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INTERNATIONAL ACADEMY OF SCIENCE
H&E



SCIENCE WITHOUT BORDERS

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of the International Academy of Science
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H&E



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**Transactions
of the International Academy of Science
H&E**

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ICSD/IAS H&E

Innsbruck

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In the book are published the transactions of Full members and Corresponding Members of the International Academy of Science/International Council For Scientific Development, 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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INTRODUCTION

The first volume of the book “Science without borders. Transactions of the International Academy of Science, H&E, 2003/2004”, has more than 50 scientific articles.

In the book are represented the articles of famous scientists of Austria, Azerbaijan, Brazil, Germany, Georgia, Italy, Russia, USA, France, Czechia, Ukraine, Japan.

This book solves one of the main problems of ICSD/IAS H&E the exchange of scientific information and uniting of efforts of different scientists of the world for solving of the most actual problems of humanity. The book consists of seven parts: Medicine and biology; Sciences about the Earth; Physics, mathematics and astrophysics; Chemistry and oil industry; Architecture and construction; Social and economical sciences; News of science.

Full members (Academicians) and Corresponding Members of IAS H&E from national sections of different countries have published their scientific articles in this book. Besides, there are the articles of scientists, presented by Academicians of IAS H&E.

It is planned the yearly editing of the book “Transactions of International Academy of Science H&E”.

The editorial board congratulates the representatives of all national sections ICSD/IAS H&E with publication of first volume of the book, and hopes that this effective beginning will have successful continuation.

Editorial Board

PROGRESS IN DEVELOPMENT OF A COMPREHENSIVE THEORY OF A HUMAN PERSON AS A SOCIAL BEING

The starting point was a model to deduce the evolutionary process as the unintended [therefore not pre-determined] consequence of intended actions of “restricted autonomous actors”. One of the consequences of the restrictions is complementarity of different abilities (according to the proposal of N. Bohr) and the conservation principle for the amount of the basic abilities. The autonomous actors (AA) are understood as enabled by abilities based on energy (to handle movement and observability - commonly associated with the epistemological term “realisation”) **and** “ordnendes Diskriminationsvermögen” [the ability to distinct and put distincted and valuated into an order as “discrimination ability, ability to organize etc” - commonly associated with the epistemological term “construction”; therefore the model can be seen from the epistemological point of view as an application of constructive realism, from the view of ontology as an evolution based monism]. Any ability is assumed to be modified within the evolutionary process as we accept this for the energetically based abilities fields and physical and chemical powers and their expressions as observable mass, form, structure etc. , the terms for the different levels of the ability which we use to handle with distinction and to bring the distincted and evaluated into an order we name “discrimination ability (non living entities), **ability to organise** (living beings), emotional ability (“Emotionsvermögen”), for living beings with organs) and Kritik-Vermögen (for humans as social beings).

With this model a differentiation between living and non-living entities is possible on the basis of the level of the “ordnenden Diskriminationsvermögen”: **Autopoiesis** of living beings can be understood as the use of self-oriented guidance of non living entities according to intention, but initiated by a (net of) entities which have learned that non living entities are limited too and select their priorities according to the given environmental setting which is changing and can be changed. These “higher” entities have learned to influence the relevance of the setting for the non living entities by using special chemical and physical conditions. They have learned to create such situation by building special structures (enzymes, catalyst): If these structures are present and are brought close enough to the non-living entities then the non-living entities change their priorities in a predictable way. So the entities with this higher level of “ability to deal with information” can initiate and stop processes according to their priorities, but because of the given intentions of the non living entities. [to handle predictable and unpredictable phenomena on the same entity I developed the so called “Petri disc-model” But maybe I will have the opportunity to explain the model to you in more details]. If you accept the

“discrimination ability” of non living entities and a progress of this ability within evolutionary progress to the “ability to organize” which integrates the “knowledge” of the enzymes and catalysts you would have a model to distinct between living and not living entities. [with this assumption the old question of Nobel laureate Muller would be answered about the “specific hetero-catalytic power” which he postulated for the determination power of gens]

The “ability to organise” is understood as limited too, according to the basic assumption of limitedness. If all these assumptions are accepted, then we have to expect “causally unspecific health effects” of additional demands on the available resources. This is state of knowledge in connection with a lack of energetically or morphology based resources. But “causally unspecific health effects” have too be expected, too, in situations with a lack on the “ability to organize” - if the assumption of this additional quality should be a helpful invention [I assume with Einstein and Kant that a human person can only observe a segment of the real world and has to create valuations about the observed in context of evolution based given and experienced modified attributions. Therefore I follow the position of Einstein that any scientific theory is a free invention of the human brain with the goal to deal better with reality. Therefore “discrimination ability” and “ability to organize” are free inventions too.]

Therefore I predicted causally unspecific health effects for an additional demand on “ability to organize” too. The phenomena I predicted should be easily to observe in borderline situation: When given pathophysiological deviations (e.g. arteriosclerosis) can be adapted adequately because of enough available capacity to organize, then the persons are free of symptoms but have relevant need of the capacity to organise. In situations with additional demand on ability to organize we should expect in such persons a lack on this ability for prior adequately balances processes. Therefore we should expect symptoms. This allowed handling the phenomena after environmental disasters, but many daily life situations with negative (and positive) health effects too.

This contribution was awarded. My goal was to extend to model to qualitative aspects of the use of ability to organize to understand the interaction between cells, tissues and organs (organism) on one hand and the individual biological entity or the person (and the manmade structures like societies, languages etc) on the other hand. I could bring this process a relevant step forward.

The **key problem** was to find an answer to the following phenomenon: All cells are “autonomous actors”, even the single cells in tissues and organs. This can be confirmed with experiments (e.g. with the cultivation of individual cells). But the tissues and organs are “autonomous actors” too: Even isolated tissues and (same) organs can be cultivated artificially outside of an organism. The healing of wounds and the physiological growing processes are confirming

this statements, too. But at the same time any higher living being is able to use these cells, tissues and organs like machines for their intentions. Therefore the organs and tissues seem to be at the same time “pseudo-autonomous actors” for the autonomous actor “biological individual and person” and “autonomous actors” for themselves within their level of intentions as organs and tissues.

There is another phenomenon we should take into consideration. Scientists can observe only the effects which can be observed by an outside observer. The key for understanding the observable processes of living beings are therefore often their interactions with the outside and therefore with **their** given reality. [This “reality” should be assumed as different according to the different levels of entities we observe.] From this point of view an additional difference has to be taken into consideration between the individuals (and persons) on one hand and tissues, organs and cells of these individuals and persons on the other hand: It makes sense to say: An individual can observe its reality by the use of sensory organs. But it makes no sense to make the same statement about organs and tissues: They have no other information about their “outside” than the information which is coming in a long cascade of translations and modification – started with the basis external stimulus (e.g. of light) going to the brain and from the brain with another cascade to the cells in organs and tissues. The organs and tissues have no possibility to get an “unfiltered” information about their external situation. This is in principle different to the position of the individual and the person: Individuals and persons have an – restricted by the quality of the sensory cells – unfiltered information about their outside reality, organs and tissues not.

The solution for the problem of the “pseudo-autonomous actors” which are at the same time “autonomous actors” should be deducible from the given model which allowed handling non-living and living processes within one scientific frame. Therefore it was to assume that cells, tissues and organs should have priorities and intentions too. But the level of these intentions should be different – according to the evolutionary age when they occurred first within the evolutionary process: Therefore the intentions of cells should be different from the tissue-specific intentions of cells and the organ-specific intention of cells in tissues. And these intentions should be different from the level of the intention of biological individual “homo sapiens Linéé” and they should be different from the human person as a social being with his final intentions.

There is no reason why the brain should be able to oblige organs and tissues to act for intentions which are not part of the intentions attributable to the acting organs and tissues. (The proposed model allows such form of interactions just on the level of individual and higher). But the model allows the assumption that “higher evaluated entities” can motivate “less evaluated ones” for a special priority within the list of their given priorities of entities which is a intended function for the “higher entity” too. This is the

evolutionary principle which was assumed to be helpful to understand the autopoiesis of a living cell from un-living beings. But any cell knows the “trick” and can not be motivated for an action which is obviously against the self-oriented intentions. Therefore this principle can be used to explain the co-ordination of the activities of single cellular to act like a cooperative to solve problems of all integrated entities: The experiences of organelles in unicellular demonstrates: The efficiency of an action which is focussed to repeat a special type of function with specialised structures is much higher then the non-specialist action. Therefore there are acceptable arguments to assume that single cellular can be motivated to build a multi cellular to solve problem of any individual cell. But this co-operation should take place just as long as it is needed to solve the common problem – like in cooperatives of farmers in our time. There are same phenomena in biology which confirm such a view (e.g. the “Schleimpilz” – a special species of Myxomyceta, a subspecial of amoeba. In the case of an environmental problem one of them emits cAMP and other amoebas with the same problem move to the emitter. They change their form according to different specialised cells and build a multi-cellular you can see without microscope. Each cell can play any role. After solving the problem the rhythmic emission of cAMP will be stopped. The specialised cells change again back to the form of the amoeba and move away.)

This is an explanation for the autopoiesis of multi-cellular built by unicellular as autonomous actors. This principle can be to explain a hierarchical organisation of organs and tissues by the brain under special conditions: If the flow of information from outside of the environment to the single cell integrated into the co-operative is filtered and can be modified by the “central helmsman” (the brain) according to the needs of the helmsman, but at the same time according to the priorities of the “pseudo-autonomous actors” (organs, tissues) too, with regards to their assumption of their actual outside information. The intentions of the “helmsman” can be (and will be) in principle different from the intentions of the organs and tissues. Using such argumentation the model would propose the possibility of multi-cellular with organs and organisms, if a net of cells (=brain) made the evolutionary progress from the level of the ability to organise to the next level. The must have learned

- to separate the function units from the external direct information (which is done by the skin),
- to modify the flow of information coming from outside in a way that just messengers give report from the outside situation (which is done by the physiological principle of the sensory organs and the translation into different “languages”)
- to be able to influence the intensity of the ingoing stimuli – which is possible by the selection of the ganglia and the principles of active

inhibition (Pavlov) and active enforcement (motivation – according to Anokhin)

- to transfer the so selected and in their intensity modified information in a similar principle of cascades to the function units. (So the cascade of information can be seen like a chain of stones of Domino, which falls down if you push the first stone, but in a dynamic way: The falling can be dynamically inhibited or touched by the “central helmsman”.)
- Then the situation can be given, in which the outside reality does not fit with the expectation of the individual brain about the outside situation. Then the helmsman can act according to his assumption only if he is able to produce the same follow up of Domino stones if he can start the chain by the sensory organ but without an external stimulus. And this paradox assumption can be confirmed by the biological facts: Any sensory cell can be activated not only by the specific external stimulus but by efferent innervations of the sensory cell – and therefore by the “helmsman itself!”. All sensory cells have afferent and efferent innervations! Therefore the brain can create an imagination of any “reality”. (In my paper of the Honour Lecture I have included good examples for this phenomenon)

All this can be observed in the biological reality. So it is possible to enforce the “extended view” for the better understanding of the multi-cellular, the organism and the individual and the person.

There are relevant consequences for health:

This model gives the (first) answer in which **placebo** phenomenon and **Toxicopy** can work: These are just special cases in the relationship between the priorities of the individual / person and the priorities of the organs and tissues. The special situation is not given from the view of the organs and tissues. They live in a “matrix-world” (have you seen this movie?). The special situation of placebo is given for the scientists as an outside observer with a different valuation of the outside reality than the patient. For the scientist it is not explainable why the body shows unexpected reactions. But the outside observer is not able to explain why any biological process takes place. Scientists has only learned not to ask why such a biological process takes place, if the same phenomena are predictable observable because of the repeated observability, if the observable conditions are standardized. In opposite to physics the biologist does not ask for an unobservable reason (like field, power) for the observable phenomena. The problem of the biologist or medical scientist in the case of placebo is that there is no significant correlation of the phenomena which are usually caused by chemical and physical stimuli. But in the situation of Placebo (or Toxicopy as an “Environmental placebo”) there are no outside physical and chemical stimuli to observe. But if the follow up of the “falling Domino stones” is started we are used to observe the “rest”

of the chain of the domino stones in the same way in placebo as in the “common situation”. This is in a good agreement to the predictions.

The knowledge of the special relationship between the individual (and his goal) and his “pseudo-autonomous actors” can be used for a better understanding of many health relevant environmental situations: On one hand it is in a good agreement with the traditional toxicological view and with the view of psychosomatic. But on the other hand it allows predictions for “comprehensive combined situations”. Such situations are typical for daily life: Influences from physical, chemical and biological stimuli are offered at the same time, when the person is in psychosocial relationships and in a setting dominated by social structures.

The model allows the deduction of the creation of social structures by the humans as social beings too: Humans of today focus more and more on values which are based on assumptions of relationship to other humans and on the values of humans itself then to parts of the real physical, chemical and biological world. This shift from realized world more and more to a world constructed by man made constructions allows to explain why such construct-constructions are so effective in influencing the wishes, goals and fears: The persons accept them as “causes” which act by themselves like the weather or gravitation, or as existing autonomous actors like lions or other humans. But these manmade constructions are not able to act by itself - not only in energetically based aspects but in the aspect to be able to build new creations too. But such man made construct-constructions influence effectively the life of any social being: Therefore governments, ministries, universities, but NGOs etc. too can be understood as **Para-autonomic actors**: If there are no persons, they are unable to act on the level they have reached.

Academician of ICSD/IAS.

Prof. Dr. Kofler W.W.

The President of International Academy of Science/ICSD H&E

(Innsbruck, Austria)

SCIENCE DOES NOT KNOW BORDERS
(For 10-years of establishing the Russian Section of International Academy of Science)

Occurring of the first creative, professional associations of scientists (non-governmental, non-sectoral, non-commercial) arose the skeptical reaction as far back as some years ago. The time turned out the medico for sceptics. More and more scientists and organizers of science understand that professional self-determination of scientists, makers of science and culture

happens not by orders and circulars. Junction to international tradition of development of science finally convinces of the fact that free professional communities are true keepers of traditions of scientific creation, keepers of professional culture and ethics, aims and values. The example of it, is founding of Russian Section of International Academy of Science (RS IAS).

International Academy of Science (IAS) is public organization, working with principle of club, unites prominent scientists and philosophers, political, public figures and statesmen of the world. Among them there are 120 Nobel Prize laureates, more than 50 former and acting ministers. There are more than 80 national academies of science in the IAS. More than 60 universities of different countries and many research institutes have become the collective members of academy. There are created and actively work national sections of the Academy: German, French, Indian, Japanese, East-European, Azerbaijan, South American, etc.

In October 1993 in Moscow in Constituent Assembly, carried out in SRI of normal physiology named after P.K.Anokhin, with active support of Russian Academy of Medical Science was established Russian Section of International Academy of Science (RS IAS). The leading scientists of state academies of Russian Academy of Science, of Russian Academy of Medical Science, of Russian Academy of Education, of series of public academies, scientific and educational institutions of Russia are members of Russian Section. At the beginning of establishing of Russian Section of IAS were the prominent representatives of domestic science: Nobel Prize Laureates N.G.Basov, A.M.Prokhorov, Academicians N.N.Moiseyev, V.I.Pokrovskiy, K.V.Sudakov, N.P.Laverov, F.I.Komarov, O.L.Kuznetsov and others. In 1999 was made the re-registering of RS IAS in Ministry of Justice of RF as the representative of foreign public organization in Russia – “Russian Section of IAS”.

Today among RS IAS there are more than 380 full members – Academicians of RS IAS, 16 Honourable Academicians, 17 foreign members of RS IAS, 26 associative members of RS IAS.

In 2002-2003 to membership of RS IAS were taken 22 new members of RS IAS. Among them, there are representatives of biomedical specialties - Prof. Byakhov M.Y., Prof. Galsan Y.Suxbat (Mongolia), Prof. Denisov-Nikolskiy Y.I., of exact sciences – Prof. Yakubov V.Y., of social sciences – director general of SRI “Nature”, Doctor of b. s., Prof. Rybalskiy N.G., a rector of International Independent ecological-political University, Prof. Stapanov S.A., Doctor of p. s. Kapustin S.N. and others. In membership of RS IAS was taken the group of famous Byelorussian scientists, who plan the establishing of Byelorussian Section of IAS: Medved A.V., Voytovich A.P., Gurin A.V. Matyukhin V.A., Kashlev S.M., Savitskiy M.A. Was enlarged the representation in RS IAS of leading specialists of different scientific directions – biology, ecology, pedagogics, exact sciences (physics, chemistry, theoretical and applied mathematics), political science, sociology.

28 organizations – collective members of RS IAS were officially registered. Russian Section of IAS actively cooperates with Academy of natural sciences (President – Kuznetsov O.L.), with International Academy of creation (President – Glagyshev G.P.), with International Academy of noosphere (President – Ursul A.D.), with International Confederation of sports organizations and its leaders – members of RS IAS Rogatin B.N. and Yefimenko A.N., International Academy of Communication (President – Varakin L.Y.), All-Russian Public Movement “Orthodox Russia” (Chairman of Central Council – Burkin A.I.) and others.

Ecological Department of RS IAS (Academician – Secretary Professor Glazachev S.N.) works hard. ED RS IAS together with All-Russian Public Organization “Ecology of concrete works” established the scientific-enlightening project-program – “Ecological culture”; with Russian Exhibition Complex “Expodesign” in AEC were carried out 2 exhibitions “Man-nature-creation”.

The department of medical-biological science (DMB RS IAS) (more than 160 members, Academician-Secretary – Prof. Sherstnev V.V.) plans to publish the guide “Who is who in RS IAS”.

Also was created the department of physical-technical science of RS IAS (Academician – secretary - Filaretov G.N., scientific secretary – Lukashev V.Y.).

Not long ago the members of Directorate of RS IAS took part in the work of General Assembly of the Presidium of ICSD/IAS (Health and Ecology) in Sao Paulo, Brazil. The Co-President of Russian Section of IAS Academician Sudakov K.V. made a speech about activity of RS IAS. In the Assembly was elected the new membership of the Presidium of International Council For Scientific Development/International Academy of Science (Health and Ecology). As Vice-President of IAS was elected Sudakov K.V., and Glazachev O.S. has become the representative of RS IAS in the Presidium. In the Assembly also was considered and passed “Memorandum of International Academy of Science in Sao Paulo”, suggested by the member of Presidium of ICSD/IAS Prof. D.X.Shreder, determining the priorities of development of organization in the modern world. Was stressed the positive experience and high scientific potential of RS IAS (information is available in site of RS IAS).

It is necessary to note, that the Assembly was carried out in the frames of Global Conference for construction of stable world, organized by International Union of National Associations for preventing of air pollution and protection of environment (President of Organizational Committee is Rondolfo M. Lobato). (www.abepolar.org), in the work of which took direct part the representatives of RS IAS.

The work of RS IAS is elucidated on the pages of magazines “Medical Market”, “Bulletin of new medical technologies” (Tula), “Search”, “Medical newspaper”, “Bulletin of ecological-pedagogical education”, bulletin

“Ecopedagogics” of MSPU named after M.A.Sholokhov and others. The page of Russian Section of IAS in Internet is kept to develop: www.rsias.nm.ru

With purpose of organizing the public acknowledgement and popularization of activity of scientists under the aegis of RS IAS in 1999, the directorate instituted the honorable Pavlov’s Pin (gold and silvery), which is given to prominent scientists of Russia and countries of CIS. Totally from 1999 37 Russian scientists have been given the deserved award. In 2002 the honorable pins were given to 4 members of RS IAS.

As it is known, the Ecological Department of RS IAS and Regional Public Organization “Renewed Motherland” in 1999 instituted the Honorable gold pin “Together”, which are given to members of IAS, who made outstanding contribution into the elaboration of problems of ecological culture, keeping the peace, harmony of cosmos, nature and man, physical and intellectual health of man and society. During 1999-2001, 9 scientists have become the laureates of honorable pin “Together” for elaboration and development of theoretical, social and scientific-applied aspects of problems of ecological safety, ecological culture and ecological education in modern world. In 2002 with the pin “Together” was awarded 2 scientists, in 2003 – 1 scientist.

Very important aspect of the activity of Directorate of RS IAS is the establishing by Regional Public Organization “Renewed Motherland” and Commission “Health and Ecology” at the Presidium of IAS (Innsbruck, Austria), the incentive grants-scholarships named after I.P.Pavlov for young scientists of Russia, who has carried out the researches in the sphere of biomedical science, natural sciences and ecology. During 3 years more than 30 persons were given the scholarships.

Scientific and organizational relations of RS IAS are being widened. So, in May – June of 2003 the President of International Academy of Science (Health and Ecology), Doctor of Medicine, Professor, Director of Institute of Social Medicine of the University of Innsbruck Walter W. Kofler (Austria) visited Moscow, Barnaul and Baku (Azerbaijan).

In the meeting with the scientists of International Ecological-Political University (IEPU): with rector, Academician of RS IAS Stapanov S.A. and with dean of ecological faculty Marfenin N.N. were discussed the problems of cooperation in the sphere of ecology of man, researching the problems of health. Special mutual interest aroused the questions of researching of measure of influence of man on ecosystems of the Earth, the limits of quaternary influence on global processes of evolution of biosphere into noosphere. IAS and IEPU are going to join the efforts for elaboration, substantiation and applied using of index of ecological potential of ecosystems of different regions of the world. It is especially actual because of establishing of global ecological fund, in conditions of forming of market of global ecological services.

In Barnaul on 28-29 May of 2003 under the aegis of RS IAS, Russian Academy of Medical Science and Altaian State Medical University (rector is Academician of RS IAS V.M. Bryukhanov) was held International Symposium "Stress and adaptation". The participants listened with big interest the plenary report of W.Kofler "Stress and adaptation: broadened view to the problem". In the speech was mentioned, that the man and its connections with environment are characterized with not only terms of material (energetic) qualities, but also with qualities, with which he is able to self-organizing of himself and those around him, who are non-material. Consequently, the process of evolution is also may be considered with positions of material and non-material relations. These theses (theory of broadened view to the process of evolution of man) allow to again consider the connections of man with environment, give the opportunity to forecast and prevent undesirable effects of disadaptation, stressor disturbances of psychosomatic status of man.

These ideas were being developed in other reports of participants of the symposium, where with concrete examples were considered the new data about neuronal-molecular, endocrine-vegetative mechanisms of development of stress, aspects of early diagnostics of psychosomatic stress-induced disturbances, opportunities of their non-medicinal correction and new technologies of complex increasing of stress-resistance of man. Should be especially noted the efforts of Academician of RS IAS Kiselyev V.I., who provided organizing of symposium in international level.

In Azerbaijan, the representatives of Directorate of Russian Section of IAS and Prof. W. Kofler took part in the ceremony of grand opening of headquarter of Azerbaijan Section of IAS. It is necessary to note, that the activity of national section of IAS in Azerbaijan, established in 2001, meets with support of National Academy of Science and its President – Academician of IAS M.K.Kerimov, of rectors of leading institutes of higher education, of Parliament of the Republic. And it is not by accident, that during year and a little after establishing of national section, the AS IAS has its own building; the interdisciplinary scientific center, elaboration of scientists with support of AS IAS are involved in applied projects, on basis of enterprise "Intergeo-Tethys" (director – co-president of Azerbaijan Section of IAS, Prof. E.N.Khalilov) is elaborated the geographical informational system for using them in scientific, marketing, demographic researches, etc.

In the meeting of scientists of AS IAS were heard interesting multidisciplinary reports of Prof. M.Salahov "Global ecological problems of halogenated dioxins" and co-president of AS IAS E.Khalilov "Gravitational waves and seismicity of the Earth", and were solved the series of organizational decisions. In particular, E.Khalilov made speech with initiative of publishing of series of books on base of AS IAS – yearly reports of scientists – members of International Academy of Science "Science without borders: fundamental scientific researches" (in English). First volume of this

edition, where also took part Russian scientists (G.P.Gladyshev, K.V.Sydakov, S.N.Glazachev, K.V.Anokhin and others, in all 6 reports), will be published in 2004.

President of IAS W.Kofler announced the new scientific project under the aegis of IAS – project of Convergence, the aim of which is uniting, elaboration of resumptive theoretical ideas and scientific language for researching of environment, man, ecological problems in contrast to more specialization of separate sector scientific disciplines, where are used different exact techniques, methods, but for getting new knowledge about one and the same – about the world, where we live. It is supposed that such epistemological approach to explaining the interactions of man with environment will be successful in uniting of scientists of different specialties.

Here is the brief list of conferences, symposiums, and scientific discussions, organized and planned for holding during last time. At the end of November of 2003, on basis of SU SRI of normal physiology of RAMS was held Third Conference “Informational mechanisms of integrative activity of the organism”, devoted to 100-years birthday of A.N.Kolmogorov.

On 15 September 2004 was held the Jubilee Annual Meeting of Russian Section of the Academy in Moscow Scientists’ House. On 17-18 January of 2004 was organized and held the scientific-practical conference “Problems of prophylaxis and human health” (Izhevsk, Udmurtiya) with participation of President of IAS W.Kofler.

Should be especially noted the joint with UPF ME RF holding on 1-3 March 2004 of Second International Symposium “PROBLEMS OF RHYTHMS IN NATURAL SCIENCE”, devoted to 90-years jubilee of Honored Professor of MSU, Academician of RAS V.Y.Khain (Russia), to 80-years jubilee of President of East-European Section of IAS, Academician of IAS and RAMS K.Hecht (Germany) and 10-years of Russian Section of International Academy of Science. First Conference of analogous theme was brilliantly organized and held by Azerbaijan Section of IAS in 2002 in Shemakha Observatory, where was taken the decision to carry out such conferences once in two years. And now this initiative is kept by not only Russian scientists – members of RS IAS, but also Presidium of Russian Academy of Medical Science, and in multidisciplinary conference in Moscow gathered more than 250 scientists from different countries of the world.

Under the aegis of RS IAS is also planned to hold in April of 2004 the Conference “Symbol in system of culture” on basis of Pedagogical University of KOMI in Syktyvkar.

All this once more convinces that the science does not know the borders. Arises the question about state financing of science on actual complex directions, not only in frames of Russian Academy of science as a branch system. The government and RAS should take into account the scientific potential and the opportunities of other scientific unions of scientists.

We remind of the fact that D.I.Mendeleyev was not elected in Russian Academy of Science. Full member of RAS L.L.Yanshin during many years tried to found any “ecological” structure in RAS, but never convinced academic management. He established Russian Ecological Academy on a voluntary basis, the President of which he was to his dying day. May be, because disdaining the ecological problems in RAS, its full member N.N.Moiseyev left the Academy, to his dying day serving the Motherland and whole world in ecological field.

What to do here but ponder with M.Bulgakov (paraphrasing his thought) “May be, the ecological dislocation also begins in the heads of scientists, substantiating the resource way of development of Russia, hoping for two pipes and high price of energy carriers”.

In whole, during last ten years, under the aegis of Russian Section of International Academy of Science is carried out significant work for integration of scientists, creative collectives, scientific-research, educational institutes of Russia in order to elaborate and decide social common to all mankind problems.

Academician of ICSD/IAS,

Prof. Dr. Sudakov K. V.

Co-president of RS/IAS, Academician of RAMS

Academician of ICSD/IAS,

Prof. Dr. Glazachev S.N.

Academician-Secretary of Ecological Department of RS/IAS

Academician of ICSD/IAS,

Prof. Dr. Glazachev O.S.

Secretary General of RS/IAS

(Moskow, Russia)

AZERBAIJAN SECTION OF IAS/ICSD ACHIEVEMENTS AND PROSPECTS

History of establishment

Azerbaijan Section of International Council on Scientific Development of International Academy of Sciences was established 03 November 2003 by support of Eastern-European and Russian Sections of International Academy of Sciences. The establishment of Azerbaijan Section of IAS was devoted to the 100th anniversary of the twice laureate of Nobel Prize Laynus Poling- the

founder and the first president of International Council on Scientific Development/ International Academy of Sciences

The founders of Azerbaijan section of IAS were: National Academy of Sciences, National Academy of Aviation, Baku State University, Azerbaijan University of architecture and construction, Azerbaijan Medical University, Azerbaijan Technical University, Azerbaijan Economical University, University “Khazar”, ISTC “INTERGEO-TETHYS” and other organizations.

Scientific activity

Three International Symposiums, three conferences and three scientific seminars has been by Azerbaijan Section of IAS during its activity period:

-International symposium “The problems of ecology and technology at extreme conditions” was held jointly with association “FOVGAL” 8-10 October 2002.

-International symposium “Cyclic recurrence and cosmological problems”, devoted to the 80th anniversary of the President of Azerbaijan Heydar Aliyev jointly with Shamakha Astrophysical Observatory which was held at Shamaha Observatory with participation of scientists from Germany Russia and Iran 3-4 May.

-Azerbaijan and Russian Sections of International academy of sciences jointly with Ministry of education of Russia held big international symposium “Problems of rhythms in natural science” in Moscow on base of Russian university of Friendship of Nations 1-3 March, 2004. Scientists from USA, Japan, Germany, Austria, Russia, Azerbaijan, Ukraine and other states participated at symposium. Russia and Azerbaijan were chairing at symposium

-Two international conferences, conducted jointly with association FOVGAL and University of architecture and construction on problems of extreme situations and safety of vital functions were held in 2002 and 2003.

-Scientific seminars with participation of professor of Hamburg University of Severin Duda (seismology), Professor, the President of Eastern-European Section of IAS Karl Hecht were held.

Organization activity

Presidium of Azerbaijan section of IAS rewarded Academician Telman Aliyev with golden breastplate and Prize after Nasreddin Tusi for his prominent merits in the sphere of science and publication of fundamental scientific monograph in USA, in 2003.

Azerbaijan Grand master Teymur Rajabov was rewarded by golden breastplate of Azerbaijan section IAS and Prize after Nusreddin Tusi for his prominent merits in the sphere of intellectual activity, particularly, at international chess tournaments.

The President of Azerbaijan Heydar Aliyev was elected as Honored Academician of Sciences in 2003. He was handed over the golden breastplate after Nobel Laureate Pavlov for his prominent merits shown in development of science and education in Azerbaijan

During these years Azerbaijan section of IAS has published five books, including scientific works and monographs and also four joint sets of materials of conferences.

Azerbaijan section of IAS shot two scientific-popular animation films “Universe and we” and “Rhythms and Universe”, which were demonstrated at international symposiums in Moscow and Baku, film, devoted to the history of establishment Azerbaijan Section of IAS, and also film, devoted to jubilees of International Academy of Sciences.

The official site of Azerbaijan section of International Academy of Sciences has started functioning since 2002 (www.intacademy.com)

Co-president of AS of IAS E. Khalilov participated at International conference in Sao Paolo, Brazil, which was organized with participation of International Academy of Sciences and participated at the out session of the Presidium of International Council on Scientific Development/International Academy of Sciences, where he was elected, as a member of Presidium of International Academy of Sciences.

Presidium of IAS ICSD rewarded the Rector of National Academy of Sciences of Azerbaijan, Academician of National Academy of Sciences of Azerbaijan, Academician of ICSD/IAS, Doctor of physical and mathematical sciences, Professor Pashayev Arif Mirjalal and Academician of Russian Academy of Sciences, Academician of ICSD/IAS, Doctor of geological-mineralogical sciences, Honored professor of MSU after M.V.Lomonosov Viktor Yefimovich Khain with golden breastplates after laureate of Nobel Prize Pavlov for prominent merits in 2004.

Academicians of Russian Academy of Medical sciences and ICSD/IAS, Professors Sudakov Konstantin Viktorovich and Karl Gekht were rewarded by Azerbaijan section of IAS with golden breastplate in 2004.

Azerbaijan section accomplishes joint programs in many directions, including medicine, geophysics, astrophysics, biophysics, geology etc.

Residence and subdivisions of AS of IAS

Residence of Azerbaijan Section of International Academy of Sciences/International Council on Scientific Development was opened in June, 2003. Following subdivisions started functioning in the building of Residence of AS IAS:

- Scientific-research institute on prediction and study of earthquakes;
- Scientific Center of fundamental and applied researches;
- Scientific industrial company “Yeni-TEX”;
- Scientific industrial company “Elm Duyasi”;
- Center of GIS technologies;

- Laboratory of space researches;
- Laboratory of physiological researches and diagnostics;
- Studio of production of scientific and popular films “Elm Dunyasi”
- Publishing office “Elm Dunyasi”;
- Guest house “Elm Dunyasi”;
- Conference hall for 80 persons;
- Small hall for conferences;
- Café-bar for employees and guests of Academy;
- Training center
- Computer center



Photo of the building of Residence of Presidium of Azerbaijan Section of International Academy of Science



Photo of the building of scientific research center of Azerbaijan Section of International Academy of Science

The most important scientific achievements of AS of IAS

One of the most important achievements of AS of IAS are the results of scientific researches on registration of super long gravitational waves.

For the first time in the world, the detector of super long gravitational waves (SGW) ATROPATENA is put into operation, where absolutely new physical principle, not used earlier, is applied. The author and the manager of the project GEOCOS is geophysicist, doctor of sciences and professor Elchin Khalilov. Elchin Khalilov is the Director of Scientific Center of Fundamental and Applied Researches. The objective of the project is registration of SGW, detection of relation between astrophysical and geophysical processes and detection of causes of variation of measured values of gravitational constant G.

-For the first time original conception, explaining variations in time and space of values of gravitational constant G, observed by different scientists of the world.

-Installation for study of gravitational quantum effects “G-Quantum” was established on polygon AS IAS, where, for the first time, it was possible to detect experimentally gravitational quantum effects.

-Research on study of influence of solar activity and geophysical factors on brain activity

-Variations of gravitational field of the Earth on the eve of strong earthquakes, located at the distance of more than 1000km from registering station were established.

-Effects of gravitational screening at Moon and Solar Eclipse were established

-Gravitational effects at greatest confrontation of Mars and at approaching of Venus to the Earth were registered

Prospects

International Inter-disciplinary project “GEOCOS” was developed at Azerbaijan section of IAS.

The aim of researches is registering of super long gravitational waves and study of the possibility of their influence on geophysical processes.

The main tasks of researches are:

-study of possibility of influence of SGW on indications of Cavendish balance during measuring of G value;

-study of possibility of influence of SGW on atmospheric processes;

- study of possibility of influence of SGW on processes in ionosphere and on solar activity;
- study of possibility of influence of SGW on geophysical processes (variations of geophysical fields, changing of spectrum of seismic noises, etc.);
- study of possibility of influence of SGW on geodynamic processes (activity of the earthquakes, volcano eruptions, slow movements of the Earth crust, movements of lithosphere plates, etc.)

Presently, Scientific-research institute on prediction and study of earthquake, Shamakha Astrophysical Observatory and Abastumani Astrophysical Observatory joined to the project.

In 2004 was concluded a treaty about cooperation between Azerbaijan Section of International Academy of Science and Russian University of Friendship of Peoples.

It is planned to conduct in 2005 International conferences jointly with Russian University of Friendship of Nations and Russian section of International Academy of Sciences named:

1. "Modern technologies in medicine"
2. "Diseases of civilization in aspect of conception of V.I.Vernadskiy".

In 2005 is planned to publish the second volume of Transactions of the International Academy of Science. Besides, beginning from 2005, it is planned to begin to publish once a quarter the bulletin of the International Academy of Science in English.

It is planned to conduct International conference on problems of seismic resistant construction and architecture jointly with Azerbaijan University of architecture and construction in 2005.

It is planned to conduct joint international conferences and seminars with association FOVGAL, Shamakha Astrophysical Observatory and other organizations in 2005.

Academician of ICSD/IAS,
Prof.Dr. Khalilov E.N.
Co-president, Chairman of Bureau of Presidium of
Azerbaijan Section of International
Academy of Sciences/ICSD
(Baku, Azerbaijan)

MEDICINE AND BIOLOGY

THE NEED ON A “CRITICAL EXTENDED EVOLUTION RELATED VIEW” OF REALITY AS A BASIS FOR AN “EXTENDED VIEW” OF HEALTH*

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The need of a comprehensive theory for medicine Medicine deals with aspects of various scientific fields

Medicine is a special form of service and art, which must be based on scientific knowledge. Medicine deals with many aspects of physics, chemistry, biology and other special fields we count to science (in closer sense). But medicine has to integrate the results of research of other disciplines dealing with reality too: e.g. psychology, economy, sociology, law, politics as well as music, arts and other research fields we cannot count to science and even not to humanities. And medicine has to integrate the results of the applied aspects of science, humanities and other research fields, we call techniques and mathematics, statistics, etc. and last but not least epistemology, but ethics, logic and other aspects of philosophy e.g. epistemology, too. Therefore we will define medicine as follows:

Medicine is a special service and art, which has to integrate the results of so called “natural sciences” and “non-natural sciences” for applied aspects to cure and prevent illnesses but to contribute to health promotion for humans, too. We see humans as well as individuals, representing the biological species Homo sapiens, as as persons. The person is understood from its interactions with other individuals, groups and social structures, with parts of ecosystems and material and immaterial tool, but with the created immaterial values, knowledge attitudes about the reality but virtual creations in consent too. These are all “equipments” for the person used to reach goals and avoid dangers within the individual “given world”. The human influence on health depending on individual, community and society levels.

So it is not a surprise that there is up to now no “special and autonomic theory for medicine”. Medicine has to use a set of offers of an increasing

number of more and more highly specified given sectoral scientific views.

Each special scientific field has its special “axiom-analogue” basic assumptions which often can not be reduced to the basics of the “neighbour sciences”. Their theories are based on special terms and scientific techniques. Therefore they are often incompatible with the scientific frame of the “neighbours”. These limitations are not urgently relevant in the daily life of scientists of the sectoral sciences. In opposite: Their power results often from their specialisation. And it is acceptable for them to avoid topics and questions, which are on the borderline to other research fields. So the process of further splitting into new disciplines will go on. And medicine is the profiteer of this process of specialisation.

But medicine has to carry the negative aspects of this progress too. These results from the difference in the scientific goals: The research object of medicine is in principle different to them of the sectoral sciences: Medical questions deal finally all the time with the health of a “comprehensive person” * Therefore it is an ethical “must” for a scientist and applier in medicine to take care for the best integration of all health relevant aspects within his topic.

But there is the priority for medical experts to act as the servant for the client on the actually best level of argumentation. Therefore a medical doctor has to accept the argument to use actually available techniques even they reduce the level of argumentation e.g. from “causality” (according to the principles of natural science or of them of “non-natural sciences”) to “risk” (Evidence based Medicine EBM) or to the best pragmatic offer. (risk-management) . The need to help is the final reason to accept concepts for actions based only on epidemiological results and statistical comparisons.

These are the basics of the so called “Evidence Based Medicine”(Therefore a measure on the basis of EBM is not based on “natural science”). And of there is no “golden way” the pragmatic solution of “risk management” has to be used to minimize possible negative consequences.

Such an argumentation is not acceptable for the long term view: Without an argumentation based on causality no measures are based on causality. Such a lost of power is not acceptable for the medical scientific community which is responsible for the strategies for future medicine: It is an ethical “must” for the medical scientific community to develop strategies to solve this dilemma in principle.

We can compare the situation with a puzzle in which the different stones represent the different sectoral health related scientific disciplines. They seem to cover all health related topics and fit together like a two - dimensional picture. So medicine is able to handle adequate all questions on a causal level, which are related just to a single puzzle stone. But we have many relevant

questions that deal with two or more puzzle stones. We have “overlapping” situations which are matter of research for different frames: Therefore we would need a scientific technique for a three-dimensional figure. But the available theories are not able to bridge this gap. And EBM extends not the power of the single stones but make it easier to accept special assumptions: So as the stones of the puzzle would be sought together by epidemiology and statistics to a more stabile two dimensional “patchwork”. But daily life demonstrates: Each person integrates all the different aspects permanently to a comprehensive reaction. So it is obvious: The given lack in compatibility is not the consequence of the nature of our research objects. The lack is the **unintended** consequence of our scientific approaches. But the techniques to research health can be changed. They are based on a social agreement within the scientific community. Therefore we should take care for more „nature oriented” epistemological instruments.

