu\neq0\end{cases}\,,\qquad(17)$$

here
$$\lambda_{\underset{xx}{\circ\circ}}^{R}(\mu) \approx \left[N^{+}(\mu) - N^{-}(\mu) \right]\langle\Delta\lambda(\mu=1)\rangle \qquad \text{(18)}$$

$$\langle\Delta\lambda(\text{м}=1)\rangle = \left[1/N^{-}(\text{м}=1) \right]\lambda(\text{м}=1) \qquad \text{(19)}$$

$N^{+}(\mu)$, $N-(\mu)$, is the number of the positive and negative $g^{\epsilon}(i\Delta t)$ $g^{\epsilon}((i+\mu)\Delta t)$ pairs.

$$a_{n_g} = \frac{1}{2N}\sum_{i=1}^{N}g(i\Delta t)\cos n\omega(i\Delta t) \qquad \text{(20)}$$

$$b_{n_g} = \frac{1}{2N}\sum_{i=1}^{N}g(i\Delta t)\sin n\omega(i\Delta t) \qquad \text{(21)}$$

$$a_{n_\varepsilon} = \frac{1}{2N}\sum_{i=1}^{N}\varepsilon^{*}(i\Delta t)\cos n\omega(i\Delta t) \qquad \text{(22)}$$

$$b_{n_\varepsilon} = \frac{1}{2N}\sum_{i=1}^{N}\varepsilon^{*}(i\Delta t)\sin n\omega(i\Delta t) \qquad \text{(23)}$$

$$a_{n_x} = \frac{1}{2N}\sum_{i=1}^{N}x^{*}(i\Delta t)\cos n\omega(i\Delta t) \qquad \text{(24)}$$

$$b_{n_x} = \frac{1}{2N}\sum_{i=1}^{N}x^{*}(i\Delta t)\sin n\omega(i\Delta t) \qquad \text{(25)}$$

$$r_{g\varepsilon} \approx r_{g\varepsilon}^{*} = \frac{1}{N}\sum_{i=1}^{N}\operatorname{sgn}\overset{\circ}{g}(i\Delta t)\operatorname{sgn}\overset{\circ}{\varepsilon}{}^{*}(i\Delta t) \qquad \text{(26)}$$

$$\varepsilon^{*}(i\Delta t) = \frac{1}{N}\sum_{i=1}^{N}\operatorname{sgn}\overset{\circ}{g}(i\Delta t)\operatorname{sgn}[\varepsilon'(i\Delta t)-\varepsilon''(i\Delta t)]\sqrt{|\varepsilon'(i\Delta t)-\varepsilon''(i\Delta t)|} \qquad \text{(27)}$$

$$x^{*}(i\Delta t) = g^{*}(i\Delta t) - \varepsilon^{*}(i\Delta t) \qquad \text{(28)}$$

Beside this, for the each signal it is determined the row's $E_j(i\Delta t)$ and the histogram which characterises avoid from the supposing amount. This time, given in the $[0 - e_{ma}]$ diapason for the approximate counted price of the $e^0{}^{*}(i\Delta t)$ =sgn $\backsim(i\Delta t)$ v $\backsim(i\Delta t)$ equality, by the e° that separates equally from the $T = N\Delta t$ and N_1 $N_2\dots N_m$ amount, it is possible to build easily the crooked histogram for the look-

ing quantity. In this case it is possible to carry out the compare between the necessary $\mathcal{X} \circ (i\Delta t)$ signal and the e^0 $(i\Delta t)$ wave and to build the histogram showing the e^0 $(i Дt)$ wave spreading law that counted in the variants N_1 N_2…. N_m, according to

the $e^0 * (i\Delta t) = \text{sgn}$ $[\acute{e}(i\Delta t)- \grave{\varepsilon}(i\Delta t)] \sqrt{[\ \acute{\varepsilon}(i\Delta t) - \grave{\varepsilon}(i\Delta t)]}$ volume.

If $N >?$ then the taken price of W $[e(iДt)]$ in the variants N_1 N_2…. N_m appoachs to the searching factor(quantity) according to the wave spreading law. Also the histogram keeps these prices in its memory as standard.

The system acts in the four regimes. At the beginning stage the system is training by the necessary informations. Here g_j $(i\Delta t)$ signals are analising, it is getting the proper $e_j (i\Delta t)$ prices from the corresponding devices assembled in the monitoring objects that determined according to the (formula 16–17) and these factors is keeping in the memory also is determining their minimal, middle and maximum pull of.

After the training stage the system passes to the monitoring regime. At the first regime of the system it is determining the current prices of the $R_{0\ 0}(\mu)$, $_,$ RR_0 $_{0,}(\mu)$, a $_{n\ g}$, b $_{ng.,}$ a $_{n\ g}$, b $_{ng.,}$ a $_{n\ g}$, b $_{ng.,}$ r_{ge} factors and W $[e^{(i\Delta t)}]$ histogram in term by the expressions (16-25). They are comparing by the noted etalon numbers in the training proses. If the difference between the factors does not pass the limit during the comparing proses then it is considering that it had not happened any changes in $O_1, O_2, …… O_m$ technical situation of the proper objects. In the contrary the difference passes the accepted minimum limit and it is forming the signal that determines the first changes in the technical situation of the object. So, it is determining the volumes of the enormous pull off that accepted for the extraordinary cases.

In the second regime differently from the first one, the signal that informing the the dangerous case is noted with the differences passed minimum limit of the signal prices that put in the near distance and got from the object qroup. In order to be sure about the reliability of the results got from the system it is carrying out the systemic training analysis of the signals by the help of formula (17-25), so this analysis had been carried out in the (1-16) regimes.

In order simultaneously to note the minimum allowed pull off of the signals current prices that enters to some object system and the effective interval distance of the objects from each other the S server system passes to the action in III regimes.

In I and also in the II regime in order to get the $g_j (i\Delta t)$ signals it is used from the like etalon cases according to the training proses. The pull off from the etalon cases is noted as the dangerous situation. So in on the basis of the diapason volume for the object qroup in which the monitoring carrying out it is noted the riskiness

of the seismic situation. In dangerous situation that is when the pull off from the allowed level is on the maximum limit, the server gives the excitement signal about the beginning of the anomal seismic proses.

At the end in order to get the information from the SP system it is making a passage to the 4th regime. So the system acts as in the III system and also in order to increase the reliability level of the received total results about the seismic situation it is carrying out the compare in the S system and SP system.