**“Science of Human health”:
from an application of “sciences of reality ” (the given “natural” and “non-natural sciences”) to the application of a “Critically extended evolution related view of Reality (CeeS)? ”.**

The needed epistemological technique should allow linking all health relevant aspects to a **“unified theory for human health”**. But the key problem pointed out above persists: Human health is not a research topic which can be handled isolated from all the other research fields of “natural sciences” and “non-natural sciences”. Therefore the call for a “unified theory for health” is very close to a call for a “unified theory of reality”. This request seems to be impossible to realize.

There is an argument, which makes the problem a little easier: We need a frame, which is just applicable for a comprehensive view of social medical aspects of health and not for all other topics. So it would be sufficient if the “extended view of reality” would only be a draft of a blueprint for such a “unified theory of reality”, which is applicable for health research without additional power within the different sectoral fields. But the needed extensions should not be in contradiction with the given state of knowledge within the different disciplines.

This conclusion seems to me correct with regards to the predicates but maybe impossible to realise - not only for one person but for a group of scientists too - because of the obvious limitations of scientists. But what does this assumption mean? Should the relevance of the problem define the scientific needs or the quality of individual scientists? I think we should look for the lost key in the dark if we lost them there and not under the street light because of the argument that it is easier to look for keys in the light than in the dark. So the problem should define the goal and the resources they way.

Therefore I have invited my scientific friends within International Academy of Science and volunteers of outside to give helping hands:

- Primarily to characterise the indispensables of the related disciplines which must be respected by a “draft of a blueprint” as a basis to deduce the “extended view of reality” with its application for “Cybernetic evolution based Social Medicine (CES)”.
- And secondary I invited to do this in a way which contributes to bring the different sciences closer together.

This is the invitation to cooperate within the “**Convergence Project**”.

If we do this in a clever way we should not be surprised if the experts in the sectoral fields would be able to use such a frame – if it is helpful for medical aspects – for some open questions in their field too.

So we should realise a “blueprint for a “**Critical extended evolution related view of reality**” (CeeV)

Einstein, Kant, Popper, Lorenz and others are our company

Overview

In empirical based science there are very interesting experiences and proposals for a more comprehensive and integrative view to solve such problems. We should invite some related famous scientists – especially Einstein, Kant, Darwin, Lorenz and Popper – to accompany us. We should use their experiences and creations systematically:

- For the solution of this problem we have to remember the limitations which are given for a “critical scientist” (according to Kant) as observer of reality. The progress made by Kant can be seen as the “Second Copernican Revolution” in the scientific view of our world: We can observe the world only with the limitations of the inborn perception apparatus (a priori given “Outer sense”) and have to evaluate them according to a given but modifiable matrix (“Inner sense”). So we have to create our view of reality: We can not know what all can be relevant independent from the observer (“objective”).
- These limitations were pointed out by I. Kant and transferred by A. Einstein according to the special needs of natural science: According to his position “all scientific terms and theories are just free inventions of the human brain”, created so that we can handle reality more appropriate.
- Then we should remember that Einstein developed epistemological techniques to link “natural scientific” approaches, which seem

incompatible: He developed the technique of “Real theories” to link the frames of Newton and Maxwell. The basic ideas behind is are:

- to modify different given, but incompatible terms (e.g. of movement in context of light and vs. movement in context of stars) so clever that the former definitions are just special applications of the new one
- Additional terms are needed only within the comprehensive view, but not in the special cases, for which the basic theories are used further on.
- And we should combine the progresses made by J. Darwin and K. Lorenz for all aspects of reality: They discovered the general principle of evolution. We should use it – as Einstein has done it - to understand reality from the very early beginning up to now, applied them to living beings and could enforce that the level of material and immaterial qualities are consequences of the evolutionary process.
- And Einstein’s argumentation in selecting different possible solutions for further progress in fundamental physics confirmed that he accepted the same (and single) evolutionary process even for the development of more complex physical entities up to the universe including persons within this universe.
- Therefore we should integrate in our thinking the possibility that non only all material qualities we can observe are based just on one basic entity which we call usually “quantum” but all their immaterial qualities too- so far as they can cause observable effects.
- Then we should integrate this extension into our theoretical frame in such a way, that it allows us to formulate predictions which can be matter of experimental testing.
- Therefore we postulate that a human person – consisting just from such basic entities we defined in such a comprehensive way - is able to realize e.g. movement autonomously because of its material- energetic abilities and construct his realisations e.g. the speed and direction of his movement autonomously too because of his “ability to organize” (“ordnendem Organisationsvermögen”).
- This is an introduction of an additional term for “natural scientists” but not for the self-understanding of persons like you and me. But we accept that we are “products of the evolutionary process too”. Therefore it should be acceptable (and not only conclusive) to test the helpfulness of such an assumption.

- In the “extended view” the human person is understood as a “restricted autonomous actor”: “autonomous” because of his potentials to realise using his energetically resources and to construct with his “ability to organise”, and “restricted” because of the assumption that as well his energetically potential as his “ability to organise” is limited (and modifiable) too.
- Therefore we can formulate testing experiments to falsify or to enforce the proposed assumptions.

Second Copernicanean Revolution of Kant and Albert Einstein - the “Kant of natural science”:

Albert Einstein was able to extent basic epistemological knowledge developed by Immanuel Kant to deal with the possibilities of a researcher as an observer with a given perception apparatus – extended by artificial observers to discover intersubjective (“objective”) figures of reality. It is obvious that the perception apparatus is inborn and limited to special aspects of the real world e.g. to percept just special frequencies of electromagnetic waves. And by inborn categories we experience as humans electromagnetic waves in different ways: as temperature, light or sound. But the qualities of the research objects are independent from the perception apparatus and the evaluation matrix of the researcher. Therefore just an intersubjective segment of the real world can be “caught” by observers. And these information we percept with our “Outer sense” have to be valuated with the “Inner sense” on the basis of inborn categories (e.g. causality) but the individually experienced based values, expectations etc. too. So we have no other chance: We cannot observe our world or parts of it in an “objective” way, i.e. without an influence of the nature of the observer. We have to construct a – more or less – individual view of reality. With agreements in the way of observation (guidelines for correct use of scientific techniques to observe) and the use of scientific guidelines to make conclusions from them (“theories”) we have the chance that compatible and reproducible observations and conclusions can by done. Einstein deduced that this situation does not change in principle using scientific techniques: neither with the use of artificial observers (e.g. microscopes, chemical reactions or physical observers e.g. a chamber of fog) nor with the use of high sophisticated theories and scientific techniques.

Have all substantives the same explanation power for causality?

Albert Einstein pointed out that our theories including the used scientific terms are abstract creations of the human brain, which cannot be explained by a priori facts of reality. But such abstract terms are extremely helpful and a prerequisite for any science. With our “free invented” definitions of our created scientific terms e.g. “quantum”, “dog”, “cat”, “mammal” we can

link phenomena we percept from real objects in their interactions with other real objects with a possibility to organise our world. On this basis we can simplify our surrounding and can make a decision on the basis of these observations. So we can discriminate, in which “box” we can give an individual real object we have observed in the nature. This relationship between the real object, e.g. “Bello” and the term “dog” is similar to the relationship between an element and the set in set theory in mathematics: The elements of a set can be (but need not to be) real objects but the set itself is all the time an abstract term which cannot be observed in the real world. This difference is relevant: The term we use to organise objects does not have any attribute or abilities but just a list of characteristics of attributes and abilities which a real object must have to be selected as an element of a set correctly. The creation of such terms for “sets” (Kant would call them “transcendental terms”) allows to simplify our observations. This simplification allows e.g. to put a special monochromatic beam of light into the box “quantum”, the existing animals “Fiffi” and “Bello” into the (created) box “dog” and the existing animal “Minka” into the box “cat” and to bring the (created) boxes “cat” and “dog” into the superior box “mammals”. So all scientific terms are terms for “sets” to handle individual objects in a generalised and simplified way. And their connections to “natural laws” should allow us to characterise the interactions of individual objects in given settings in a generalised way. So it is to understand that Einstein came to the conclusion that any theoretical term, any so called natural law and any type of theory is just a free invention of a human brain, and that they are not based on an a priori given. They are just a help for a better orientation in reality in consent with other humans.

Einstein´s Real theories

Our “free inventions of the human brain” are focussed on the appropriate handling of different problems and not on the “objective reality”. Different problems allow different simplifications and therefore different scientific theories. Therefore it is possible that the simplifications of one indispensable theory can be incompatible with another indispensable theory but both theories can be in agreement with the nature. Now it is to understand why Einstein pointed out that those logical incompatibilities of basic assumptions and conclusions of different scientific frames (e.g. the frame of “classical Newtonian physics” and the frame of electromagnetism”) need not to be in contradiction to nature even basic assumptions seems to exclude each other according to the Aristotelians logic. Maybe only the free inventions of human brain to characterize reality are in contradiction. The solution for such situation is obvious: Inventions can be changed. Einstein recommended to use such situations in which two indispensable theories seem to be in contradiction to extend the state of knowledge in the way to create a so called “Real theory”. This is a special for of a meta-theory, adjusted to the needs of natural science.

In a metatheory two (or more) theories with different fields of application will be **restituted** by one theory, which covers both fields. The “Real theory” should do in principle the same but not with the goal to substitute the given theories. Therefore in opposition to the common ongoing in philosophical metatheories the used terms should not be exchanged by a new set of terms if it is acceptable. The given terms should be adjusted and extended in such a way that they can be used now not only in each of the former incompatible old theories but for questions too in which the old views must be integrated to the “Real theory”. The same ongoing should be done in the case of introduction of additional terms: They must be in agreement with the given sets of terms of the integrated theories. Einstein has developed this epistemological technique in the context of a special problem: He had to solve such an incompatibility between two different scientific frames to deal with physical phenomena: The theoretical frame created by Newton, Kepler, Galilee and other persons and the frame created by Faraday, Maxwell, Lorentz and others. The conclusion of the two different frames seems to be in contradiction with the Aristotelian logic: Newton based on the assumption that any statement about movement e.g. of a star, which does not integrate the speed and position of the observer must be unscientific. The position of Faraday and Maxwell was that any statement about the movement of electromagnetic waves (e.g. of the light of this star) is in contradiction to science if you integrate the position and speed of the observer of the electromagnetic wave even if the observer would be moved together with this light. To solve such situations Einstein created an epistemologically correct solution for an “extended view” which allows to see all phenomena explained with the theory of Newton as well as the phenomena which can be adequately handled with electromagnetic theories as special cases from the meta-theory “real theory” according to Einstein: We know them as the Specific and General Relativity Theories.

There is an additional relevant aspect we should take into consideration: The basic theories are accepted as stay of knowledge because of the empirical enforcement. All extensions of the “Real theory” are in agreement with the basic theories. Therefore all experiments confirming the old theories can be used to enforce the “Real theory” from the moment of its creation. This is a scientific argument. Therefore the argumentation for the acceptability of a “Real theory” is in principle different from the argumentation that an additional hypothesis is accepted as new stay of knowledge according to the recommendation of Poppers Logic of Science. There are no scientific arguments to stop the series of attempts to falsify an additional hypothesis. This is a social agreement within the community of scientists.

Evolution: Lorenz extended the discovery of Darwin on immaterial qualities

A link between all health relevant nature and non natural sciences is the agreement that all objects are the result of an unique evolutionary process. Since Conrad Lorenz – a former honorary president of IAS-Health and Ecology – we know that “evolution” is not only an explanation for the morphological characteristics of all living beings (and all entities in the universe) but for the understanding of the immaterial aspects too: K. Lorenz received the Nobel prize for his contribution to explain the joint basis of animal and human psychic abilities incl. behaviour. Lorenz was the last follower of I. Kant on his chair in Koenigsberg. Therefore it is not a surprise that he integrated his natural scientific work into a theory of natural philosophy too: The so called “**Evolutionäre Erkenntnistheorie**”. The key conclusion – which is up to now stay of knowledge - is that we have to understand the “a priori” given perception organs and the brain with its **immaterial** possibilities from an evolutionary point of view too – and not only their morphology. And a consequence of this extension of the understanding of evolution is that the (immaterial) abilities of a human person to deal with “outer stimuli” and to make them to information, which can be used for conclusions a posteriori, has precursors in a similar way as the human person has precursors in his morphology. And all of them are actors and observers. And they are all limited. These limitations are given by physical, chemical and biological prerequisites, which modified the possibilities of “**Erkennen**” within the progress of evolution.

Lorenz pointed out that “the a priori of today is the a posteriori of yesterday”. So we have to accept that not only the human person is an actor and observer, which is restricted by its limited material and immaterial abilities, but his ancestor, too and the ancestor of the ancestor and so on. With each step back in the history of the earth the level of material and immaterial abilities is more and more reduced – but they persist in principle but on a less complex level. Therefore we have finally to accept that the observable basic units of any material has to be actors and observers too. We know from physicists a lot of the most basic observable unit / actor but just with regards to its physical qualities. According to the standard model the most basic observable entities are quanta of action. If we accept the given argumentation we have to assume that quanta of actions are the oldest and most basic observable actors in the CeeS too – including immaterial abilities.

Einstein – Evolution and the most basic observable actor for psychology too?

This position can be enforced with arguments which are basically for the Relativity Theories: Einstein – the “Kant of the Natural scientists”- started with this quanta too. He characterised the “monochromatic light” as “.....”Einstein accepted material and immaterial aspects in any levels of

the evolutionary progress in principle. Therefore he pointed out that physics and psychology are just two techniques to deal with the same object. Even any living being consists just from basic units, which can be described from the view of the physicist as quantum. But physicists have no instruments to characterize other abilities as physical ones. Therefore they can not inform as from non-physical qualities of the “observable basic units” we have to expect. We will express the immaterial aspects of them with the “working term” “Kwantum of action” and the “comprehensive basic observable actor” as “Qwantum of action”).

Einstein needs the principle of “evolution” for his chain of argumentation to explain progress within physics. He pointed out that there are many theoretically correct mathematic solutions for a progress on the basis of a given evolutionary situation, e.g. to explain on the basis of quantum and the Relativity Theories the cosmic evolution. This position is in good agreement to the generally accepted assumption that the evolutionary process had/ has no goal, which is fixed in advance. ¹And Einstein pointed out that there is no “natural scientific” or epistemological instrument to select the relevant theory out from the different correct alternatives. But Einstein did not see any problem for science in this fact: There is no need for such an instrument because of the fact that there is just one evolutionary process. Therefore we have only to look to the nature and to see what kind of phenomena can be observed and to compare the power of the alternatives with these phenomena which must be deducible. So we can exclude all other theoretically correct predictions without the only one, which can explain the given reality. This is a very interesting argument for a medical doctor. Humans are a result of the cosmological process too. In consequence of this argument we have to look for models for physics and cosmology which are linkable not only with the fact that with the given basic actors more complex matter, stars of different natures with physical characteristics, different forms of energy waves etc could evolve themselves but living beings too: Including humans like you and me with the ability of abstract expectations, with culture and social structures, with wishes, hopes and fears. And this process should be seen just as one unintended realised possibility of an unpredictable evolutionary process in consequence of activities (of stars, not of machines). Menger characterised similar the economic and social processes: as the unintended consequences of intended activities of persons. (The level of the intention of humans are of course on a much higher level as the very basic intentions of the basic actors – if we accept such a way of interpretation in principle)

Einstein accepted this unique evolutionary process when he used “evolution” as argument to select out other correct possibilities. This can be

confirmed with unmistakable statements: e.g. “Psychology and Physics are just two techniques to analyse the same research object”.

But his ongoing in the special field of his research work –which deled with the basic actors in the evolution – did not integrate psychological aspects. With good reasons according to his epistemological “credo”: To limit the used terms to the minimum of terms, which allows the answer the given questions. And his given question was not: In which way can we create a “real theory” for Physics and Psychology. His goal was to create a “real theory” for basic physical answers, e.g. about movement within in time and space at the basis of the most basic observable actor we know in evolution (e.g. monochromatic light) and the components deduced from them in detail (movement of masses) and in general (Cosmology). And this with as less terms as possible! So he expressed the basic material aspects of the “basic observable unit” in toto as “energy and therefore the movement of entities (with and without mass) within time and space as consequence of their energy. He has integrated the energetically and immaterial aspects (the guidance of the movement and changing of the directions according to the changing in the environment, experienced by the basic actors) with one term: the (gravitation) field. A prerequisite for this step was the assumption that time and space are – for the actors on this level of evolution – not distinct, not given a priori and not as an absolute space distinct from an absolute time.²

Einstein had the hope to substitute the Quantum Theory (incl. “Uncertainty Relationship”) and to integrate them with all other theories of fields and powers within a General Field Theory. As we know is was not possible to develop such a general field theory to express all physical phenomena. So we should be surprised if it would be possible in future to create a “real theory” for physics, biology, psychology and the other health related sciences just with the terms Einstein used for his “real theories” to link the theories of Newton and Maxwell.

The theory defines what we can observe: four different explanations of the same

Einstein pointed out that the theory defines what we can observe and what kind of explanations for the observations has to be made and what kind of alternative explanations are acceptable within a theory. B. Russell demonstrated in his famous book ”The A B C of Relativity Theory” the difference in the view of Newton ad the view of Einstein with an example. In this changing in the position of observables of the type A in relation to the position of an observable of the type B has to be explained according to different common scientific frames in principal different: If you would have only techniques of physics and theories of physic the explanation would be a passive movement of the observables of the type A caused by a repulsing power of the observable B. If you would have the techniques and theories of

biology active movement in consequence of an external stimulus – perceived with the “outer sense” - causes the movement of the observables type A. A third explanation has to be accepted if the scientific frame accepts intersubjective information processing within the observables from the type A, as a psychological theory would allow. And the fourth explanation would be possible, if the scientific frame of a medical specialist (psychiatrist) is accepted: He is able to integrate an abnormal reaction created just by the subjective processes because of an “ill brain”: The example is easy to understand: Russell starts his example with a situation in which persons waking in a park and can observe a tiger in a cave. The physicist can only observe masses: The mass of the tiger (type B) is in principle different to the much smaller masses of the humans (type A). The observation of movement was started in the moment when the persons see that the door of the cave gets open – but the tiger remain staying in the cave: All persons start to run away from the tiger. This movement is for the biologist based on the activity of the persons caused by the perceived stimulus of the real tiger in connection with the open door. But physicists do not have a technique to handle with such types of empirical data. Therefore they have to explain any movement as a passive movement (and need a “first mover” to explain movement in general). But B. Russell extended the example with the case that it would be possible to create just the impression of an existing tiger in the mind of the persons – but there is no real tiger. Then all persons would be motivated to run away in the same intensity as in the case with the observation of the real tiger. And a fourth solution would be that a psychiatrically ill person assume that there is a tiger without any intersubjective reason.

Remember the well known example of the train: It is obviously not possible to decide without a consent about the position of the observer if the train is moving and the earth is unmoved or the train is staying and the earth is moving. The example of B. Russell confirms: it is not possible to exclude the possibility of an automotive movement and self guided changing in the direction of any movement, if the theory does not allow a distinction between active and passive movement and the possibility to change actively and passively the direction. As Einstein expressed: The theory defines what we can observe.

3 Application for medical phenomena: The “extended view” of Cybernetic evolution based Social Medicine (CES).

A similar situation in medicine as in physics 100 years ago.

The given situation in medicine is quite similar to the situation in which Albert Einstein has been. He had two indispensable but incompatible physical theories, the theory of Newton and the theory of Maxwell. He could solve his

dilemma using the technique of “Real theory”. Modern medicine is using the results of a high number of specialised research fields. They can be covered into two groups according to their epistemological principles: The “natural sciences” and the “non natural sciences”. They are the basis for two incompatible but indispensable branches of school medicine: the “natural science based medicine” on one hand and the “psychosomatic medicine and social medicine” on the other hand. Both branches deal with the same research object: The health of human persons. Both accept that the human person has bodily and non-bodily characterised abilities. Therefore both views are based on a so-called monistic view. (Dualistic view e.g. the Cartesian view splitting divine eternal immaterial substance from the earthly transient matter are never accepted). But the difference which causes the incompatibilities is the result of the different consents within the different scientific communities about the simplification which is the basis of their research: But they differ in the aspect they believe it is the neglectable: Natural scientists agree that it is sufficient for their research topics to exclude all immaterial qualities aspects. “Non-natural scientists agree that it is sufficient for their research topics to exclude material qualities. But both have developed similar techniques to handle with the excluded aspect of the “comprehensive substance”. They express the “opposite” aspect with special terms of “their” quality or neglect the opposite aspects. A third common technique is to start with a new special discipline: No science without scientifically not deducible “axiom-analog” assumptions. Therefore it is correct from the epistemological point of view to start with “evident” given: Biology starts with the assumption: There is life on the earth. The research field of biology is the consequences of life. For this you have not to explain the step from unliving to living. If you are immunologist it is correct to give a definition of antigen and antibody. You have not to explain what kind of abilities of a person and of a birch poll that the person is able to be sensitised etc. So it is possible to characterise the different information content of the same structures by changing the terms.

This technique is used to handle aspects, which are by definition different to matter, just with “material” terms: So N. Wiener has defined: “Information is information and not energy or matter”. But in natural science “information” is handled just as an immanent and unchangeable quality of a given structure with a term, which includes per definitionem the needed immaterial consequences: Therefore they see no help in the introduction of immaterial qualities. A common example is the use of the term “gene”. There is an agreement that the genetic code includes the information to build living beings. We all know the comparison with a library. And we know: There must be a person able to read books. Otherwise a library is not more than a decorative room. And we know that it was not easy to learn to read real books. We know that it can be exhausting to work in libraries. But this are not

relevant questions for biology. Geneticist handles all these problems just with material aspects. The structure (of gene) and the information linked with this structure are exchangeable terms. Why a special structure can carry an information like a postman for a process of an other object and additional to the information of reduplication of its own structure can not be handled with the instruments of natural science (as Nobel Laureate Muller pointed out in different papers XX).³

So natural science is based on a materialistic evolution based monism.

Non-natural scientific theories (e.g. psychosomatic frames, but economy, sociology etc too) based on the assumption that material aspects of phenomena can be neglected (e.g. the quality of paper of bank notes for the exchange rate). Or they believe they can handle material aspects adequately with the use of special terms for immaterial aspects: e.g. to express the material aspect of any material with the price of this material. A technique we know in principle from natural science. Psychosocial medicine deals e.g. with the fact that the information of the same structure can be changed (e.g. by learning, Verdrängung...,)

So the “non-natural sciences” is using an evolution based idealistic monism.

So each of the two branches believe that human health can be handled adequately if the quality is neglected which is indispensable for the other branch. And both branches are able to develop more and more indispensable results for health. Understandable that there is no hope that further research work on the given basis will unify the two branches. Therefore we should not expect a solution of the given lack by the use of the given ontologies.

Compatibility with both basic scientific frames by a “Real Theory”

According to the recommendation of Albert Einstein we have to develop a view, which allows to integrating both indispensable but incompatible theories: the natural scientific view as well as the “non- natural scientific view”. We should start at a position which is accepted by both but used in a different way: A joint basic position is the monistic view: Both sides accept that all in our their research objects are just from one type of substance but this substance has two forms of expression: the materialistic aspects (of realisation including movement) and immaterialistic aspects (of constructions, incl. goals, values) one substance. The difference which is based on the special view of the scientists to handle **their** research processes easier is which aspect of the substance is assumed to be expressible with the other: Non natural scientists assume they can express all material aspects of their research objects with immaterial qualities and substitute on this way the – in principle accepted –

material aspects (There is no influence of the quality of the used paper on the exchange rate of Euro and Dollar). But the “natural scientist” assumes that there is no need to integrate immaterial aspects into his chain of argumentation. He believes that he can express all immaterial aspects adequately with matter based terms. “Natural sciences” can be counted to “materialistic monism” and “non natural scientific views” to “idealistic monism”. A linkage is possible if we use a so-called “evolution related neutral monism” in which materialistic and idealistic aspects can be more or less dispensable/relevant – depending on the special problem, which has to be solved. This allows three forms of applications:

- a) There are questions in which immaterial aspects (e.g. to link information with structure) are neglectable e.g. because of information does not change within the process which is matter of the research topic. Then there is defacto no difference between a materialistic monism and the neural monism. It is a generally accepted technique in any science to neglect all aspects which will not change within the experiment. Therefore the classic scientific approach is the adequate technique for such cases. We would do the same if we apply the “extended view”: We would use the “extended view” but would limit the parameters just to the variables. We would not neat an additional quality to deal with immaterial aspects: There is no need to integrate immaterial aspects according to the characterisation of the problem. This was the argument of Einstein when he recommended not to use RT to calculate e.g. the amount of fuel which is needed for the transport of a satellite but to use the theories of Newton for that purpose: The difference would not be adequate to the additional work which is linked with the use of RT)
- b) And there are other research problems dealing with reality in which we do not need take care on materialistic aspects, if the material aspect is irrelevant (e.g. the quality of paper for the exchange rate of currencies). Then we have defacto no difference to the idealistic monism. So it is correct to focus on the variables only: and these are immaterial aspects only. Therefore the “classic” techniques of non-natural disciplines are the adequate and most economic instruments to solve the common problems. You can not make a decision: Was this done using the “extended view” or using the “common view”.
- c) But there are questions in which we have to deal with material-energetically aspects and with immaterial aspects at the same time: Such cases would be the application field of the “extended view” of a “Real Theory” according to Einstein. Typical applications for such a “Critical extended evolution based view (CeeV)” of our world or its

application for social medicine (the “Cybernetic Evolution based Social Medicine = CES”) are e.g.

- a. Qualitative consequences.
 - i. processes in which morphologically characterised aspects and their information is changing,
 - ii. processes with spontaneous modifications of the organisation of objects and combined effects in consequence of information based and “material-energetically” based stimuli.
 - iii. A relevant need for an “extended view” occurs in consequence of the fact that a human person is answering with one activity at the same time to many demands too.
- b. Quantitative consequences:
 - i. Processes in consequence of a lack of material or immaterial abilities in situations in which the other ability is available

All listed types of situations are not rear. They are of great health relevance.

FIRST RESULTS:
CAUSALLY UNSPECIFIC HEALTH EFFECTS IN CONSEQUENCE OF A LACK ON
„ABILITY TO ORGANISE“

Predictions:

- a) If the assumption is helpful, that any “restricted autonomous actor” (like a person) and all his sub-actors (his cells, tissues, organs) are limited in their “ability to organise” then we have to expect observable phenomena only because of a lack on this ability even there is no lack on material /energetically resources.
- b) Another conclusion of our statement, based on the evolution related nature of all “complex restricted autonomous actors” allows predictions about the localisations where negative health effects should be observable in situations with acute additional demand to balance.

The starting point for this chain of argumentation is the statement that any complex “restricted autonomous actor” consists from – from the evolutionary view - older sub-actors, which had to be motivated to co-organise with others the “actor on the higher level”. This “more complex actor” persists only as long as he is able to organise his subunits so that they are organising themselves and

the “more complex actor” as the “over-system” too. In situations with limitations we have to expect that each “restricted actor” will focus on his immediate survival and not on the survival of the “over-system”.

Therefore we have to expect that in situations with an unusual intensive additional need to organise

- the sub-units have priority which are affected - without relevant regards to the consequences for the whole organism.
- observable phenomena are caused in functions without former observable phenomena if this symptom-free situation was the consequence of the adequate availability to balance the given pathophysiological changing which was never given because of the additional demand on the affected area.
- an increase of the relevance of phenomena is caused if the intensity of pathophysiological abnormality could not be totally balanced before the additional event even with the former focus to organise.
- There is no causal connection between the cause for such an additional demand to balance (e.g. because of different types of environmental disasters, extreme focus on interests etc) and the “locus minoris resistentiae” (= the function units which have pathophysiological changings which have to be balanced by adaptive processes)
- But cultural and behavioural factors, specifics in the age and the sex of persons can influence the typical functions with additional needs on adaptive processes. They are known eg. As civilisation illnesses etc.
- Therefore we have to expect causally unspecific (any additional relevant demand can cause) effects on functions which are not specifically related to the nature of the stimulus but to the given biopsychological situation of the affected person.
- These “causally unspecific effects have to occur additional to the specific effects of the stimulus.

Confirmations

These predictions were made same years ago in connection to the surprising result that CHD and psychiatric disorders persisted in rescue workers after Chernobyl. They could be confirmed with the - former unexplainable deviation of the - distribution of mortality of subgroups of survivors of Hiroshima and Nagasaki.

But the predictions are in very good agreement to many - up to now unexplained - causes of death in different cultural settings with highly evaluated situations (Sudden unexpected nocturnal death syndrome, Death in Soccer Stadium), after chemical (e.g. London smog, Seveso) or physical (e.g. earthquakes) disasters, during extreme climate conditions. We could observe -

as expected - an increase in mortality and intensity of these diseases which can be balanced quite adequate under common conditions (e.g. CHD) in any type of disasters. We could observe – as expected - an increase in diseases in persons which are in situations with a physiological higher need to organise (e.g. during healing, within growing and therefore during special phases in childhood) but to balance behavioural based pathophysiological changing (e.g. in elderlies), too.

a) Some examples which are much better to understand – and to prevent – with the “extended view” are published in the long version of this contribution and in the paper which was awarded as “Hope for the Future for a Sustainable World”.

Gaps in the understanding of hemodynamics in the heart and of death in highly distressful situations – bridged by the use of the “extended view”

Sports physicians have reported acute cardiac death of spectators on football fields. A typical example is the death of male Dutch during the semi-final in the European Championship 1996 game between France and the Netherlands. The French won in the penalty shooting because a world famous Dutch football hero missed his chance. What happened at that moment in the heart of the affected persons when a tall man 200 meters away was not able to place a leather ball between two wooden goalposts? For pathologists it seems to be easy to understand: The Dutch who died had a high degree of arteriosclerosis and "acute heart failure" was diagnosed. But why they died in this particular moment? These persons were able to march into the stadium singing and swinging flags - free of any cardiac symptoms despite of intensive objective morphological abnormalities! Coronary hemodynamics and the effects of stenoses is a key for understanding ischemic heart diseases. It is extremely hard to visualize adequately the dynamics with computer tomography or any other imaging modality. The permanent changes of the position of the heart with regard to its vessels are too rapid to be measured by these techniques. Therefore highly sophisticated mathematical models are needed. Impressive is e.g. the model of Quatember [⁴] for stenoses in the heart. This model is in good correspondence with the life situation and can be able to calculate the effects of different degrees of stenoses on hemodynamics but including a relevant limitation: Quatember pointed out that such models, which use machine-like assumptions, are in principle unable to deal with the "adaptive capacity" of individuals. He estimated [⁵] that a human being could cope - using its "adaptive capacity" - with the physical effects of up to many umpteen % of stenoses - depending on the individual situation. Now we

understand: The visitors with extreme abnormalities showed no symptoms when they came to the stadium because of their adaptive capacity! Obviously the adaptive situation changed after the miss - as we conclude from the occurrence of cardiac symptoms. But "were" was the in principle available amount of this ability (or maybe better: for what purpose this ability was used at this time)? A scientist can not answer this question on the basis of natural sciences. - As an observer from outside who uses just objective data could not explain or predict what would happen even if he knew the morphological cardiac situation of any visitor. To be French or Dutch is not a morphological datum. But just Dutch men died. And the "adaptive process" does not change the existing morphological background. The morphology was just modified in consequence of immaterial aspects. What was the shifting in the immaterial aspects between to marching in and (after) the eleven meter shooting? The Dutch changed their "distribution of interest". During marching in they had all high expectations but no additional lost. During the eleven meter shooting the Dutch and French focussed on an extremely valued goal they expected to reach immediately but Dutch missed with the success of Platini. The assumption of a limited ability to organize which can be shifted within time and different functions of the valuation person allows a plausible explanation and correct predictions.

According to a scientific view that is based just on morphological and empirical data, such an immaterial goal should not have to do anything with the morphology of the cardiac vessels. But as we know from experience, there are relevant links. We know that it can be lifesaving if a physician is able to calm a patient after an acute myocardial infarction by administering a sedative drug [a good example for the possibility to influence mental effects with biological/chemical stimuli, which cause a feedback to somatic effects and with the somatic effects to mental effects, too].

The changing in hemodynamics, which caused the shift from happy life to death, cannot be explained in terms of energy and morphology. Arteriosclerosis was the necessary but not the sufficient factor in causing "Platini-death". We can understand the observable cardiac symptoms as consequences of the limited unobservable ability to balance given morphological deviations ("adaptation"), which, however, was sufficient before the mist goal but insufficient afterwards.

The "extended view" can explain the moment of the "acute heart failure", too

If you agree that the organization of hemodynamics is a performance that needs a specific ability and if you agree that this ability is not unlimited, then you have to agree that the lack of this ability in relation to the actual demand can be a cause for hemodynamic symptoms which would not appear

with an adequate amount of this availability. Such demands can occur immediately and can last just over a short period (e.g. football games)

The relevance of changings

The degree of pre-existing hemodynamic abnormalities as well as the degree and the duration of any additional need of this ability should influence the degree of symptoms. This assumption would help explain the high incidence of CHD as an unspecific consequence of environmental disasters. The assumption of this ability and the consequences of high and conflicting demands placed upon it would also help to understand the relevance of CHD in connection with changes that happen not only in extremely emotional situations as there are in a football stadium, but also in common situations such as changes in weather conditions. These effects may be interpreted verbally as e.g. "exhaustion of adaptive capacity" [6]. But no author characterizes what kind of quality this is. They just describe and label: Kalkstein L. and R.E. Davis [7] linked in their review cardiac symptoms with the degree of "increasing changes and their persistence", their "unusuality", "acclimatization", "reduction of sunlight", "pre-existing limitations of adaptability" (elderly, chronically ill) etc. The health relevance of such, in principle ordinary situations, is important: During a heat wave (41-44°C) in Athens the excess mortality was about 2000 persons and it was caused primarily by CHD and lung diseases [8]. The Commission of Climate and Ozone research reported an increase of the rate of AMI by 30% due to an increase of humidity and heat [9]. A significant increase of CHD was observed under extreme cold weather conditions, too. Faiche and Rose [10] attributed the increase of CHD for a five-day period after a storm to "meteorological and psychological stress".

SUNDS, Death on Arrival - unexplainable for and in contradiction to the "conventional view".

"Cardiac death" was discussed by Thai scientists to explain Sudden Unexplained Nocturnal Death Syndrome (SUNDS), [11]. Only (young) men from rural areas are affected (man: women ration 10:1). Usually they have relevant problems in their psychosocial self-esteem. These people die from SUNDS during a nightmare that is so intensive that the affected person cannot be awaked. Autopsies did not reveal any significant pathological condition or

evidence of poisoning in order to explain why these persons died or why they died under such remarkable conditions. This phenomenon is a relevant public health problem in many areas of the world: US Centre of Disease Control labelled this phenomenon as SUNDS and provided evidence that this was the leading cause of death of male Asian refugees aged 25 - 44 in the 1980s [12]. With an estimated annual incidence of 225.9 per 100,000 men aged 20-49, SUNDS ranks as the third leading cause of death in north eastern Thailand. Similar rates are reported from other areas in Asia. The incidence of SUNDS among Thai workers in Singapore was 98 per 100,000 person/years. Among Laotian and Cambodian refugees (20-44a) in Thailand, there were 574 cases from SUNDS per 100,000 [13], [14] Thai scientists offered "cardiac death" as the explanation because of the relatively abnormal high degree of arteriosclerosis in some affected men [15] But for American scientists that degree was - in relation to the American average - within the "normal range". Since 1917 scientists are publishing explanations for such phenomena [16]. The Thai group listed 4 ICD-Codes for SUNDS and 11 theories with statistical evidence (ranging from different heart failures over viral infection, genetic predisposition up to deficiency in vitamins or potassium etc. etc.) [17]. They analysed the distribution of "abnormal finding" in persons died from SUNDS: The "findings" can not be used to explain death without contradiction to the state of the art in pathology. But their distribution is of interest from the view of the "extended model": The distribution of the "abnormal findings" in persons died from SUNDS is similar to that of the most relevant mortality reasons of the area where the affected come from [18].

The same figure of distribution of the abnormal findings is described for persons who died from "dead on arrival (DOA)" [1]. This is another cause of death, which cannot be explained by pathological data. It can be observed in Asian men and women (ratio 2:1) of rural areas. Persons of any ages die from DOA- in opposite to SUNDS (which shows a maximum in the age of 20 - 30) during the first night in the totally strange Environment of the hospital. But the pathological data neither of the reason to visit the hospital nor any other data can not explain the death.

b) The epidemiological study on survivors of Hiroshima and Nagasaki (Stewart and Kneale, Int. J. Epid., 2000) was used as "critical experiment" for the

“Extended view”: The study was done independently from the predictions Kofler made years before about the consequences of such an accident. The deviations in the mortality distribution of collectives of survivors with more than two bodily insures in context with the fall of the A-bombe, in comparison to survivors without bodily injuries, the but standardised to the same load of radiation, can be explained by the causally unspecific of this disaster and must not be a falsification of the assumption that the survivors are – besides the specific effects of radioactivity – normal persons.

The "extended view" is based on the assumptions of the material and immaterial psychological") nature of human beings and of linkages between them (see more in part two [:

1. *"If one assumes a monistic view and that the material nature is limited, he can accept that the immaterial nature is complementary to the material nature and has to assume that the immaterial nature is limited, too."* To be limited is accepted as a general and unspecific characteristic of a natural system. Therefore effects have to be expected, if there is an excessive demand placed on this limited stock of ability.
2. *"The "extended view" assumes that any organization of functions in a human organism is a demand on the immaterial nature of the organism. The postulated ability " to handle differences and to organize" is to accept as limited."* Therefore any additional specific stimulus causes an additional (causally unspecific) demand on this ability and may lead to a causally unspecific effect as a consequence of a lack of this ability.
3. *"Mental process" is in this model a terms which is used to summarize the characteristics of a use of a special evolutionary level of the immaterial ability to "handle differences, to select from alternatives, to organize the given abilities and to initiate action" (summarized here as "ability to organize"). These processes presuppose a complementary evolutionary level of matter (especially a highly developed brain).*
4. *Repair mechanisms and adaptive processes (e.g. to balance hemodynamic effects of arteriosclerosis etc.) cannot be understood adequately without accepting the ability of cells, tissues and organs to handle the permanently changing flow of information on their level and to organize the limited resources available.*

The power of the assumption of this ability and the efficiency of such a "lower level ability to organize" can be demonstrated e.g. in human cells, which continue various functions in cell cultures without the presence of a brain or a nervous system.
5. *A human person is just one system because of the given linkage between the ability to organize on all biological and psychological levels to this system, we can name as a particular individual.*

Following these assumptions, predictions for health consequences of environmental disasters can be made, which can then be subject to experimental testing, as Kofler proposed 1996 [5]:

- A) If an unspecific adverse health effect is caused just by the temporary lack of the availability of the postulated ability (and not by an increased morphological abnormality), this effect should disappear if the person survives the unbalanced situation. This prognosis can be tested by checking the mortality of comparable persons with and without a temporary lack in two steps: a) ERR during the period with the temporary lack. b) ERR over a long term, with a relatively short period with a temporary lack within.

Persons with the lack should show a higher rate in study a), but should show no difference in study b) in comparison with the control group without the temporary lack: The "temporary lack" will be commonly in concurrence with higher demands in consequence of lifestyle. Such demands will increase in time and finally often cause death (the same cause we expect from "temporary lack"). The duration of the "temporary lack" should depend on the duration of the influence of the stimulus. When considering its duration, we must also take into account its half live time.

- B) We should expect a (causally unspecific) increase of the degree of symptoms/ of mortalities/ of morbidities on pre-existing illnesses and illnesses that show a wide range of adaptive processes e.g. coronary heart disease (CHD) [2] after any type of environmental or natural disaster
- C) We should expect an increase of mortalities/morbidities in the group of persons with pathophysiologically limited capacity to organize (e.g. the elderly) and in persons with a physiologically higher demand on the ability to organize (such as growing children) or persons with a healing process in action after any type of environmental disaster. *A-bomb survivors should have specific and causally unspecific effects.*
- D) *The observable specific radio-toxic effects should be the dose-related specific (ionisation) effects and the consequences of the ability of the cells to organize repair mechanisms and to accommodate deficits by the normal mechanisms of regeneration.*
- E) Radioactive burdens influence biological processes over a long period, as we know from the time lag between exposure and the appearance of cancer. As we know from therapy of cancer, treatment measures are more effective the sooner they are initiated and the more intensive they are. We have postulated that the healing process in acute injuries needs capacity to organize. If there is no additional need for healing processes in survivors,

the ability to organize is available to a great extent for repair mechanisms and regeneration in opposite to situations with multiple healing processes.

With regards to the experiences with cancer we should calculate the possibility, that the efficiency to deal with any type of demand to organize in survivors should be more and longer restricted, the more injuries there are to be dealt with parallel to deal with radiotoxic effects.

- F) *The causally unspecific effects can be expected to be more severe and more frequent in children.* The process of growing needs to be organized as well and this places an additional demand on the limited ability to organize.
- G) *The causally unspecific effects can be expected to be more severe and evident in the elderly.* The elderly have to deal more often with pathophysiological deviations (e.g. degree of arteriosclerosis), which are the consequence of lifelong habits than younger persons. Therefore, the additional need to organize repair mechanisms, regeneration of cells and any other demands for healing processes caused by an A-bombing should result in a higher relevance of observable symptoms and in a more intensive increase in the severity of the existing symptoms in comparison to other adults.
- H) Our view predicts that there is a higher risk of mortality after the incident of an A-bomb in children and the elderly in general and *in children and elderly with multiple injuries (like burns, purpura, epilation etc.) in comparison to children and elderly people without such injuries*
- I) *The unspecific effects should be dependent with regards to the temporary relevance of the additional demand on the ability to organize:* Within the period of "temporary lack" we expect evidence on the dose of radioactivity, but also on other aspects (e.g. stress)
- J) *The duration of unspecific aspects has to be seen in the context of the effective half life of the stimulus.*
- K) *Causally unspecific effects of a particular function should occur according to its physiological range of adaptation and the degree of pathophysiological deviation in consequence of its misuse.* There is evidence for a high demand when organizing cardiac hemodynamics even in physiologically normal situations. [2]. Morphological abnormalities of the cardiovascular system can be coped with a surprisingly high degree. Therefore, on the one hand, we have to expect a wide range in the time lag between the occurrence of relevant morphological abnormalities (e.g. by arteriosclerosis) and the occurrence of symptoms in the standard population. On the other hand, *we have to expect that the (long-term-) additional demand of the ability to organize (which we have to expect in persons exposed to radioactivity) should initiate observable cardiac symptoms in survivors much earlier than in the standard population and*

just earlier in survivors with additional demands (test group) than in the control group..

- L) *Causally unspecific effects should not change the total mortality of survivors with and without acute multiple injuries over the period of 35 years in a relevant degree*

The causes of death, which should be expected to be a „normal“ cause of death with or without radioactivity under such circumstances, should be observable earlier, especially in the test group..

- M) *Civilization-dependent chronic diseases are determined by cultural differences, too. After environmental incidents, it can be expected that in a particular society, there is a temporary increase in the incidence of such diseases as also of mortality resulting from them.*

- N) *Specific mental effects (e.g. because of stress) are to be expected in the context of A-bomb. In view of the diversity and complexity of psychosocial coping mechanisms we should not expect a significant difference in the distribution of specific mental effects in survivors with and without acute injuries (see e.g. Lazarus [8]).*

Therefore no relevant difference in the pathophysiological processes for CHD (based on the conventional theories) is to be expected within the sub-groups of the survivors.

- O) *Persons with the exposure age of < 10 and over 55 years of age comprise 15.5 % in the test group; in the control group they comprise 31.2%.*

This confirms the predictions (4) and (5).

- P) *There was evidence of radiation associations for leukaemia, malignant tumors and "all neoplasm" for the total cohort, controls and test group . confirmation of prediction (2)*

- Q) *Only for the test group there was evidence of radiation associations for CHD, trauma and "others" confirmation of the predictions (7), (6) and (10)*

- R) *For more than 40 year the total LSS cohort maintained a normal non-cancer death rate [7].*

not in contradiction of the predictions

- S) *It was only among the survivors who had claimed any acute injuries that leukaemia deaths were at all common*

not related to a prediction.

T) Levels of radiosensitivity of survivors with sign of acute radiation effects were higher at the beginning and end of the life span. *confirmation of the predictions (4), (5) and (6)*

U) There are significant and relevant differences (in cancer and non-cancer) between the excess mortality risk (EER) per Gray between persons with and without multiple injuries.

This confirms the predictions (1), (2) and (3).

V) The ERR per Gray was extremely higher in children with multiple injuries than in children without injuries.

This confirms the predictions (2), (3), (4) and (6).

W) The ERR per Gray was significantly and relevantly higher (about three times) in the elderly who survived multiple injuries for e.g. "all causes" *confirmation of (5) and (6).*

X) The ERR per Gray for CHD was significantly and relevantly higher in children with multiple injuries. The degree of ERR showed a decrease with the increase of age in the so-called "resistant ages". From 17 times (age 10-20) over 14 times (20-35) to no difference in the elderly. *confirmation of (8), (9) and (10)*

Y) ages". From 17 times (age 10-20) over 14 times (20-35) to no difference in the elderly. *confirmation of (8), (9) and (10)*

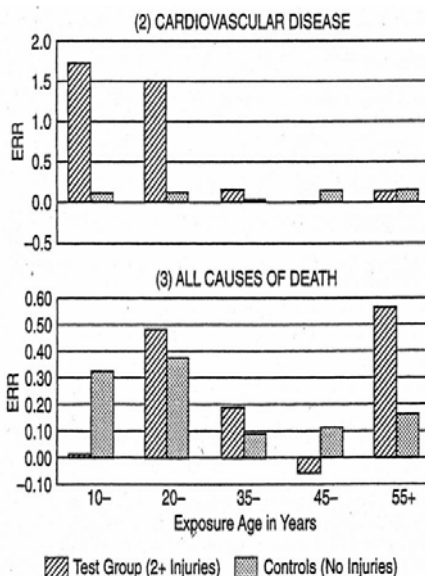


Figure 1: Excess relative risk (ERR) for cardiovascular disease and all causes of death, from figure 1 Stewart & Kneale 2000, excluding survivors with age < 10 years at A-bomb exposure (see Table 1, scales incompatible)

Table 1

Poisson regression analysis: excess relative risk (ERR) per Gray (Gy), survivors of A-bomb, extracted from table 3, Stewart and Kneale 2000, (out of 6 age groups –age in the year 1945)

AGE AT EXPOSURE < 10 YEARS			Subgroup of the Total cohort			
Causes of death	Total cohort		Test Group		Controls	
	EER/Gy	Chi ²	EER/Gy	Chi ²	EER/Gy	Chi ²
Leukaemia	20.92	48.0**	1.3 x 10 ⁴ (3)	1.5	21.32 (21)	44.4**
Carcinoma	1.08	6.3*	7.4 x 10 ³ (4)	4.5*	1.27 (91)	5.1*
ALL Carcinoma	3.04	39.2**	3.5 x 10 ⁴ (7)	6.0*	3.48 (123)	36.9**
Cardiovascular diseases	0.56	2.6	4.2 x 10 ⁵ (2)	8.4**	0.3 (89)	0.4
Other causes	-0.05	0.1	6.4 x 10 ⁴ (5)	7.1 **	-0.02 (200)	0.0
All causes	0.70	19.4**	3.4 x 10 ⁴ (19)	20.0 **	0.64 (605)	11.3*
AGE AT EXPOSURE < 55 YEARS						
Leukaemia	3.90	5.4*	1.18 (3)	0.90	13.06 (8)	8.9**
Carcinoma	0.50	13.8**	7.6* 10 ³ (19)	9.50**	0.45 (662)	7.9**
ALL Carcinoma	0.50	15.1**	1.7 (26)	4.50*	0.51 (706)	10.4**
Cardiovascular diseases	0.13	3.7	0.12 (56)	0.30	0.13 (3812)	2.1
Other causes	0.12	3.5	0.87 (63)	3.90*	0.1 (2846)	1.6
All causes	0.17	16.6**	0.56 (147)	7.10**	0.16 (6514)	8.7 **

Z) For causes of death other than neoplasm (all ages), there was no difference between the test group (27.8%) and the controls (28.5%). There was no difference in the total mortality from CHD (13.9% and 14.4) or in "other or unspecified death " (11.9 and 12.2%) and" trauma" (2.0 and 1.9%) *confirmation of (10), (11), in agreement with (12)*

The significantly higher ERR for leukaemia and malignant tumours in the test group was not predicted, especially in the time period of <10 years and in the elderly.

But qualitatively this is in good agreement with the "extended view" if we assume that different demands on the ability to organize can limit each other. Thus, the use of the ability to organize for healing and for growing processes would limit the efficiency to carry out functions to suppress leukaemia and other cancer

In this paper the special case of the consequences of inadequate availability of immaterial abilities will be discussed on the example of the consequences of environmental disasters.

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ATC DISPATCHERS' BP WORKING AND CIRCADIAN RHYTHM SYSTEM ANALYSIS

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"Living matter, blending with the already finished time-spatial structure of world, could not avoid " absorbing "into itself its properties. Therefore living organism, having systemic organization, reflects in its components, as adaptive results, any changes in the parameters of time-spatial laws governing the external world "(P.K. Anokhin).

Human organism as an open self-regulating functional system (1), constantly interacting with the environment, with its cyclically repetitive components, has developed the rhythmical organization of processes, in the mechanisms of adaptation to this medium. The rhythm of physiological processes, bonded with the living environment, lies for this reason at the basis of the vital activity of the human body, including energetic working activity. The maintenance of the organism's constants or final and stage results of the "system-quanta" of vital activity (6) is possible, because of the time-spatial organization of the self-regulating, dynamic, functional systems, rhythmically changing and ensuring thus the mechanism of adaptation and concord both inside the organism and between the organism and the medium.

The circadian (diurnal) "rhythms" (2), which are caused by the change of day and night, including the rhythms that appear in the period of day or night working activity or leisure occupy an important place in entire rhythmical spectrum.

Among these rhythms, rhythms of sleep (rapid - REM and slow - NON REM sleep) and working activity have the high value.

Balance, or synchronization, of these cardinal states of organism, depending both on the "rhythms" of circadian, psycho-physiological and

working processes and on the optimality of positive adaptive results reached by the functional systems of the organism (P.K. Anokhin) ensures the necessary level of harmony, health and fitness for work. All this has a great value in all spheres of work and social life (2), and particularly under the extreme conditions of the activity of pilots and dispatchers of air traffic control, occupied with the flight control and safety.

Although the basis of the self-regulating functional systems' operation and the "system-quanta" is the optimality principle of obtaining positive adaptive results, they (stage and final results) do not always turn out to be optimum, i.e. frequently they are achieved at the expense of high "physiological price" (3).

When optimum (or relative optimum) stage or final for the organism results are achieved, provided the minimum "physiological price" (3) paid, the high degree of the harmony, accompanied by the balance of circadian and "working" psycho-physiological rhythms is accomplished.

If we visualize the functional system, maintaining BP (blood pressure) at the fixed, optimal for organism level (120/80), then in addition to consideration of the level of changes in BP, it is necessary to evaluate both the BP circadian rhythm and the rhythm of changes in BP, under the conditions of different vital activities, including work life (5).

It is well known that the circadian rhythms by themselves are very sensitive to the stresses (change in the regime of day and night, shift work sequence, trans-meridian flights etc.), and rhythm disturbance is the first sign of trouble (5).

From the position of the self-regulating functional systems' theory comes a constant reciprocal effect of circadian rhythms to the BP level and rhythm during the working activity ("working rhythm" of BP), and vice versa.

Divergence between the endogenous rhythms and exogenous (geophysical, social, working etc.) time clocks disrupts concord and balance of the multi-effect functional systems in the first place, influencing working, psycho-physiological and circadian rhythms; changes behavioral regulation etc., increase "physiological price" and reduces the optimality level of the attainable results.

This violates the synchronous activity of many physiological systems; nonconformities appear among the rhythms of the steady circadian system and the psycho-physiological indicators (including changes in BP) during the working activity.

Increased number of rhythm divergences enumerated above, leads to the so-called jet lag syndrome or asynchronicity, which has a very negative effect on health, work efficiency and "flight safety" on the human factor.

Therefore, we from the position of the theory of functional systems (P.K. Anokhin) researched the psycho-physiological indicators of the "system-quanta" (4) of rhythmical changes in the "working" BP of the air traffic control

dispatchers under various day and night shift conditions, during their occupational activity.

Method

Studies are carried out on 33 dispatchers of "Azerbaijan Hava Yollari" State Concern aero-navigational service, in the day and night shifts conditions of real occupational activity.

In accordance with the theory of functional systems (1) and the systematical quantizing behavior principles (7, 8) BP and variability (CV) of R-R intervals of electrocardiogram (EKG) were recorded in connection with different stage or final resulting activity, which made it possible not only to judge value, but BP rhythm in the process of work as well ("working" rhythm). BP was registered by semi-automatic BP dynamics gauge (Germany) (9). Single-channel electrocardiograph was used to research variability (CV) of EKG R-R intervals. Then CV was calculated by the formula

$$CV = \frac{\sigma}{M} \times 100\%$$

Where M - mean arithmetic value of EKG R-R intervals;

σ - mean-square deviation

Concurrently psychometric testing based on such indicators as health, activity and mood (HAM), level of anxiety and concentration was conducted.

It should be noted that a number of works is known (2, 5), in which BP circadian rhythm was investigated with the aid of the monitoring systems under the natural conditions round the clock (in the daytime - wakefulness, at night - sleep). In this case, the specific information about the BP circadian rhythm was obtained, which was examined without the data about the real "working" change rhythm and activity at night.

The study of the BP "working rhythm" in this work was conducted on the basis of the systematical "quantizing" of real occupational activity, in accordance with its different resulting stages under the conditions of both day shift and night activity, when natural BP circadian rhythm was sharply disrupted. This made it possible to research the influence of circadian rhythm on BP "working" rhythm in the same person with the same occupational activity, but during the different time of twenty-four hours, i.e. depending on the degree of circadian rhythm disturbance.

Research Results

Conducting system-quantum analysis (1,4,6,8) of changes in the BP, the variability of EKG R-R intervals and number of other psycho-physiological

indicators of the air-traffic controllers under the conditions of real occupational activity, made it possible:

- To reveal those who perform daily operations without the stress of psycho-physiological functions and those who work with certain degree of stress

- To determine peculiarities of analyzed parameter changes in the different groups and shifts. (Fig.1, tables 1)

The dispatchers of the first "clinically healthy" group were observed to have "rhythmical" changes (increase, with the subsequent decrease) in the BP levels and variability (CV) of EKG R-R intervals, in accordance with the stages of direct resulting activity and rest (Fig.1, tables1).

Table 1.
Phased inflexions of variability (CV%) of heart rhythm during immediate professional activity and pauses among of the dispatchers of the different groups.

Conditions CV%	Stages of activity and pauses					
	Activity	Pause	Activity	Pause	Activity	Pause
I "healthy group"	3,9%±0,23	4,6%±0,31	3,6%±0,21	4,4%±0,19	3,6%±0,19	4,6%±0,29
II "risk group"	2,9%±0,17	2,8%±0,16	2,7%±0,16	2,9%±0,19	3,1%±0,32	3,2%±0,1

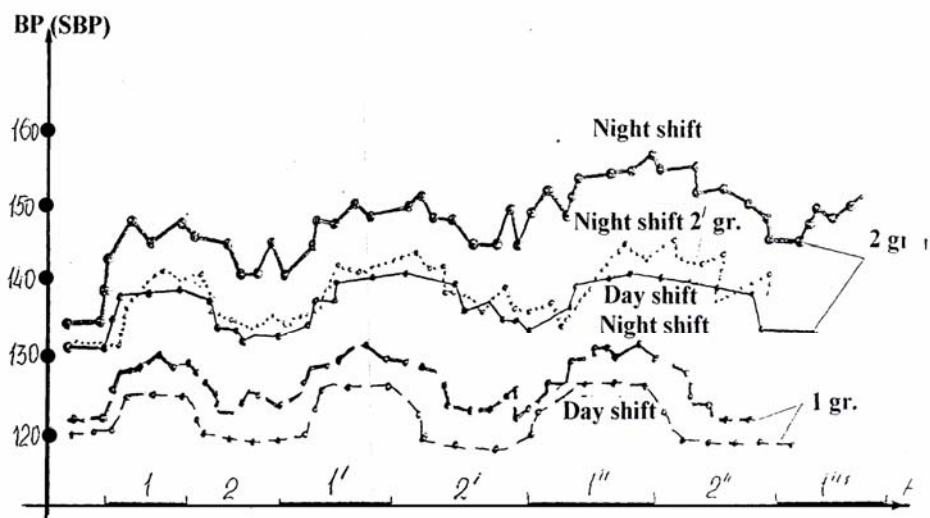


Fig. 1 Dynamics of “systemquantas” of the mean values of blood pressure (BP) among aviadispatchers (1 and 2 groups) in the day and night shifts at the different stages (A) of activity (1, 1', 1'', 1''') and pauses (2, 2', 2'').

Moreover, these changes, as a rule, were differently directed, i.e. with the BP increase, the variability (CV) had a tendency toward a decrease, and vice versa. First, it should be noted that BP rose (138/84 \pm 3,8), with direct activity- air traffic control, with the subsequent decrease to the standard, during the pauses. Meanwhile, the changes in the variability level (CV) of R-R intervals were "reverse", with a decrease during the activity (3,9% \pm 0,23) and the restoration (increase) in the pauses (4,6% \pm 0,31).

Thus, both parameters changed "rhythmically" during the activity and the pauses, accompanied by the corresponding shifts of other psycho-physiological indicators. These are normal, harmonic interrelations (characterizing voltage lift and drop during the activity and the pauses) between the psycho-physiological and working processes, which makes an important adaptive sense. These indicators were accompanied by the normal or increased level in HAM (health, activity and mood) and higher concentration (1089÷1156). At the same time, the level of anxiety (\leq 30) in these persons was for the most part lower, or within the standard limits.

The "risk" group, was characterized by more pronounced disturbances of "rhythmical" changes in BP, variability of EKG R-R intervals and other analyzed parameters, during the activity and the pauses (Fig.1, tables.1).

So, increased BP (on the average up to 143/88÷156/92), pulse rate (72÷86) and situational anxiety (\geq 46) were registered during the immediate

intensive activity, accompanied by reduced variability ($CV = 3,6\% \pm 0,38$) of R-R intervals, against the background of the lower HAM values (≤ 4) and concentration ($578 \div 289$), rather than in the first group's dispatchers.

It is important to emphasize that typical negative shifts of BP and other analyzed psycho-physiological indicators recorded in the "risk" group dispatchers, were not restored to the end in the pauses between activities, remaining sometimes after shifts as well. (Fig.1) Thus, concord and normal BP rhythm of psycho-physiological and working processes are disrupted; and the state of increased emotional stress is shaped.

The prolonged maintenance of the stressed state acquires "congestive" nature and finally leads to the functional disturbances, which can be prerequisite for the development of different psychosomatic diseases. The problem of control of psycho-physiological indicators, and hence of the work efficiency, sharply stands before the night shift dispatchers. Just so, the night shift is subjectively perceived as longest lasting and severe, i.e. extreme.

Health status deterioration in night shift depends on the:

- Specific psycho-physiological features of the human body, combined with the bio-rhythmic activity (because of the circadian rhythms disturbance)
- Age (from 35 years),
- Seniority (above 8 years)
- Morbidity structure (for example, cardiovascular neurocirculatory dystonia, arterial hypertension transitory phase, etc.)
- Occupational activity specific organization and conditions

The psycho-physiological features of people working in the night shift include: the increase in the activity of the parasympathetic section of peripheral nervous system, which leads to the shift of processes "excitations - inhibition" to the inhibition side; speech / mental processes deceleration; decreased heart rate; brain blood supply deterioration. Such features as reduction in the intensity of flights, the low illumination of work sites, the insufficient flow of information ("sensory hunger") and hypodynamia relate to the night shift organization specifics. All this leads to the development of specific phase state - monotony, which can quickly take dispatcher away from the operational state. According to the experimental data, the state of night shift monotony is characterized by frequency heart rate decrease to 20% and more, with the simultaneous decrease of electro-cutaneous resistance to 25% and more.

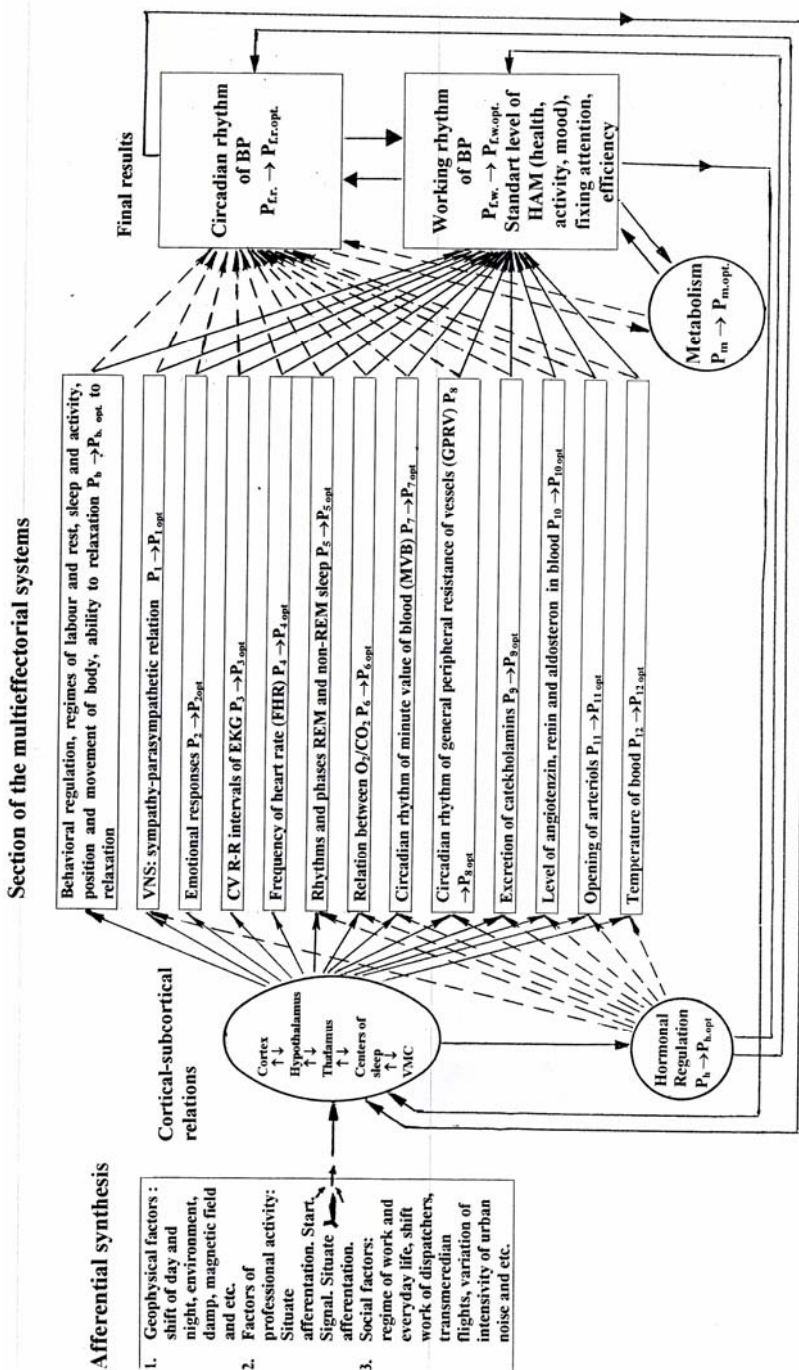


Fig.2. Functional system of supporting final results (P_f), labour (P_{r,1} → P_{r,1, opt.}) and circadian rhythms (P_{r,1} → P_{r, opt.}) of BP with the help of multifactorial systems and their results (P₁ - P₁₂) in day (light background) and night (dark background) shifts in accordance with the principle of optimality of functional systems self-regulating, indicators of attainable results "aspire" to optimality (P → P_{opt.}). CV is variability R-R intervals at electrocardiogram (ECG); BP – blood pressure; P_{r,1} – final result of labour rhythm; P_{r,c} – final result of circadian rhythm of BP; P_{opt.} – optimal index; FHR – frequency of heart rate; VNS – vegetative nervous system; HAM – health, activity, mood; VMS – vessel-motor center; MVB – minute value of blood; GPRV – general peripheral resistance of vessels

It should be noted that along with total, gradual reduction in the work efficiency, night shift prolongation revealed two unfavorable time intervals,

with high probability of vigilance relaxation and falling asleep, lowest work capacity, and highest risk of dreamy state or erroneous actions. These critical periods are from 1:00 to 2:00 am and from 4:00 to 5:30 am.

The peculiarity of the air traffic control in Baku airport is in the fact that the peak of work intensity starts between 4:00 to 6:00 am (And that is, when the work efficiency is reduced to the minimum). During this period, maximum flights occur according to the timetable, due to Baku's geographical position.

Thus, the highest work capability and vigilance required from the dispatchers correspond to the period of maximum reduction in the functional efficiency of organism. Specifically, the greatest shifts of psycho-physiological indicators occur in this period, which can be classified as extreme. At this time the HAM indicators are reduced by more than 20%, testifying drop in capability, and the probability of the erroneous actions rises.

The method of "quantum" analysis, carried out in the night shift groups of "risk", showed greater (in comparison with the day shift) disturbances in the level of variability (CV) of EKG R - R intervals and BP "working" rhythm (considerably rising during work stages and frequently staying the same in the pauses and after work). (Fig. 1, tables.1). This means that emotional stress after the work stages is not completely reduced, thus sharply disrupting normal rhythm of psycho-physiological and "working" processes, testifying the formation, in the night shift, of the continuous emotional stress. The significant variances of BP circadian rhythm in the night shift disrupt even more the level and rhythm of "working" BP, including interrelations with the "system-quanta" of the dispatcher's activity. In this case group of "risk" have the periods of pulse and BP instability: pulse is quickened, systolic blood pressure (SBP) is reduced, and diastolic blood pressure (DBP) rises. Differently directed changes in these parameters, after the direct work/rest cycles, testify the possibility of the development of overfatigue accompanied by reduction of attention (≈ 385), HAM (≤ 4) and in some cases rise in the level of situational anxiety ($31 \div 40$).

According to the theory of functional systems, the circadian and "working" multifactor systems of BP "rhythm" chrono-regulation include environmental, behavioral and homeostatic blocks (fig 2). Natural circadian and working BP "rhythms" as the final useful adaptive results of functional system, are supported, first of all, by the constancy of the environmental rhythm synchronizers joining the afferent synthesis:

- Geophysical factors (light and temperature conditions of air, humidity, earth's magnetic field, day/night change, etc.).
- Social factors (work and household regime, variation and intensity of urban noise, etc.).

Specific behavioral reactions (body position, regime of working activity and leisure, duration and the quality of natural night sleep and day wakefulness, relaxation capability, emotional reactions) adapted to these environmental factors form the multi-effect functional system of circadian and

working BP "rhythms" self-adjustment. Homeostatic block is also included in this multi-effect functional system. (Fig.2).

Homeostatic multi-effect blocks of functional systems and their results, "striving" to the optimum values ($P \rightarrow P_{opt}$) support this way circadian and working BP "rhythms" in the limits of norm and include:

- specific correlation of activity of brain corticosubcortical structures
- sympatho-parasympathetic effects of vegetative nervous system, which reflect at frequencies of the heart contractions and respiration, variability of EKG intervals, the lumen of arterioles, temperature, emotional reactions
- according to the authors (5) also at the stability of blood minute volume circadian rhythms of blood minute volume (BMV) and general peripheral resistance of vessels (GPRV)
- excretion of catecholamines and content of renin, angiotensin and aldosterone in the blood plasma. (Fig.2)

External environmental (night shifts, etc.) and behavioral synchronizing factor (increase dirregularity of working activity rhythm, in particular at night shift, disturbance of phase relationships of REM rhythms and sleep non-REM, body position change, increased negative emotional reactions and reduction in the capability for relaxation, etc.) disorders result in changes first of all at the homeostatic level of multi-effectoral functional systems and shifts in their results in the opposite direction (from $P_{opt} \rightarrow P$). This in turn, causes disintegrating influences on the circadian and working chrono-structures of the BP "rhythms" (final adaptive results $P_{f.opt.} \rightarrow P_f$) and forms the state of desynchronizes, and subsequently hypertension.

The shifts of BP circadian and working rhythms chrono-structures contribute to further development of indicated pathogenetic disorders in the organism, which are accompanied by frequent negative emotional overstrain. All of these results in the formation of "congestive" emotiogenic excitations reverberating in the structures of cortex and limbic-hypothalamic-reticular complex of the brain, which have the disintegrating, descending effects on vegetative and cardiovascular systems. In this case, sympatho- parasympathetic interrelations are disrupted, and heart contractions and respiration frequency shifts, variability of EKG intervals, temperature, the contraction of the arterioles' lumen, etc. evince that.

Such changes in the multi-effect homeostatic block of functional system as MVB circadian rhythms disorder and general peripheral resistance of vessels (GPRV), excretion of catecholamines and content of renin, angiotensin and aldosterone in the blood plasma also contribute to the progression of desynchronizes and to an increase in BP (5). It is important to note that disintegrating influences of multi-effect functional systems are caused by the trend shift of results reached by them, changing from optimal to "current"

values (Popt → P) and causing disruption of "working" and circadian chronostructures of BP "rhythms", up to the desynchronosis formation and subsequently hypertention of steady form.

Further was determined that besides the chrono-biological aspects, which influence rhythmical changes in the "quanta" working BP and emotional stress level, dispatchers' individual capabilities for "relaxation" (in the pauses, between the stages of activity, after work), determined by K.Hecht's (9) procedure and included in the behavioral block of self-adjustment functional system also have the great value in this plan. (Fig.3)

The gist of this procedure is in the fact that (prior to the beginning of real occupational activity), the capability of a person for the relaxation is measured with automatic tonometer (gauge of BP): during 10 minutes each second minute during relaxation BP was recorded (with instruction to concentrate on the inhalation and the expiration). Measurements were conducted in both groups of dispatchers.

There were revealed four "relaxation capability" types, determined by four characteristic changes in the curves-decrements of BP damping during relaxation (Fig.3).

First two decrement types of BP damping - "very good" and "good" – primarily related to the dispatchers of the first group; 3rd and 4th - "insignificant" or "weak" and "stressed" - to the second group of risk (Fig.3). Employing this procedure (9) makes it possible to forecast how successfully (rhythmically or un rhythmically in accordance with the work activity and the pauses) will dispatcher work in the actual conditions and what group he belongs to.

Regular "relaxation" trainings bring to an "improvement" in the decrements of damping BP, changing from the "stressed" type to "good", which under the actual conditions for work is evinced by recovery of rhythmical "systa-quantum", due to the decrease of BP during the direct work and, especially, in the pauses between the activity.

The rehabilitation of working BP rhythm and values can also attest the reduction in the "psycho-physiological price" for the results reached and about their tendency toward the optimization in different stages of the air traffic control (Fig.3)

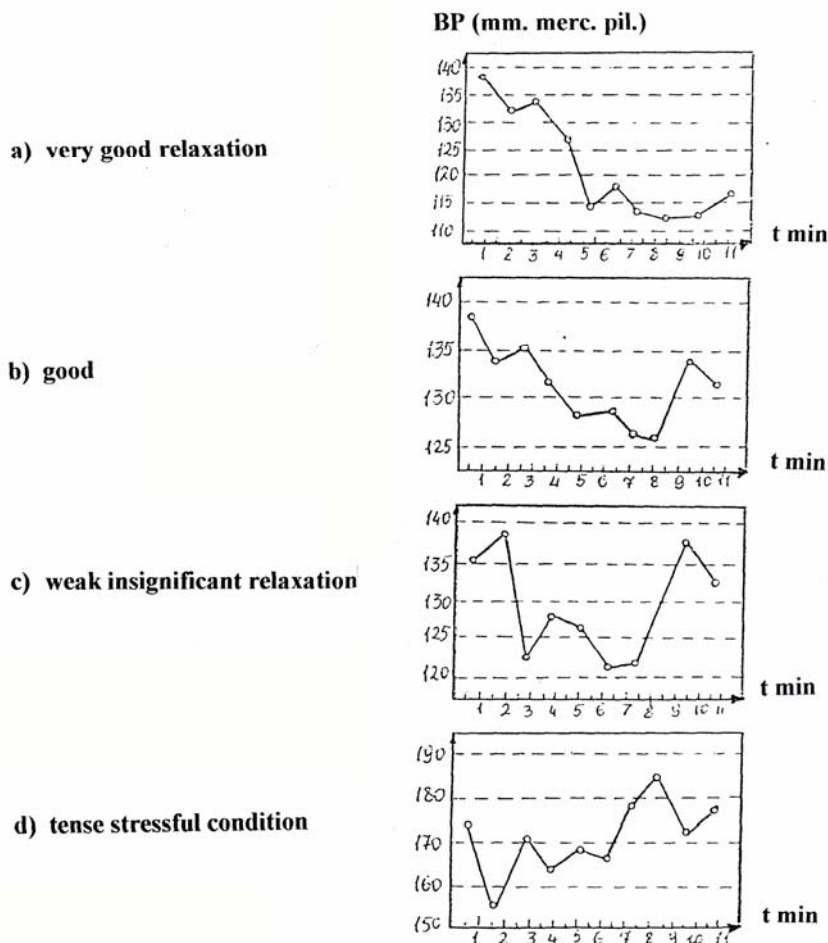


Fig. 3 Correction of blood pressure (BP) by relaxation method of K. Hecht: 4 types of curves-decrements (a, b, c, d) of reduction of BP after conducting “relaxation”.

The use of K.Hecht’s method of behavioral relaxation makes it possible to conduct correction and restore the disrupted "rhythmicity", normalize BP values and other psycho-physiological indicators, thus increasing and supporting harmony between them and circadian rhythmic. Furthermore, according to 4 revealed "relaxation curves " types it is possible to forecast the degree BP rhythmicity disorder, in accordance with the "quanta" of the forthcoming occupational activity, determining thus, beforehand relaxation capabilities – individually for each dispatcher. This procedure can also be used for purpose of professional orientation and career selection.

In the conclusion, one should emphasize that the systems approach is new in chronobiology. It allows to reveal amplitude, rhythm and periodicity of BP change in compliance with the successful day and night activity stages; to judge about the level circadian and "working" psycho-physiological rhythm accordion disruption; their reciprocal effects in the different conditions of shift work without the monitoring, through changes in BP parameters of the successful working "systemquanta" of psycho-physiological indicators.

Conclusion

"Working" BP change in "clinically healthy" people has the rhythmical nature: rising in the process of direct activity and descending in the pauses (it has adaptive value).

Comparison of the "working" BP rhythm and psycho-physiological indicators value disturbance of the same persons during the day and night shifts showed that they were more expressed at night. The prolonged maintenance of such disrupted "rhythmic" state, especially, in the group of "risk", entails increase and stabilization of BP "working" rhythm values, accompanied by significant HAM shifts, shift in level of anxiety and concentration.

Certainly, BP increase is caused by the preceding derangements of its rhythmic and by the shifts in multi-effect functional systems results, very sensitive to the stresses and the stressed states, caused by working activity. At the beginning in some of the 2nd group dispatchers, relating to the risk group, there was only observed "working" BP rhythmicity disorder without a significant increase in BP values. However, after several night shifts BP values rose as in the remaining 2nd group dispatchers. (Fig.1)

Therefore BP "working rhythm" violation is not only the indirect indicator of circadian rhythm shift, which affect the former, but also is the primary signal of the expected increase in arterial-blood pressure.

The frequent and lasting fluctuations of internal and exogenous rhythms as a result of shift work, especially the night shift, lead to the transgression of the harmony between these rhythms and, as a result, to desynchronizes, insomnia and disturbance of psyche, to rapid tiredness and to the undermining of health, that reflects in the fitness for work and "flight safety".

In accordance with the systems approach, at this time of a day, the optimality of the values reached by organism, stage and final results are reduced, "physiological price" increased.

Thus, systematical approach and systematic behavior "quantization" principle, allows to conduct timely preventive check-up and forecast of the expected increase in the values of BP, on the preceded violation of its "rhythm", in accordance with the successful stages of the dispatcher activity under the actual conditions of the air traffic control.

The possibility of the disturbance detection in the BP "rhythmic", directly relating to the formation of the riskiest and the most extended among the crew hypertension, allows performing the effective preventive measures for correction. It serves for averting the development of disease, staying healthy, fit for work and contributes ensuring human factor related "flight safety".

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RHYTHMS, SYNCHRONIZATION AND RESONANCE

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Everything in nature is being continually moved, because “the world is not in existence, it is in progress” /Cramer 1998/. Usually, natural moving is fluctuating-unstable. These fluctuations have hierarchic structure in time. This dynamical-rhythmical hierarchy is characterized by spatio-temporal fluctuations, harmony; and its regularities may be evaluated mathematically.

It is generally adopted and proved that to the systems with relatively stable structures and forms are peculiar the networks of interrelated regular circles with mechanisms of feed-back, and informational coordinated functions. This scientific knowledge is valid and apply to systems of molecules, cells, the organism in whole, and to ecological – geo-, planetary and space - systems. These regularities are certainly related to all biological systems and, of course, to human being. To biosystems are peculiar temporal circles, circular processes, harmonic vibrations, periods, frequency. Relatively stable structure and form of a man are kept by countless, permanently renewable, interrelated regular circles. Spatial figure of a man that we see, is nothing but the function of different, connected with one another circular processes /circulation of the blood, heart activity, digestion, reproduction, moving/ of fluctuating impulses of excitement of nerve fibres and so on. Absolute stopping of the system of regular circles of a man means his death, partial delay – sickness.

How do these relatively stable structures, consisted of regular circles, interact?

Processes of synchronization and, accordingly, of resonance temporarily or permanently unite among themselves the regular circles or disjoint them from each other. For perception of this phenomenon, in many respects promoted the chronobiology, revealing the hierarchy of biological rhythms with length of the period from 10^{-6} till 10^8 seconds in human organism. In chronobiologic aspect the following essential tasks feature to cyclic functions of the organism:

1. Economical method of regulation;
2. Synchronization of biological processes provides the dynamics of adjustment processes of living being. Their synchronization may proceed endogenous–endogenous and exogenous–endogenous;
3. Regulation of time and perception of time by man.

What do we understand under synchronization?

Synchronization as a biological term underlines, that biological rhythms of numerous physiological functions interact temporarily or continuously on permanent phase of fluctuations, on permanent amplitudes and frequencies, and thereby harmonize and optimize biological and psychobiological processes with the purpose of providing of homeostasis internal and external environment. Synchronized biorhythmic processes reflect good health and capacity of work.

What is resonance?

“Resonance lies in the fact that fluctuations go into interaction and are transformed. At that they become inter-excited or reduced, intensified or weakened” /Cramer 1998/. If we compare definition of chronobiologic term “synchronization” with determining of “resonance” notion in our biological sense, then we can state many commons between them. Synchronization and resonance provide optimizing of our living processes.

Functional neuronal connections

For a long time in neurophysiology are known functional neuronal connections and neural regular circles. Coordination of nerve cells, provided by synapses, formed in the result of fluctuating movements, is the foundation of different functions /thinking, feeling, memory and so on/. So, neuronal connections form temporal synaptic unions in form of regular circles, in the result of which is generated proper rhythmic, providing processes of feedback and exciting information tank /memory/. Informatics on basis of bionics constructed the architecture of computer, using the structures and functions of neuronal network structures.

Resonance of molecules

Lynus Pauling (1948) brought the principle of resonance in chemistry. He firstly used wave equations of Shrodinger in chemistry. On basis of it we know today that complex molecules, for example, stay stable because of the fact that their electrons correspond to definite resonance scheme, and that for stabilization of these molecules is needed energy minimum. /Pauling 1948/.