In general for the exact prognosication it is important to get necessary informations that they are fulfilling in the statistical and dynamic regimes. The prognostication is finding out according to the sign of the event. The information about the sign of the event must be entered dynamically so this is possible by the carrying out of the exact monitoring. The carried out investigations allow to come to the result that the followings can be enclosed to the main measures that provides the population's safety in an extraordinary cases:

– getting and assembling the necessary mechanisms for the exactly carrying out of the supposing extraordinary cases ;

– strengthening the co-ordination between the proper build for the exactly valuing and preventing results of the extraordinary cases;

– informing the population about the supposing events in time;

– improving the building marketing and learning the matters about the safety of the life activity;

– preparing and applying the measures that is directed to the preventing or reducing of the happening assume of the supposing extraordinary cases;

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◂AZERBAIJAN CULTURE OF THE XX CENTURY

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The nationwide leader Heydar Aliyev`s monument
erected in Baku, 2005

"…We are from Turk nationality, from Islamic community and West cultured. Because of saying "We are from Turk nationality we shall try to point out originality and impersonality of the Turk liking and intellect for language, esthetics, moral, law, even in religion and in Turk culture.

When we say "We are from Islamic community" there will be the most sacred man, Allah's prophet Muhamad and Islam, the holiest religion of ours.

We say "We come from the West culture", because we shall act in science, philosophy, techniques and in other cultural systems as perfect European."

Ziya Goyalp

· 1917-1927 years Cultural Revolution contains the basis of social – culturologics epoch.

· During the time of repression more than 100 thousand

· people under guard were sent to the camp, thousands of peasants were exterminated"

· The Azerbaijanis, Muslims…were looked upon as fourth, fifth-class in the country.

· Under the direction of Garbachovs's "Displacement of people" plan had been worked out and was being implemented. In this plan was meant removing the majority of muslin population living in Turk republics to Russia and other Slavyan republics intending to populate Christians instead.

In XX century the people who lived in the territory of Russia and the USSR passed through such an implicated historical development phases that this period had a strong effect in all spheres of the life. The Azerbaijan Government as a democratic republic was in power only 23 months. But this, in fact, as an incompatible event remained in the memories. This time in world and all over the regions difficult, inevitable political processes were going on. To put the most important national problems in order and train national cadres within a short time was rather difficult and hard for a newly formed government.

In spite of everything, first of all, there were made changes in educational system inherited from Tsarism. So that, in primary schools the pupils were educated in their own languages, as well as in national language compulsorily and this rule registered by the resolution of Council of Minister, on August 28, 1918[1]. The Azerbaijan Department of Gorey teachers training seminary was moved to the town of Kazakh and as an independent educational Institution continued its activity. Opening of pedagogical University was projected in Baku and the foundation of the national Conservatory was brought into agenda. The Parlament passed

a law on setting up the Baku State University on September 1, 1919. Ph.D.V.I.Razumovski was appointed the first principle of the University. Lacking of national scientific cadres and specialists many prominent men of science were invited from Moscow Universities, as well as from Rostov, Yekatrinaslav, Kharkov and other cities of Russia[1]. Uzeir Hadjibayov, the composer, publicist was assigned the editor-in-chief for the state set up newspaper"Azerbaijan"[2].

"…By the effort of M.A.Rasulzade, A.M.Topchubashov, N.Yusifbayli, U.Hajibayov, S.Hajibayov, A.Agaoglu and other national strugglers of culture Azerbaijan language was proclaimed a national language[3]. The government's one of the next prominent steps was the rehabilitation of ancient Ganja's name. The Rusified (the Georgian by nationality)general Sisyanov after occupying Ganja in 1804 changed the name of this ancient land into "Yelizavetapol"in honor of the wife of imperator Alexander I[4]. Those who called Ganja with its former name were fined one silver manat. There was a tale saying that the Ganjavites caring neither threat nor fear, taking in beforehand one silver manta with them paying the fine they would say "Ganja" in front of the Municipality Office[5]. The word "Yelizavetepol" as a stain had been on Ganja for 114 years. In the spring of 1920 the Azerbailan artists under U.Hajibayov's leadership were in Iran and were received by Sheikh Muhamad Khiyabani in Tabriz. But the government establishment and the governmental management affairs—on the one hand the political disagreement between Muslim parties, five-time changes of the cabinet of government within two years period, splitting of Musavat party's into two, the aid of local communists to dashnaks over the Garabag war, as well as foreign intervention – the occupational attack of XI army caused the collapsing of the government. Nevertheless the Azerbaijan Government demonstrated its attributes of national blazon, army, money unit and the national anthem on the basis of democratic traditions. At night from 27 to 28 April, 1920 the Parlament handed over the government to the interim Revolutionary Comity[6]. The great patriot and public figure N. Narimanov in absentia having been elected chairman, the staff of the Comity was formed and Azerbaijan was given to the jurisdiction of the Soviet Russia. Having been sent to Baku in armored train A.I.Mikoyan not telling N.Narimanov began signing the decrees under his signature. The nowadays analyses consider 1917 to be a beginning of a new social structure in Russia, but 20s and 60s years are not one meaning spoken about. These years in Russia and in separate national republics are presented as a period of socio-political changes, steps of development and formation of a new atmosphera.1917-1927 years Cultural Revolution contained the basis of the Socio-Cultural logical epoch.

On the first days of the revolution V.I. Lenin put forward the duties-first of all to eliminate the illiteracy, to develop a good condition for the workers' creative power, forming of the socialist inelegancy and reinforcing the effect of ideas in sci-

entific communism in the large crowds' mind. On December 26.1919 a decree was signed" Abolition the illiteracy among the population of the RSFSR".

This decree had been channeled into elimination of illiteracy of Russian or their own languages between eight to fifty years old. That movement was under the supervision of M.I.Kalinin, N.K.Krupskaya, A.V.Lunacharski. It is natural that, the theoretics of the existing establishment thought much more creating of a new socialist culture. What were they anxious about were the problems of cadres and intensifying of the class struggle in the sphere of culture. The teaching of pedagogical and social sciences, the works of art, and the attitude toward churches were of great importance. In 1921a decree on education was established and teaching of History of Party, Dialectical Materialism, Polite Economy, Scientific Communism became compulsory in high schools[1]. The appropriate decrees were established in Soviet Azerbaijan. The right for supervision of all the educational affairs were given to the Popular Educational Commissars.