Therapy on basis of functional regular circles

Prophylactic and therapeutic bioactive substances or in whole therapeutic principles are adequate only when they strengthen the resonance of regular circles or brought defective regular circles with the help of synchronization and resonance to harmonious synergy of synchronized fluctuations. Broken synchronization and resonance should be verified by corresponding diagnostics. In medicine of slumber they are the criterion of quality of interaction of meanings regulating the slumber. /Fig.1/

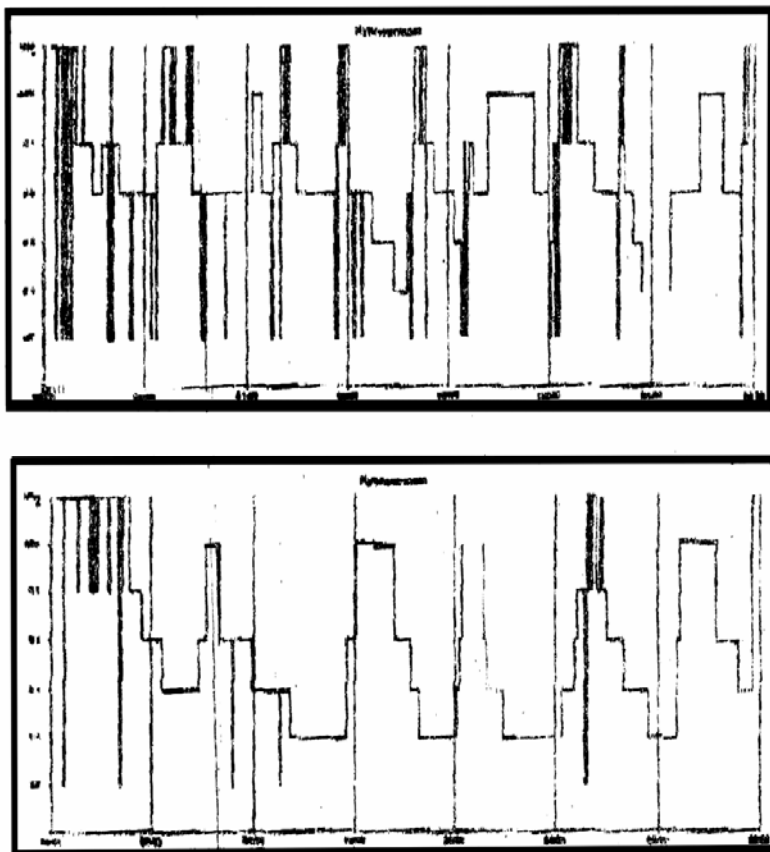
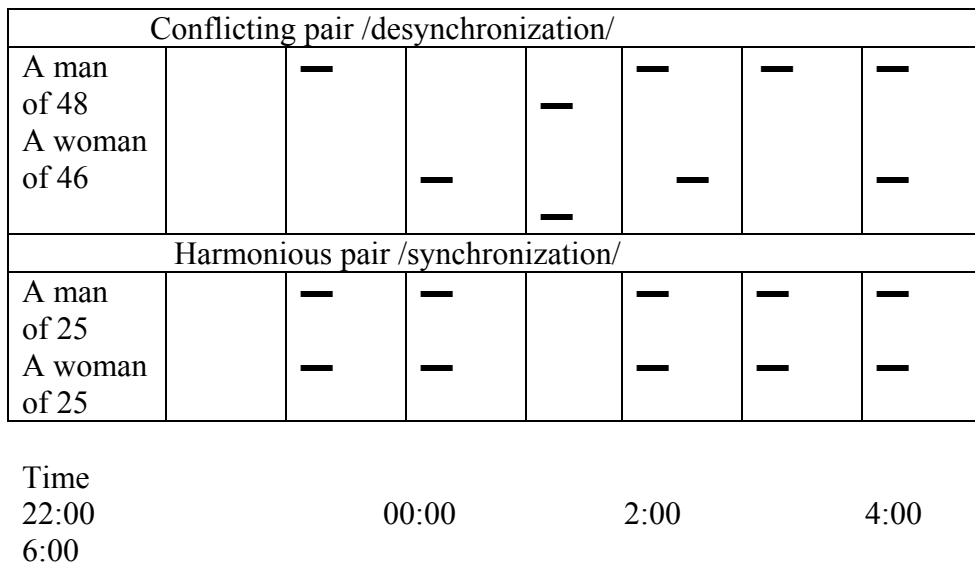


Fig.1 The polygram of slumber of one patient /Brattstrom, Archiv 2002/
Above: disturbance of slumber /desynchronization/
Below: in two weeks of treating of two tablets of medication from valerian and hop, disturbed rhythmic was reconstructed /synchronization/.



**Fig. 2 Synchronized and desynchronized REM-slumber of pairs
 Profile of slumber of REM-phase /Hecht 2002/**

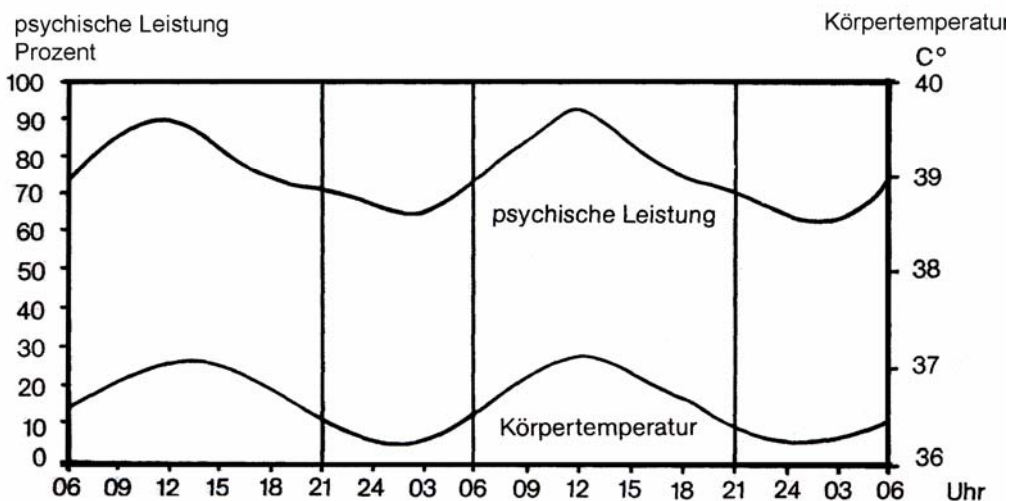


Fig. 3 Circadian synchronization of rhythms of body temperature and psychic potential

Circadian rhythm of body temperature /lower curve/ has the lowest value. Low temperature is prerequisite of healthy slumber. High psychic potential /upper curve/ is reached in the highest values of body temperature and vice versa. Abscissa: time in hours; ordinate: in the left – potential in %, in the right – degrees Celsius /Hecht 1992/.

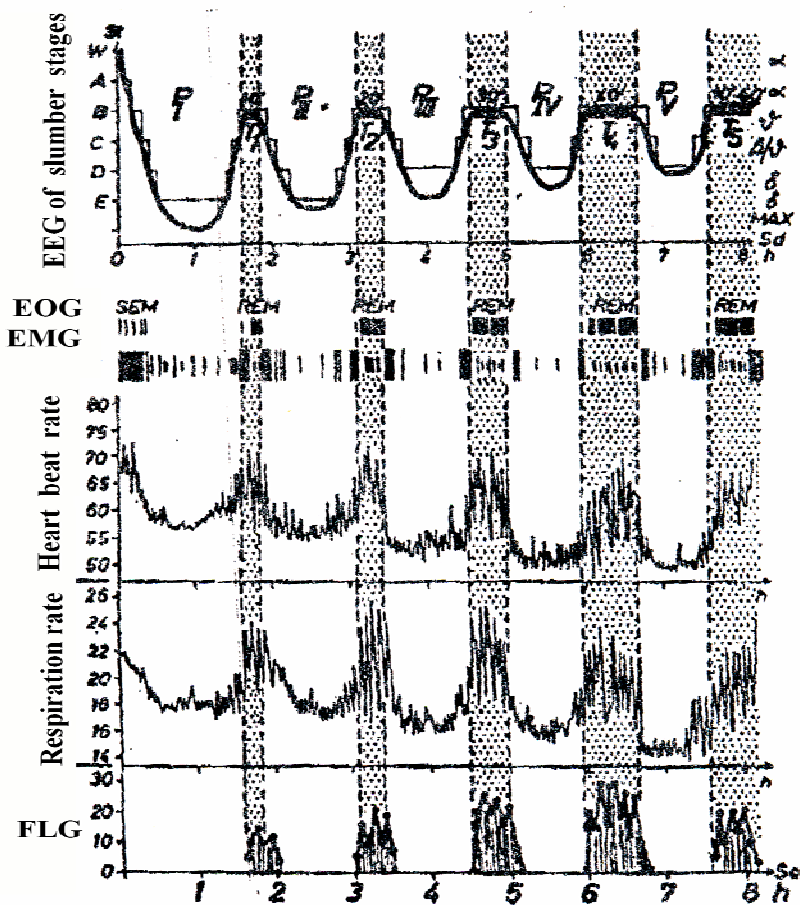


Fig. 4 Synchronized passing of periods of essential parameters during slumber.

- Top-down
- Cycles of slumber
- Electrooculogram
- Electromyogram
- Heart beat rate
- Respiration rate
- Falogram

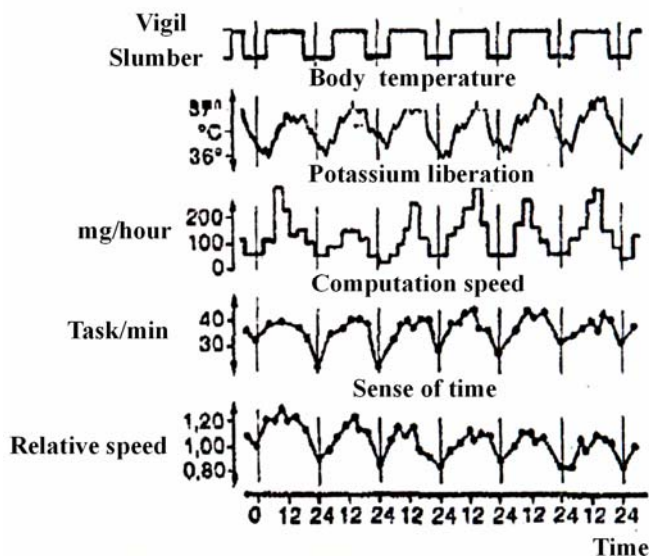


Fig. 5 Parameters of probationer with strict daily routine. Disciplined keeping of physiological rhythm in everyday life guarantees health and longevity.

So looks the synchronization of 24-hours rhythm of different parameters of probationer in strict keeping of daily routine /Bierbaumer 1996/.

Bringing in medicine of such criteria as rhythms, synchronization and resonance clears absolutely new ways in the field of diagnostics, therapy and prophylaxis.

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**WEEKLY RHYTHMS OF
PHYSIOLOGICAL PARAMETERS OF SLEEP
Investigations with a mobile, automated
and miniaturized sleep analyzer**

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I. INTRODUCTION

One may understand physiology of sleep and physiopathology of its violations only in case of chronobiological approach to the problem. As is well

known, chronobiology is the science about all functional processes of living creatures. This science describes biological and, more specifically, psychobiological rhythms within range of lengths of periods from 10^{-6} to 10^8 seconds. Rhythms in physiological structure are reflected within the range of lengths of periods from 15 hertz to 1 week. These periods, obtained as a result of measurements of definite parameters serve, as the basis for objective appraisal of quality of sleep, including its violations too. Subjective appraisal of personal sleep is subjected to definite restrictions, connected with retrospective perception and interpretation. Along with this, continuous conducting of protocols of sleep for several weeks period, though is considered as reflection of subjective appraisal, nevertheless, it serves, as auxiliary diagnostic method and allows realizing personal experience of sleep.

Physiological processes during sleep may be measured. Measurements of function of sleep for last 70 years are accomplished by means of ElectroEncephaloGram /EEG/, i.e. first of all by reproduction of picture of currents of cerebrum. EEG waves allow describing following functional processes:

1. Beta-waves >12 Hertz: wake, excitement, stress;
2. Alfa-waves 7-12 Hertz: relaxed wake, tiredness;
3. Tetra-wave 6-4 Hertz: status of trance, half-dream, dream sleep;
4. Teta-waves 1-3 Hertz: deep sleep <1 Hertz: coma, narcosis.

Rechtshaffen and Kales /1968/ on base of EEG waves and currents of action of muscles /electro myograms EMG/ and currents of eye muscles /electricoculogram EOG/ attempted dividing sleep into stages. Discovering by Aserinskiy and Kleytman in 1953 of REM-Sleep was an important condition of detection of such stages. REM is the abbreviation of /rapid eye movement/. Both specialists in the sphere of sleep noticed, that rapid eye movement with duration of 10-20 minutes are registered at healthy people during their sleep with periodicity of 70-120 minutes. This phenomenon was forming in parallel to specific pictures, reflecting during registration of currents of cerebrum and muscles. So-called NONREM-Sleep, consisting of four parts, was opposed to REM-sleep.

Stage 1- transition from wake to status of sleep

Stage 2 - surface sleep

Stage 3- sleep of middle depth

Stage 4- deep sleep /delta-sleep/

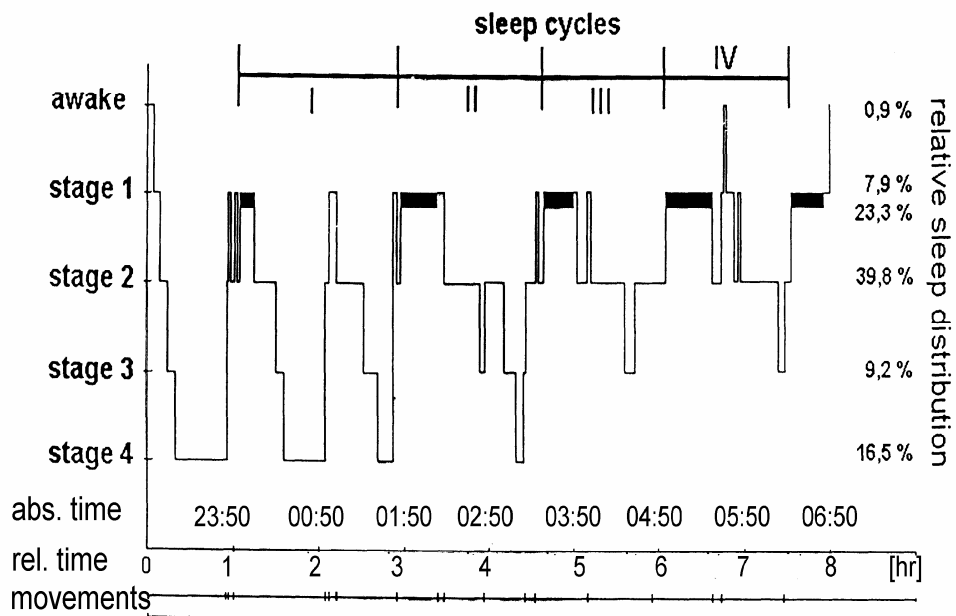


Figure 1: Hypnogram of a healthy man (Maschke 2000).

Thus, one gets diagram of sleep, which is also called as hypnogram /fig.1/. The most important phases of sleep profile, reflected in hypnogram, are REM-sleep and deep sleep /NONREM-stage 4/. Both stages, jointly with state of wake, are responsible for three very important cardinal states. Rhythmic coordination of these three cardinal states is an important criterion of quality of sleep. The most significant characteristic features of these three cardinal states are reflected in table 1.

Table 1.
Measured functions, relating to three cardinal states of rhythm of sleep and wake

Parameters	Wake	REM sleep	Deep sleep NoNREM- sleep
EEG	Beta-waves />13 hertz/	Teta-waves with low amplitude /4-6 Hertz/	Delta-waves
EMG	High activity	Absence of activity	Low activity
EOG	Movement of eye,	Rapid eye	Slow movement

	providing sight and its variability	movement	of eyes or relaxation
Hormones of growth	Without significant changes	Without significant changes	Highly increased
Synthesis of protein for functions of memory	Without significant changes	very active	Increases short before RAM sleep
Vegetative functions – metabolism	High activity	High activity	Very low activity
Dreamy trance	Dreamy trance	Highly expressed	Low expressed
Micro sleeps	Frequent	Rare	Rare
Sex hormones	Without significant changes	High activity	Without significant changes

Whereas deep sleep serves predominantly for physical relaxation, and it is present, first of all, in the first half of the night, REM-sleep provides psychic relaxation, transformation of information, obtained during the day for accumulation in long term memory, individualism of behavior program. REM-sleep dominates in the second half of the night. Approximately two-hours rhythms of cycles of REM-sleep are reflected then during the wake, as /BRAC/basic relaxation- activity cycle /Kleitman 1970/. They refer to the group of ultra radian rhythms length of periods of biological rhythms less than 20 hours/. As we already indicated, rhythms of sleep, consisting of REM and NONREM-sleep are constituent part of 24 hour/day rhythm. It is called circadian rhythm /circa-near, approximately and dies –day from Latin language circadian rhythmus/ figure 2 /.

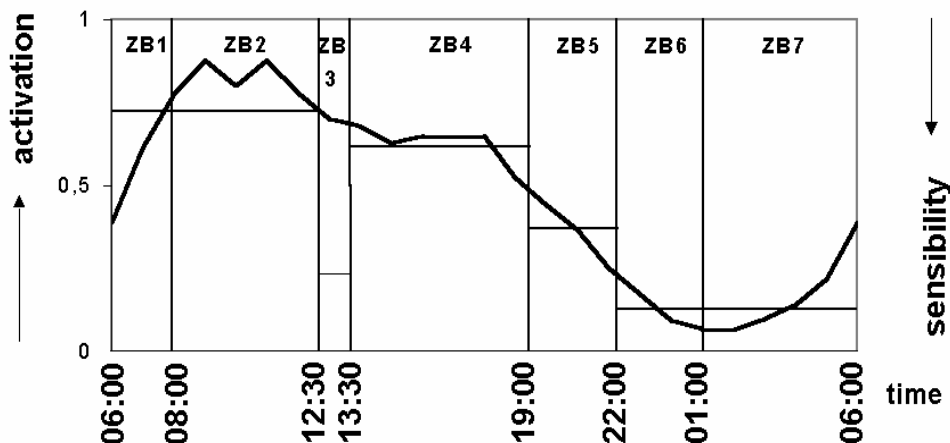


Figure 2: Circadian rhythm development of the activation of body functions and of noise sensibility with subdivision in time intervalls

- time intervall 1:** rising activation, unstable regulation phase
- time intervall 2:** high activation level, low level of sensibility
- time intervall 3:** natural midday sleeptime (siesta)
- time intervall 4:** high activation level, low level of sensibility
- time intervall 5:** descending activation level, unstable regulation phase
- time intervall 6:** sleep, sleep onset latency, dominance of NREM-sleep, that means physical recovery
- time intervall 7:** sleep, donance of REM-sleep, that means mental-emotional recovery

Physiological parameters are not functional constants. They change from night to night. Its means it's impossible to get night-by-night reproduced data of physiological parameters of sleep. They are subjected to weekly rhythm /circaseptane Rhythmus/ /Sept-7/, approximately, seven-day rhythm. Sleep behavior of dream of healthy person during one week discovers better quality of sleep from Friday to Saturday and the worst one from Sunday to Monday /Hecht 1993, Siems et al. 1993, Hecht et al. 2002/ /fig.3/.

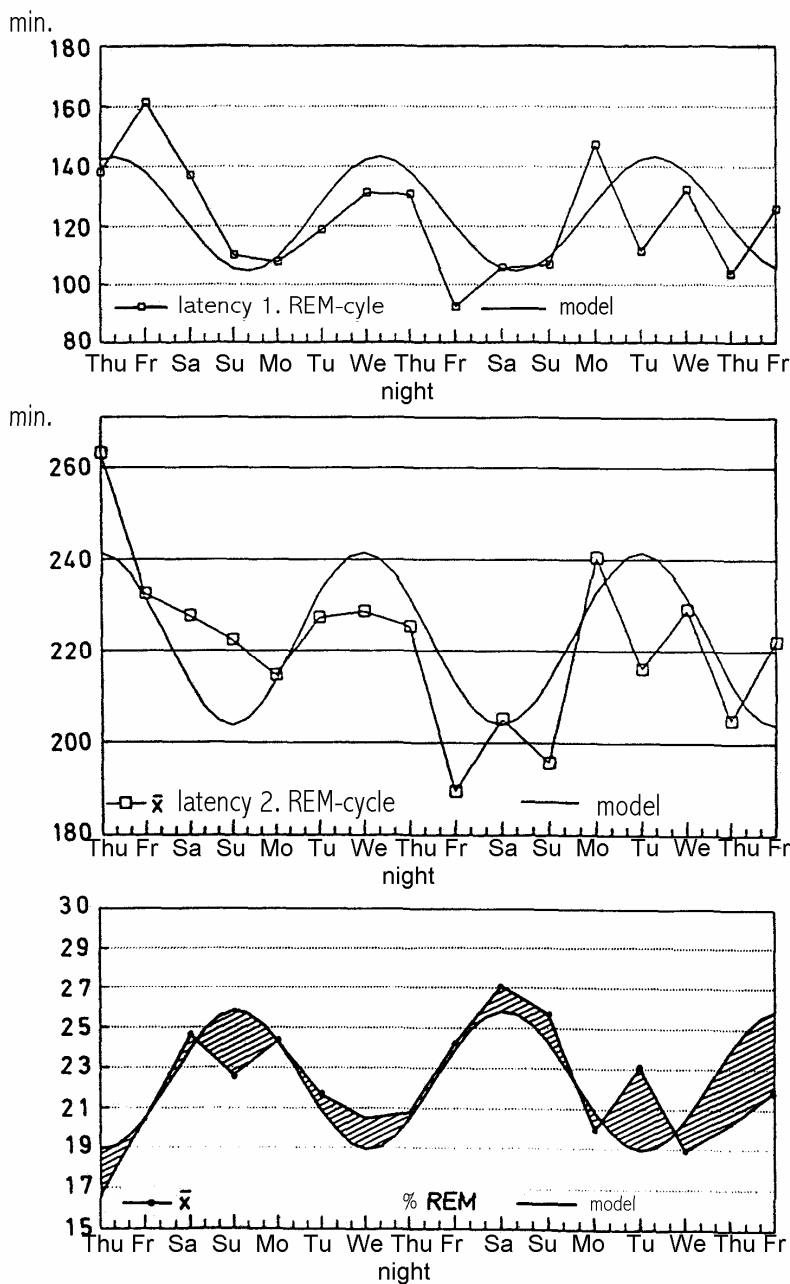


Figure 3: Examples for the circaseptan periodic of some sleep parameter during a 16-nights lasting investigation in a sleep laboratory (n = 7) [Diedrich et al. 1993].

To guarantee diagnostic of sleep by exactly produced data, at least, 14-16 continuously successive nights are necessary for research. However, such requirement is beyond possibilities of laboratory of sleep. Acknowledgement of this fact instigates to rethink diagnostic of sleep in laboratory and correspondingly clinic-pharmacological researches, practiced hitherto.

Diagnostic methods of polygraph of sleep are, hitherto, the most important method of assessment of quality of sleep and proof, confirming violation of sleep by means of objectively measured parameters. Diagnostic of sleep in conditions of laboratory is presently subjected to criticism due to:

-Conditions of sleep in laboratory alien to human

-Burden of patient by cables etc.,

Wastefulness of forces for reprocessing of avalanche of data,

-High cost,

-Time limit for studies

Critical attitude is also based on vagueness of problem of adaptation of patient to sleep at laboratory conditions and impossibility of comparison of successive nights with previous nights. /Siems et al. 1991, Diedrich et al. 1993/. Studies in laboratory of sleep, accompanied by different psychophysiological tests, indicated that incompatibility of data of physiological parameters, obtained simultaneously from different patients, or from one and the same person during different days, may be explained by following reasons:

1. Adaptation to unknown conditions in the laboratory of sleep /Papousek 1978/
2. Stress influence of polygraph of sleep of previous night on next night Sims et al. 1991/.
3. Psychic load, to which tested person was subjected during the day/conflicts, stress etc. /Siems et al. 1991/. /Diedrich et al. 1993/
4. Heavy physical work, which at coming night increases the share of NONREM-sleep /Beakland and Lasky 1966, Torsvall and Akerstedt 1983, Frühstorfer et al 1988/ decreases share of REM-sleep /Torsvall and Akerstedt 1983/
5. Proportionality of duration of Slow-Wave Sleep /Delta-sleep/ preceding phase of wake /Borbely et all 1981/
6. Study and mental stress, increasing duration of share of REM-sleep /Fishbein 1971, Empson and Clark 1970/

From ancient times some medical specialists in the sphere of sleep prefer ambulatory systems of measurement of polysomnography in avoidance of numerous negative factors, accompanying laboratory of sleep. /Torsvall and Akerstedt 1983, Burgess 1992, Edinger et al 1989, McCall et al 1992, Hecht et al 2003/. On basis of given problematic, task of conducting of long lasting studies /28 nights/ by means of mobile automatic

miniature analyzer of sleep at conditions of sleep customary for patient is arisen. The purpose is verification of weekly rhythms, obtaining of new cognition in research of sleep, its diagnostics, detection and development of optimal and combined methods of therapy.

Methods

Description of the mobile automatic miniature sleepanalyser QUISI[®]

“QUISI[®] has been developed as an one-channel, ambulatory EEG recording device with 3 electrodes placed on the forehead close to F_{p1} , F_Z and F_{p2} . While F_Z serves as ground electrode, the channel F_{p1} - F_{p2} was recorded, filtered and analyzed by Fourier-Transform with the subsequent determination of power spectrum estimates. These variables served as input variables for neural network technique classification, taking 12 input variables, 2 hidden layer and 7 outcome variables for 0 = Movement time, 1 = Wake, 2 = REM, 3 = S_1 , 4 = S_2 , 5 = S_3 , 6 = S_4 . Out of 118 primary values, 12 were selected using evolutionary and genetic algorithms. 8 neural networks were established using 8 different patients. Every 30 s sleep EEG epoch (segment) was subsequently classified 8 times. The final decision for each epoch of 30 s was made taking the median of the 8 classifications. Subsequently smoothing rules were applied in analogy to the Rechtschaffen and Kales [1968] smoothing rules. The analysis is fully automated. There is no artefact rejection and no removal of any sleep epoch. Once the rule was established, it was validated by forward classification of 38 sleep disturbed patients, none of whom had been used for the establishment of the classification rule. Every patient had been recorded with polysomnography (PSG) as well according to the standards of the German Sleep Research Society and with the QUISI[®] equipment.” [Ehlert et al. 1998 as well as Danker-Hopfe et al. 2000; Wortelboer 2000; Baumgart-Schmitt et al. 1998, 1997]

General specifications

1. Real-time processing of EEG by the recorder (feature extraction)
2. On-line recording of the EEG (with the PC connected by fiber optic cable)
3. Frontal single-channel evaluation of the EEG-signal
4. Adaptive classification by neural networks (PC software)
5. Signal input range 250 μ V
6. Sampling frequency 128 Hz
7. Off-line processing of the sleep EEG in epochs of 30 seconds
8. 24 hours stand-by
9. Alarm function
10. Fully-automated battery-recharging takes between half an hour and 4 hours
11. Power supply: 4 x 1.2 V of NiMH batteries (1300 mAh)

- 12. Accessories power pack: input 230 V ~, output 9 V = /66 mA
- 13. Loading- and application temperature: 5°C to +40°C
- 14. Storage temperature: -20°C to +40°C

The QUISI[®] software runs under Windows 95, 98, NT (3.51 or higher), 2000 or ME.

Disposal notes

The recorder is to be disposed with attention as special trash, as it contains a Nickel metal hydride battery. Disposal as normal domestic trash is not permitted.

The single-use electrodes can be disposed via the normal domestic refuse/trash.

QUISI[®]: mobile automatic miniature sleepanalyser: technics and function
Technic of mobile ambulatory sleep analyser

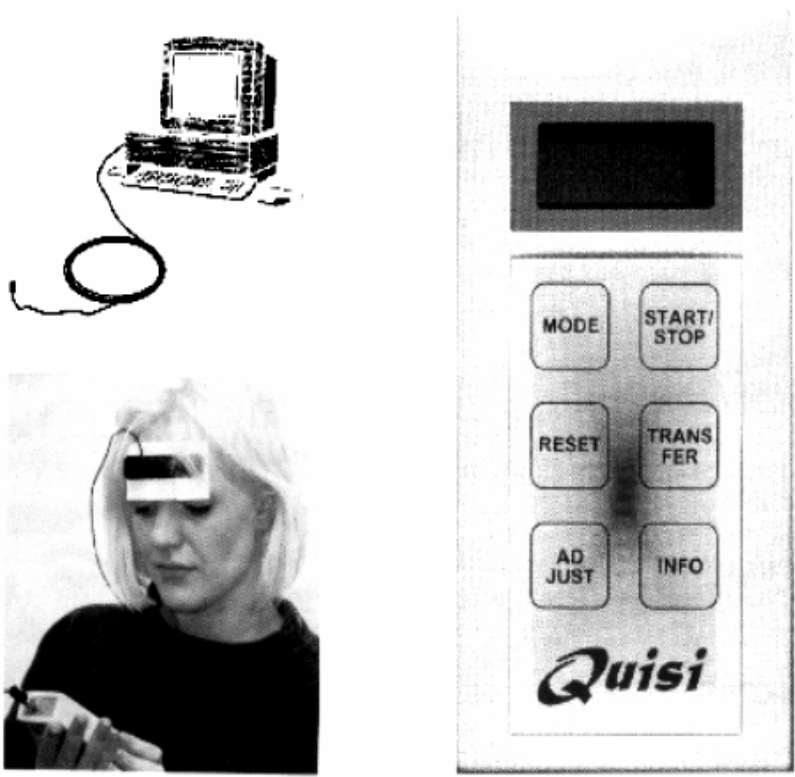


Figure 4: QUISI[®]: mobile automatic miniature sleepanalyser
Function of a QUISI[®] sleepanalyser

No	Label	Explanation
1	QUISI® W95	Version of the QUISI® program
2	Name, Age	Name and age of the subject
3	Sex	Sex of the subject
4	Date, Type	Date and type of recording
5	Sleep profile	Sleep profile
6	Time (in Hours)	Time during the recording
7	Legend	Sleep stage statistics
8	Exit	Click here to close the window
9	Print	Click here to print the sleep profile
10	Notes	Click here to display the notes
11	Data	Click here to display a preview of the printed report
12	Feature data	Click here to show Feature data (button active in off-line mode)
13	On-line data	Click here to show on-line data (button active in on-line mode)
14	Sleep stages	Names of sleep stages

Instructions to prepare the measuring

To prepare the record clean your forehead well with soap.

15. Clip the selfadhesive SKINTACT-Electrode on the active electrode,
16. then remove the protective foil from the selfadhesive electrode
17. and put it, the cable pointing up to the hairline, on your forehead.
18. Connect the cable of the active electrode with the QUISI®.
19. Switch on the device and please go to sleep.
20. In the morning switch off the device and give it to the specialist for analysis.

Examples for hypnograms

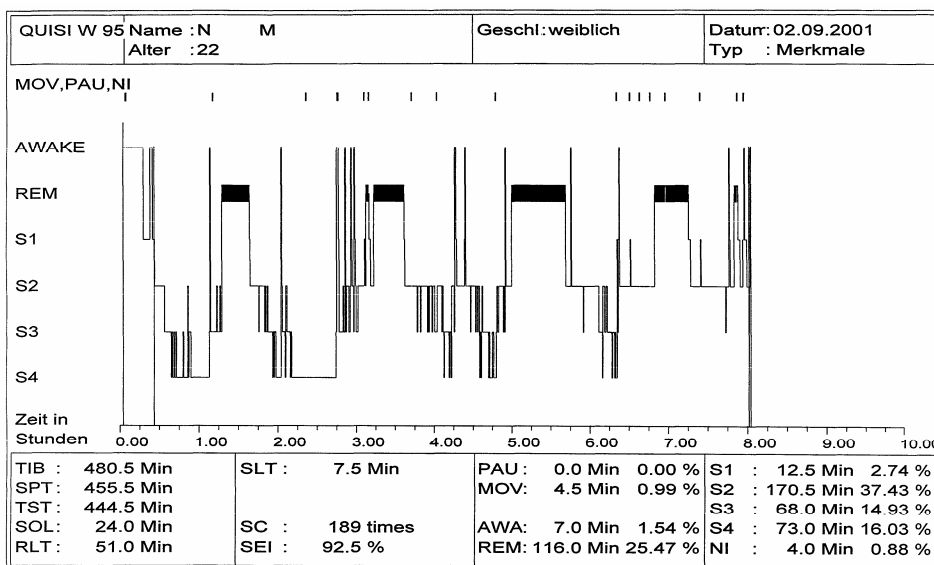


Fig. 5a: Hypnogram of a healthy person

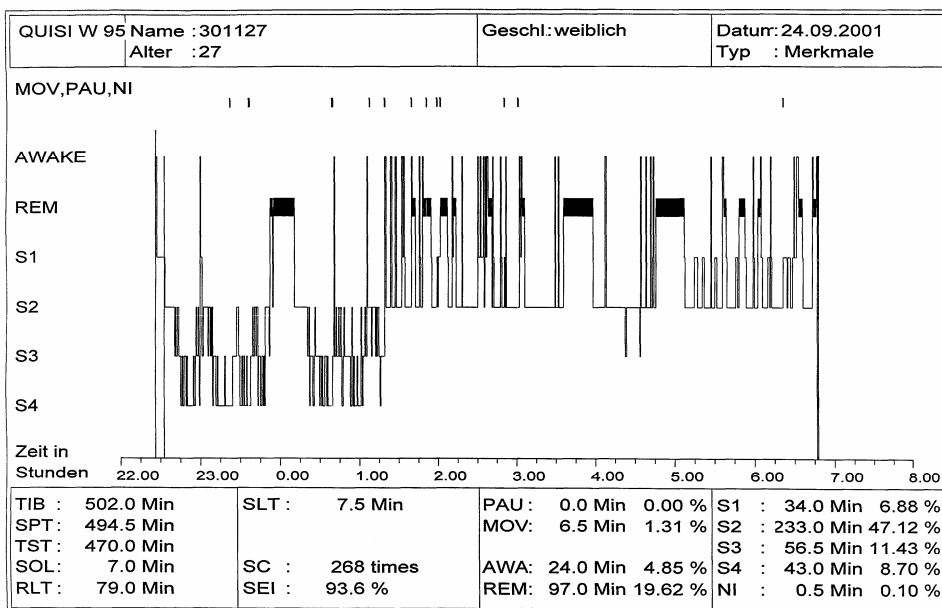


Fig. 5b: Hypnogram of a person with sleep problems. Dominance of stage 2; fragmented sleep profile; sleep rhythm deformation

Results of administration: extended output

Abbreviation	Label	Definition
TIB	Time In Bed	Time from switching on the recorder until switching off the recorder
SPT	Sleep Period Time	Time from sleep onset until wake up
TST	Total Sleep Tme	SPT minus AWAKE time after sleep onset minus NOT IDENTIFIED time
SOL	Sleep Onset Latecy	Time from switsching on the recorder until sleep onset
RLT	REM Latency Time	Time from sleep onset until the firs REM epoch
SLT	SWS Latency Time	Time from sleep onset until the first epoch of STAGE 3 or STAGE 4
SC	Stage Changing	Number of stage changes
SEI	Sleep Efficiency Index	Sleep efficiency is eputal to TST divided by TIB multiplied by 100
PAU	Pause	Percentage of pauses during SPT
MOV	Movement	Perscentage of movement during SPT
AWA	Awake	Perscentage of awake during SPT
REM	Rapid Eye Movement	Perscentage of REM during SPT
S1	Stage 1	Perscentage of STAGE 1 during SPT
S2	Stage 2	Perscentage of STAGE 2 during SPT
S3	Stage 3	Perscentage of STAGE 3 during SPT
S4	Stage 4	Perscentage of STAGE 4 during SPT
NI	Not Identified	Perscentage of NOT IDENTIFIED epochs during SPT

Latencies and cycles

Label	Definition
SO	Sleep Onset
SOL	Sleep latency (from lights off)
S1 latency	Time from lights off until the first epoch of STAGE 1
S2 latency	Time from lights off until the first epoch of STAGE 2
S3 latency	Time from sleep onset until the first epoch of STAGE 3
S4 latency	Time from sleep onset until the first epoch of STAGE 4
REM latency	RLT
NREM/REM cycles	Number of REM cycles
REM cycle	Time from beginning of NREM period until end of the following REM period

2.9. Subjects

We investigated with help of the sleepanalyser QUIISI[®] 7 youth (6 male and 1 female) at the age of 13-15 years during 28 consecutive nights in their own bedroom with one precedent adaptation night. In total 196 usable sleepingpfiles were gained.

3. Results

We included 10 parameters of sleep of juveniles, from each of them into assessment of sleep, namely: Total Sleep time, Sleep Onset Latency, REM latency, Awake, REM, NONREM Stage 1-4.

As an example, we demonstrated distribution of temporary series of REM sleep and delta sleep of three juveniles in figures 6 and 7. Hence, it is evident running of parameters of sleep is characterized by dynamic and oscillation. Along with this there was no parallel running of oscillations, while comparing it at different juveniles. Parallelism was not disclosed in oscillation of different parameters of one and the same experienced person during all 28 days of studies /fig.8 and 9/ Hence, establishment of average value is to be excluded, as in any case, it is not adequate to temporary series. By means of autocorrelation function we verified the lengths of periods containing in different parameters. At that, domination of 4 and 7-day lengths of periods, which were, especially, distinguished during falling asleep and share of REM sleep, was discovered.

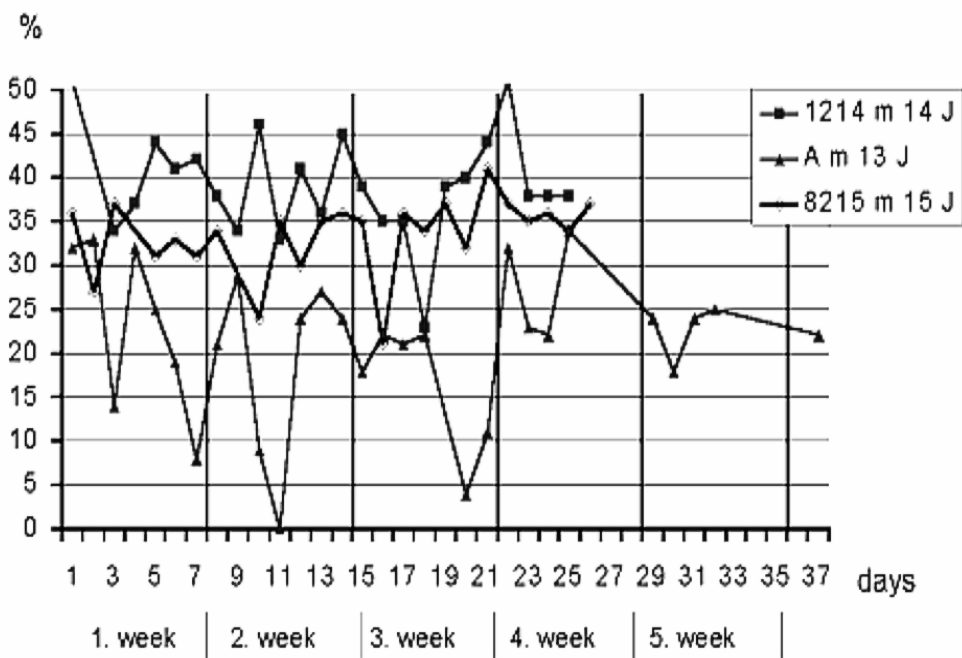


Fig. 6: Time rows of the share of REM-sleep of 28 nights expressed as percentage. Comparison of the results of three youth, investigated at home under their usual sleeping conditions with QUISI[®] analyser.