There were established educational department under the Provencal Revolutionary Comity. A new Committee of Vocational Education had been established under N.Narimanovs signiture. Mahmudbay Mahmudbayov, Abdulla Shaig, Farhad Agazade – the experienced pedagogics were being involved in writing new text-books The Soviet of Azerbaijan Popular Commissars' and Central Executive Comity decree" The eliminating of illiteracy throughout the Azerbaijan population" on March 18, 1924 put out as a duty to educate writing and reading those who are 15–25 years old. When the Soviet Government was established in Azerbaijan the old alphabet with Arabic graphic was being used. In order for transition from Azerbaijan alphabet into Latin, the Plenary Cession of Azerbaijan Communist Party of Bolsheviks held on March 6, 1922 set up a special Commission under the leadership of Sammadaga Agamalioglu,the Chairman of Azerbaijan Central Executive Comity. Transition into Latin graphics accelerated the liquidation of illiteracy. According to the statistics data during 1920-1927 years as many as 53,957out of 65,607 Azerbaijani had learned new alphabet[1].

On 18 August, 1920 Azerbaijan Revolutionary Comity signed a decree for organization of printing affairs and its centralization. The publication of weekly newspapers such as "Kand fuqarasi" "(The village poor)", "Azerbaijan fugarasi" " (The Azerbaijan poor) "The communist "were launched. From May 1922 (founded in 1906) "The Bakinski Rabochi" (The Baku workers) renewed its publication. At the end of 1927-1935 s years magazines and other publications were issued[1]. N.Narimanov wrote "… the relations of religious affairs are of extremely important." This opinion of him as a head of Azerbaijan Government was reflected in his resolution signed in 1922. But with relation to religion the government abstained and didn't support it either financially or morally. The education of the young generation was only in charge of those schools that were under the jurisdic-

tion of Popular Educational Commissarial and the religions ceremonies were banned.

In 1929 "Allahsizlar" (Godlessness) society was set up in Baku and with the object of rescuing the workers from "spiritual bondage" was hoisted the flag of "combating atheism». The people involved in the religion were persuited. The women's associations' workshops were organized. On May the first session of southern Caucasus Women' s was summoned in Baku. The women got education in High Schools, technical-schools, middle-schools, gave lessons, were assigned in Children's institutions, schools, cooperatives, national courts. Moscow attached more importance to Baku rather than neighboring republics. It was not by chance holding the first Turk logic session here in 1927. The people of the East having the ancient cultural history following the socio-political processes and kept the inner bounds as much as they could. In fact, Bake was the gate of the East. But the class struggle policy led by Stalin with regard to strengthening the socialism intensified socio-political atmosphere not only in all countries, but also in Azerbaijan. But by pushing forward of Russian language among 'the people of equal rights', ruling of multinational countries in an administrative way from Moscow appeared as ideology of totalitarian regime over the spheres of national affairs. "Bourgeois nationality", panturkists "traitors", "trotskis", "spies" "tendentious" and so on. were searched everywhere and "found".

On wolume VII of "Azerbaijan History"it is noted that the first secretary of the Comity of Trunscaucasusian All - Union (bolshevik) party, Beriya in "The Pravda", August 19, 1936 wrote an article saying that he found enemy groups of "counter-revolutionaries "and" trotski-zinovyevists" in Baku and Kirovobad (Ganja-N.H.). Sumbatov-Topurudze, Yemilyanov, Grigoryan, Borshov, Atakishiyev and the like whom the first Secretary of Central Comity of Azerbaijan Communist(bolsheviks) party M.J.Bagirov trusted in and gave authorities to Sumbatov-Topurudze,Yemilyanov, Grigoryan, Borshov, Atakishiyev and the others who were utter tormenters of Azerbaican people and afterwards was condemned and sentenced to death penalty together with them. After some calculation it was found out that"…more than 100 thousand people under guard were sent to exile and exterminated[1]. The prominent party and public figures, well-known represen-tatives of government and culture were shot down and sent to exiles unlawfully and not being tried. H.Javid, M.Mushviq, Y.V.Chamanzaminli, H.K.Sanili, Ahmed cavad, S.Huseyn, T.Shahbazi, B.Chobanzade and the hundreds of thinking minds were annihilated. The ruinous methods of the Soviet inquisition court which left behind the European court of XII century, was quite short"… We warn you that for untrue, suspicious, indefinite information, you well be sentenced to be short "."The accused" would write at the bottom of the indictment bill, that was submitted to him "I read, take into account, and sign"[2].

Oleq Volkov, a Russian writer, who suffered hard, long years in prisons and prison camps with full of pains in his heart writes about 300 Azerbaijanis who undergone misfortune, living the last days of their lives in torture together with him in Solovki island and called some of their names[3]. The Soviet Government rehabilitated A.M.Sharifzade the genius actor of our theatre 17 years later after he had been shot dead and disgracefully announced him not guilty. Rafael Huseynov the research writer in one place of his book "The Cavids" remembers a touching talk with a daughter of the great poet "…those days when Cavid afandi crossing". "Communist" street every time with his slow paces and approaching this building – his house – passers by world willy-nilly look at him with admiration[4]. Intolerable civic – social environment in Azerbaijan made the watchful youth and representatives of the older generation who were able to tell black from white searched a way out and the ideas for national liberation struggle appeared in some writings that made people think. At the beginnings of 60 s years a group of students that lived with ideas of freedom began this illegal political struggle under the leader ship of Abulfaz Elchibay[5]. "The National Liberation Headquarter" was under Oqtay Rarili and Khudu Mammadovs supervision[6]. They demanded a promotion of Azerbaijani cadres to important position. The members illegally functioning "Lightening" (Ildrim) comity had put together all efforts for Azerbaijan's freedom. Among those who had been sent to exile were the talented writers such as Ismikhan Rahimov, Gulhuseyn Abdullayev (Huseynoqlu), Kamil Aliyev, Aydin Vahidov and others[1]. On the resolution Presidium of the Supreme Soviet of Azerbaijan SSR, may 7 1969 ratificated the resolution signed on May 5, 1938 of giving more then 2 thousand hectares Azerbaijan lands from frontier regions to armenans. Heydar Aliyev stood on the way of this resolution to be carried out[2]. In the court with relation to intolerable misfortune that the people were subjected to, M.Baqirov said: "Feeling trust, I have confided organs of XDIKM in this. For this matter I must be torn asunder, and beaten all to pieces[3]. This historic confession on the one hand was an exposure of the Soviet repression before the population and on the other hand it was the tragedy of people and leaders. During the Great Patriotic War the Azerbaijan people once more demonstrated its national dignity and sense of proud against the enemy; the Azerbaijan's five (402, 223, 416, 271 and 77) divisions stood face to face with fascism which was armed with the newest types of weapons. In 1941-1945 years, in general, as many as 700 thousand people were mobilized; over 11 thousand of them were women[4].

Baku oil had a special place in Hitler's occupational plans. In his book "Meine Kampf" (My Struggle) Hitler called the Turk nations living in the USSR territory as "a distractive force" and wrote about "muslim mongoloids" that they must turn into the slaves of super race[5]. During the war the peoples all financial and moral power were mobilized. The USSR's oil industry in World War II extract-

ed 110 million ton oil which 75 million tons of it gave Baku[6]. Among the first Azerbaijan representatives that went to Krasnodar and Novorossiyski were S.Vurqun, R.Rza, Z.Khalil, Mir Jalal, too. The young writers and poets of Azerbaijan such as Abulhasan, I.Shikhli, A.Jamil, V.Qasimzade, I.Safarli, Z.Cabbarzade put on soldier overcoat and went straight to the front. Twelve books of Azerbaijan writers and special collection of poems of front-time poets had been published for the front. The people's artist Bulbul, from the composers, J.Jahangirov, S.Rustamov, Niyazi and others very often went to the front and were beside the soldiers. The works of Azerbaijan artists' and sculptures' on the war topic had been demonstrated at the Tretyakov gallery in Moscow. On March 23, 1975 on the basis of the brunch of Azerbaijan Academy of Science of USSR was founded (nowadays Academy of national Science of Azerbaijan) and Academician M.Mirqasimov was its first president[7]. The Azerbaijan scientist attached a special importance to the field of seismology and set up such seismic stations in Shamakhi, Ganja, Nakhchivan. The foundation of Shamakhi obeservatory was being laid of and so on. The Soviet period of Azerbaijan made great progress. The new symphonies of Q.Qarayev, S.Haciyev, S.Hajibayov, the symphonic mugams of F.Amirov "Shur" and "Kurdovshari", Niyazi "Rast", S.Alaskarov "Bayati Shiraz" and J.Jahangirov "Fizuli" cantata appeared at the end of 50 s years. The operas of A.Badalbayli 'Nizami", F.Amirov "Sevil", J.Jahangirov "Azad", R.Mustafayev "Vagif," the balet of S.Hacibayov "Gulshan" was a triumph of the great Useir's school of Azerbaijan music history. The great Uzeyir bey's everlasting works ("Asli and Karam"), "Leyli and Majnun", "Koroqlu", "Arshin malalan", "O olmasin bu olsun" an so on occupied central places in theatres repertoire. Qara Qarayev speaking about Uzeyir bey Hacibayov's great professionalism he wrote: The unforgettable teacher, great professionalist… Huzeyir Hajibayov must be unforgettable example for our composers[1]. F.Amirov said: "I have acquired the cleanness of folk music from Uzeyir bey", "We are all the leavers of Uzeyir's school"[2].

The well-known composers Q.Qarayev s "Yeddi Gozal" (Seven beauties), on Nizami's poem, the ballet "The Path of Thunder" dealing with a struggle for freedom of the people's of Africa and F.Amirov's "The Arabian nights" ballet were appreciated as the best examples of the world s advanced music art.

The composer Arif Malikov's ballet, "The Legend of love" was being put on stage successfully in many countries of the world[3]. From the world- famed singers Bulbul and Rashid Behbudov and also Fatma Mukhtarova, Shovket Mammadova, Khan Shushinski, Shovkat Alakbarova, Sara Qadimova, G.Primov, A.Bakixanov, B.Mansurov and H.Mammadov as tar players their skill of performance were up to the mark. T.Quliyev, S.Rustamov, G.Huseynli, J.Jahangirov, S.Alaskarov and R.Hajiyevs works they composed in song genre were widely spread out.

In the field of the Fine arts the researchers considers A.Azimzade's creation more productive for 30-40 years. In this period he created a whole serious of famous drawings called "100 characters" "The Ramadan Holiday in a rich man's hours ", "The Ramadan holiday in a poor man's house, "A sacrifice holiday" are of the same serious. The modern works of the People's artists such as O. Khaligov's, S.Salamzade's and Sh. Sharifzade's are considered to be success in painting. "Guba seeneries," "Khinalg," (S.Bahlulzade),the illustration in Nizami underground station,"Fuzuli's "Leyli and Majnun," "Repairers," "The Platform." "Gara Garayev," 'The Pomigranate," "Mugam," (T.Narimanbayovare) are indeed the examples of masterpiece. The works of artists on carpet making stood out in exhibitions with their full of national colour and the culture of superb workman-ship.The works of sculptures erected both in Baku and other towns demonstrate great talents of our masters. The portrait-monuments of Fuad Abdurrahmanov's "Nizami," "Samad Vurgun" "Fuzuli"; J.Garyagdi's "M.A.Sabir." "Narimanov", "Bulbul"; O.Eldarov's "Natavan", "Hasan Aliyev," "Heydar Aliyev", "Zarifa khanim Aliyeva," and other works are of the great monuments[1]. By Heydar Alirza ogli Aliyev's being elected the first secretary of the Centeral Comity of the Comminist Party (1969) was laid the foundation of the turning point in the repub-lic's contemporary history. Not only the fast development of oil industry, cotton-growing, viniculture, but also began renascence of literature, culture and art. The jubilees of Nizami, AJAMI, Nizami, Fuzuli, Uzeir Hajibay, Muslim Magomayev and other men of science, literature, art held in Moscow and Baku, their books were published and monuments were erected. Branded as "Traitor», the play-writer and poet-thinker of Azerbaijan Huseyn Javid whose remains in 1982 was brought from Irkutsk to Nakhichivan and buried there. The term» Azerbaijan of Iran» carrying the political purpose was changed and used as"Southen Azerbaijan» that is, as it was. In the Soviet period History of Azerbaijan was taught on falsified text-books and programs. In 1958-59th in middle schools History of Azerbaijan (total 40 hours) was done within.

History of the USSR, basically History of Russia was presented[2]. Teaching of Russian Literature and language in II-X classes in middle schools were given 5-6 hours a week. Nevertheless in this period the authors of the book 'Language of Modern Azerbaijan" in three volumes were honored the Government reward of Azerbaijan Republic. These historical steps required the creative initiative, nation-al and political boldness.