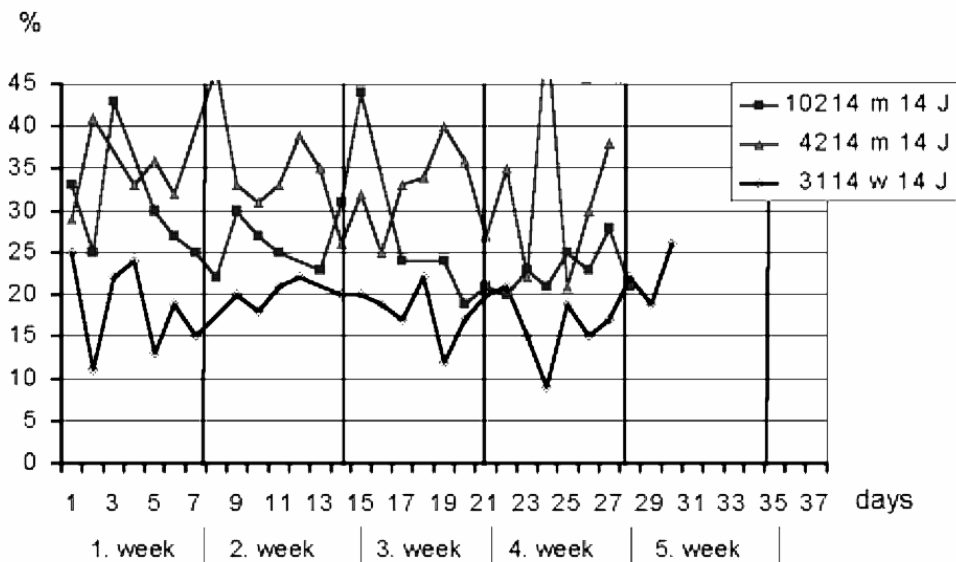


Fig. 7: Time rows of the share of Deltasleep (NONREM S3 and S4) of 28 nights expressed as percentage. Comparison of the results of three youth, investigated at home under their usual sleeping conditions with QUISI[®] analyser.

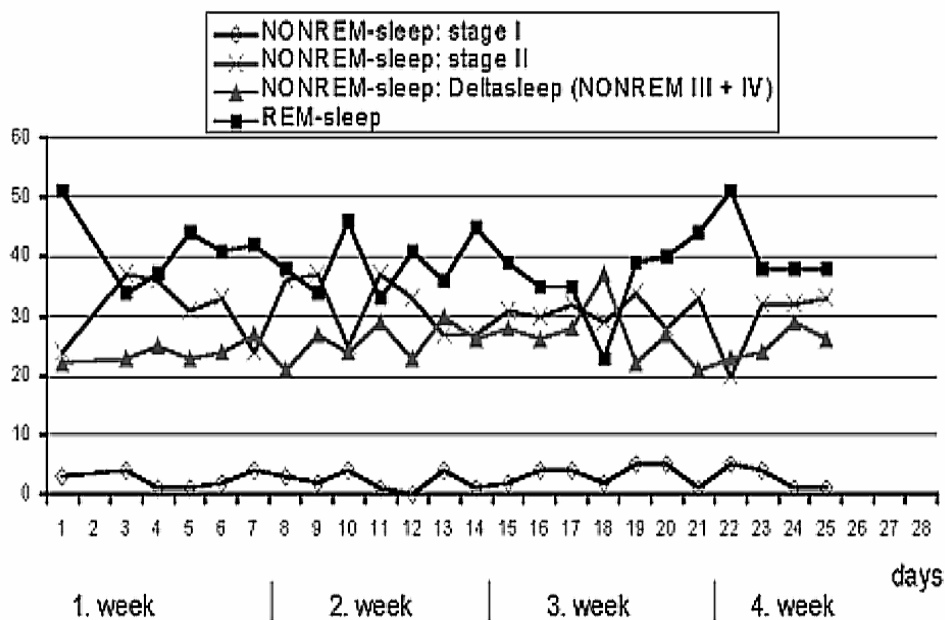


Fig. 8: Time rows of the share of different sleep stadiums of 28 nights expressed as percentage. Comparison of the parameter of one youth, investigated at home under his usual sleeping conditions with QUISI[®] analyser.

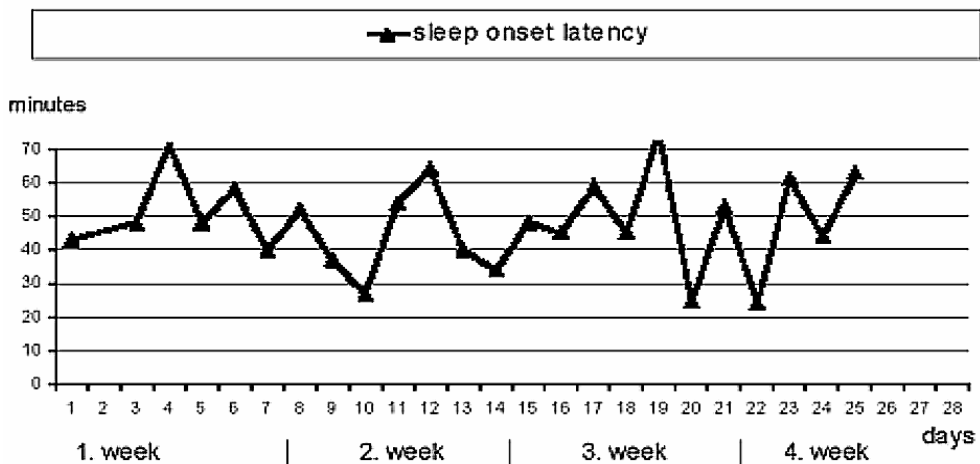
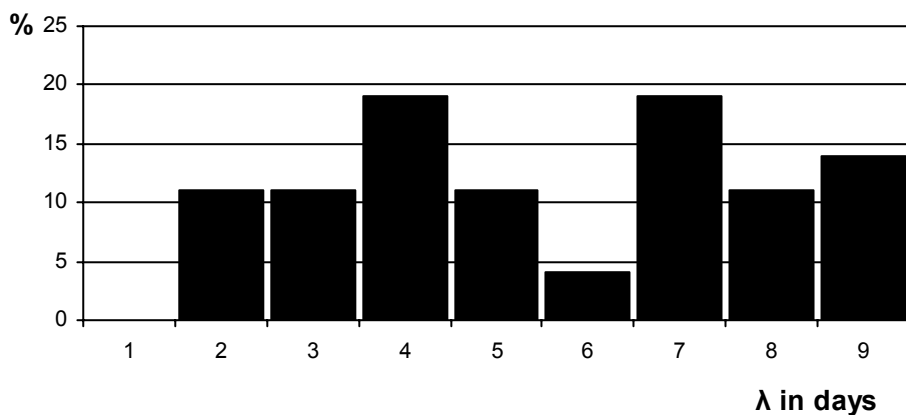


Fig. 9: Time row of the sleep onset latency of 28 nights of one youth, investigated at home under his usual sleeping conditions with QUISI® analyser.

Sleep onset latency (n = 70)



REM-sleep (n = 70)

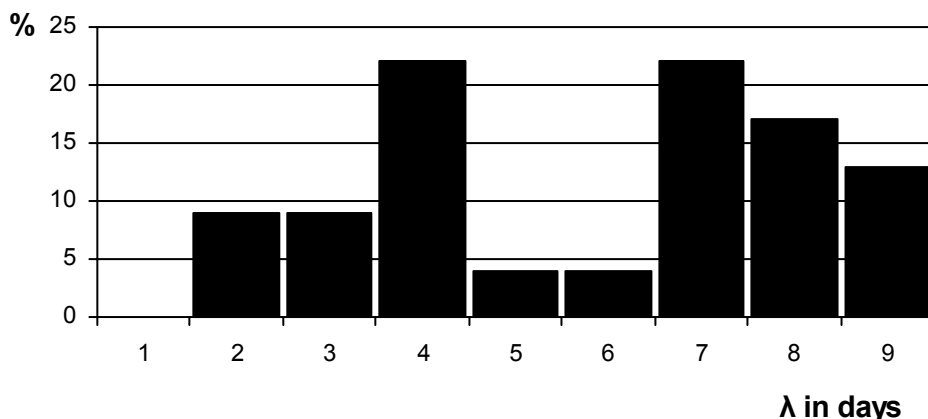


Fig. 10: Frequency distribution of the verified period length (by means of autocorrelation) of the sleep parameter “sleep onset latency” and “REM-sleep”

4. Discussion

Application of mobile automatic miniature analyzer of sleep QUISI allowed registering physiological parameters of sleep, continuously during 28 days. Studies of sleep of such duration are novelty. Results confirm, as it was previously established in laboratory of sleep /Siems et al 1991, Diedrich et al 1993/ and during recording of protocols of sleep /Hecht 1993, Hecht et al 2002/, about availability of circaseptane rhythm at different parameters of sleep. Moreover 4-day rhythm, called circasemiseptane rhythm, was verified. Baltzer and Hecht /1993/, observing earlier the same phenomena while analyzing temporary series of protocols of sleep, interpreted availability of these rhythms, circaseptane and circasemiseptane rhythm, as an expression of optimal dynamic of regulation. Such long duration of studies allowed concluding, that sleep is not generalized constant, and it is specifically individual for each person /Hajak and Rütger 1995, Dement et al 1984/. This fact may be proved only in case of study of temporary series, processed by methods of biorhythmic analysis. Mobile automatic miniature analyzer of sleep is the most successful device for study of temporary areas, besides it allows avoiding many factors, influencing on sleep in conditions of laboratory. Other factors as stress, physical and intellectual activity are subjected to regulation by means of recording of protocols of sleep.

For diagnostics of sleep, it is very important aspect, as in correspondence with International Sleep diagnostic manual, it is necessary to distinguish 88 different violations of sleep. At last, it is possible to demonstrate to every healthy person, to what extent, his night sleep was recovered.

Sleep for person is the most important function, regenerating physical and psychic processes every day. The famous German doctor, treating Goethe and Schiller, Christoph Wilhelm Hufeland /1860/, established daily rhythms and regularity of the cycle sleep-wake, providing optimal relaxation 150 years ago. He also stuck to the opinion, that sleep is the repeating night “process of rejuvenation”. And really, absence of good sleep decreases labor activity, leads to violation of social relations and increases risk of diseases /Hajak and Rüter 1995, Dement et al 1984/.

Modern medicine of sleep shares Hufeland’s opinion, that not duration of sleep, but regularity of rhythm sleep-wake is the decisive factor in regeneration of psycho-physiological functions /Zulley 1993, Hecht 1993/. His assessment supposes, exclusively, chrono-biological approach. At that, special attention is to be paid to ultraadian, circadian and circaseptane rhythms. It is also necessary to take into consideration that every day a person experiences during 24 hour period three cardinal conditions: wake, NONREM-sleep and REM sleep /Koella 1988/. Wake consumes energy and regenerates, first of all, physical processes. REM sleep is called, otherwise, as “vision”, provides relaxation from psychic processes and reproduces the program of social behavior. These three cardinal conditions are regulated by biologic oscillator of circadian rhythms, at that, the cycle “bright-dark” acts as a sensor of synchronizing pulses. Rhythmic balance of these three cardinal conditions provides good quality of sleep.

Summarizing, it is necessary to indicate again the importance of application of mobile automatic miniature analyzer of sleep. Latest studies of Penzel et al /2003/ stress non-reliability of visual analysis of polygrams of sleep in laboratory. Eight records of nights of healthy tested persons and patients with violation of sleep were proposed to nine German laboratories of sleep for visual analysis. Comparison of assessments of these polygrams by 10 laboratories of sleep indicated very big scattering. Scattering of measurement at patients was more than at healthy persons. Absence of unanimity of opinion concerning analysis of these patients with apnea was especially irrelevant and puzzling.

Weekly rhythms in this study were not considered at all.

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SYSTEM DIAGNOSTICS OF STRESS AT WORK

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The most of the life a human spends at work. Just there people often experience stress which can lead to drastic dysfunction. As a rule, the estimation of a human state at work is performed because of the complains of the workers or by psychological tests which evaluate even a subjective attitude of workers to their production activity. Subjective complains are considered to be the most earliest symptoms of emotional tension in workers. The main complains at work are related to the changes of emotional states and behavior (Levi, 1990). Daily psychoemotional strain 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.

For a long time human organism was regarded as a set of organs united by nervous and humoral regulation. The functions of separate organs and tissues of a human organism are traditionally studied as reflected reactions on various external influences. Medical professions are also orientated towards diseases of separate organs. Such approach leaves aside the internal organization of a human organism and considers only human reactions to the influence of the environment. At the same time from the earliest stages of embryogenesis a human organism and its functions are developing as self-regulating adaptive processes. Just that adaptive self-organization integrates firstly molecular and then organic processes a complete system structure providing a normal life activity of the organism.

The leading role in adaptive self-organization of organism's various functions belongs to its different vital needs and, in the first place, metabolic ones. The needs primarily unite various molecular processes and tissues into system organizations, which meet these needs. In its turn in the process of satisfaction of needs i.e. under reinforcement and achievement of adaptive results a peculiar fixation of molecular and organic integration into dynamic self-regulating functional systems, discovered by P.K.Anokhin (1974), takes place under the influence of the formed need.

As a consequence the activity of any functional system is directed to the achievement of adaptive results useful for the organism. Functional systems providing the achievement of useful adaptive results become not a simple set of molecular processes, organs and tissues, but dynamic organizations meeting different needs of the organism.

Functional systems can be defined as dynamic self-organizing central-peripheral organizations all components of which in their interaction are directed to the achievement of useful adaptive results providing resistance of various manifestations of metabolic processes and adaptation of a human to the environment.

The theory of functional systems radically changes the established concept about the structure of a human organism and its functions as a set of organs linked by nervous and humoral regulation. The theory of functional system regards a human organism as a totality of multiple interactive functional systems of molecular, cellular, homeostatic and behavioral levels of organization where every organization ensures the achievement of different adaptive results useful for the organism (Sudakov, 1997).

On a social level multiple functional systems determine the achievement of socially important results in studies, at work, in social life. Besides,

functional systems of homeostatic level integrate and contribute to the achievement of the results of socially important human activity.

All functional systems of the organism are well coordinated and determine in the long run a normal metabolic process in the organism as a whole.

In its turn, the resistance of different metabolic processes in tissues and their well coordinated adaptation to various behavioral and psychic tasks determine normal healthy state of a human.

A general activity of different functional systems of human organism when any changes in the result of action of any functional system immediately effect the results of action of other related functional systems is observed in a human organism as a whole. This principle was called “multiparametric interaction”.

On this principle a homeostasis as a generalized result of interactive activity of different functional systems is built.

Besides, a generalized functional system can be formed on the basis of cumulative activity of functional systems when some of them ensure the achievement of behavioral or social results, and the others – the corresponding to them results of functional systems of homeostatic level.

As a result of these interactions the achieved behavioral and socially important results are optimal.

Our observations showed that in all cases 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 feel psycho-emotional strain, i.e. stress. In these cases a so called index of correlation capacity makes possible vividly to evaluate the level of integrative inter-effects of the results of the activity of different functional systems (Sudakov, Yumatov, & Tarakanov, 1996).

A high index means that the tested parameters are inter-correlated. A decrease in that index testifies to a dissociated change in some physiological functions, to a reduction of regulating influences of the functional systems, providing them, i.e. to the break in the process of their multiparametric interaction.

In the whole human organism the activity of different functional systems is also successively connected in time, when one functional system after getting a useful for it and the organism adaptive result is successively shifted by another one.

The continuum of a human life span on various levels of organization can be divided into separate, determined by special functional systems, discrete parts –“system-quanta” of vital activity (Sudakov, 1997). 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.

Incidentally the assessment of different parameters of intermediate and final results of action is constantly performed by return afferentation, coming from various receptors of the organism to central nervous system and, in particular, to apparatus of anticipation of the needed result – to acceptor of action result.

The theory of functional systems shows new approaches to estimation of emotional stress in humans at work (Sudakov & Glazachev, 2001).

According to this theory any production activity of a person can be divided into separate effective (resultant) “system-quanta”, where every quantum is determined by a cumulative activity of functional systems of behavioral and homeostatic levels. The estimation of system physiological parameters at work is performed by contact or telemetric method according to intermediate and end results of “system-quanta” in production activity (Fig. 1).

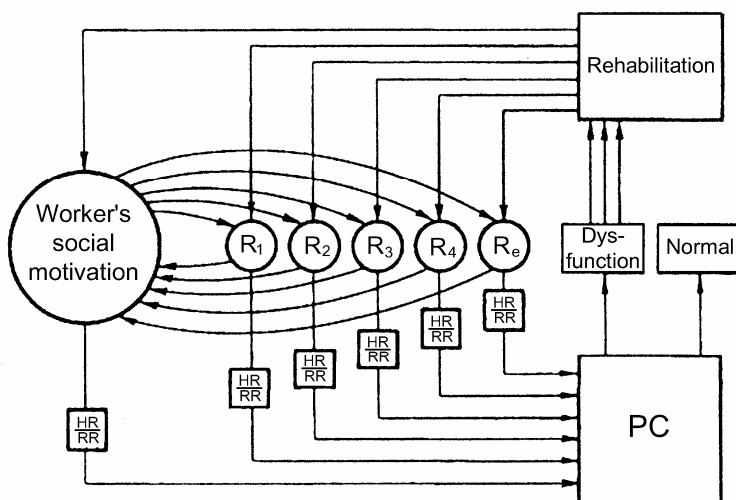


Fig. 1. Estimation of human functional state at different stages of a resultant productive activity by automatic system of control and correction. R₁–R₄ – intermediate results. R_e – end result of production activity.

The so-called “physiological price” of “system-quanta” of the production activity of some workers is defined by the changes of respiration (RR) and heart rates (HR), muscle activity, skin-galvanic reactions and other parameters, registered during the work.

Our observations were made on 125 female assemblers aged 17–30 at one of Moscow electronic plants.

Resultant “system-quanta” of the women assemblers’ production activity had the following intermediate and final results: picking a cylinder by the left hand. Fixing it on a mounting, picking a plate or an angle bar by the right hand, placing it on the cylinder surface, point welding, removing the cylinder from

the mounting and throwing the finished part into a tray. During the shift such operations followed one another repeatedly and monotonously day after day. The cumulative “system quantum” of production activity was evaluated in every subject primarily by the time of its realization. Besides, every “system quantum” was differentiated by the electromyographic parameters, registered from the 2nd and 3rd fingers of both hands. The dynamics of ECG and respiration were studied according to the intermediate and end results of “system quantum” in their cross correlation.

The tests 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 (HR and RR) were well correlated and corresponded to intermediate and final results of “system-quanta” did not manifest any psycho-emotional tension or fatigue and showed good productive results. The workers whose HR and RR were not synchronized and did not correspond to the intermediate and final results of “system-quanta” of productive activity complain of psycho-emotional strain and fatigue. Many days’ ECG monitoring registered arrhythmia and extrasystoles in that group. The workers showed low productivity and higher morbidity rate. They often retired prematurely despite their high motivation for work.

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 HR and RR is disturbed.

To answer the question in what degree the correlation between heart and respiration rates can be an objective criterion of psycho-emotional stress some investigations in rats under experimental emotional stress were carried on. The marked decrease in correlation of arterial pressure and heart and respiration rates was registered (Sudakov, Yumatov, & Tarakanov, 1996). The discovered decrease in correlation of arterial pressure and heart and respiration rates gave

grounds to investigate that phenomenon in people at work. Cross-correlation of HR and RR as an indicator of psycho-emotional stress during productive activity in 36 female workers of an electronic plant aged 17–38 was studied. 16 workers of this group were trained during one month to be skilled as vacuum-assembly workers of electronic optical systems. Their work demanded high visual poznotonic tension, was hypodynamic and monotonous. The workers did various in complicity and duration technological operations of the productive cycle which had a rigid structure necessary for the technological process. The work consisted of operations of the same type during the shift. “System-quanta” of the resultant productive activity of these workers due to their socially conditioned motivation had intermediate results: picking the intermediate product, fixing it on a mounting, montage and point welding of separate parts and the final result –putting the ready part into the tray.

The learning criterion of the vacuum assemblers-beginners was integral index (I , %) which considered the shortening of “system-quantum” by the end of the working day, stability of its duration and labour productivity. According to the results of gaining the skill and integral index of learning the workers were divided into 3 groups: well trained ($I = 9,45 \pm 1,32\%$), satisfactory trained ($I = 3,06 \pm 0,15\%$), badly trained ($I = 0$). The experiments showed the following: in the group of well trained workers a high correlation of HR and RR was marked already in the state of operational rest. On the stage of transmission to the resultant activity the coefficient of correlation increased. In badly trained workers the coefficient of correlation of HR and RR was low in the state of operational rest, and under transmission to a resultant activity it decreased to negative values (Fig. 2).

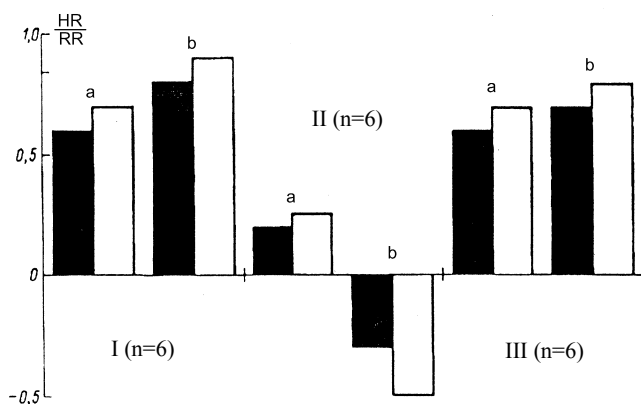


Fig. 2. HR and RR correlation in workers of different skills. Black columns – the beginning of the shift; blank columns – the end. a – rest, b – work, I – well-trained workers; II – poorly-trained workers; III – skilled workers.

In skilled workers relatively constant value of coefficients in correlation of heart and respiration rates before the work as well as at different time of the productive activity were revealed.

While analyzing the indices of psychomotor excitation: static and dynamic tremor, situational anxiety, it was found that in the beginning and in the end of the working shift, these indices in badly trained workers were higher compared with those in well trained and skilled workers.

These data show that badly trained workers having a low value of correlation coefficient of heart and respiration rates showed a psycho-emotional tension. So the coefficient of correlation of heart and respiration rates in this case also reliably reflected the state of psycho-emotional tension in workers.

Some observations were carried on 12 schoolchildren aged 15–17 during studies in school and out of school. They were divided into 2 groups according to their progress in school: 6 with good progress and 6 – with bad progress. The first group, mainly extraverts, had a high motivation to studies, low or ordinary (average) situational anxiety ($33 \pm 0,5$), low level of dynamic ($4,95 \pm 1,9$) and static tremor ($3,7 \pm 0,9$). The second group, intraverts, had a low motivation to studies, high situational anxiety (more than 45) and high level of dynamic (more than 10) and static (more than 15) tremor.

The observations showed that the schoolchildren of the first group during the studies and out of school were characterized by more high values of coefficient correlation in heart and respiration rates compared with schoolchildren of the second group (Fig. 3). The schoolchildren of the second group with bad progress in studies revealed a negative correlation of heart and respiration rates during studies. They also complained of fatigue, headache and apathy. These data show that the decrease in correlation between heart and respiration rates is an objective indicator of emotional stress in people at work. The changes in correlation between these indices reflect more vividly the state of emotional stress than the changes of these indices when registered separately.

All that testifies to the fact that the primary consequence of psycho-emotional stress at work is disintegration of leading functional systems of homeostatic level, when their normal interrelations based on the principle of multi-link interaction are violated.

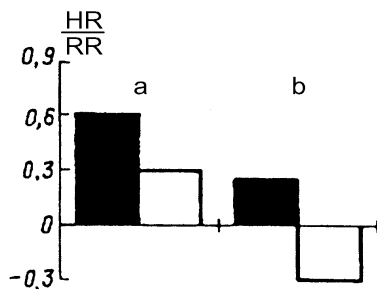


Fig. 3. HR and RR correlation in schoolchildren of different progress. Black columns – outside school; blank column – during classes; a – good and excellent progress (n=6); b – satisfactory and poor progress (n=6).

Under sustained stress due to tonic effector influences the shift from normal level of main indices of the activity of these functional systems takes place leading in the long run to pathology (Fig. 4).

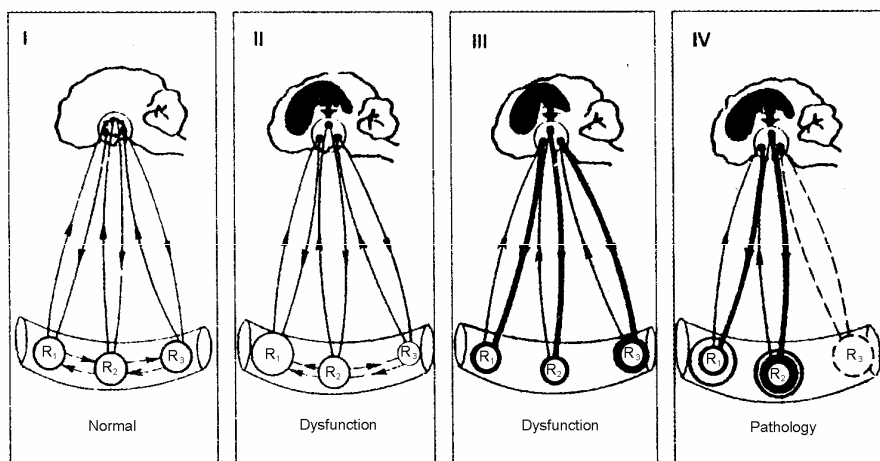


Fig. 4. Successive breaks in co-ordination of functional system activity on homeostatic level under sustained conflict situation leading to emotional stress. R₁, R₂, R₃ – results; I – the initial multi-parametric interaction; II – the break in multi-parametric interaction of the results of functional system activity leading to dysfunction; III – the tension of effector mechanisms of functional system regulation leading to their isolated functioning; IV – complete break in the activity of one of the functional systems – pathological state.

The presented experimental observations show that system organization of human functions along with its theoretical importance has a vivid practical direction.

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THE ROLE OF MOTIVATIONAL AND REINFORCEMENT FACTORS IN C-FOS EXPRESSION IN THE MOUSE BRAIN DURING FOOTSHOCK AVOIDANCE LEARNING

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Learning in a goal-directed behaviour critically depends on a process of reinforcement (Anokhin P.K., 1968, Sudakov K.V., 1996). In the theory of the functional systems (Anokhin P.K., 1968) reinforcement is produced by reafferentation from the results of goal-directed behavior, which interacts with sensory and motivational inputs on neurons that are activated under conditions of novelty. It was further suggested that the converging sensory, motivational and reinforcing inputs interact in the cytoplasm and nuclei of single neurons (Sudakov K.V., 1996). However, how reinforcing signals influence gene expression induced during learning remains poorly understood.

Recent findings demonstrate that immediate early genes, particularly *c-fos*, are induced in the in the animal brain during learning and may play a critical role in the formation of long-term memory (Anokhin K.V. et. al., 1991; Anokhin K.V. and Rose S.P.R., 1991; Kachmarek L., 2002). Expression of *c-fos* in the nervous system is induced by motivational stimuli and novelty and correlate with acquisition of new behaviour (Anokhin K.V., Sudakov K.V., 1993; Hess U.S. et. al., 1995; Jarvis E.D. et. al., 1995; Mello C. et. al., 1995; Zhu X.O. et. al., 1995) thus providing a potential molecular substrate for the action of reinforcing stimuli.

The objective of the present work was to examine how expression of *c-fos* is modulated by reinforcement, i.e. by attainment of adaptive results during goal-directed learning. For this purpose we have compared *c-fos* mRNA expression in the brains of mice that could not escape from the nociceptive footshock stimulation and animals that gradually learned to attain results of escape or avoidance behavior.

Methods

Adult CBWA male mice, 8-10 weeks old, (Stolbovaya, Russia) were housed for at least 5-7 days before experiments under standard conditions of 12 h light/dark cycle and free access to food and water.

Conditioned avoidance training was performed in an electric grid floor box which consisted of two equal compartments (25x25x30 cm) that were separated by an opaque wall (28). Left compartment had a shelf (25x3 cm) attached to the wall at 9 cm from the floor, the right compartment had no shelf. Two mice were placed simultaneously in the box and after one minute of adaptation a conditioned signal (combined light and tone) was delivered to both compartments. After five seconds of CS presentation a footshock (40-60 V, 50 Hz) was applied through the grid floor to both compartments. A mouse in the left compartment could escape from the footshock by jumping on the shelf. This behaviour terminated CS and US presentation in both compartments. Ten seconds later a mouse in the left compartment was displaced from the shelf to the floor and after 20 seconds a new CS-US pairing was presented. Training session consisted of 30 CS-US presentations during which the animal in the left compartment could learn to avoid a footshock by escaping on the platform while the mouse in the right compartment could learn only the contingency between CS and unavoidable US presentation, though both mice in each pair received an equal amount of CS and US stimulation. The latency of avoidance reaction and the number of correct reactions (avoidance) was recorded for mice in the left compartment. An additional group of mice was trained in the left compartment to escape the footshock under conditions when light and tone were turned on simultaneously with the footshock and therefore could not serve as conditioned signals. Thus animals in this group received the same kind of stimuli as in the first case but light and tone in this group could not serve as CS that were signaling the occurrence of the footshock. An additional control group consisted of mice sacrificed from their home cages.

Thirty minutes after training mice were killed by cervical dislocation, brains were removed and total RNA was isolated from the dissected cerebral cortex and hippocampus using guanidini thiocyanate/phenol method (11). RNA samples from each animal were separated on agarose-formaldehyde gels, transferred to the nylon membranes (Hybond-N, Amersham) and hybridized with mouse *c-fos* and β -actin cDNA probes which were labeled with ^{32}P -dNTP by nick-translation. After washing filters were exposed to X-ray film and the intensity of the bands was quantified using Beckman DU-70 densitometer. Levels of mRNA in each band was quantified as a ratio of a signal from *c-fos* hybridization divided by the signal from β -actin hybridization to compensate for possible variations of total RNA between the bands.

Statistical comparison between groups of animals were made using unpaired two-tailed Student's *t*-test.

Results

The aim of the first experiment was to compare the levels of *c-fos* mRNA expression in the mouse brain at the beginning of escape learning and after a prolonged training, when animals could readily attain the results of escape behaviour. This experiment was performed on 24 mice that were trained to escape from the footshock by jumping on a shelf attached to the wall of the box. Training consisted of nine daily sessions, 30 trials each. During the first five days there was a significant reduction of mean escape latencies in trained mice and starting from day 5 animals reached a stable level of performance in the task (Fig. 1A).

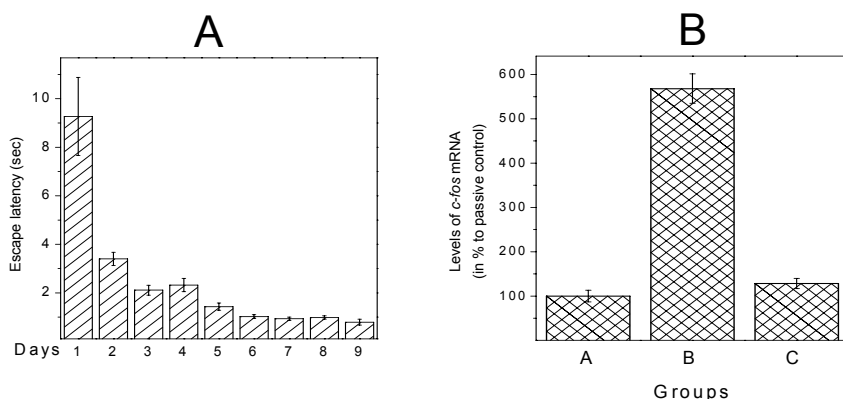


Fig.1. (A) Decrease in the mean latency of escape reaction in mice during daily learning sessions. (B) Levels of *c-fos* mRNA in the forebrain of mice. A- passive control; B – at the Day 1 of training; C – at the Day 9 of training.

After the first training session a significant increase of *c-fos* mRNA expression was observed in the cerebral cortex and hippocampus of trained mice as compared to the quiet control group (570%, $p < 0,001$). However at the 9th day of training of *c-fos* mRNA contents in the brains of experimental animals was at a low level that nonsignificantly exceeded the quiet control only by 30% (Fig 1B).

Thus learning to attain the results of escape behavior led to downregulation of *c-fos* expression produced by aversive stimulation. However animals on the 9th day of training also received substantially less footshock stimulation than the group at the first training session. In order to control for the role of this variable in *c-fos* induction the next experiment was performed.

Levels of *c-fos* mRNA in the cerebral cortex and hippocampus were compared in four groups of mice after the first training session: conditioned avoidance group (n=11), matched yoked control group (n=11), escape reaction group (n=8) and quiet control group (n=12).

The percent of mistakes decreased significantly ($p < 0,05$) in the conditioned avoidance group from $78 \pm 6\%$ during the first 10 trials to $31 \pm 9\%$ during the last 10 trials of the training session. The mean time of reaction also decreased significantly ($p < 0,05$) from $10,4 \pm 1,0$ seconds for the first 10 trials to $3,5 \pm 0,6$ seconds during the last 10 trials.

As compared to the quiet control group levels of *c-fos* mRNA in the cerebral cortex and hippocampus were significantly increased in the avoidance conditioning group ($195 \pm 50\%$, $p < 0,05$), yoked control group ($182 \pm 30\%$, $p < 0,05$) and escape training group ($212 \pm 27\%$, $p < 0,05$).

Next we analyzed the dependence of *c-fos* mRNA brain levels from the effectiveness of mice learning and performance. For this purpose the group of avoidance conditioned animals was divided into two subgroups. Animals in the first subgroup (n=5) had low percentage of mistakes (30% and lower) during the last 10 presentations of conditioned signals in the training session while mice in the second subgroup (n=5) had higher amount of mistakes (40% and higher) during the last 10 trials. Comparison of *c-fos* mRNA levels in these two groups demonstrated that it was 1,8 times higher ($p < 0,05$) in the group with a higher percentage of mistakes (Fig. 2).

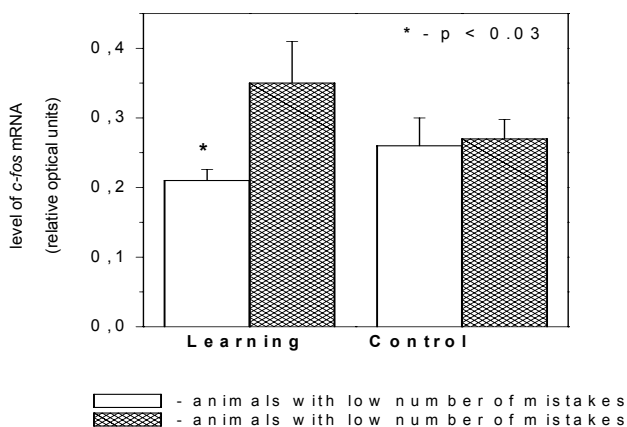


Fig. 2. Levels of *c-fos* mRNA in the forebrain of mice that have different speed of learning. Learning – the group that learned conditioned avoidance. Control – the matched group of active control. Left bar in each pair – animals with low amount of mistakes in the last 10 trials of the training session, right bar – animals with high amount of mistakes in the last 10 trials of the training session.

Mice from the yoked control group were also divided into two subgroups according to their matched avoidance conditioning pairs. Therefore mice in these two subgroups received the same amount of footshock

stimulation and in the same sequence as their trained partners from the corresponding subgroups with the high and low amount of mistakes. No significant difference was found in *c-fos* mRNA levels in the cerebral cortex and hippocampus between these yoked control subgroups (Fig. 2).

Discussion

Our results show that presentation of a footshock in a novel environment produced a marked induction of brain *c-fos* expression in all groups of experimental animals that were subjected to this treatment. Therefore a dominating motivational state under conditions of inability to attain the adaptive results of avoidance or escape behaviour induces a pronounced transcription activation in the neurons of cortical structures. These data are in a agreement with the results of our previous studies (3,4,12) and the data from other groups that have investigated *c-fos* expression in the rat and mouse brain after an aversive footshock stimulation (13,14).

However, the mice that already learned to escape from the footshock by jumping on a safe shelf had no substantial *c-fos* activation in the cerebral cortex and hippocampus. Similar data about the decay of immediate early gene expression in the course of learning were also obtained in other studies (9, 15, 16). For example Kleim and al. (15) trained rats to traverse a complex series of obstacles in order to attain food reinforcement and studied the number of Fos-positive neurons in the motor cortex at different phases of task acquisition. Though the level of food deprivation was the same in rats of all experimental groups the levels of Fos expression were much greater during the acquisition versus the maintenance phase. Thus under a conditions when the means of attainment of the results of goal-directed behavior are already learned by animal, the motivational states and their satisfaction are no longer able to produce massive *c-fos* responses in the populations of cortical and hippocampal neurons.

Our data also show that levels of *c-fos* expression differ in animals with different effectiveness in attainment of results in avoidance learning. The mice that reached high level of performance during the last 10 trials of the training session had significantly lower levels of *c-fos* mRNA than animals that produced more mistakes in attempts to avoid the footshock. Importantly, this difference was not due to the amount of footshock received by these two groups of animals since the yoked control mice that were matched to these groups in the number and duration of footshock stimuli but could not avoid this stimulation had no such difference in the levels of *c-fos* mRNA.

Thus our experiments suggest that reinforcement, i.e. the attainment of adaptive results of a goal-directed behaviour, not only plays a role in the consolidation of new adaptive responses but is also able to down-regulate further induction of immediate early genes by motivational inputs.

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NEW APPROACHES TO MEDICAL TREATMENT OF PRIMARY MALIGNANT BONE TUMORS

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The primary malignant bone tumors make up comparatively small share in the structure of malignant neoplasms (1-2% by different authors), but at the same time they have an important place in practical oncology because of the heaviness of clinical current and sensibility to different types of treatment (1,3,5). As known sarcoma of bones appears especially in the age of childhood and youth, and distinguish with aggressive clinical stream with high inclination to hematogenic metastasis to lungs, other bones of skeleton, inner organs, low effectiveness of treatment measures and etc (1,4,6).

The problem of exact and early detection of malignant bone tumors is actual at present time in oncology. How shows experience, the frequency of diagnostic mistakes in first appeal of the patients to doctor, composes nearly 55-70%. The results of the treatment of patients with sarcoma of bones are unsatisfactory too. (SB) (2,3,5).

In spite of successful treatment of the primary tumor hearth, most of the patients die because of hematogenic dissemination in a short time after treatment. This also confirms existing opinions about presence of so called subclinical metastasis, in appeal of patients to oncologist (3,6,7). The expansion of our knowledge about biology of tumor's growth and metastatic character of bone sarcomas puts forward to the first place the problem of prevention and treatment of hematogenic metastasis (7,8).

At present time, for the treatment of patients with bone tumors we apply surgical, radical and medicinal methods of the treatment and also their combinations. However for the most patients with bone tumors, the surgical method of treatment occupies the main place. If in the previous times the highly-traumatic operations dominated (amputation and exarticulation, interiliac-abdominal amputation, interscapular-chest amputation) otherwise, for the last period, tendency to fulfill the organosaving operations is observed. It became possible because of success in early diagnostic of bone tumors, expansion of knowledge about the biological properties of tumors and application of different allografts and endoprosthesis and introduction to practice modern methods of combine and complex treatment of bone sarcomas (1, 3, 8,9). This method of treatment is applied to patients with osteogenic sarcoma (OS), malignant fibrous hystocytoma of bones (MFHB), Ewing's sarcoma (ES), reticulacellular sarcoma (RS), mesenchimal chondrosarcoma (MCh) – the most frequently met forms among all primary malignant bone tumors. In this work we present the results of treatment of patients only with the primary malignant bone tumors, which were treated in Oncologic Clinic of Azerbaijan Medical University from 1992 to 2002.

Materials and methods of investigations: In the period of 1992-2002, there were 262 patients with bone sarcomas, in Oncologic Clinic of Azerbaijan Medical University (men - 152 (58.4%), women – 110 (41.6%)).