Heydar Aliyev's "Let justice glory! call up and his new governmental thought – serves awakening of national mentality and created suitable conditions and possibility to promote democrative demands. "The one of those plans, more likely the first one is to familiarize the people with itself and to restore its normal ethno-culturologic life[3]. In his speech in his historical meeting in Milli Majlis of

Azerbaijan June 15, 1993. He said: "The State Independence of Azerbaijan Republic must be provided with modern requirements and must be closely connected with the process going on in the world on the principles of Azerbaijan Democratic Republic, established in 1918. For this purpose I will always try and no one can doubt that the rest of my life wherever it is I will devote only and only to develop Azerbaijan Republic as an independent government. The greatest initiator and creator constructed the independent government's foundation on the basis of strong and eternal supports aiming our people at a way of democratic development, dedicating his heart's light and flame to the Motherland which he loved more than his life, on this way as a commander he perished and erected as a national monument. Azerbaijanism, sense of love for men ran in this great man's blood. Heydar Aliyev wanted an attitude in a humane way towards man not depending on his nationality, race, language and religion. Whatever level it is he could not conceal his heart pains if not seeing it. He said: "Azerbaijan Muslims were looked upon (in the USSR – N.H.) as fourth, fifth-class in the country"[1]. Representing the fourth fifth –class and being one of the influential members of Polit- Bureau in Moscow, or may be the first and this most famous and intellectual son of Turkish world, brought up in XX century, didn't stand it and of cause, could not stand at all. He denoted that, this policy was the result of Gorbachov 's enmity towards the Turk and Muslim nations. Under direction of Gorbachov' s plan "Displacement of people" had been worked out and was already being implemented In this plan the was meant removing the majority of Muslim population living in Turkish republics to Russia and other Slavian republics and populate Christians nations instead[3]. Doesn't it whether or not remember the massacres of Christian and Muslims that repeated seven times in history since 1099 and the terrible "Crusade "financed by Europe?[3] Of course, the support of political social system called as" heart of machinations" and insidious imperia was subject to collapse. At last in the sitting of Supreme Soviet, on October 18, 1991 the deputies adopted the resolution, declaring the independency of Azerbaijan. The historical experience denotes that, signing the act of independency is not the end of the affairs but the beginning of it. The struggle must always continue, In this direction Heydar Aliyev seeing the bright future of Azerbaijan with all its clearness in a meeting of Milli Majlis (15 June 1993) said the fallowing words that are to be written instead of epigraphy in our most modern history. Azerbaijan Republic from now on whatever happens will never lose its independence and be a consisting part of any government and weal not fall under any governments' oppression. These words were the people's pledge.

ABOUT SOME RESULTS OF DEVELOPMENT OF NEW TECHNOLOGY OF SEISMIC STABLE CONSTRUCTION
(The project of NATO: Seismic Resistant Building, SfP982167)

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INTRODUCTION

The problem of safe and inexpensive dwelling easy to construct is one of most important issues in the part of the world where the project is implemented. Majority of residents of Azerbaijan, Turkey, Kazakhstan and other countries of the region located in seismically active zones live in non-seismic resistant buildings. This is because of high cost of up-to-date seismic resistant constructions and their inaccessibility for the majority of local people. Masonry buildings of bricks, clay or wood, inexpensive but seismically unstable, are very popular there.

The project is targeted to creating a new, cheap and simple seismically resistant construction technology of mass seismic resistant construction enabling construction of seismically resistant buildings of up to several floors with the same or lower price than standard masonry buildings, for great masses of population in cities and rural areas.

The principal objectives of the project are as follows:

– Simplification of the technology allowing construction of small (1-2 story) seismically stable houses capable of withstanding earthquakes and, by extension, explosions.

– Reducing the prime cost of seismic resistant buildings that will make construction of earthquake-proof houses available for majority of local people.

– Theoretical and experimental research and comparative analysis of seismic stability of buildings in Azerbaijan, Kazakhstan and Turkey compared with seismic resistant buildings on base of the new seismic construction technology.

During the Project implementation:

− New seismically resistant construction technology (ACT) will be developed and applied,

− Manufacturing line for mass production of ACB will be created,

− A large-size SSP will be constructed,

− Building models will be constructed and tested,

− Test results will be analyzed, ACT modified with necessary improvements.

On successful completion of the Project, the new ACT will be transferred for use by the end users, which are to provide manufacture and commercialization of the end products.

Developing and making a modernized machine tool for ACB manufacturing

For manufacturing modified ACB on the basis of patent # 009832, a machine tool allowing production of six construction blocks concurrently for one cycle has been developed. One cycle lasts 4-5 minutes on the average. This machine tool's productivity is 500-600 ACB per shift. The tool produces 25 x 12,5 x 12,5 (plus 5 cm of projection height) cm sized ACB.

The main advantages of the enhanced ACB are as follows:

− High durability of projections (caps) which do not break at the edge of their junction with the ACB frame. This is achieved due to using hyperbolic form of section of the area where the caps are connected to the ACB frame.

− Enhanced seismic resistance due to using hyperbolic section of the area where the caps are connected to the ACB frame.

− Easier process of ACB connection because of the spherical surface of a cap's upper side.

− More prompt and effective construction process due to application of more compact ACB size 25 x 12,5 x 12,5 cm instead of the former standard which was 40 x 20 x 20 cm.
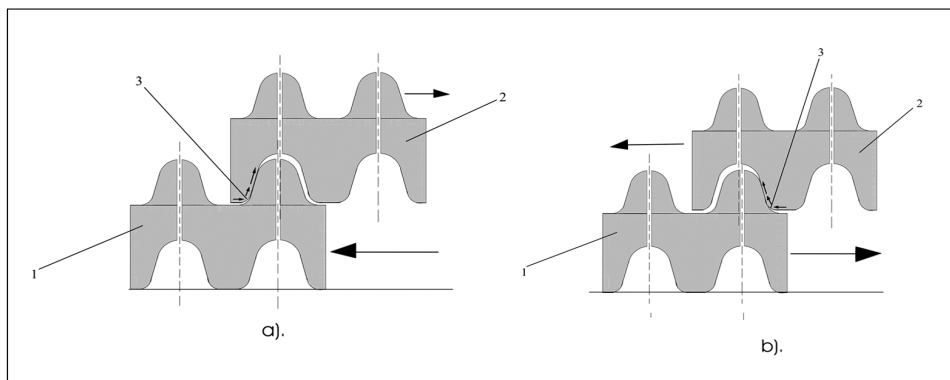

Figure1. Structure of the improved blocks

Unlike the previous tool, a new technology of vibropressing is used here. The main design features of the new machine tool compared to the first model are as follows:

– Hydraulic press instead of pressure by a system of loads;
– Six-cell press mold (multicavity mold) instead of single-cavity mold;
– Semiautomatic operation instead of manual operation;
– System of pneumatic ejection of the ACB caps.
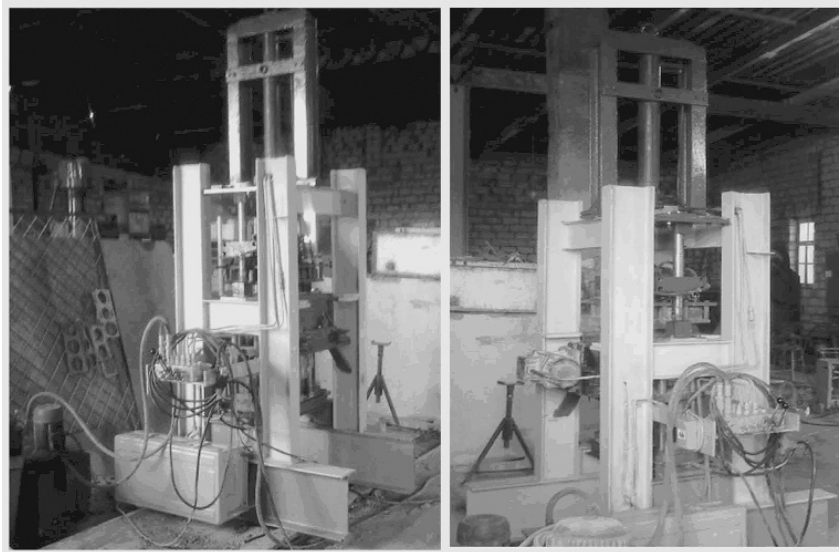
Figure 2. Photo of ACB manufacturing machine tool's new design

The design of the new press mold is considerably different from the first model. The new mold's punch is equipped with special pneumatic valves. At the moment when the punch is elevated, pneumatic valves are opened in its upper part for each ACB cap and a spray of compressed air and oil is injected into the lower part of the mold. The compressed air with the oil spray pushes the cap down and thereby prevents it from breaking off from the ACB frame. At the same time, the compressed air cleans the punch's upper part as well as valves from remains of sand-cement mixture. The oil spray lubricates the surface of the punch and the mold, and makes it easier for the ACB to come out of the press mold.

Development and testing of ACB of different standards and forms

SRIPSE has developed three standards of ACB for now:

1. 40 cm x 20 cm x 20 cm;
2. 25 cm x 12,5 cm x 12,5 cm;
3. 20 cm x 10 cm x 10 cm.

These standards have been elaborated taking into account the necessity of making internal walls of buildings thinner than the outer ones. Besides, in some countries with hot climate situated in seismic active zones, standards with thinner walls are used: for example, 11-14 cm in Indonesia and Pakistan. For those countries, small sized ACB are more acceptable. Another advantage of smaller ACB is that they are lighter in weight that makes the construction process easier for workers. There is one more important precondition: when using ACB of smaller size, number of ACB per area unit is higher and therefore, effectiveness of dissipation of seismic energy also increases.

All these problems are planned to be examined in detail during the tests on the SSP. Fig 10 shows ACB of all three standards developed by SRIPSE.

Producing and testing of different types of damping substance (DS)

Researches of different DS compositions have been conducted. As a result, the research team has managed to come up with absolutely new compositions which demonstrate high effectiveness. These compositions are based on applying of different polymers and natural minerals as fillers, and now they are at the stage of being patented. In addition, a new type of DS for ACB – damping gaskets have been developed and tested. First tests of the damping gaskets showed good results. Preparation of an application to receive a patent for damping gaskets is currently underway.

Production of damping gaskets

For manufacturing of damping gaskets, SRIPSE have commissioned DBT Company to develop and make a damping gaskets fabricating machine tool. Its scheme is shown on Fig 11. The machine tool is designed to cut damping gaskets out of special film made of damping substance and developed by SRIPSE, with a special stamp-knife. The film is rolled up into a reel and placed on the initial bobbin (1). After that, the film is stretched between two steel cylinders covered with special rubber. On the surface of cylinders (2), some stamp-knifes are attached, shaped as required for a damping gasket. Then the film is fixed on the second bobbin (3). Cylinders (2) are clenched to each other with a special regulated pressing mechanism and rotate with equal speed. Bobbins (1, 3) rotate with a variable speed regulated through a special mechanism. On the scheme (Fig.5), some strip of the film (4) before the gaskets are cut out and some (5) after the gaskets are cut out are shown. Having been cut out, the damping gaskets are pushed out from the film by a special mechanism and collected in a pallet located under the part (5) of the film.
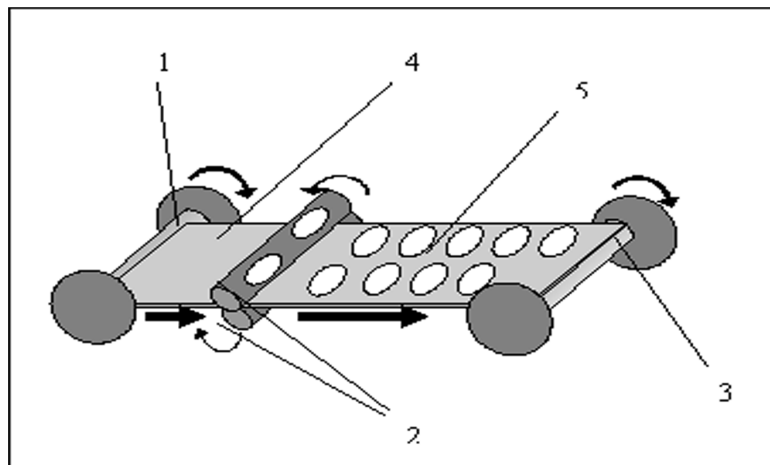
Figure 5. Scheme of operating principle of damping gaskets fabricating machine tool

Development and construction of a minor SSP with working area of 1.5 x 2 m for testing main units of the major SSP and building models

Before starting the physical production of the major SSP, it was needed to experimentally check the working capacity of its main mechanical elements and, in particular, mobile chassis moving on rails. SRIPSE's small seismic platform made earlier (in 2003-2004) had quite a different principle of mechanical fastening by means of springs. Flaws of such construction lead to side inclined movements and resonance vibrations of the platform. As a result, the effectiveness of experiments decreased.

Therefore, SRIPSE developed and made a minor SSP for simulation of harmonic vibrations of the ground using the physical principle provided for the major SSP: SSP on metal wheels is set in horizontal oscillatory motion and moves on the rails. The minor SSP has been fully manufactured by SRIPSE and successfully tested.

Production of the major SSP's (metal base, rotation mechanism, compensating mechanism, engines)

Following the works plan and in pursuance of SRIPSE's commission, the Scientific Center for fundamental and applied researches has developed and made a rotation mechanism for turning the metal surface of the seismic platform. The rotation mechanism is intended for turning the surface of the seismic platform to a required angle relative to the platform base.

The design of the seismic platform secures that the surface vibrates horizon-

tally towards one direction only. At the same time, to bring the testing process nearer to real conditions, checking the impact of different directions of seismic vibrations on building models is needed. For that purpose, a fundamentally new design of seismic platform has been suggested having a rotation mechanism for turning the vibratory metal surface.