Clinico-X-ray diagnoses of bone tumor were confirmed by the data of either morphological investigations of surgically removed tumor or investigations of biopsy material from the primary hearth. During examination of the patients clinical and morphological methods were applied, also the following methods were used: selective x-radiography and angiography, ultrasonic research, computer tomography, radioisotope and nuclear magnetic resonance researches. The patients were distributed depending on the histologic structure of tumor by following manner: osteogenic sarcoma - 118(45.1%), mesenchimal chondrosarcoma - 14 (5.4%), malignant fibrous hystocytoma of bones – 11 (4.2%), high-differentiated chondrosarcoma (HDChS) – 25 (9.5%), parosteal sarcoma (PS) - 8 (3.0%), giantcellular tumor (GT) – 21 (8.0%), Ewing's sarcoma - 46 (17.5%), reticulocellular sarcoma– 19 (7.3%) patients (tab.№ 1).

Table № 1

Distribution of patients depending on histological structure of tumor

№	Nosological structure of tumor	Number of patients
1.	Osteogenic sarcoma	118 (45.1%)
2.	Malignant fibrouz hystocytoma	11 (4.2%)
3.	High-differentiated chondrosarcoma	25 (9.5%)
4.	Mesenchimal chondrosarcoma	14 (5.4%)

5.	Parosteal sarcoma	8 (3.0%)
6.	Giantcellular tumor	21 (8.0%)
7.	Ewing's sarcoma	46 (17.5%)
8.	Reticulocellular sarcoma	19 (7.3%)
9.	Total	262 (100%)

The most of patients were at the age of 11-20 and 21-30 years old - 154 (58.8%). Among patients with osteogenic sarcoma, MFHB and MCh (143) the tumor was more frequently situated in metaepiphysis and metaphysis distal zone of the femur and proximal zone of tibia and humerus - 131 (91.6%). In group of patients with Ewing's sarcoma and reticulosarcoma the tumor is more frequently found in metadiaphysial zone of femur and tibia, and also in the ribs and bones of pelvis. Choice methods of surgical treatment depend on morphological structure of tumor, character of illness current, size of tumor and age of patients.

Patients were divided into the following groups depending on the volume of operation: distal resection of femur with endoprosthetics of knee joint – 88 (44.7%); proximal resection of tibia with endoprosthetics of knee joint – 11 (5.6%); proximal resection of humerus with endoprosthetics of shoulder joint – 31 (15.7%); interscapular - chest resection - 29 (14.7%); segmental resection of diaphysial zone of femur by using Ilizarov device – 3 (1.6%); amputations and exarticulations - 35 (17.8%) (tab. №2).

Table № 2

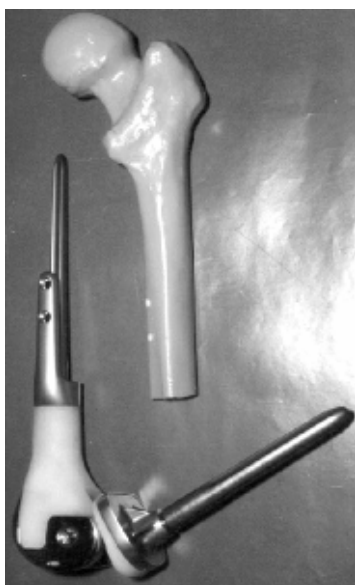
Distribution of patients depending on the volume of the operation

Types of organosaving operations	Nosological structure of tumor					Total
	OS	ChS	MFHB	PS	GS	
Endoprosthetics of knee joint	66	15	4	5	9	99
Endoprosthetics of shoulder joint	9	9	3	2	8	31
Interscapular-chest resection	23	3	3			29
Segmental resection of femur by using Ilizarov device	3					3
Amputations and exarticulations	17	12	1	1	4	35
Total	118	39	11	8	21	197

The combined treatment of patients with OS, MFHB and MCh includes preoperational chemotherapy; surgical interfere; prophylactic chemotherapy

after operation, depending on degree of therapeutic pathomorphosis of tumor; then rehabilitation measures. Rests of patients were treated surgically only.

At the first stage of treatment patients underwent puncture and a catheterization of hip artery, by Seldinger method (localization of the tumor in lower extremities). During 3 days, by the special infusion devices “Perfusor-secura” (Germany) carries out intraarterial infusion of one of the most effective medicine - Adriamycine by 30 mg/m^2 in total dosage TD – 90 mg/m^2 . At the second stage, 14-21 days after completing regional chemotherapy the organosaving operation is carried out in volume of segmental resection of hip and tibia with endoprosthetics of knee joint or amputation. In case of localization of tumor in bones on shoulder zone, the preoperational system chemotherapy is carried out on the first stage, by Adriamycine TD- 90 mg/m^2 or by CAP's schema (look down) and then operation in volume of proximal resection of humerus with endoprosthetics of the shoulder joint or interscapular-chest resection or amputaion is applied. In the beginning of this research we were using the endoposthesis of K.M. Sivash, but now we use the products of: “Poldi” (Czechia), “Link” (Germany) and also local products (photo 1a, 1b, 1c, 1d).



1a Endoprosthesis product of Russia and Sweden



1b Endoprosthesis “Link”, Germany

In our oncologic clinic we worked out the criteria for organosaving operations:

- 1.Primary localization of tumors in the bones consisting the knee and the shoulder joint.
2. X-radiographic and the CT confirmation of absence of metastasis in lungs.

3. Morphological confirmation of diagnosis.
4. Absence of contraindications to carry out preoperational chemotherapy.
5. Low intergrowth to surrounding soft tissues.



1c Endoprosthesis product of Azerbaijan



1d Endoprosthesis of shoulder joint (Azerbaijan)

On the third stage, we estimated the results of treatment by degree of regression of primary removed tumor on the basis of histological investigations in postoperative period. If we could reach III – IV degree of medical pathomorphosis of tumor (necrosis of tumor more 90%) during preoperative chemotherapy, so the adjuvant chemotherapy in postoperative period was continued with the same medicines, in this case: Adriamycine by 30 mg/m² intravenous, during 3 days (TD – 90mg/m²) In case of I – II degrees of medical pathomorphosis of tumor (necrosis less than 50% of tumor mass) prophylactic chemotherapy was applied by CAP schema:

1. CIS-platina (platidium) by 40-50 mg/m² in 1,2,3rd days intravenous on water pivot.
2. Adriamycine 40-50 mg/m² intravenous in 1st day.

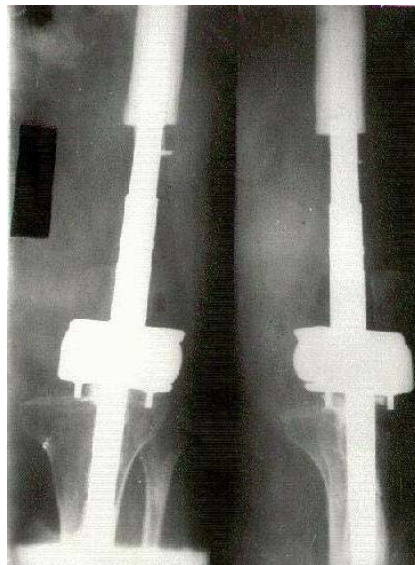
3.Cyclophosphanum 500 – 600 mg/m² in 2nd day intravenous. Prophylactic chemotherapy is composed of 6 courses with 3 –4 weeks interval between the courses.

We present our observations:

The patient R. was born in 1979, history of illness N 1913/96. Has entered in 05.08.96 to COD named by A.T.Abasov with complains to tumor in the down third of right hip, strong aches, especially at night, general weakness. On the base of clinico-x-radiographic data and hystological research diagnosis of osteogenic sarcoma of the right hip bone was confirmed. 1 course of intraarterial infusion of Adriamycine was carried from 23.08.96 till 25.08.96 during 3 days TD – 120 mg, resulting by good effects. The operation of: distal resection of the right femur with endoprosthetics of knee joint was carried out in 20.09.96. Histological conclusion № 10694–99: osteogenic sarcoma, mixed type, II – III degree of medical pathomorphosis. Taking into account this the patient has undergone 6 courses of adjuvant chemotherapy by Adriamycine TD 120mg for each course in postoperative period. The patient moves free, the function of knee joint can be expressed as good. We are observing the patient during 6 years and 2 months (photos 2a, 2b and 3a, 3b).



**2a Patient R. roentgenogram.
OS of left femur**



**2b Patient T. roentgenogram
(15 days after operation)
Endoprosthetics of left knee joint**



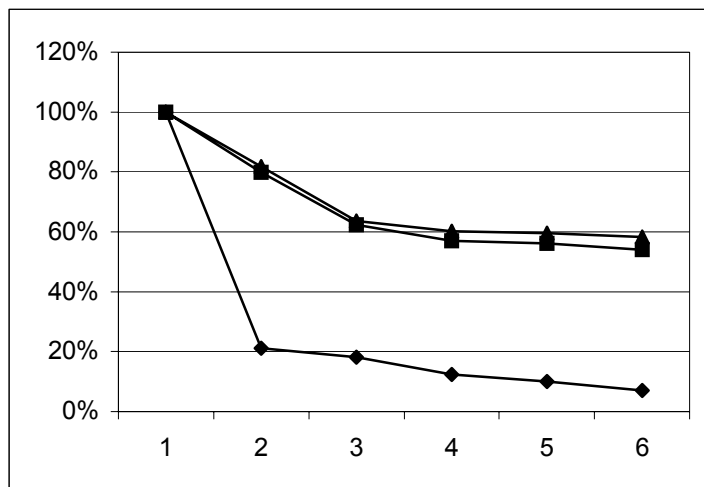
3a General view of patient after operation (sitting)



3b General view of patient after operation (standing)

For evaluation of the effectiveness of applied therapy we used the traditional method of comparison with group of patients who underwent only surgical treatment (so called “historical control” group), in which the survival rate is 7% w. The index of 5-year survival rate without metastasis among 118 patients with osteogenic sarcoma composes $54 \pm 5,6\%$ (graph. № 1).

Graph.1 Results of treatment of OS



◆ Historical control
 ■ Combined treatment (Adr.)
 ▲ Combined treatment (CAP)

The results of treatment of the patients with MFHB

and MCh are analogical and this testifies advantage of combine methods of treatment in such category of patients. 81 other patients underwent only surgical treatment and the 5-year survival rate composed 73,1±5,1 %. On the final stage, the main attention was paid to rehabilitation measures to patients who underwent organosaving and highly-traumatic operations. For restoration and rehabilitation of functions of parts the following measures were used: medical gymnastics, massage, psychotherapy and etc. 90% of patients walk without any additional support. In group of patients with endoprosthetics of knee joint functional results appear as follows: in 21 (21.2%) patients – excellent; in 42 (42.4%) patients – good; in 27 (27.2%) patients – satisfactory; 9 (9.2%) patients - unsatisfactory (tab №3).

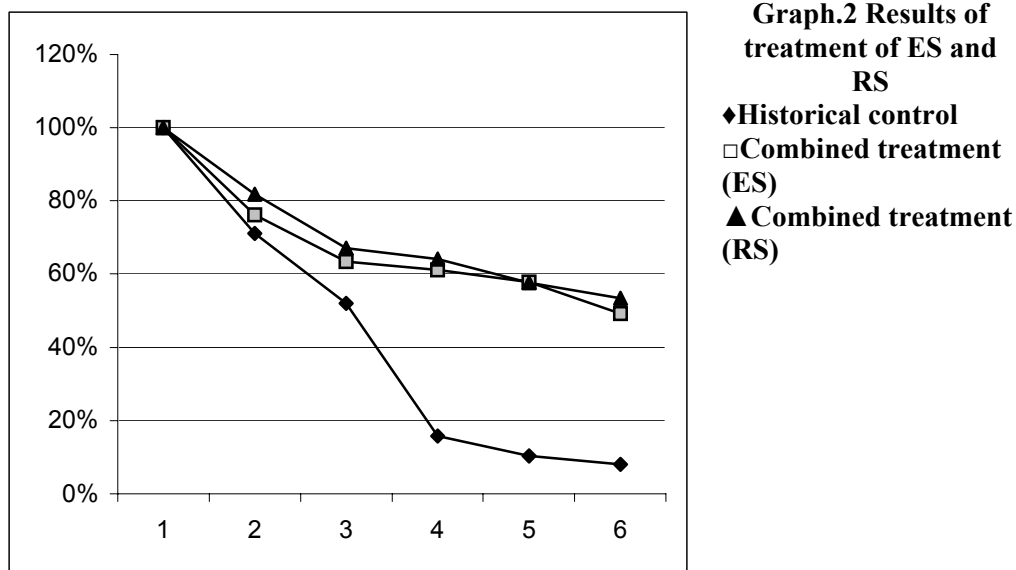
Table № 3

Functional results of endoprosthetics of knee and shoulder joints

Functional results	Volume of surgical interfere	
	Endoprosthetics of knee joint	Endoprosthetics of shoulder joint
Excellent	21 (21.2%)	
Good	42 (42.4%)	12 (38.7%)
Satisfactory	27 (27.2)	11 (35.5%)
Unsatisfactory	9 (9.2%)	8 (25.8%)
Total	99(100%)	31(100%)

In group of the patients with ES and RS in 1st stage patients were carrying out regional or system chemotherapy by the method described before. As biological property of these tumors is their high radiosensibility, the radial therapy is the conventional method of local therapy. The equipment for distant gamma-therapy, generally using static regime in, carries out the radial therapy of the most patients with ES and RS. It is known that dissemination by medullar canal is typical for these tumors, that’s why irradiation of whole bone is more effective. The large-field irradiation is used in most of the patients. Irradiation is carried out every day, single doze – 2 Gr., TFD is between 50-70 Gr., in the average 60-64 Gr. Decrease of pain and reducing of soft-tissue component of tumor appears immediately after irradiation in most patients, but the first manifestations of bone reparations were expressed on 3-4th week after the beginning of treatment. On the following stage, taking into account the high inclination of these tumors to hematogenic metastasis prophylactic chemotherapy by CAP, ACOP, VAC- I, VAC – II and others schemes. In some cases (localizations in bones, the flat bone and also pathologic fractures) the

surgical method of treatment is carried out. The results of the of treatment with ES and RS bones are shown on graphic №2 (5-year survival rate index without metastasis consists 48+2,7% and 52+3,1%).



Received results let us to come to the following main conclusions:

1. In group with OS, MFHB and MCh organosaving operations are shown as one of the main stages of combined treatment, but with HS high-differentiated, PS and giant cellule tumor as an independent and radical methods of treatment.
- 2.The results of combined methods in group of patients with ES and RS of bones of showed us the advantage of conservative methods and allowed to improve the results of survival rate index without metastasis.
3. Application of endoprosthethics of different joints and researching of new methods of rehabilitation treatment, allowed to keep afflict with tumor parts and return the most patients to normal life and working activity.

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HEALTH SCIENCE, SEXOLOGY AND AIDS

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The following is concerned with the relationship between health science and the science of sexology. The aim is to show developmental tendencies in both fields. In its beginnings sexology was regarded as a branch of health science. Early sexologists were orientated towards medical thinking and the "psychopathia sexualis". This was followed by a gradual differentiation in the development of sexology, which set it apart from health science and recognised it as an independent research discipline with an empirical field of enquiry. Subsequent to the further development within health

science, influenced by the Anglo-Saxon Public Health orientation from a bio-medical paradigm to a social-scientific one, the academic institutionalisation of health science in Germany was established. At the present stage of development, a connection between health science (understood as Public Health) and sexology can be drawn, which is on the one hand of theoretical interest and on the other has practical significance for the fields of therapy, counselling and behaviour modification.

Sexology as a branch of health science

The historical development of medical treatment can be traced back to the earliest cultures. The norming of sexuality is also to be found in all societies. There has always been discourse on both these important aspects of life. The beginning of modernity saw an adjustment in the medical system to the code values "ill/ healthy". Sexuality became at that time a topic of intensive discourse which, nourished by the Catholic tradition of confession, demanded to know everything about "unchaste sex", a demand which the Marquis de Sade took up in his book, "The One-Hundred-and-Twenty Days of Sodom or the School of Dissipation",¹⁹ as did also an English libertarian of the Victorian era who described his secret life. This demand is also met by the psychoanalytic method of treatment. Sexuality has been subjected to scientific methodology and domesticated. This civilisation of the emotions, as described by Norbert Elias,²⁰ and the domestication of the body, a theme which has been taken up by Michel Foucault,²¹ have become part of the western process of rationalisation. They are tied up with the development of self-reference.²²

The development of the health system

The development of the health and medical systems to an independent power in the field of health politics took place during the French Revolution in connection with the formulation of universal articles of equality. Health became a public responsibility. Medical research and treatment were given a scientific basis and older methods of therapy were eliminated. Both the English sanitary movement and the Public Health movement in Puritan America emphasised the duty towards cleanliness, morality and healthy living which were to be achieved through the imposition of hygiene and moral conduct. Experimental medical thinking drew a distinction between morality and health and thus confronted the health system with the task of investing the field of health with new significance. Health care became a social good which was intended to guarantee economic stability and growth. In order to achieve this goal, various techniques were conceived. Pettenkofer made suggestions for the improvement of hygiene and Robert Koch for the battle against disease. These suggestions were added to by the "Social Pathology" of Grotjan, thus leading to a new area of responsibility for local administration. Social Pathology rests on the theory that degenerative

¹⁹ Marquis de Sade, Die hundertzwanzig Tage von Sodom, 7. Aufl., Dortmund 1987

²⁰ Elias, Norbert, Über den Prozeß der Zivilisation, Frankfurt am Main 1976

²¹ Foucault, Michel, Sexualität und Wahrheit, Bd. 1, Frankfurt am Main 1976

²² Runkel, Gunter, Die Entwicklung zur Selbstreferenz, in: Plake, Klaus (Hg.), Sozialer Wandel und Geschichte, Hamburg 1994

illnesses threaten the masses. Regular sport and cleanliness were declared to be the fundamentals of a healthy lifestyle, concepts which were also carried over into the world of work. During the National Socialist period in Germany these concepts were reformulated and abused. Increasingly, health and employment insurance schemes gained in significance as the financial sponsors of public health, with the responsibility, as intermediary institutions, for the promotion of public health and the integration of the population as a whole into the public health system. The limited possibilities of these schemes were to be supported by charitable organisations and other associations in order to educate the lower classes, in particular, towards greater awareness of health measures. Welfare doctors and district nurses, whose work was now regarded under the aspect of "professionalised motherliness", a typical vocation for women, were held responsible for the integration of the working classes into the society of the "homo hygienicus".²³ Social hygiene and the intensification of medical care by means of the constant observation and treatment of high-risk groups, comprehensive medical examination and compulsory vaccination were imposed in the guise of a semantic reformulation of health as modernity, so that, for example, a clean, light dwelling was considered not only healthy but also modern and attractive. The development of mankind to "homo hygienicus" has led to the entrusting of illness and health care to a differentiating, scientific, depersonified system, the costs of which are mostly carried by the public as a whole.

The development of sexology

At its beginnings, sexology as a discipline consisted of the research of doctors who were concerned with the, in many cases disturbed, sexuality of their patients, as well as erotic literature and books preaching virtue and morality by laying down rules of behaviour.²⁴ In recent centuries there has been a generalisation of sex research, as, for example, through the recognition that sexual behaviour is orientated towards certain sexual norms and sexual milieus. A development from "psychopathia sexualis" to "sexology" has taken place.²⁵ The term "sexology" was coined by Ivan Bloch in his book "The sexual life of our times in relation to modern culture" of 1907, which propagated the necessity for the founding of sexology as a pure science. Magnus Hirschfeld founded the first "Journal of Sexology" in 1908 in which sexology was conceived of as a branch of the natural sciences, an idea to which Ivan Bloch later also tended. Further attempts were made to establish sexology as an independent science by Albert Moll with the founding of the "Archive for sexual research". In his essay "Sexology as cultural science", which appeared in the first edition of that journal, Julius Wolf called for the division of sexology into a natural scientific and a cultural

²³ Labisch, Alfons, *Homo Hygienicus*, Frankfurt am Main, New York 1992

²⁴ Gindort, Rolf; Haerberle, Erwin J.. *Sozialwissenschaftliche Sexualforschung. Zur Institutionalisierung eines Begriffs*, in: dies. (Hg.), *Sexualität als sozialer Tatbestand*, Berlin, New York 1986

²⁵ This is the title of a book by A. Wettley, in: *Beiträge zur Sexualforschung*, No. 17, Stuttgart 1959

scientific paradigm, to be kept "value-free" as in the theory of Max Weber.²⁶ Following on from there, sexologists such as Max Marcuse²⁷ and Arthur Kronfeld pursued a concept of sexology which was influenced by various scientific disciplines, including biology, psychology, anthropology, sociology and ethics. In particular, the work done by Alfred Kinsey and his team established an empirical basis for research into sexuality which was in accordance with the demands for value-free judgement. The special "Kinsey Effect" had such impact because behaviour that had been up till then regarded as criminal or disgusting was shown to be part of the usual practice of most or a great many of the test persons. Kinsey's research had a cooling-off effect on the emotional political and moral debate which so often accompanies the topic of sexuality. The lack of empirical research into sexuality in the Federal Republic of Germany can at least partly be explained by the fact that the flourishing beginnings of sexual research during the Weimar Republic were to be eradicated by the Nazis, and after the Second World War were only re-introduced in their rudiments by the late sexologist Hans Giese. Hans Giese's orientation was towards medicine and psychiatry, in which he had been trained, but he carried out several empirical research projects with colleagues and also edited a series of social scientific essays under the overall heading of sexology. The student movement of the sixties led to a renaissance in sexological thinking, involving the reception of the works of Sigmund Freud, Wilhelm Reich and Herbert Marcuse. This, however, did not result in more than an insignificant institutionalisation of sexual research in the Federal Republic of Germany.

The *future of sexuality*²⁸ can be conceived of as a prolongation of the process towards the development of self-reference, which has its roots in modernity. A result of this process has been the trend towards one-parent families in parts of Europe, accompanied increasingly by the problems that go along with this development with regard to the socialisation of the children and economic provision for these families. Growing deritualisation, too, has an influence on sexuality because limits and taboos are necessary in order to structure one's sexuality in a meaningful way. A society completely devoid of taboos would not be worth living for the members of that society. The self-reference of the body can be shown in the operative closed system of the organism which, in order to maintain the survival of the species, must couple itself with other organisms. This is what we term "sexuality". As human beings turn to each other for other reasons as well, and as interpenetration of a non-sexual character also takes place, these interactions, in addition to one's own body, become the subject of

²⁶ To Max Weber see also: Runkel, Gunter, The Protestant Ethic and the Spirit of the Health System, in: Arbeitsberichte des Fachbereichs Wirtschafts- und Sozialwissenschaften der Universität Lüneburg Nr. 232, Lüneburg 2000

²⁷ Marcuse, Max (Hg.), Handwörterbuch der Sexualwissenschaft, Bonn 1923

²⁸ Runkel, Gunter, The Development and Future of Sexuality, in: World Association for Sexology (Hg.), Back to future, 15th World Congress of Sexology, Paris 2001

Runkel, Gunter, The Development of Sexuality and Love, in: World Association for Sexology (Hg.), Sexuality and Human Development, 16th World Congress of Sexology, Havana, Cuba 2003

concern.²⁹ Also resulting from the increasing development towards self-reference and deritualisation, a new problem has taken shape in the form of a dominating concern for one's own well-being,³⁰ demonstrated among other things by the predominant value given to good health over all other criteria for the quality of life of the individual.³¹ The connection between health and sexuality can also be seen in the growing significance of fitness studios and beauty farms, frequented increasingly by both men and women with the aim of perfecting their bodies. Sexually-active groups lay a strong emphasis on the cult of the body. Fitness and beauty are used as distinctive signals³² and play a large part in the achievement of sexual successes. The future of sexuality shows signs of an ambiguous development. On the one hand, a sexual liberalisation is taking place. This is not only a result of the material changes in modern society but also of the development of universal principles, the growth of a compulsion to legitimate, which increasingly has as its basis the universal equality of rights, and the dismantling of "natural" roles. On the other hand, modernity has seen an growing concentration on the body,³³ which has been freed from its metaphysical ties and has come to be regarded as last instance. This has led to an increase in the significance of the relationship between sexuality and body, as sexuality has also come to be regarded under the aspect of danger and concern for the self. Sexuality is very closely bound to the person and his body and manifests itself in the continuity of life: through conception, birth, maturity and death. Humanity tries to overcome death by orgiastic behaviour and strives to relive the lost unity with the significant other, as experienced in the womb. Ideas about reincarnation or a life after death are also connected to the reluctance to recognise death as final, and so human beings find refuge in experiences

²⁹ Dux, Gunter. *Geschlecht und Gesellschaft. Warum wir lieben*, Frankfurt am Main 1994, S.95.

³⁰ Foucault, Michel. *Sexualität und Wahrheit 3, Die Sorge um sich*, 3. Aufl., Frankfurt am Main 1993 (French original: *L'histoire de la sexualité*)

Dux, Günter, *Geschlecht und Gesellschaft*, a.a.O.

Schmölders, Claudia. *Die Erfindung der Liebe*, München 1996, p. 12 "Die Sorge um sich selbst".

³¹ Troschke, Jürgen von, *Gesundheit als Wert*, in: Runkel, Gunter (Hg.), *Gesundheit, Lüneburg 1993*. Here "good health" was named by 76%, then "happiness in private life" by 15%, after that "financial security" and "a secure job" respectively by 4% as the most important values in life.

³² Bourdieu, Pierre, *Die feinen Unterschiede*, Frankfurt am Main 1985

³³ Bette, Karl-Heinrich, *Körperspuren. Zur Semantik und Paradoxie moderner Körperlichkeit*, Berlin, New York 1989

Featherstone, Mike; Hepworth, Mike; Turner, Bryan S. (Hg.), *The Body, Social Process and Culture Theory*, London. Thousand Oaks. New Delhi 1995

Giddens maintains that the "positioning of the body" puts this into the "direct state of co-presence in relation to others" (Giddens, Anthony. *Die Konstitution der Gesellschaft*, Frankfurt am Main, New York, 3. Aufl. 1997, p.38 –translation from English-) whereby only that which consciousness regards as body (Luhman, Niklas. *Wahrnehmung und Kommunikation sexueller Interessen*, in: Gindorf, Rolf; Haeberle, Erwin, I. (Hg.), *Sexualitäten in unserer Gesellschaft*, Berlin, New York 1989) can be set in relation to others, i.e. so that the body is only perceived as such when transmitted through consciousness.

such as sexuality which, although fleeting, suggest eternity."All desire wants is eternity - wants deep, deep eternity"³⁴

The further development of the Health Sciences: from a medical paradigm to Public Health

In the last few centuries there have been great successes as regards the analysis and therapy of most diseases which are caused by viruses, bacteria and parasites. Control of these widespread diseases has led, together with other factors, to higher life-expectancy. This development has taken place, among other things, thanks to medical research which has produced effective drugs and methods of treatment. At the same time, already at an early stage, healthy living was promoted by changes in hygiene, for example, clean drinking water and the building of sewage systems. Today, traditional medical research has reached its limits. The most frequent and widespread illnesses, such as those affecting the heart and circulation, the lungs or bronchial tubes, cancer, or muscular and skin diseases, no longer have one specific, identifiable cause but are influenced by a group of somatic, personal, social and environmentally relevant factors. Chronic-degenerative diseases, such as those now dominating modern industrial societies, as well as new ones, for example, immune deficiency can not be explained purely along the lines of a bio-medical paradigm but must be complemented by the epidemiological, sociological and behavioural aspects involved. Interdisciplinary collaboration is, however, difficult because of varying interests. Doctors, for example, are primarily interested in healing the patient while scientists seek to extend their knowledge by giving priority to research into the causes of disease. The health system consists of the triad, first, prevention, second, treatment, third, rehabilitation. Until now, in accordance with the dominance given to the biomedical paradigm, the second stage, the treatment of illness, has been given pride of place and, in particular, the prevention of illness has been neglected. This area, which concerns the life situation of the patient, his psycho-social problems and calls for help, does not fit in with the traditional bio-medical model. This results from the fact that it is the illness itself which starts the processes of the health system going. Dentists can only earn a living by treating decayed teeth - and so it is only parents and health insurances who end up being interested in regular teeth cleaning. In the field of health treatment, illness is thus valued positively and good health negatively. Doctors are concerned with illness and not with health. There are many different kinds of illness, in contrast to the one state of good health. The binary division of the code ill versus healthy, and thus positive versus negative, is characteristic for the health system. In this way it is negative for the HIV-positive patient to find out that he is positive. Prevention is becoming increasingly important because many illnesses, such as AIDS, cannot be successfully treated and so must be avoided through preventative measures. Chronic illnesses are caused to a large extent by behaviour which has already begun quite early on in the life history of the patient. Smoking, the consumption of alcohol and drugs, overweight and other indicators are the main causes of heart and circulatory diseases. Dangerous driving, aggressive behaviour towards oneself and unprotected sexual relations are important factors which can lead

³⁴

Nietzsche, Friedrich, Also sprach Zarathustra. München 1967, S. 705

to early death. These risk factors can be potentially controlled by the individual although they are also embedded in the cultural patterns of society and its way of life. Health damage can be prevented when the individual is prepared to change his life-style by the avoidance of risk factors and preference for a healthy way of living. This new "science of health", which is dedicated to research into the social factors involved in the areas of "health" and "illness", is part of an interdisciplinary movement in which traditional medicine is complemented by contributions from the fields of sociology, psychology, pedagogy and ecology. This movement is not only influenced by the bio-medical paradigm but also, increasingly, by social and behavioural paradigms. Among others, these consist of social-epidemiology, industrial and environmental factors, research into rehabilitation, coping, social support, personality development, and also health economics and health politics. Accordingly, progress in the general state of health of the population can primarily be aimed at by a continuation of work along sociological lines. However, up till now the bio-medical paradigm has accounted for almost the entire costs of the health system because medics trained in the natural sciences have been in control of health care and its finances. In order to achieve medical progress there must be improvements in social conditions because an evolutionary perspective on health and illness shows that they are embedded in social systems. This leads to a bio-psycho-social-cultural model of health and to a conception of medicine as the "science of health".

In research circles, too, there is a binary code division. Thus, in bio-medical research there is a focussing on "illness" and in public health research a concentration on "health".³⁵ The term "health science" first appeared in Berlin in 1925 in the introduction to the "Handbook for Social Hygiene and Health Care", edited by Gottstein, Schlossmann and Teleky. The study of life-style, which threads its way through cultural and social patterns of behaviour, is a theme which has cropped up in various publications of the health sciences. The mortality rate is dependent on the varying economic situation, the way in which the health system has been institutionalised, differing nutritional and living habits, and environmental pollution and general environmental conditions, such as climate etc. Thus, inhabitants of the Third World die significantly earlier than those of the developed world. Comparing different European countries, it is possible to state that, for example, the prognosed and factual life-expectancy of the East European countries which until recently had communist governments had the lowest rates. A further important variable is the world of work.³⁶ In this context external work conditions can be distinguished from internal ones. In the case of external work conditions both the general working conditions, as, for example, the social and economic framework, and also the organisation of work, showed among other things in the working hours. These general conditions can be further shown in other objective factors. The lower the social strata, the higher is the mortality rate. Another objective variable is demonstrated by the kind of occupation. Manual workers are more frequently ill than office or other white-collar workers,

³⁵ See Luhmann, Niklas, *Der medizinische Code*, in: Runkel, Gunter (Hg),. *Gesundheit, Beiträge zur Sozialwissenschaft*, Bd 2, Lüneburg 1993

³⁶ See Runkel, Gunter, *The influence of the employment system on health*, in: *Toxicopy Satellite Symposium. Abstracts*, Bangkok 1991

unskilled labourers more often than apprentices or skilled workers. Class differences relating to health are also dependent on general factors. Variations of income lead to varying use being made of the educational and health systems, and also have an effect on differences in living conditions, hygiene, nutrition and other related problems, for example, under-nourishment. Within the field of health, it can be shown that social differences in the last fifty years have remained stable. Social disadvantage leads generally to earlier mortality. This objective finding has one notable exception. Women, in many areas of life at a social disadvantage in relation to men, live longer than men, on average 5 years. Lower-class women have a life expectancy comparable to that of the highest of upper-class men. In addition to the objective factors which influence on health there are also subjective ones. Thus, sociologists have included the cognition, preferences and norms of individual actors in their analyses in order to consider the subjective coping strategies as well as the objective demands involved. The functionality of the health system is also based on informal factors. Two thirds of all illnesses in industrial societies, for example, are dealt with within the circle of family and friends. Large hospitals, characterised by bureaucracy and hierarchical organisation, lead to the incapacity of the patient to make his own decisions, to routine behaviour on the part of staff and to an impersonalisation of the relationship between staff and patient.³⁷ Because of rising costs and growing inefficiency, this type of hospital has reached its limits. For some time there has therefore been a preference for self-help.

Modern interpenetration of both sciences

Health science, as described, is a fairly new discipline which has been given institutional importance in Germany in recent years. This has led to the establishment of courses of study in Germany in which the new discipline of Public Health can be studied. Sexology plays only a very minor role at German universities. There are no major courses of study in this discipline which can only be studied as an additional subject at a few universities in combination with a major subject. The insignificant degree of institutionalisation of sexology in Germany is connected to the controversies among sexologists in their discussion of the subject.³⁸ As sexology has of late been able to extricate itself from the system of the treatment of patients, an interpenetration of health science, in the sense of Public Health, and sexology, in the guise of a serious science and not as a literary discipline, is now called for both disciplines are based on recent sociological insights into methods of empirical social research. The areas of research of both disciplines also overlap. This is especially obvious in the case of "sexually-transmitted diseases" (STDs) and AIDS. AIDS in particular is one of the central challenges to the modern world. In spite of assurances about the course of the AIDS pandemic on the part of sex researchers, AIDS has become swiftly widespread and is one of the main causes of death in some regions, for example, East Africa.

³⁷ See Goffmann, Erwing, *Das ärztliche Berufsmodell und die psychiatrische Hospitalisierung: Einige Bemerkungen zum Schicksal der helfenden Berufe*, in: Runkel, Gunter (Hg.), *Gesundheit, Lüneburg* 1993

³⁸ See Gindorf, Rolf, *Sexualwissenschaft als Beruf*, in: Gindorf, Rolf; Haeberle, Erwin J. (Hg.), *Sexualwissenschaft und Sexualpolitik*, Berlin, New York 1992

The development of AIDS

The disease with the name "Acquired Immune Deficiency Syndrom" (AIDS) is a grave health risk to mankind as a whole. This disease was first identified towards the end of the seventies in the USA. It probably originated in Central Africa.³⁹ Later AIDS became widespread in America and Europe and has also reached Asia and Oceania.

AIDS is a viral disease. The virus was first isolated and described by the French doctor Luc Montagnier and was later given the name "Human Immune Deficiency Virus" HIV).

Number of cumulative cases of AIDS in the Federal Republic of Germany⁴⁰

The particular danger of AIDS lies in the rapid rise in the number of cases. The period of incubation for this disease is particularly long. In Europe and America it lasts one to two years. HIV positives do not necessarily show any symptoms during this time up until the full outbreak of AIDS proper but are nevertheless able to infect others, often without themselves knowing that they are infected, and so the virus is frequently transmitted without the knowledge of either party. The main channels of transmission are through sexual intercourse⁴¹ and the exchanging of blood in the course of blood transfusion or the mutual use of needles by drug addicts who inject themselves intravenously.

The cases registered by the World Health Organisation (WHO) do not always reflect the actual numbers. Many countries register fewer AIDS cases with the WHO, partly because their health system is underdeveloped and partly because they do not want to put off tourists. In 1987 a doctor of tropical medicine wrote in an article titled "AIDS in Africa",⁴² which he had to publish anonymously, that about 10 to 20% of the general population of sexually mature age, up to 30% of those with venereal diseases, and up to 70% of the female prostitutes were infected with HIV. The relationship between sufferers from AIDS and HIV positives is estimated at 1 to 100. The number of HIV-positives, now 100 times as many as AIDS sufferers, shows now the prognosed number of AIDS patients over the next decades.

A trans-cultural comparison shows that AIDS sufferers in Africa are made up of men and women in almost equal numbers as sexual behaviour among Africans is almost exclusively heterosexual. The high rate of heterosexual promiscuity in Africa contributes towards the rapid spreading of AIDS.

³⁹ Koch, Michael G, AIDS. Vom Molekül zur Pandemie, Heidelberg 1987

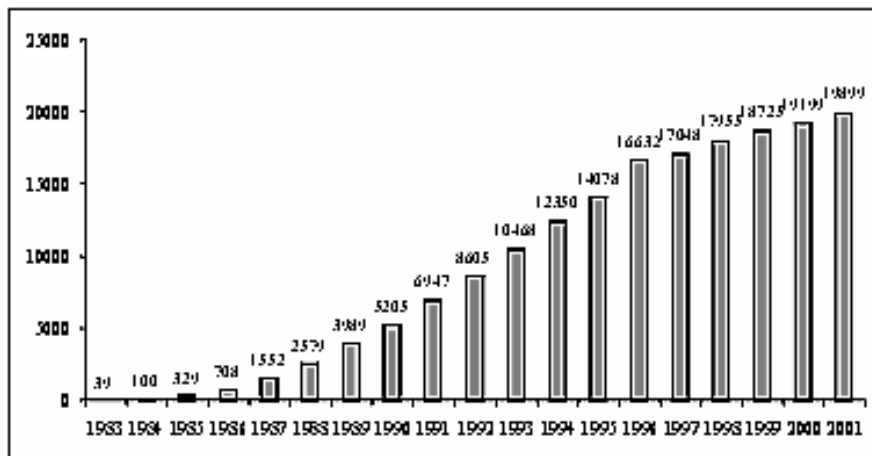
⁴⁰ This data has been taken from i.a. "Reports from the AIDS Center at the Robert Koch Institute on current epidemiological data", Berlin, Germany.

⁴¹ Runkel, Gunter, Sexual Behaviour and AIDS in the Federal Republic of Germany, in: Nordisk Sexologi, Nr. 2, 1991

Runkel, Gunter, Sexual Behavior and Attitudes toward AIDS in Germany, in: Journal of Sex Education and Therapy, Vol. 18, 2, New York 1992

⁴² Anonymous, AIDS in Africa, in: AIFO, No.1, January 1987

In America and Europe most AIDS patients have up till now been homosexual in their behaviour, a tendency which is, however, decreasing.⁴³ Male homosexuals in America⁴⁴ and Europe⁴⁵ have a higher rate of partner change and a high coitus frequency than comparable heterosexuale. This higher promiscuity is a further contributory factor towards the spreading of AIDS.



There are three exceptions in Europe with regard to the dominance of homosexuals among AIDS sufferers: in Italy and Spain there are more drug addicts and in Belgium more heterosexuals from Africa. In the USA there are now about half a million people infected with AIDS. The number of HIV-carriers is much higher 365,000 people in the USA died of AIDS up to the year 1992. An increase of 21% in the following year shows that the disease is continuing to spread. In the meantime many people are mourning the loss of a friend or acquaintance through AIDS.

It is estimated that one-fifth of American HIV-positives are teenagers and a further quarter are in their twenties. Estimates show that the rate of infection doubles among HIV infected young people every 14 months. This rate is higher for minority groups: for Blacks 16 times higher and for Hispanics, that is, immigrants from Latin America, 1 times higher.⁴⁶

It can be assumed that in Europe the number of HIV-positive homosexuals will rise as up until now educational campaigns have not effected the necessary changes in behaviour.⁴⁷ The number of HIV-positive heterosexuals will also greatly increase

⁴³ From 28,098 AIDS sufferers in the USA on 8.12. 1986, 18,162 were homo and bisexual and 2.165 were male homosexual and drug addicts, in: AIFO, No.4, April 1987

⁴⁴ Saphir, Marcel T.; Robins, Eli. Male and Female Homosexuality, Baltimore 1973

⁴⁵ Gindorf, Ralf. Sexualberatung, Sexualverhalten, Sexualideologie: Zur Situation bi- und homosexueller Männer vor und in der AIDS-Krise, in: Gindorf, Rolf; Haeberle, Erwin J. (Hg.), Sexualitäten in unserer Gesellschaft, Berlin, New York 1988

⁴⁶ Sosnowitz, Barbara G., AIDS in the USA: Etiology and Social History, in: Arbeitsberichte des Fachbereichs Wirtschafts- und Sozialwissenschaften der Universität Lüneburg, Lüneburg 1994

⁴⁷ Changes in behaviour have from time to time been rejected by AIDS experts. See particular contributions at the Conference held by the "Bundeszentrale für

because they will be infected in particular in the first stage by bisexuals and prostitutes. Female heterosexual prostitution, which is practised by a large number of infected fixers, carries the virus into the heterosexual population as many fixers have become HIV-positive through shared use of needles. In the rest of the world,⁴⁸ too, AIDS is spreading rapidly. This is a result of world-wide travel and the wide extent of hetero and homosexual prostitution. All this leads to the conclusion that AIDS education and prevention must be intensified until at some point a vaccination has been developed to protect those who are still uninfected. There is a great difference between knowing about dangers on the one hand and changing actual behaviour on the other, a problem which can be shown in other areas, too, for example, smoking, drinking and fast driving. A change in sexual behaviour is particularly difficult because behavioural patterns have been formed during the course of the whole of the previous life of the individual. As HIV-positives do not necessarily show any symptoms of illness, natural warning signals are not given or received. The main channel of transmission of AIDS, sexual intercourse, often takes place at a time in which the persons involved have less control over their actions than normal. Also, alcohol and an emotionally-influenced situation can reduce inhibitions which would otherwise have been felt. AIDS sufferers do not die of AIDS but of the illnesses to which the patient succumbs on account of his weakened immune system. AIDS-related illnesses vary according to culture. This is because there is a varying distribution of illnesses in the world, which are, among other reasons, caused by social factors (such as the standard of the health system and hygiene), sexual factors (such as the differing extent of promiscuity and homo and heterosexuality) and regional factors which can lead to unequal frequencies (such as tropical diseases). It is significant that AIDS patients more often suffered from other diseases such as venereal diseases and hepatitis B before they became infected with HIV. These earlier infections, which contributed towards a weakening of the immune system, are co-factors of AIDS. An important indicator for the spread of AIDS - which can be analysed with the help of the Toxikopy Model⁴⁹ - connects the frequency of sexual intercourse with HIV infection. There is no direct empirical relationship between these two factors as a HIV infection can take place after one or after more than 1,000 sexual acts. Also, an immunity on the part of some people is assumed. The individual situation and the immune system have a great influence on the Contact Index. This means that in one case an AIDS infection can be transmitted after the first sexual contact with an infected person, and in another case, after as many as 1,000 sexual contacts still no HIV-antibodies can be established.

gesundheitliche Aufklärung", as documented in Rosenbrock, Rolf; Salmen, Andreas (Hg.), AIDS-Prävention, Berlin 1990

⁴⁸ Runkel, Gunter. AIDS - a New Worldwide Epidemic, Arbeitsbericht Nr. 69 des Fachbereichs Wirtschafts- und Sozialwissenschaften der Universität Lüneburg, 2. Aufl. 1992 (chinese translation; in: Chinese Journal of Epidemiology, vol. 2, 1989)

⁴⁹ Kofler, Walter; Wongphanich, Malinee (Hg.), Toxicopy, Bangkok 1988

AIDS as challenge for Health Science and Sexology

We are faced with a world-wide pandemic of AIDS. In Africa, America and Europe there are regions or parts of the population in which the majority is already infected. In Europe we are behind the USA in the development of AIDS by three to four years: Asia and Oceania are again three to four years behind Europe. If no decisive medical intervention is taken against AIDS in the near future, then the AIDS epidemic will reach such proportions that the social structure of many parts of the world will break down. The WHO estimated an increase in the number of HIV-infected persons from 9 million world-wide in the year 1990 to 26 million in the year 2000. 1.8 million would then die yearly of AIDS.⁵⁰ This estimation was quiet good. Now only in Africa there are more than 20 million people infected by HIV. In Kenya a quarter of young girls are infected in 1998. AIDS and the lack in adequate public health care are the main reasons for the early death of young people in Africa today.⁵¹ As it is probable that the AIDS epidemic will not be brought under control within the next few years, social, demographic and economic structures will be destroyed. In that case, the consequences of AIDS will exceed the damage wrought by two World Wars. Thus considered, it is amazing that there are scarcely any effective programmes against AIDS in the world.⁵² AIDS is a great challenge for health science and for sexology and an important field for collaboration. Particularly at the first stage of medical intervention, prevention, there are possibilities for co-operation between both sciences. The two disciplines can also complement each other in the field of treatment and care, as shown by self-help organisations such as the *German AIDS-Aid*, for example. Cooperation of this kind would be beneficial to all those involved and would demonstrate the use to society of both sciences. Dr. Gunter Runkel is Professor for Sociology at the University of Lueneburg in Germany. He is President of the German Society for Social Scientific Sexuality Research. He is Member of the International Academy of Science and of the International Academy of Sex Research. He is coorganizer of the last three World Congresses of Sexology. He is Scientific Councilor of the Shanghai Sexual Research Institute. He is bearer of the Thomas Kuhn Gold Medal for Science. He was Guest Professor at the Central Connecticut State University in the USA. He published different books e.g. "Allgemeine Soziologie: Gesellschaftstheorie, Sozialstruktur und Semantik", R. Oldenbourg Wissenschaftsverlag, Munich Vienna, 2002.

⁵⁰ The World Bank (Hg.), World Development Report 1993, New York 1993

⁵¹ Katastrophale Folgen von AIDS in Afrika, in: Frankfurter Allgemeine Zeitung, 23.07.99 (About the report of Unicef for 1998)

⁵² Reports of the German Embassy on the spreading of AIDS as well as on the already taken and planned measures in the fight against AIDS in the host country. (Dated: End of February/ beginning of March 1987), in: AIFO, No. 9, September 1987

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QUANTUM MEDICINE - THE MEDICINE OF TOMORROW'S DAY

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The quantum medicine is a medicine, founded not on operating of chemical medicinal preparations entered into an organism of the person, but on reacting of this live organism to electromagnetic fields, effect, with the purpose to return an organism to an equilibrium point. The quantum medicine rests simultaneously on the latest achievements of physics and on most ancient knowledge of eastern medicine.

The quantum physics, for one - chimera or magic, for other - reality and breakthrough in the future, puts under doubt mechanical and realistic materialism of our everyday life.

It is not necessary to overlook, that in 1938 the disintegration of an atomic nucleus was discovered, but nuclear bomb - " the quantum invention"! Embodied utopia or sad reality?

The quantum theory - simultaneously physical, chemical, biological, cosmological and metaphysical - bears in itself the present life revolution, with which one, doubtlessly, our future will be marked.

" Physics of quanta - a "wild" theory, blasting and destructive - disorganizes of all recognized during centuries, carried up building of conventional science. It enters us in patterns of a fantasy. Bourgeois, Marxist, Islamic and the other revolutions once can show insignificant before a face of revolution of quantum.

Our socially - political organization and type of intellection were already shaken by quantum revolution more, than any other event, or it still will happen hereafter! ", - declare S. Ortolý and J.P. Farabo in the book " Quantum Cantata".

The quantum theory does not encompass the laws of classical mechanics (or physics) in that, as to motion of bodies. It tenders the new approach by consideration of phenomena at a level of atom and its components, for comprehension of which needed new types of formulas and new type of intellection.

The concept of a quantum was formulated by Max Planck in 1900, and in 1913 he already could say: " The Quantum hypothesis has resulted in idea, that in the nature there are changes, which implement not continuously (according to principles of the electromagnetic theory), but in explosive mode (i.e. discontinuously and discretely) ".

In his book Dr. Cannenpass - Riffar, attempting to open before us "entirety" of vacuum and offering quantum comprehension of consciousness and physics of resonant systems, wrote: " The quantum mechanics is a description of behavior of a matter and light in full details and, particularly, description of phenomena at nuclear levels. There objects behave not as waves, not as fragments, clouds, billiard balls or weights on a rope, or anything at all you ever saw, by the saying of known scientist Richard Feynman. "

The quantum physics results in scientific comprehension of that one fact, which does not depend on our desire, does not depend on whether we want to accept it or not, the fact, that the Person is a part of Space.

And you, dear reader, and we - writers of the article - all of us are made of dust of stars, which are huge reactors, from which came out fragments of all alive and hard matter and which are categorized in the table of Mendeleev.

Quantum-photon revolution

We know, that the quantum is an elementary dose of energy which is radiated by atom; on definition of English physic Steven Hawking, the quantum is an indivisible unit, pursuant to which either coming out the radiation, or happen wave absorption.

The word "quantum" describes the dual nature of electrons: simultaneously corpuscular and wave. It can be paradoxical, but this nuclear reality was demonstrated by De Broil in 1923, but practically was obtained in a reality of ... Quantum! To this concept the hierarchy of material systems is added, which they call also as "a quantum scale ": the identity of atom is saved as long as it does not subject to quantum effects...

For example, the very small energy suffices for the change of quantum state of a large molecule; the change of a quantum state of atom energy should be much more; and to make changes inside of an atomic nucleus - in hundred thousand times more. These reasoning illustrate the concept " of a quantum scale ".

Light also has the dual nature: as a wave it has a spatial expansion, and as a fragment it is simultaneously massed in infinitesimal point.

The quantum in optical range is called as a photon. A photon, which they simplistically sometimes call " as a light grain ", is an immortal fundamental particle, that simultaneously is both - fragment, and quantum of energy, the flow of which will derive electromagnetic radiation.

The photon is " a quantum object, transport means of an electromagnetic interaction ", on definition of Arve Lobe, who also asserted, that " the photons bear in themselves the information on medium, that has released them, and about medium, through which they have passed ".

Light can be decomposed in spectral area, and it is very useful thing to do, as allows learning an elemental composition of medium! Really, every

chemical element has its unique "signature": it takes (or beams) definite group of energies (therefore, photons) ".

For this reason can be used the expression - " photon medicine ", or even " superlight medicine ", according to header of the book of the professor R. Dutey!

To "quantum" or "photon" medicine

Therefore, the quantum medicine is a medicine, founded not on operating of chemical elements, entered in an organism of the person, but on reacting of this alive organism to electromagnetic fields. This effect, where an organism is the subject with the purpose to return it to an equilibrium point they called also as "stable state".

These reacting should note for all biological nature of the subject and, in particular, his genetic predisposition, in other words - heredity. Besides, the quantum medicine considers basic mutuality between a mind and body at all stages of life. It accounts for the spiritual part of an individual as his integral characteristic ", the professor Cannenpass-Riffar considers.

It is an implementation of an almost prophetic prediction of Ervin Schroedinger (one of the founders of quantum mechanics), made by him in 1943 concerning the quantum nature of living matter. " The Alive entity should not accept itself as a fabric resuscitated by energy. The energy is first in relation to a fabric and will orient a fabric to a phenomenon of life ", asserts the Chinese scientist Lin Chu. It is important to point out, that in quantum medicine there is no necessity to apply high levels of energy (as, for example, in use of laser scalpel). It uses only very gentle radiation and gentle magnetic fields, which at a sensory level are not sensible (the patient do not fill the perception of an electric current or heat). Thus, not braking flow, but "low level signal", the carrier of a definite type of the information acts on an organism. Thus, the effect in quantum medicine descends extremely on an information level of molecules and cells, and then - through chain reaction of energy - is transmitted to all organism.

Therefore, in quantum therapy it is possible to use only micro level of radiation of about 1-3 electron volts (eV), the positive operating of which on an organism well notably and shows at once. For compare, it is necessary to remember, that the bond energy of a core of atom (nucleon + bound protons + neutrons) makes about one million electron volt (MeV).

Russian scientists work in the given area for more than 20 years and now for effect on the person in space (and on Earth) they use the following kinds of radiation:

- * Laser radiation in optical range;
- * Radio wave radiation in range UMW (ultra-microwaves) and very high frequency (centimeter waves);

- * Radiation of chromatic light in visible optical range;
- * Low frequency electromagnetic radiation;
- * Acoustic radiation.

All these types of wave radiation are peculiar to physics of alive and are organically connected to processes of life activity of an individual. Under some conditions these radiation can render rather positive influencing on a level of stability of live systems (bio-photonics, a synergy of functions, which enter in " integration functional model ", connecting energy, information and matter).

What information and why?

To understand the cause of efficiency and universality of this quantum revolution and the gear of effects of application of quantum medicine, there are necessary to learn one more area - genetics.

First of all, we shall consider the problems of biotechnology (genetic manipulations and transplantation, so developed in the countries of West) and, particularly, the clone concept, about which now they often speak in connection with creation famous Scottish ship, named Dolly. Cloning is a simulated reproduction of a live entity. An ideal genetic copy realized on the basis of one cell of an organism.

Whether there is a concern of an individual in creation of one or several his own absolutely identical twins (but not his identical persons)? Similarly to machine - to have spares? Such solution - mechanistic and surgical in any way does not respond on the present problem put by life?

And we interest ourselves to the problem answer, mainly: how the stem cell can save the information of the future adult copy of Dolly? What color of its wool, its eyes will be? What way of dialogue with kin will be its behavior? It is possible to set endless questions, concerning relations of an individual with himself and with a surrounding world. Where all data indispensable for the answers are stored?

Some explorers have calculated, that if to organize a volume of the genetic information stored in one sex cell (gamete) of chromosome's length of one millimeter (onto data type stored in the computer), then it will be stretched in a chain lengthening in 5-7 spacing intervals from the Earth up to the Sun!

These researches result us in the very relevant conclusion: the information on development of a sex cell of an adult individual can not be stored and be transmitted extremely at a cell-like level. Physic-chemical cell resources, i.e. potentials of material, which derive the cell, apparently are not sufficient to store such huge amount of information.

There is a problem: where this information of genetic heritage, this vast data bank is stored. The one, that allows to receive from a blastula - the person, from a simple cell of the ship to spawn the ship, and from a Sid of an apple - an apple? Moreover, it is necessary to mean not only enormous volume of this

genetic information, but also the remarkable reliability, transmission, and also recovery level of such information!

Really, the change or the loss of only one such unit of the inheritable information can result in pathology or death of whole body. Well-known by an example is the cancer process, in which the genetic program of cell divisions has exposed to change.

Program or hologram?

The recent researches have shown that the inheritable data (genetic code) are saved not only as a biochemical substance of a gene, but also in the form "of field frame" or "of quantum frame". Moreover, this quantum frame - the carrier of the genetic information - is organized in the form of the hologram. And the hologram has remarkable and completely exclusive property - each of its parts contains the information on all system. Then becomes understandable, why one cell bears in itself the information relating to all live organisms.

As is known from a quantum physics, to create the hologram and to supply it, it is necessary to have a source of coherent light (coherent analysis such as laser)! And where in a living cell there can be such stimulus source? The Russian scientists Gurvich, Lubishev, Beklemishev, Garyaev have managed to demonstrate, that some molecules, for example, molecule of DNA, work in an organism by a principle of radiators of coherent light. Except for property to save genetic heritage, each cell has the capacity to treat the information (by a principle of the computer) and even to restore it in case of loss. Not speaking about its major quality - to realize a development program, legibly executing in time and in space a preset sequence of energy informative transformations (it has inspired idea of space flights!). Today many explorers come to an admission of that fact, that for transmission, processing and the neo geneses of the biological data with success will be used radiation of SW and very high frequency of range, laser, optic and acoustic fields.

Natural memory or quantum map?

The experience of the American explorers on analysis of Aura can illustrate cognitive capacity of living tissues and their memory concerning an organism, from which they have descend. For example, for customary able-bodied plant saw a plate element, then the amputated leaf in a high-voltage field is photographed with the help of very sensing instrumentation which is capable to entrap SW, by laser, acoustic and other electromagnetic fields. To surprise of the scientists, on the synthesized photo they see the whole plant!... How the cut off element can appear recovered on a photo - you see physically it got missed? It means, that the stayed cells of a leaf are capable to storage (in the form of the structured electromagnetic field) the quantum map of all organism, built by the nature, from which they have taken place!

Quantum medicine

The quantum medicine can be defined as a new medical direction, founded on synthesis of all last achievements of a quantum physics, integrating last data about the deep nature of alive with thousands of years of experience of eastern medicine (or with an informational - energy reality of an alive entity).

The quantum medicine is based on usage of quanta of energy, i.e. small doses of electromagnetic radiation, for the purposes of diagnostic, treatment and preventive maintenance of set of diseases with the subsequent recovery of health of the person. The electromagnetic radiation, thus, is close to natural and purposes to render positive influencing on a function of cells, tissues, organs, systems and all organisms.

It is necessary to mark that the low powers of energy effect used in quantum medicine are absolutely secure. The designed method consists in correcting functional anomaly (or else, information, bound with a pathology), with the purpose of recovery of a condition of informational - energy equilibrium, which is called as health. It is explained to that the quantum effect realize adaptation abilities in an organism, as at a level of a cell, and all alive system. Fast boosting immune defense and mobilizing protective mechanisms of an organism on fissile counteraction to rejections (or changes) in operation.

So, doctor Uri Heyfetz, Russian practicing doctor and the scientific employee of JSC "MILTA - PKP GIT" in the field of quantum medicine, gives such definition of health: " Health is a harmony of informational - energy relationships between an individual (subject) and Nature (object); this harmony expresses through a homeostasis of an organism on the physical, mental and spiritual levels ". Thus, the homeostasis can be perceived as optimization of mechanisms of self-regulation, self-defense and self-environmental sanitation of a live organism, i.e. as active dynamics of health encompassing the whole person.

Summarizing, it is possible to say: the quantum medicine will use that fact, that all biological processes, bound with habitability of an organism, have the unique representation in the structure of information electromagnetic fields, which is arranged both "inside", and "outside" of this organism.

Quantum diagnostic

The quantum diagnostic is based on observation of the fact, that the informational - energy parameter of an organisms characterize a precise, concrete and reproduced mode of a functional condition of all organism and its parts: organs, systems and connections between them. So, registering on a skin of the subject micro-electrical parameters conforming to internal functional structures, it is possible not only to watch the parameters, which start diseases, but also a degree of development of pathogenicity and specially precisely to evaluate a pathological potential (or predisposition to it) of the subject. As like that the regular overseeing of the condition of health of astronauts are carried

out! This new type of "the monitoring of health" introduces an additional benefit: the registered figures can be transferred by satellite to any point of the Earth - today it is called as "Tele-medicine".

Quantum therapy

The quantum therapy applies all types of biological and non-polluting radiation, to recover of an informational electromagnetic field, changed by pathology, and bringing this field in a stable state. For this purpose there is used the information electromagnetic radiation working in unison with informational - energy processes of a live organism, or else, in a resonance with them.

The areas of application of quantum therapy in medicine of the person and veterinary medicine are as multiple, as medical specializations (cardiology, pulmanology, surgery, traumatology, gastroenterology, gynecology, urology, dentology, dermatology, ophthalmology, neurology, rheumatology, cosmetology etc.), and vast medical statistics confirms the efficiency of treatment and significance of the obtained outcomes. Today the field of application of quantum medicine prolongs to extend, and in Russia the advanced researches are carried out in the field of treatment of such diseases, as oncology (swellings), radial illness, AIDS, some cardiovascular diseases, barrenness, alopecia, nephrolithiasis, children's cerebral paralysis, bronchial asthma, incontinence of urine...

Quantum preventive maintenance

The experience demonstrates operational effectiveness of quantum technologies in the preventive purposes, as, for example, in the seasons of seasonal allergy or in time of before epidemic phase of seasonal virus infection contamination. Really, it is possible to apply 3... 5-day's preventive courses of treatment of 5-10 minutes per day. The reliable statistical data obtained in Russia, demonstrate, that the number of epidemic flashes is reduced in 4-6 times, depending on a type of disease and a moment of the beginning of a course of quantum preventive maintenance, which applies the same methods, as quantum therapy. It also finds a use in sporting and space medicine, at training for competing and space flights.

It is possible to suspect, that the preventive application of quantum technologies 2-3 times annually would allow to prolong able-bodied life of the person by 5-7 years!

The future of quantum technologies

The quantum medicine is very young and has not conquered yet a general recognition. However, the speed, with which develops commercialization of technologies of quantum medicine, which is much surpasses all other forms of medical technologies widespread all over the world.

Efficiency of quantum technology, bound with its universality, and also its ecological aspects, non-aggressive and painless, not having of iatrogenic

effect and not having of drug dependencies, are the prime trumps in the struggle for health of mankind in the near future. Besides, it is necessary to mark the low cost of treatment, which is recommended at more than 200 diseases of a different symptomatology and allows to avoid a surgical intervention in some cases. For example, peptic ulcer, varicose, adenoma of a prostate, fibroma...

The current researches allow to assert, that the quantum technologies in the close future will be applied to preventive maintenance and treatment of such diseases, as auto-immune pathologies, Diabetes, cancer, arteriosclerosis, epilepsy, schizophrenia etc. The researches dedicated influencing of electromagnetic radiation on genetic structures (effect on DNA), on mechanisms of specific memory and on the information vehicle of genes, allow to speak about a capability of neo genesis of organs of the persons lost incidentally, as a result of operation or underdevelopment (for example " teeth, eyes, pins, arms, legs, liver...), on an example of warms, snails or lizards who keep the natural capacity to restore the lost organs and - or functions.

Instead of studying surgical process of transplantation (which would justify all biotechnology of manufacturing of organs with the help of genetic manipulations, cloning or other), the Russian scientists consider for themselves as an honor to find that key, which would allow them to receive the mechanism of quantum bio neo genesis of organs capable to determine a reference direction of forthcoming struggle for health of the person in the near future.

Conclusion.

The quantum medicine is still poorly known area, which promises to revolutionize the majority of methods of maintenance of health of the person in the close future. The quantum medicine optimizes all areas of public health services by means of development of informational energy, absolutely biologically conformant processes, not resorting to genetic manipulations or introducing of vaccines, returning creation initial sense, which was given to him by Life.

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THE FIRST PEDAGOGICAL UNIVERSITY OF AZERBAIJAN

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Standing in a characteristic place among the higher schools of Azerbaijan, the first institution of higher pedagogical education, center of scientific and scientific-pedagogical thought, Azerbaijan State Pedagogical University belonging rich tradition coming 80 years developing ways, had become famous scientific center and educational institution. This educational institution is considered flagman of the pedagogical training specialists in our republic with its some indicators, Academy of the pedagogical sciences in the pedagogical and scientific- pedagogical training specialists according its high services in the developing of the pedagogical and methodical thought.

Starting to activity with 6 persons in 1921, this educational institution had been established for the aim of ensuring schools with high specialized pedagogical cadres which newly organized in republic. Besides this, it also might ensure cultural-educational purposes of condemned east people. During the activity this old and educational center, fulfilled the mission with honor, prepared pedagogical and scientific – pedagogical cadres more than 110 thousands, had become a scientific center upon some professions, played a standard-bearer role in the formation and progress of higher pedagogical education system. On the base of its department and faculties, in the years 20-30 of XX centuries a lot of higher pedagogical schools – Institution of Baku people education (1922), Institution of higher pedagogical women (1923), improvement of professional skill institution of people education workers (1929), Baku two years teachers institution (1926), Azerbaijan State Correspondence Pedagogical Institution (1933), Ganja State Pedagogical University (1938); between the second part of 40th years and 50th years Azerbaijan Russian language and literature Institution (1946). Foreign Languages Pedagogical Institution (1948); in Baku and in 7 cities of

Azerbaijan – Nakhchivan, Ganja, Shaki, Guba, Lankeran, Gazakh and in Aghdam two years teachers institutions; the end of 60th years – at the beginning of 70th years Nakhchivan State Pedagogical Institution, Khankendi State Pedagogical Institution, at the beginning of 90th years Shamakhi and Shusha branches of Pedagogical University had been organized. For all the districts of republic in aspu duty of preparing higher educational teachers cadres today is fulfilled with responsibility and honors.

Pedagogical University being cradle of scientific- pedagogical thought in Azerbaijan had always played an exceptional role in the rising of the intellectual potency of scientific– pedagogical cadres. For the first time here specialists had been created upon all the spheres of science and had been sent to different districts of our country. It prepared higher educational teachers and scientific cadres not only for our republic, but also for Caucasus districts, central Asian republics, Bulgaria and other countries and had begun to cooperation with educational institutions and scientific centers largering year by year.

Besides fulfilling the duties educating people and organization of higher pedagogical institutions in our republic aspu and plays a more important role in the spiritual and cultural, social and political life of our republic. This magnificent work is continued with honor in institutions of higher educational institutions which keeps traditions of our cultures, scientific-pedagogical thought, gives useful information to all sides of social life, education, knowledge being against to the contradiction of the life and becomes real science institution, temple of science.

It is not coincides that, raising azerbaijan science in high levels and participating in the cultural life of our land hundreds of scientists, poet and writer, social-political scholar in this institution, educated in this institution , they had been shown the samples of to serve with dignity to our culture and people, had given educated certificate. Graduator from Pedagogical University Yusif Mammadaliyev, Mehdi Mehdizade, Heydar Huseynov, Zahid Khalilov, Hassan Abdullayev , Ashraf Huseynov, Ismayil Huseynov, Suleyman Rahimov, Shikhali Gurbanov, Abdulla Garayev, Hamid Arasli, Alisohbet Sumbatzade, Mammad Arif Dadashzade, Mammadjafar Jafarov, Ibrahim Ibrahimov, Mammadagha Shiraliyev, Feyzulla Gasimzade. The name of Ismayil Shikhli and Habidulla Amirkhanov is also named with honor far away from our country. Heroes of Soviet Union – legendary partisan Mehdi Huseynzade, Xidir Mustafayev, Fariz Safarov, Salahaddin Kazimov, heroes of socialist labor –Safa Imanov, Zarbali Samadov, Rustam Safarov is remembered as a symbol of bravery, courage, patriotism. Such people with their discovers, activities, deeds, frankness and valor raised the honor of educational institution in which they studied and they have made known it in the world wide fame.

Today Pedagogical University is the largest institution in our republic showing activity in the field of preparing pedagogical and scientific – pedagogical cadres and is the first educational and scientific institution receiving university statutes among schools.

At the present time more than 7500 students study in the 10 faculties of university. There are students among them coming from some foreign countries. 176 persons upon 28 specialties high professional scientific – pedagogical cadres are prepared in 10 directions of the magistracy of university. In 50 chairs of educational institution 724 professor-teachers train with the instruction and education of young students. There are 135 doctors of science, professors, 395 candidates of science, docents among them. Cooperators of our university are represented in Azerbaijan National Academy, Russian education center, International Pedagogical Academy, New-York Science Academy. There are not a few people be honored with science education figure in professor – teachers stuff, Honored Higher School worker and Honored Teacher. Realizing education reforms successfully adpu benefiting by world experience, steps usefully for integration of education and science to world unity. In the present days new pages are written to the interesting and meaningful history of Azerbaijan State University.

By the line of Pedagogical University till today hundreds of talented youths receiving certificate to life, crossed difficult and trouble way, which their teachers began, at the same time honorable high school teacher, docent, professor, are engaged in education and culture of the kin of teacher had devoted their life to the preparation of the teachers kin by the science-theoretical and practice point of view.

During these years representatives of two-three kin passed on the baton and continued with honor.

Pedagogical university prepared a lot of scientists, public man and developed as a science center. In this high education and science center pedagogic and psychology (A.Y. Seyidov, M.M. Mehdizare, A.K. Zakuzade, M.A. Muradkhanov, SH.S. Aghayev, H.M. Ahmedov, A. Alizade), mathematics (M.R.Afandiyev, M.A. Javadov, I.I.Ibrahimov, M.H.Javadov), physics (A.G.Abbaszade, S.SH.Imanov), chemistry (H.Shakhtakhtinski, SH.A. Mammadov, A.A. Verdizade), biology (Z.M.Shakhtakhtinskaya, A.I.Garayev), history (A.Ubaydulin, I.A.Huseynov, Z.I.Ibrahimov, Y.B.Yusifov), philology (B.V.Chobanzade, M.SH.Shiraltiyev, A.M.Damirchizade, A.R.Sultanly, H.M. Arasli, F.S. Gasimzade, A.M. Gurbanov), philosophy (H.I. Huseynov) and upon the other fields schools and directions are formed and developed.

During last year pedagogical university had become a main center of science of people and scientific pedagogical thought. Cooperators of university have made a useful gift to the development of physics, mathematics, psychology, history and other sciences in republic. Bases of chairs upon the educational methodology separate subjects had been put in aspu that the first

gave education in native tongue among the high schools. Paying attention to the history way of aspu that passed, we may come to a conclusion that it is impossible to consider modern azerbaijan science – pedagogical thought apart from this educational and science center.

At the present time international relations of aspu get a wide scope. University takes an active part in preparing pedagogical and science – pedagogical cadres, for foreign languages, this enlarges the relationship with the high educational institutions of countries.

After the getting independency of Azerbaijan Republic, activity circle of aspu had enlarged any more. In this years aspu signed agreement with turkey, iran, afghanistan, france and other countries, agreed about mutually experience exchange in the field of preparing student, magistrate and post graduate, about cooperating in the field of education and science works.

In pedagogical university one of the main functions, specific features of education culture process is cultivating of young kin in the spirit of patriotism. But with scholastic, pattern culture manners, abstract pedagogical thesis, law and demands, it is difficult to judge the heart of modern youth, the spirit, penetrate its spiritual – psychology world. The most perfect, the most tested way in the culture of civic, patriotism, is the patriotism of tutor and showing love sample to motherland and people. We see clearer, more bright the etalon of this sample in the life, activity, idea, mentality of our national leader h.aliyev. Our language, literature, culture and social-humanitarian thought, rising of our world to the perfect picks, cleaning alien and harmful elements of our national psychology, practice of to base on internal-national factors of in the way of self-realizing, in general meaning national fanaticism - all of these are unrepeatable intellect and cognition lights of emanation of national leader of world azerbaijanis. These lights fill the heart of civil and patriot people, bright on the way of substituting generations, call us to high ideals.

Simple and tireless activity of Haydar Aliyev national leader of Azerbaijan Republic is closely connected with our university. He had come to university 5 times in final 30 year, had given a useful advice to professor-teacher staff and student collective, had given advice and instruction, interested in wish and cares of each young people. Perspectives standing in front of our collectives had been explained widely in program character speech of H. Aliyev. His useful advice had played a deciding role in getting better spiritual – psychology continent choosing cadres in our university and accommodating and culturing, taking out of the faults, in rising the quality and use of education – culture, rising social activity of youths, in preparation of broad-minded scientific and scientific- pedagogical cadres.

Passing developing way more than 80 years aspu being guided by its rich traditions, national-spiritual and national values, to material technical base that we crated in the last years, intellectual potential, international practice, in

20 years of XX century continues successfully the historical mission today in preparing pedagogical and scientific – pedagogical cadres.

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THE EQUILIBRIUM SUPRAMOLECULAR THERMODYNAMICS OF QUASI-CLOSED BIOLOGICAL SYSTEMS. EVOLUTION AND AGING

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Abstract

The law of temporal hierarchies makes it possible to identify quasi-closed systems in open biological systems and to use the approaches of hierarchical quasi-equilibrium thermodynamics to establish the direction of ontogenesis and the evolutionary processes. A short review of the achievements of thermodynamics of biological evolution and aging are presented. The application of the principle of stability of matter to the structures of adjacent hierarchies constitutes additional proof that quasi-equilibrium thermodynamics can be applied to the biological systems in the real world.

Key words: Biological evolution, aging, second law, law of temporal hierarchies, principle of stability, caloric restriction

"One of the principal objects of theoretical research in any department of knowledge is to find the point of view from which the subject appears in its greatest simplicity."

Willard Gibbs

The study of the processes that lead to the origin and development of living systems in terms of hierarchical structures and identification of the law of temporal hierarchies gives reason to assert that the direction of the processes of the development and evolution of living beings can be ascertained on the basis of thermodynamic (thermostatic) principles formulated by the classics of the natural sciences, R. Clausius, J.W. Gibbs and others.

The formation of structural hierarchies in open natural biosystem within the framework of the model of quasi-closed systems can be described in terms of hierarchical thermodynamics (thermostatistics).

In the course of the evolution of open natural systems, each higher hierarchical level j is formed as a result of thermodynamic self-organization (self-assembly) of lower-level, $j-1$, structures. This self-assembly occurs through the stabilization of level j . The latter is connected with the fact that the Gibbs specific function of the formation of structure j tends to a minimum.

The cycle – the relative matter circulation in nature can also be studied from the stand of hierarchical thermodynamics (macrothermodynamics). Fig. 1 presents the scheme of the change of Gibbs function (Gibbs’ free energy of the formation of structures of the biological world). Obviously, the motive force of the *non-spontaneous processes* of the cycle of matter, first of all, is connected with the Sun. In terms of “dark” *spontaneous processes*, the motive force of the self-assembly and evolution of biological structures at all hierarchical levels is “thermodynamic forces.” In conformity with the principle of energy differentiation (and the law of temporal hierarchies), the specific values of Gibbs function of self-assembly (thermodynamic self-organization) at different hierarchical levels differs significantly. Thus, there exist the series

$$\dots \gg \Delta\Delta\widetilde{G}^j \gg \Delta\Delta\widetilde{G}^{j+1} \gg \dots, \tag{1}$$

where $\Delta\Delta\widetilde{G}^j$ and $\Delta\Delta\widetilde{G}^{j+1}$ are the changes of the specific values of Gibbs function of the formation of structural hierarchies j and $j + 1$ calculated for a unit of volume or mass. In other words, the coordinate axes of the scheme presented in Fig. 1 are of different scale in a significant degree.

Gibbs function of the formation of molecules and supramolecular structures as complex systems often coincide, in the conditions of the Earth, with the Gibbs function of the formation of the corresponding simple systems. In view of this, the asterisk in ΔG^* may be omitted.

The law of temporal hierarchies makes it possible to identify quasi-closed thermodynamic systems (subsystems) in open biosystem. It is possible to study their development (ontogenesis) and evolution (phylogenesis) by studying the changes of the value of specific (per unit of volume or mass) Gibbs function of the formation of the given higher hierarchical structure out of lower-level structures.

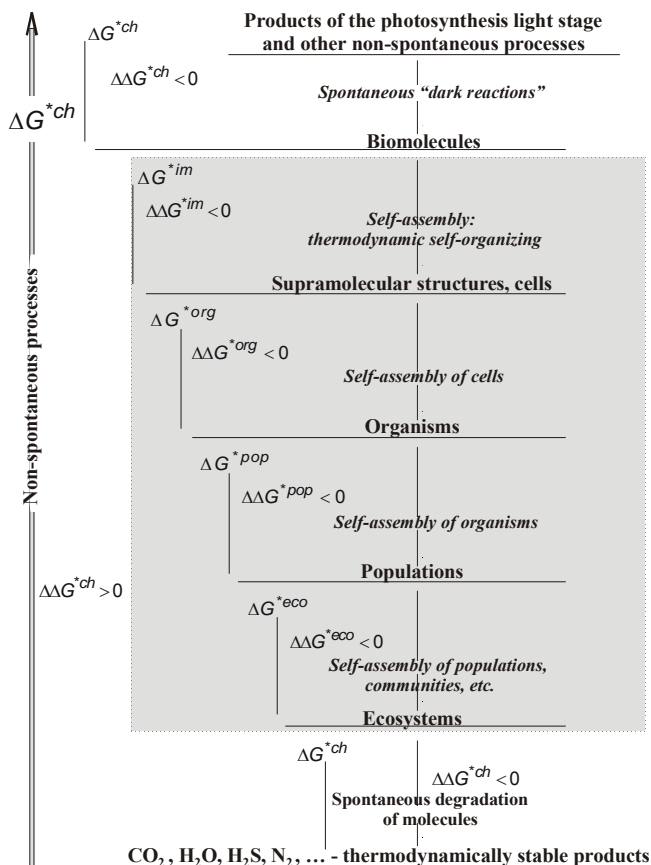


Fig. 1. Scheme of the change of Gibbs function of the formation of complex systems, ΔG^{*i} during the emergence and degradation of chemical (*ch*) and supramolecular structures (*im*), as well as organisms (*org*), populations (*pop*), communities (*com*), and ecosystems (*eco*).

Thus, it was established that in ontogenesis (or phylogenesis), the specific Gibbs function of the formation of supramolecular structures of an organism's tissues, \bar{G}_i^{im} , tends to minimum:

$$\bar{G}_i^{im} = \frac{1}{V} \int_0^V \frac{\partial \tilde{G}^{im}}{\partial m} (x, y, z) dx dy dz \rightarrow \min \quad (2)$$

where V is the volume of the system; m is the mass of the identified micro-volumes; x, y, z are coordinates; symbol «--» means that value \widetilde{G}_i^{im} is specific; and symbol «~» emphasizes the heterogeneous character of the system. Let us note that equation (2) implies taking account of all supramolecular interactions in all hierarchical bio-tissue structures (intracellular, intercellular and others). This is fully justified because the structural hierarchy does not always coincide with the temporal hierarchy. Thus, some types of cells do not divide and, like organisms, age simultaneously with the organism. However, any supramolecular hierarchy ($j-1$) has some higher hierarchy ($j+x$), so that

$$t^{j-1} \ll t^{j+x},$$

where t^{j-1} and t^{j+x} are the mean life times (life spans) of elementary structures of the corresponding structural hierarchies in a living system, $x = 0, 1, 2, \dots$, etc.

The use of equality (2) means, in fact, that we apply the law of temporal hierarchies as:

$$\dots \ll t^m \ll t^{im} \ll t^{organism} \ll t^{pop} \ll \dots \quad (3)$$

Here, t^m (t^{ch}) is the average life span of an organism's molecules (chemical compounds) that take part in metabolism, t^{im} (t^{supra}) is the average life span of any supramolecular structures of an organism's tissues that are renewed in the process of its growth and development, $t^{organism}$ is the average life span of an organism in a population. And t^{pop} is the population's average life span. The series of strong inequalities (3) does not include the life span of cells (*cell*) and some other supramolecular structures. However, this series of course tallies well with reality and reflects the existence of temporal hierarchies in the living systems. The latter rigidly substantiates the possibility of identifying quasi-closed systems (subsystems) in open biological systems.

The thermodynamic theory of biological evolution and the aging of living beings accords with numerous facts and with mankind's empirical experience. A graphic example (Fig. 2) of the accord between theory and observations is connected with the well-known medical recommendation to include vegetable oil and seafood (cold seas) into one's diet.⁵³ These products add "young chemical matter" to the biotissues, "building material" that corresponds to the composition of a young organism. In thermodynamic terms

⁵³ This example may help the reader believe in the effectiveness of the thermodynamic theory when ascertaining the direction of the evolution and development of the living organisms.

(and in the light of known facts), this rejuvenates the organism's tissues. This is easy to see having analyzed the approximate equation — an analogue of Gibbs-Helmholtz equation:

$$\Delta \widetilde{G}_i^{im} = (\Delta \widetilde{H}_{m_i}^{im} / T_{m_i})(T_{m_i} - T_0) = \Delta \widetilde{S}_{m_i}^{im} \Delta T, \quad (4)$$

where $\Delta \widetilde{G}_i^{im}$ is the specific Gibbs function (Gibbs specific free energy) of the formation of the condensed phase of matter i , $\Delta \widetilde{H}_{m_i}^{im}$ and $\Delta \widetilde{S}_{m_i}^{im}$ are the change of specific enthalpy and entropy during the solidification of natural fat (oil), T_{m_i} is the melting or freezing point, and T_0 is the standard temperature (e.g., 37° C) at which the comparison of values $\Delta \widetilde{G}_i^{im}$ is done.

It follows from equation (4) that, at a certain approximation, there should be a correlation between $\Delta \widetilde{G}_i^{im}$ (calculated for the standard temperature) or the indicator of the product's anti-aging (gerontological) value, GPG_i and the fats or oils' congeal (pour or freezing, or melting) point. Let me note that the GPG_i indicator is proportionate to value $\Delta \widetilde{G}_i^{im}$. Indeed, such a correlation does exist. This is confirmed by the known data presented in Fig. 2. We can see that as a rule, vegetable oils have a relatively low pour point and, consequently, higher $\Delta \widetilde{G}_i^{im}$ values (as compared to fats). According to the theory, they have heightened anti-aging value. It is common knowledge that these oils are recommended for use as food during various diseases and to prolong the duration of healthy life. Needless to say, the correlation presented in Fig. 2 can be specified by a strict evaluation of $\Delta \widetilde{G}_i^{im}$ and the GPG_i indicator.