1 – Metal base of the seismic platform
2 – Circular support rails
3 – Ring roller bearing with internal cogwheel
4 – Metal surface of the seismic platform
5 – Support rollers
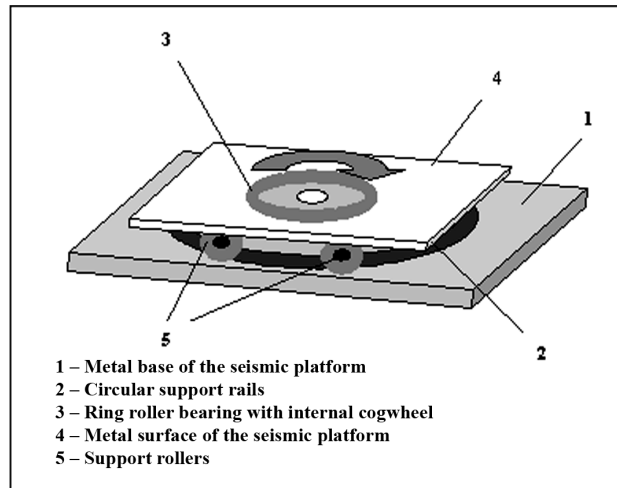
Figure 6. Construction diagram of SSP's (Seismic simulation platform)
metal surface and rotation mechanism

Developing, making and mounting mechanical units of the vibrational system and installing hydraulic engines

To set the seismic platform in horizontal vibratory motion, two hydraulic engines of high capacity are used.
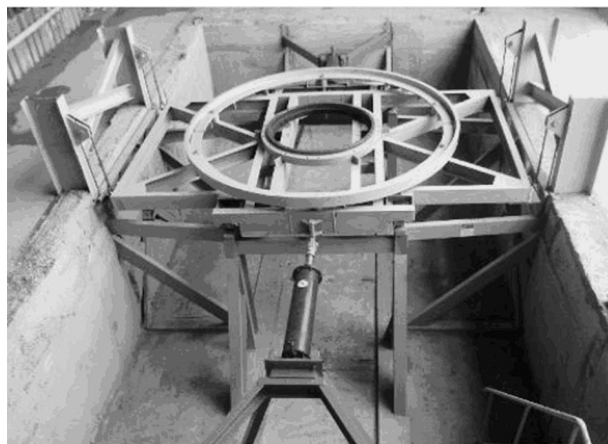
Figure 7. Rotation mechanism with two hydraulic engines

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Fig. 7 shows metal supports of the compensating mechanism with rope tension system to the right and left of the rotation mechanism.

Two hydraulic engines are placed on the opposite sides of the platform. Such a construction of the vibrational mechanism allows to evenly distribute the mechanical load from the opposite sides of the SSP and reduces the risk of mechanical damage and deformation to it. Besides, placing the engines on the opposite sides reduces the load on the junction points between hydraulic engines and the SSP and as a result, decreases the weight and erosion of the junction points.

Fig. 8 shows synchronous movement of rods of the hydraulic engines and the SSP. Self-timing of the engines' operation is obtained due to their special junction system to the hydraulic station.
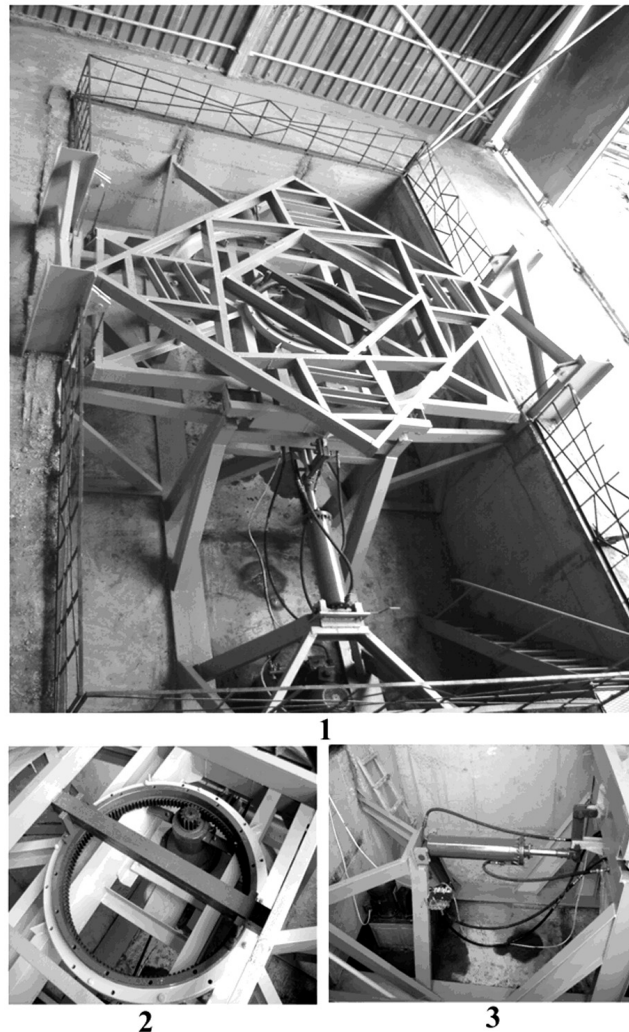
Figure 8. Seismic simulation platform with the two hydraulic engines

First tests of a Seismic simulation plarform

The first tests of a seismic platform were successful. All systems of a platform worked in the established mode. DBT bricks have shown good seismic stability.
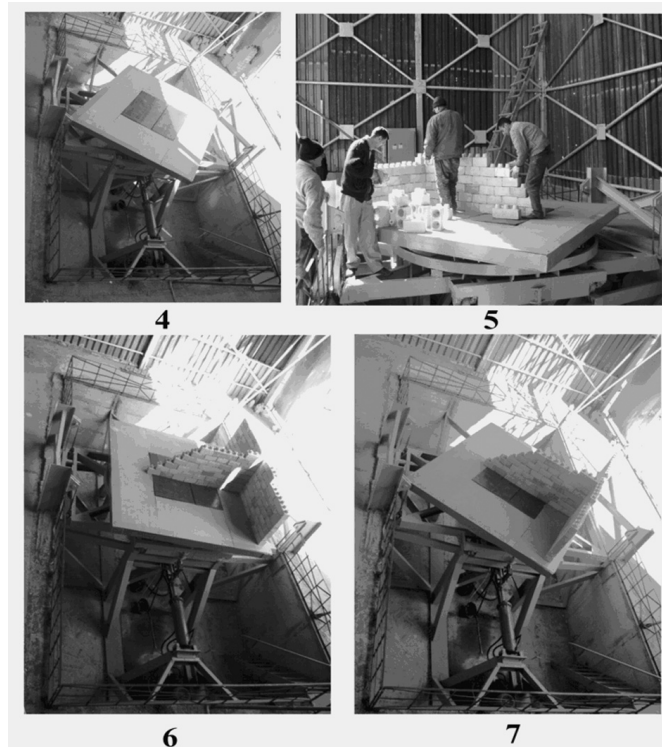
Figure 9. The first experiment of seismic simulation platform.

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COMMUNIQUÉ

on issues of Global Changes of the Geological Environment, "GEOCHANGE," for presentation to UNO, European Union, International Organizations and Governments of States

This communiqué was developed on behalf of heads of international organizations, universities, scientific institutes and centres, scientific–technical companies and scientists of different countries.

This communiqué was developed and issued by the World Organization for Scientific Cooperation (WOSCO) and the initiative team under the leadership of Victor Khain, Academician of the Russian Academy of Sciences, Prof., Doctor of Geological-Mineralogical Sciences, and Elchin Khalilov, Academician of the IAS H&E (Austria) and RANS, Prof., Doctor of Geological-Mineralogical Sciences.

During recent years an upward trend of active measures and the undertaking of specific actions intended to decrease the negative impact of technogenic activity of humanity on global changes of climate has been observed. Constructive positions on this issue from the European Union, international organizations, governments of many countries, scientists, and leaders of business, are completely supported and welcomed by this communiqué's initiative team.

"GEOCHANGE" as used in this communiqué refers to natural changes of the geological environment resulting from endogenic, exogenic, and cosmic factors, particularly solar activity and other processes taking place within Solar system, which have negative consequences for the stable development of humanity.

• Presently, multiple scientific facts confirming increasing changes of a universal character of the geological environment have been collected. These changes indicate an acceleration of the rates of growth of geodynamic activity of the Earth, which are expressed, in particular, as earthquakes and volcanic eruptions. A high risk of underestimation of the scale of impact of geologic factors on global warming is evident. Activation of geodynamic processes, particularly volcanic eruptions, is accompanied by increased degassing of the mantle of the Earth and emission of a large volume of CO_2 and other endogenous gases into the atmosphere, which cause a greenhouse effect.

Thus, in our opinion, existing forecasts of rates of global climatic changes

are underestimated; this may lead to insufficient justification and effectiveness of decisions adopted at the international level.

• Alarming facts about a drastic acceleration of the drift of magnetic poles of the Earth since 1990 not only have catastrophic consequences for global climatic changes, but also bear witness to changes in energetic processes internal to and external to the Earth that are responsible for the formation of the magnetic poles of our planet. Simultaneously, a decrease of magnetic intensity of the Earth is observed; in the last 25 years, it decreased on average by 1.7%, and in some regions, for example, in the Southern part of the Atlantic ocean, by 10%.

We would like to concentrate attention on the point that the magnetic field of the Earth generates magnetic screen from "magnetic field lines", protecting the biosphere of the Earth from hard cosmic radiation which is destructive for biological forms of life.

• It is necessary to take into account the fact that there was an increase of angle of cusps (polar holes in the magnetosphere to the North and to the South), between 1990 and 2000 reached 45°. Radiation from the solar wind and interplanetary space was directed towards expanded holes, i.e., a huge amount of additional cosmic particles and energy started to fall on polar areas, which leads to heating of polar caps. Particularly, the drift of the magnetic poles of the Earth and opening of the cusps leads not only to increased penetration of streams of hard cosmic radiation directed towards the Earth surface, but also to redistribution of temperature in its upper of the Earth's atmosphere layers too. Such changes may lead to redistribution of areas of formation of cyclones and anticyclones, and thus, impact on global climate changes. This important factor is not taken into consideration in assessments of impact of exogenic factors on global climate changes.

• According to research by scientists in many countries conducted over many years, an increase of volcanic and seismic activity has a high correlation and physical connection to an increase of solar activity. Research at leading scientific centres around the world indicates that the approaching 24th 11-year solar cycle, forecasted to peak in 2012, will have an abnormally high amount of solar activity.

During this period peaks of some solar activity cycles of periods other than 11 years coincide with the 11-year cycle; this will further increase emission of solar energy into surrounding space.

According to scientists' forecasts, the rise of solar activity will be accompanied by a significant increase of seismic and volcanic activity; its peak is forecasted to be between 2012 and 2015.

• Meanwhile, an increase of volcanic and seismic activity, in contrast to global climate changes, may lead to instant catastrophic consequences for entire regions of our planet: many people will die, the populations of large territories will be deprived of shelter and food, economies of states will be destroyed, and large scale epidemics of serious infectious diseases will occur.

• Presently, the world community is not ready to oppose such a possible aggravation of the situation. Meanwhile, periods of significant increase of endogenic activity during the geologic life of our planet have been observed many times and, according to many geologic indicators, the next such period is already starting.

• Single instances of strong earthquakes and eruptions of volcanoes, which lead to large numbers of victims and a large amount of destruction in one country or another, are usually accompanied by wide international assistance of different humanitarian international organizations and individual states. Thus, decisions are usually made by states themselves and by other organizations, and then distinct intergovernmental coordination and restoration of territories subjected to cataclysms is absent. Meanwhile, during the period of large scale natural cataclysms, a special, legal, administrative and financial mechanism and international coordinating body for the management, coordination and accomplishment of rescue, restoration and other international measures in the regions of natural calamities will be required.

• Scientific knowledge is accumulated in many countries, and experience in long-, mid-, and short-term forecast of different natural cataclysms is available. At the same time, in most cases there aren't definite rules for making decisions and particular acts of state agencies when a need is indicated by forecasts of possible natural cataclysms. The incorrect decisions and uncoordinated actions of governmental and international structures upon receipt of such forecasts can bring panic to the population and disorganization of actions by state agencies and rescue services. It not only decreases effectiveness of preparation for natural cataclysms, but also can cause complication of social and moral and psychological situations in the regions of the expected cataclysms.

TAKING INTO ACCOUNT THE AFOREMENTIONED INITIATIVE, THE TEAM ON ISSUES OF GLOBAL CHANGES OF GEOLOGICAL ENVIRONMENT "GEOCHANGE" PROPOSES:

1. To adopt a UNO Framework Convention on «Global Changes in the Geological Environment» and to establish a UNO special Intergovernmental Commission on this problem.

2. To develop and confirm a UNO International Program for the Study and Forecast of Global Changes in the Geological Environment.

3. To develop and confirm international and legal norms and mechanisms for effective management and coordination of actions of governments of countries and international humanitarian organizations upon receipt of forecasts of natural cataclysms and oncoming emergency situations as a result of global changes in the geological environment.

4. To establish a UNO International Centre for the Forecast of Natural Cataclysms and quick notification of countries about arising risks.

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