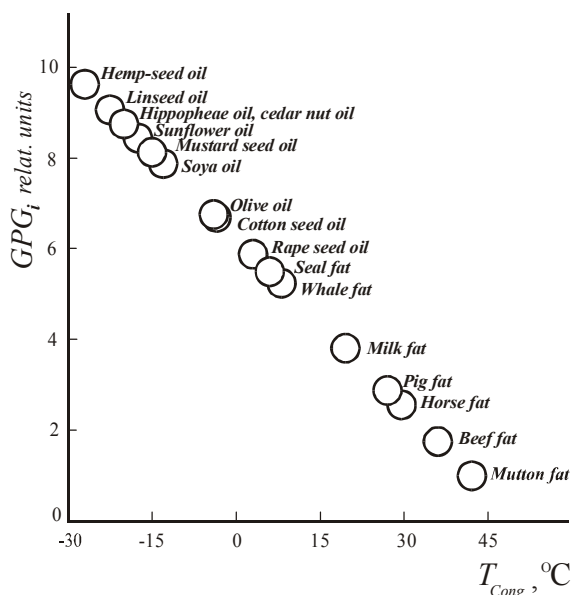


Fig. 2. Dependence of “anti-aging (gerontological) value” of edible oils and fats, GPG_i , on their congeal point, T_{cong} . GPG_i and T_{cong} depend on the environment and age of plants and animals. A ten-point GPG_i scale is used. It is assumed that ten GPG_i points are given to the oil with a congeal point of -30°C ; no points are given to fat with a pour point of 47°C .

The latter's value, as well as a product's congeal point T_{cong} (T_{m_i}), depend on the environment and the age of the plant or animal used as food. To emphasize this point, the data in Fig. 2 are presented as large circles.

Let me note that such calculations are easy to perform in relation to proteins and carbohydrates, as well as the food additives and medicines.

A convincing argument in favor of the thermodynamic theory of aging is a well-known phenomenon, namely, medical recommendations to reduce the caloric intake. In will be in order here to quote prominent gerontologists (Olshansky S.J., Hayflick L., Cames B.) saying in the popular scientific magazine: «Investigators have know for decades that caloric restriction extends life and the duration of good health in all species in which it has been studied, as long as the diet includes enough nutrition for routine maintenance of the body. These findings suggest that caloric restriction might have similar effects in humans». These researchers believe, however, that there is no indicator,

which would make it possible to objectively assess the rate of aging in humans or other species. The thermodynamic theory of aging introduces such an indicator or yardstick, which can help established the degree of aging of tissues in living organisms. This yardstick is the GPG_i index, which is calculated by measuring value $\Delta\bar{G}^{im}$ for various types of tissues. Then the less negative value of $\Delta\bar{G}^{im}$, i.e. the higher the value of indicator GPG_i , the younger the tissue is. Reducing the caloric intake helps keep the value of index GPG_i of human, animal, and plant tissues higher (cf. the scheme of the changes of value $\Delta\bar{G}^{im}$ in the process of aging. This reminds us yet again that nutrition significantly affects human longevity in the state of health. There is reason to believe that gerontologically good nutrition also has a favorable effect on overall longevity.

It is shown that the principle of stability of matter - the feedback principle is applicable to all biological systems (their hierarchies). The core of this principle is as follows: during the formation (self-assembly) of the *most stable structures* at the highest hierarchical level (j), for example, the supramolecular level, nature spontaneously uses predominantly the *least stable structures* (accessible to the given local segment of the biosystem), e.g., the molecular level ($j-1$). It has been quantitatively proved that the principle works at the molecular and the supramolecular levels of the biotissue. There are also facts confirming its applicability to the social hierarchies. Thus, hierarchical thermodynamics of complex systems can help explain the social management techniques developed over centuries, such as “divide and rule”, etc.

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INTER COMMUNICATION MONOAMIENERGETICAL AND PEPTIDERGICAL SYSTEMS OF HYPOTHALAMUS IN THE CENTRAL MECHANISMS OF BIOLOGICAL MOTIVATION

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Breach of homeostase, challenged as factor of outer and inner environment as signal about the opportunities this kind of breach through the high level of regulation activates responsible for adaptation of high regulation systemcenter of body hypothalamus (Meerson 1987). This situation of hypothalamus environmen made CNS is closely related with evolution which is conditioned Unity of nerve and hormonal regulation mechanisms of homeo statistical function of body system – energetic and etc. (Acmaev, 1987, Aleshin 1987).

There is an evidency that endogene peptides takes part. In adaptational compensator reactions of gluco – osmoreseiptors that is in the adapted reaction mechanisms and rational expenditure of energetical substrate and another homeostase in the body as we see the important place is devised to the interrelations between monoamenergetica and peptidergetical terminal systems on the pastisnaptical neuron level.

The main question of this work is to clear up the role of hyphatalomical monoamenergetical and pepdical neuron mechanisms in the realizaton feeding and drinking conduct central mechanisms.

Materials and methods of research. The work is curried on white rats of the same weight (180-250 g) and age which were devided two groups. It included series of experiments. In each one of these series were researched brain and blood from 5 to 10 animals. Control group animals got food and water, but experimentals weren't given the food during the 1,2,3,5 and 7 daily keeping drinking into two ether groups.

In the first animals groups were found maintenance of monoamin in homoegeial of hypothalamus pluorometrical methods (Matlina E. SH., Rahmanova T.B 1967).

In the second series of experiment was researched specific peculiarities of reaction β - LPT and β - endorphin on the feeding and drinking conduct in feeding and stawe animals.

The shown mixed in 3-5 mkl. physiological mortar leaded in lateral stomachs brain to the animals which moves easily in 5 mkg. dose in all cases the practice helded in the deprivation conditions of feeding and drinking and on the background rehabilitation of feeding and drinking regime.

Received data cultivated statistically.

Results of researches. Results of researches (table 1.) showed that maintenance of adrenaline compiles $1,14 \pm 0,17$ mkg/g fresh substance, but maintenance of nor adrenaline $1,57 \pm 0,15$ mkg/g fresh substance.

Table 1.
Maintenance of adrenaline and nor adrenaline in hypothalamus in white rats after different term of feeding deprivation and on the background rehabilitation of feeding regime (mkg/g fresh substance)

Term	Adrenaline		
	M ± m	P	% to contr.
Deprivation			
Living Intact	1,14 ±0,17	0,01	1000,0
a daily	1,14 ±0,21	0,01	127,0
2- daily	1,87 ±0,2	0,001	165,0
3- daily	1,97 ±0,12	0,001	172,0
5- daily	0,96 ±0,14	0,01	84,0
7- daily	0,58 ±0,13	0,02	50,0
Rehabilitation of feeding regime after 5 daily PD			
a daily	0,75 ±0,17	0,02	65,0
3- daily	0,88 ±0,11	0,01	70,0
5- daily	1,40 ±0,28	0,01	122,0
7- daily	1,19 ±0,4	0,01	104,0
Term	Nor adrenaline		
	M ± m	P	% to contr.
Deprivation			
Living Intact	1,57±0,19	0,001	100,0
a daily	2,15±0,19	0,001	136,0
2- daily	2,75±0,4	0,01	175,0
3- daily	2,84±0,45	0,01	180,0
5- daily	1,01±0,17	0,01	64,0
7- daily	0,99±0,13	0,01	63,0
Rehabilitation of feeding regime after 5 daily PD			
a daily	1,14±0,09	0,001	72,0
3- daily	1,11±0,11	0,001	70,0
5- daily	2,01±0,29	0,01	128,0
7- daily	1,49±0,24	0,01	94,0

After daily deprivation maintenance adrenaline and nor adrenaline has a tendencies to growth and accordingly maintain $1,45 \pm 0,21$ and $2,15 \pm 0,19$ mkg/g,

which maintains 125 and 136 % in comparison with control group. On the second day of feeding deprivation the adrenaline maintenance growth up to $1,89\pm 0,2$ mkg/g but nor adrenaline till $2,75\pm 0,4$ mkg/g, accordingly includes: adrenaline $1,97\pm 0,12$ mkg/g and nor adrenaline $-2,84\pm 0,45$ mkg/g accordingly maintain 127 and 180% in comparison with control group.

On the second stage of these experiments studied the content of adrenaline and nor adrenaline on the background of 1-3 daily rehabilitation of feeding regime in the content of adrenaline is observed the tendencies to the growth but this increase is vitally in the comparison with 5 daily feeding deprivation. On the 5th day rehabilitation of feeding regime the adrenaline maintenance and nor adrenaline vitally increases and accordingly maintains 122 and 128% in the comparison with control group. On the 7th day rehabilitation of feeding regime the maintenance of adrenaline and nor adrenaline nearly rehabilitated till control level.

The results analyze of these researches testifies that depending on term of feeding regime there sensitivity of hypothalamus to catechola mine, that is this threshold is regulated with position of free and tied form of adrenaline and nor adrenaline in hypothalamus.

A shown in the table 2 at controlled animals the adrenaline maintenance maintains $-1,21\pm 0,78$ mkg/g of fresh substance but the maintenance of nor adrenaline is $1,49\pm 0,13$ mkg/g of fresh substance.

After daily drinking deprivation maintenance of adrenaline and nor adrenaline vitally increases till maximal level. But the maintenance of adrenaline maintains $2,21\pm 0,17$ mkg/g of fresh substance but the maintenance of nor adrenaline maintains $2,56\pm 0,25$ mkg/g fresh substance. In the comparison with control group. Beginning with the second day the drinking deprivation differs from feeding deprivation in maintenance of adrenaline and nor adrenaline and the other picture is observed.

After 2 daily drinking deprivation maintenance of adrenaline vitally comes down and compiles $0,75\pm 0,11$ mkg/g of fresh substance. That is 125% in comparison with control group. On the third day of feeding deprivation the maintenance of adrenaline comes down and compiles $0,69\pm 0,06$ mkg/g of fresh substance. That is 125% maintenance of nor adrenaline $188\pm 0,14$ mkg/g that is 126% in comparison with control group.

Unusual picture can be observed on the background rehabilitation of drinking regime. On the 1-3 days rehabilitation of drinking regime adrenaline maintenance gets tendention to increase, the maintenance of nor adrenaline is kept on the level of daily deprivation.

Table 2.
Maintenance of adrenaline and nor adrenaline in hypothalamus of white rats after different terms of drinking deprivation and on the background maintenance of drinking regime (mkg/g fresh substance)

Term	Adrenaline		
	M ± m	P	% to contr.
D e p r i v a t i o n			
Living Intact	1,21 ±0,078	0,001	100,0
a daily	2,21 ±0,17	0,001	182,0
2- daily	0,75 ±0,11	0,01	61,0
3- daily	0,69 ±0,06	0,01	57,0
5- daily	0,57 ±0,07	0,01	47,0
7- daily	0,24 ±0,06	0,02	19,0
Rehabilitation of feeding regime after 5 daily PD			
a daily	0,45 ±0,05	0,001	31,0
3- daily	0,88 ±0,09	0,001	72,0
5- daily	1,42 ±0,16	0,001	117,0
7- daily	1,43 ±0,10	0,001	118,0
Term	Nor adrenaline		
	M ± m	P	% to contr.
D e p r i v a t i o n			
Living Intact	1,49±0,13	100,0	100,0
a daily	2,56±0,25	0,001	171,0
2- daily	2,27±0,11	0,001	125,0
3- daily	1,88±0,14	0,001	180,0
5- daily	0,89±0,07	0,001	59,0
7- daily	0,51±0,07	0,01	34,0
Rehabilitation of feeding regime after 5 daily PD			
a daily	0,49±0,07	0,01	32,0
3- daily	0,54±0,1	0,01	36,0
5- daily	1,01±0,08	0,01	34,0
7- daily	1,49±0,24	0,001	67,0
	1,31±0,19	0,01	87,0

increase, but the maintenance of nor adrenaline is kept on the 7th daily water deprivation. Beginning with 5 daily maintenance of adrenaline is restored and in the 10th day of rehabilitation period maintenance of adrenaline is stabilized.

On the 5th day the maintenance of adrenaline is too low and is kept on the 7 daily drinking deprivation level. Beginning with 7daily maintenance of drinking regime we can notice the tendensie to increase and on the 10th day nor adrenaline comes to the level of animals control group.

In this way we can come to the conclusion that the drinking deprivation challenges the more vital changes in the maintenance catekholamina in the comparison with feeding deprivation.

As shown in the table 3 inner brain injection of β -LPT of animals in the average with all choices of experimental objects (15 rats) were escorted in the whole with increase (in the comparison with background) of body mass specific dynamics of the growth (from the 6th day till the 9th day). The whole accepted food and daily diureza, in the increase of received water, the temperature nearly doesn't change.

The more seeming increase of receiving food were seen in the 19th day of observation which comes to the average 16,2, the body mass is also increased and on the 15th day increased to 8,6% the deueza was increased too, to the end of experiment and contained 13%. We have to mention that delegant data masked the real effect of β -LPT to the dynamic of registered index.

The inner stomach leading in β -endorfine to the feeding animals brought to the insignificant growth of body mass, to some increasing of receiving food and water temperature of body nearly didn't change in the 15th day, but decreasing had a tendency to the growth. With this body mass increased in the 15th day average to 7,2%, but the daily decrease come to 32,3% in the comparison with background (table 4). In this way the compared analize of β -endorfine influence to the food water of feeding animals showed that the inner stomach micro injection β -LPT and β -endorfine mainly increases the drinking and feeding activity of animals .

First, increased to the 6 day and then came down which contained the 10,4% difference (Table 5). As in the preceding experiments diligent, dates masked the picture of individual peculiar of animals reactions to the inner stomach micro injection β -LBT. In particular micro injections β -LBT were followed with growth of body mass of animals groups (from15), decreasing of water redwing and increasing of diureza in 8 from 15rats.

While, leading in the microinjection β - endorphin after 3 daily starvation we observed different changes of feeding drinking activity index of animals.

These, while leading in β -LBT the with day after feeding deprivation the received food came dawn which contained nearly 39, 9% water. 165%, but the diaries is increased nearly to 23,7%. Body mass had specific dynamic.

Table 3.

Dynamics of feeding drinking and conjugated vegetable index changes in inner stomach leading in β -LPT saturated rats.

Days and indexes	Background for 10 days	After leading in β -LPT					
		1 st day	3 rd day	6 th day	9 th day	12 th day	15 th day
Quantity A of food (q) B	68±0,41 10,0	1,6±0,22 23,5	4,6±0,49 67,6	6,8±0,42 100,0	7,9±0,58 116,2	7,9±0,28 116,2	7,2±0,29 105,9
Quantity A of water (ml) B	10,3±0,37 100,0	5,4±0,95 43,7	9,1±0,95 88,3	9,0±0,48 87,4	10,8±0,57 104,9	10,3±0,51 100,0	11,0±0,43 106,8
Size of A Diurez(ml) B	6,9±0,91 100,0	7,5±1,05 108,7	5,7±0,87 82,6	6,4±0,52 92,8	7,2±0,51 104,3	7,6±0,38 110,1	7,8±0,23 119,0
Mass A of body(q) B	228,6±3,66 100,0	231,9±3,64 93,6	240,6±4,34 98,0	228,9±4,59 100,1	232,4±5,11 101,7	239,0±5,34 104,5	248,3±5,53 108,3
Temperature (°C) B	39,0±0,05 100,0	39,1±0,08 100,3	39,1±0,08 100,3	38,±0,08 99,5	38,7±0,08 99,2	39,0±0,09 100,0	39,1±0,08 100,3
Marking: A-M ± m, when M- average; ±m arithmetical mistake. B- % in background meaning; *- degree of reliability; *** - P< 0,001; ** - P< 0,05; Quality of food and water together from calculation of 100q body.							

Table 4.

Dynamics of feeding, drinking and conjugated vegetable index changes in inner stomach leading in β - Endorphin saturated rats.

Days and indexes	Background for 10 days	After leading in β - Endorphin					
		1 st day	3 rd day	6 th day	9 th day	12 th day	15 th day
Quantity A of food (q) B	9,1±0,61 10,0	2,6±0,45 28,6	8,3±0,81 91,2	9,8±0,63 107,7	7,9±0,58 116,2	10,9±0,65 109,0	10,9±0,51 199,8
Quantity A of water (ml) B	10,3±0,37 100,0	5,5±0,65 46,2	1,1±0,8 95,0	10,9±0,63 91,6	10,8±0,57 104,9	10,7±0,47 89,9	10,8±0,57 90,7
Size of A Diurez(ml) B	11,8±1,01 100,0	7,3±0,76 112,3	6,2±0,49 95,4	6,46±0,45 101,5	7,2±0,51 104,3	8,3±0,71 127,7	8,6±0,93 132,3
Mass A of body(q) B	5,5±0,59 100,0	227,7±3,93 96,0	230,3±4,72 97,1	239,8±5,64 100,1	232,4±5,11 101,7	248,4±5,81 104,7	254,2±6,61 107,2
Temperature (°C) B	39,7±0,11 100,0	40,5±0,21 102,1	39,9±0,09 100,5	39,6±0,11 99,7	38,7±0,08 99,2	39,7±0,12 100,0	39,7±0,12 100,0
Marking : the same in the table 3.							

The other effects, where found in the result of inner stomach micro injection β -endorfin. In the difference from β -LPT, β -endorfine was followed with decreasing of body mass 31,7%, but on the 15th day after leading in β -endorfine the whole rehabilitation of the lost body mass. Parallel with this consumption of food and water suffered specific dynamic, that is to 15th day was observed decreasing of diureza 49,5% . The temperature of body changed insignificant.

The decreasing of receiving food 12,7%, and water 69,0% was observed (Table 6).

In this way hold experiments showed the high physiological activity of β -LPT and β -endorfine .The received data showed the presentation about functional role of endogene , peptit joining showed also correctness of individual approach to the analyze of inner brain ,neuro-chemical mechanisms of integration motivated excitement differences and selected role of these substances in the transformation processes of metobiological need of body in the conduct acts. Individuality of this act depends on realization of adopted -compensated, meditorial systems of brain (holienergetical and adrenergetical) connected with hormonal systems of hypotolomo-hypovise-adrenergetical, hypotal-triodial , hypotolmo- under stomach systems.

Table 5.

Dynamics of feeding, drinking and conjugated vegetable index changes in inner stomach leading in β -LPT saturated rats.

Days and indexes	Background for 10 days	Feeding deprivation					
		1 st day	3 rd day	6 th day	9 th day	12 th day	15 th day
Quantity A of food (g) B	7,8±0,28 100,0	-----	-----	-----	-----	-----	-----
Quantity A of water (ml) B	10,3±0,3 100,0	1,7±0,30 16,5	1,3±0,15 12,6	0,5±0,16 4,9	-----	-----	-----
Size of A Diurez(ml) B	9,7±0,60 100,0	5,9±0,64 60,8	4,1±0,40 42,3	3,4±0,32 35,1	-----	-----	-----
Mass A of body(q) B	246,2±2,52 100,0	204±3,08 82,9	190±4,01 77,2	176±0,21 71,2	-----	-----	-----
Temperature (°C) B	39,3±0,03 100,0	39,2±0,03 99,7	39,2±0,06 99,7	38,2±0,21 97,9	-----	-----	-----
Rehabilitation of feeding regime							
		1 st day	3 rd day	6 th day	9 th day	12 th day	15 th day
Quantity A of food (g) B	0,3±0,06 3,8	1,6±0,07 20,5	2,9±0,10 37,2	3,1±0,17 39,7	3,5±0,14 44,9	5,0±0,2 64,1	8,2±0,2 118,8
Quantity A of water (ml) B	1,9±0,05 4,8	2,3±0,19 22,3	4,5±0,42 43,7	3,9±0,25 37,9	6,9±0,38 67,0	8,6±0,31 83,6	11,1±0,3 108,7
Size of A Diurez(ml) B	5,4±0,43 55,7	10,1±0,67 104,1	12,3±0,73 126,8	10,7±0,88 110,3	10,6±0,83 109,3	12±0,9 123,7	9,6±0,65 105,5
Mass A of body(q) B	183,1±4,42 99,2	196±5,03 99,5	215±6,31 99,7	225,9±7,21 99,7	227,3±7,36 99,7	220,5±7,0 99,7	239,8±5,44 103,8
Temperature (°C) B	39±0,09 99,2	39,1±0,07 99,5	39,2±0,06 99,7	39,2±0,03 99,7	39,2±0,03 99,7	39,2±0,03 99,7	39,5±0,08 100,0
Marking : the same in the table 3.							

In this case kholienergetical mediatorian system of lateral hipotalamus is responsible for accepting of feeding deficite and linking to the regulation of conduct of central mechanism (out – Lateral zone). But Monoamenergetical responds for safety of informational and energetical potential in maintenance of funkhtional system of all levels. In early term of feeding and drinking deprivation in receiving of deficit food and water an in linking, of central neurokhormonal regulations mechanisms the leading place belongs to kholienergetical mediatorian system of Lateral hipotalamus and Lateral preoptical sphere of hipotalamus.

Table 6.
Dynamics of feeding, drinking and conjugated vegetable index changes in inner stomach leading in β - Endorphin saturated rats

Days and indexes	Background for 10 days	Feeding deprivation					
		1 st day	3 rd day	6 th day	9 th day	12 th day	15 th day
Quantity A of food (g) B	6,3±0,4 100,0	-----	-----	-----	-----	-----	-----
Quantity A of water (ml) B	10±0,28 100,0	4,3±0,74 43,0	2,8±0,42 28,0	2,2±0,52 22,0	-----	-----	-----
Size of A Diurez(ml) B	10,7±0,4 100,0	9,5±1,17 88,8	2,5±0,24 23,4	3,2±0,31 29,9	-----	-----	-----
Mass A of body(q) B	231,7±2,59 100,0	194,5±2,43 83,9	185,9±2,61 80,2	174,3±1,71 68,3	-----	-----	-----
Temperature (°C) B	39,4±0,08 100,0	39,6±0,08 100,0	39,6±0,07 100,0	39,4±0,12 100,0	-----	-----	-----
Rehabilitation of feeding regime							
		1 st day	3 rd day	6 th day	9 th day	12 th day	15 th day
Quantity A of food (g) B	6,3±0,4 100,0	1,8±0,28 28,6	2,8±0,21 44,4	5,5±0,23 87,3	4,5±0,43 87,3	5,3±0,36 84,1	5,5±0,3 87,3
Quantity A of water (ml) B	10±0,28 100,0	3,2±0,56 32,0	3,2±0,62 32,0	5,7±0,41 57,0	6,2±0,43 62,0	5,0±0,37 50,0	3,1±0,47 31,0
Size of A Diurez(ml) B	10,7±0,4 100,0	2,2±0,26 20,6	5,8±0,32 54,2	7,3±0,53 68,2	7,2±0,41 67,3	6,4±0,73 59,8	5,4±0,53 50,5
Mass A of body(q) B	231,7±2,59 100,0	174,1±2,88 75,1	186,7±3,15 80,6	194,4±2,95 83,9	209,1±2,45 90,2	228,1±3,29 98,4	235,4±3,2 101,6
Temperature (°C) B	39,4±0,08 100,0	39,8±0,49 101,0	39,4±0,06 100,0	39,5±0,04 100,3	39,5±0,04 100,3	39,3±0,06 99,7	39,2±0,06 99,5
Marking : the same in the table 3							

The observation of dynamic changes of feeding, drinking and conjugated index of inner stomach leading in β -LPT feeding animals, we explain in this mechanism .On the background of leading in β -LPT nearly during 5-6 days observed (mainly on the 5th day) decreasing quantity of received food and water and the body mass and miureza of experimental animals also decreased. This phenomena we explain with energy saving effects of peptide and mechanisms of negatives reverse relation challenged with dophamin, the content which as seen 18 increased in the hypotolomigical kernels on the background of leading in peptide. Nearly in this way regularly is saved on the background of inner stomach leading in β -endorphine reeding animals.

Results of reseavely of dynamical changes feeding, drinking and conjugated animals vegetative index in inner stomach leading in β -LPTafter feeding deprivation and on the background of rehabilitation of feeding regime showed that quantity of received food and water on control level can't be rehabilitated. And also can't rehabilitate the body mass of animals, but diurese is increased . This phenomenon brings us to the idea that body has special mechanism which is in the substances and controls the quantity of dry substances and ionnic homeostas of body. May there is a level of corelation energetic and water

resources of body. That is why these correlations on the background of leading in β -LPT increases the level of diuroz till 123'75' % in comparison with norme. We have to mention that nearly the same regularity is kept in the dynamic changes of feeding and drinking conduct conjugated vegetative index in inner stomach leading in β -endorphine to the animals which carries 3 days feeding deprivation and rehabilitation of feeding regime.

The regulation with hypotolomus of functional activity of genetic aparatus can received as proved.

Besides, these results lasting researches of C.D.Berdishev and A.S Masluk. (1988) let them to formulate the position of cellular fenome as fene regulation of system with straight and reverse relations through which is realized influence of C.N.S to the most physiological functions of body.(Berdishev C.D., Dubrova U. S., Karpenchuk.K .G.)

All these mechanisms on the feeding and drinking motivation level are included to the regulation glukomestoze in the body, hypotolomical centers, included neurohormonal mechanisms in the regulation of whole body regulates normal fomeostaz in the body. In this processes the main role belongs to the corelation of monominergetical and peptical regulation mechanisms. Which comes to the hypotholomical kernel level. Correctness of these position are confirmed literary (Nicoladis.S, 1981), where shown the starvation and feeding are regulated with products of inner cullar energy, which depends on admittance feeding substracts and hormonal secretion. The last can be defined with taste and the other outostimulators, received with special recipe system and projects on the literal hypotolomus where realized descending regulation in the change processes .The authauher points to the role of nerve element mechanisms of hypotoloms and hormones, which regulates secretary activity of under stomach ferric. This activity depends on composition of product changes and other humoral and nerve signals.

The results of our researches shows that the influence of β -endorfine to the maintenance antidiuretical hormones are conducive to the keeping inner collar water these mechanisms helps to rehabilitate the body mass to the control level, and in the case of change β -LPT in decreasing food and body mass of animals peptides are conducive to putting out water from the cullar structure of body. All these give us the base to think that on the body, cullar and molecular level are the mechanism which controls corelation quantity of dry substances. This mechanism is under the control of genetically determined hypotolomical centers which regulates the level of homo statistical index of body.

In this way on the hypotolomical kernel level the function adrenaline push to the inner cullar mechanism or energy security and energy expense functions of energy nor adrenaline, regulation of nerve mechanism of feeding conduct. In the feeding and drinking conduct cases the function of dfamine and cerotamine is pointed to the realization of central mechanism of negative reverse relation.

But realization of mechanisms is realized which is made with peptide system of hypothalamic kernel.

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BASICS FOR ECOLOGICAL CULTURE

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The state of life in all its forms on planet Earth causes alarm. This condition is unstable. The main source of Today's instability of life on Earth is man and society.

People produce and consume ever greater quantities and in the process look with increased uncertainty into the future. This uncertainty is connected, first of all, with the specifics of the vision of modern man accustomed to seclusion and the narrow horizon — both spatial and temporal

Today modern man uses up his basic energy "here and now" and for his adaptation to modern life. That is why he, like society as a whole, virtually does not have any forces left for his adaptation to life "everywhere and always."

If we look at our modern life from the future, we would see two alternatives. One of them is the aggravation of the conflict between nature and society. Its realization may lead to isolation of the basic forms of life - biological and social - from each other. Social life, as it distances ever more greatly from biological life to retire into itself, may still generate interesting phenomena, for instance, life-imitating automated systems, which turn life from a reality into an imaginary or virtual phenomenon. However, self-isolation inevitably leads public life to self-liquidation. The destruction of social life may also break biological life.

The other emerging possibility is to overcome the disruption of the biological and social forms of life, restore the full-fledged system of relationships between them, which means the formation of the noosphere. The choice is to be made by contemporary generations.

The Notion of Ecological Culture. Culture as a phenomenon

The word "culture" came into the European languages from Latin (cultura - cultivation, upbringing, development, respect). The accommodating volume of this notion is enormous. It means everything that has been created and reared by all people, the sum total of the products of man's activity, social forms of organization and process, It means everything which has been done, is being done and, to a certain extent, will be done since the future of culture is reflected in the present. Culture itself is, in a sense, reflection (it should be recalled that the original meaning of this word is respect) or the system of reflections, which is very complex by its structure. This is a peculiar creative system creating one large and an ever increasing reflective field.

What does this field reflect, what is cultivated with this method of activity, what does society absorb with its help, what is respected and developed? Nature. Culture is a phenomenon which cannot be understood, It is not correlated with nature. It is not accidental that the most laconic and comprehensive definitions of culture include the latter notion.

Culture is the second nature. (K. Marx). It is the second nature chronologically but still, let us note, nature. This is the nature reproduced in the other dimension and by other means - social, which make it possible to recognize the world and, as a result of this reflect, cultivate, educate, respect

and develop it carefully, elaborately and profoundly. As Vladimir I. Vernadsky said, nature cognizes itself by man.

A careful analysis of culture enables us to find in it everything, which can be found in nature, although in a changed and transformed form. Like in nature, there exist in culture centrifugal and centripetal forces, the principle of selection (although not "natural" selection) ensuring the changeability of the system and the principle of the preservation of biological diversity, without which the stability of the system is impossible. So, what is ecological culture? This is the method of life support, under which society forms, with the very system of spiritual values, ethic principles, economic mechanisms, legal norms and social institutions, requirements and the methods of their realization which do not create a threat to life on the Earth.

But the relationships of nature and culture are very complex. This complexity deeply permeates the life of man who acts as a link between nature and culture. Man is both a natural and social phenomenon. That is why both natural and cultural forms of manifestation are characteristic of him. However, it is necessary to take into account the correlation of them: the second form is laid on the first form and permeates it. As a result, man's culture leads him and shapes his nature.

All the most natural man's actions as a living being and a part of the biosphere - during eating, sleeping, movements, reproduction and settlement - reflect and reveal his cultural level. Moreover, as it manifests itself, the level of culture changes (for the better or for the worse) the natural quality: it can express it more clearly, fully, precisely or can distort it. Only the harmonious combination of culture as a phenomenon and its manifestations in man's activity, forms that level of culture which does not contradict the natural qualities but includes, develops and profoundly reflects the latter.

In the process of the cultural study and reflection of life, a transition from the integral to fragmented vision takes place. During the period of the greatest fragmentation and patchiness in culture a new trend emerges in it: there begins a gradual turn from the principle of separate vision of life to the principle of a comprehensive analysis and concentration on relationships. This turn is evidenced most of all vividly by the emergence in culture of ecology or an ecological approach in the reflection of reality.

The essence of renewal introduced by the ecological approach into culture consists in the transition from the analysis of separately studied phenomena to the analysis of the relationships between phenomena, the study of phenomena in their inter-relation and inter-dependence. We witness the ecologization of culture and culture turns into ecological culture. The essence of this transition consists in the elaboration and use of a new way of the harmonization of life - social and biological — through the perfection of relationships between these phenomena.

Conceptions about the basic value, for instance, land, capital, information, have always emerged and formed in culture. Such a value as humanism has acquired a considerable significance in contemporary culture. However, all these values, as it turns out, are not original but derivative, i.e. they are not absolute.

It is life that is an absolute value. Consequently, what helps life and what reproduces life is valuable and what prevents life serves as an anti-value.

The Basic languages of Ecological Culture

The human language is single and multiform. Each form of culture gradually develops its own language concentrated on the reflection of definite phenomena. Science accumulates the results of the work of reason and concentrates knowledge; art accumulates the artistic and figurative comprehension of the reality and morality - the norms of self-regulation, the realization of willingness towards preservation and development.

Ecologisation encompasses all the fields of modern culture. But it is the language of art that has reflected in culture the "foreboding," the "presentiment" of the approaching ecological crisis. It is not accidental that sometimes art is called a conjecture about what science does not know yet. What is typical of artistic creativity is its orientation to the expression of feelings, forebodings, presentiments, integral knowledge, "instant knowledge."

Both harmony and disharmony, order and chaos exist in nature, society and art. Seeking to artistically reflect modern life, modern culture, art shows disharmony and chaos as the most important characteristics. But in this process art supports with its means the trend of society's self-negation.

Science is an important language of culture, which ensures its participation in the reflection and development of the global eco-system. Intellect, the ability to cognize and comprehend is that quality of man which singled him out from the animal world. Cognition creates knowledge, i.e. the reflection of the reality in the form of conceptions, notions, judgements and theories. Knowledge is concentrated and systematized in science.

The role of science increases as society develops. Today the degree of society's level of development is judged, first of all, by the level of the development in it of science and education, and the level of the command of science by its members.

However, from the ecological point of view, the role of science is far from being unambiguous. It can be positive, i.e. it can lead to the strengthening of relationships between the elements of the global socio-natural eco-system, or it can be negative and lead to the weakening and destruction of these relationships.

Two sciences - humanitarian and natural, which have long and profoundly been isolated in modern science as specific styles of cognition and

the development of knowledge, find ways of coming close to each other. Apart from this, science is being ecologised from outside and the interaction of science and other forms of the development of spiritual culture, first of all, art, is being perfected.

Morality is sometimes defined as the "common denominator of human efforts." It is morality, which acts as a system of coordinates making it possible to assess the significance of creativity for culture and for life. It is the sphere of morality where the conception about the sense of cultural events and the sense of human existence is formed.

Morality enables, everyone (and forces everyone) to assess the influence of his actions on other people and the entire world. If a person acts for the sake of others and serves people, this is highly valued by people who surround him and is considered as moral. The basic moral principles are responsibility, serving, solidarity. The issue of the relations of science and art, on one hand, and morality, on the other hand, is topical for ecological culture as well.

Ecological culture cannot be naive. It incorporates all that has been created by man, all the fruits of creative activity. It is the richness of the relationships with all the cultural events that makes ecological culture steady. The style of culture is reflected in manners and morality. Ecological morality, naturally, is impossible without knowledge and images. However, it actively influences science and art and develops internally itself through the expansion of the area of responsibility.

Religion has played an important role in culture in the course of its entire history. Each of the peoples on earth uses religion as one of the forms of culture. Consequently, the religious symbolic system, along with the languages of art, science and morality, acts as an important language of culture. However, it is not easy to rationally determine the functions of this language. The language of religion is most of all closer to the language of morality. However, while moral norms exist and manifest themselves in relations between people, religious belief characterizes the relations of man as a natural, earthly being and God as a supreme and supernatural being.

In the period of the accelerating development of science and the basic forms of culture, the criticism of religion develops ever more actively. The founder of ecology made a considerable contribution to this process. Relying on the evolutionary theory of Charles Darwin, E.Haeckel developed the concept of monism (a viewpoint that all phenomena in the world are one unitary organic whole, a single basis of all the existing things) and organized a union of monists to struggle with the religious world outlook.

However, religion has not disappeared, although the pace of the development of knowledge increases ever more greatly.

The formation of ecological culture and ecological consciousness revive interest in the myth. This is not accidental. The key issue of ecological

consciousness is the conflict- free interaction of society and nature. At the early stages of the formation of society, when mythological consciousness plays a dominating role in culture, society is in the state of an ecological peace, equilibrium with nature and the ecological crisis is not reproduced.

Today the most popular conception about the myth is that of a language used only in archaic and primitive cultures. At the same time, it is evident that myths have existed and always exist in all societies. They are the necessary language of culture, the form of the spiritual assimilation of the world.

The myth is the first, original form of spiritual culture, man' s description of the world, a method of streamlining conceptions about reality. It emerges at a time when culture has not yet developed the language of science and no other languages of culture have been singled out in the general life flow. Everything was united by the myth.

The myth reflects precisely integrity and not fragmentation in spatial and temporal measurement. It performs the functions of ordering and orientation: it enables man and society to overcome complete uncertainty about their position in space and time, find their bearings and develop some orienting principles.

The language of the myth is not alien to modern man either. Sometimes, the language of the myth is used for anti-human purposes to manipulate public opinion. The large influence of the mass media on man can be used for the sake of creating both order and disorder in his consciousness. For instance, a myth can be created that the singers of the Russian pop group "Na-Na" are geniuses. But the conviction of a person (most likely, a young person) in this will not testify to the fact that disorder has been overcome in his consciousness.

Ecological culture does not only regenerate the topicality of the myth but also considerably changes the language of mythology, releases it from archaic backwardness and makes it possible to switch from syncretism to a system. Here the integral vision emerges not as a form of compensation for unknown details but as a form of their streamlining at the new stage of knowledge.

Time of Ecological Culture - the Past, the Present and the Future

The problem of time has a special place in ecological culture. It emerges today not as an abstract philosophic but as a relevant, vital problem, on the solution of which future depends. Will humankind have time? Is there is a reserve of time? How to dispose of time? These questions cannot be resolved without the analysis of the experience of using time accumulated in culture. The enhancement of attention to the future invariably leads to the necessity of the profound analysis of the past.

Ecological culture is not only the modern stage or the development of culture, the culture which is formed under the influence of the ecological crisis.

At all the stages of its development culture performed more or less successfully the function of interaction between society and that is why, in a broad sense, ecological culture as the culture of interaction between society and nature has existed in the entire course of the history of humankind.

The sources of ecological culture need to be looked for in the period of the transition of the global eco-system from the natural to the socio-natural state, during the time of the birth of the social form of life.

After it began, the development of culture could not be stopped. That is why lamentations about progress are absurd. But its ecological expert examination is needed. Once it has been carried out, the expert examination will reveal the trend of the deepening contradiction between nature and society as it develops.

Gradually, after it develops protection from immediate negative impacts, society switches from defence to attack on nature - already at the stage of ancient history.

In this case, the joy of the feeling of its own forces most frequently does not enable society to notice in time and avert the destructive impact it has on nature. The basic vector of attention in culture is clearly shifted from the problems of the interaction between society and nature to the internal problems of social life.

Losing sensitiveness and stopping to be guided by the parameters of life established by nature, civilized man destroyed nature not only around him but also inside himself. Striving for comfort, people destroyed their health - both physical and spiritual. In its desire to achieve independent stability and independence from nature, society has reached today a critical state of its alienation from nature, having thus created the real threat of destruction of the global socio-natural eco-system.

Previously humankind had conflicts with nature but it was not able at that time to be fundamental of life on the planet as a whole. However, beginning with the mid- 20th century, the scientific and technical revolution has been developing in the world and the achievements of science have been used to create a new generation of technology ensuring the intensification of not only physical but also mental activity of people (computers). The growth of the economic might of humankind leads to the fact that the conflict between society and nature reaches an extreme acuteness. Thanks to the use of the achievements of the scientific and technical revolution, man has for the first time felt that he can finally conquer nature. It is at this moment that he begins to perceive himself as part of nature and seeks to overcome this alienation.

It is evident that the last decade of the 20th century will remain in the history of culture as the time of the turn, the change of priorities of the trends and the transition to ecological culture. However, this transition is very difficult. The paradox consists in the fact that virtually all people on earth are not anti-ecologically minded and do not seek to consciously destroy nature. But

the actions of people are antiecological. Consequently, the way out of the situation is to bring their culture and civilization into compliance with the possibilities of nature and overcome destruction in their consciousness.

The analysis of the past helps understand the future. There exist two basic trends in today' s culture: one is towards society's isolation from nature and the other is towards rapprochement, mutual adaptation or co-adaptation of society and nature. The first trend has developed for several millennia. It seems that at present it has reached its ultimate manifestation but it still continues to develop and seeks to find its realization in the future. However, it becomes ever more clear that further isolation of society from nature and the separation of social life from biological one will break the global eco-system and lead to its destruction.

The strategic, i.e. unlimited future, probable for indefinitely many generations of people, is possible only if the other trend - co-adaptation of society and nature - takes the upper hand in the near future. We witness only the birth of this trend in culture. It looks like a revolutionary new trend. However, the previous analysis makes it possible to see that its history is much longer and that most of the history of Homo Sapiens saw people intuitively strive for a union with nature and for complementing co-existence with it.

The space of ecological culture

Ecological culture changes not only in time but also in space. The fact that it is people who reproduce it does not necessarily mean that they reproduce it equally. On the contrary, ecological culture is extremely diverse. This diversity is an indispensable condition for the health of the system. The point is that culture, as we remember, is the second nature and the principle of diversity also works in it. The reduction of this diversity serves as a common criterion of ecological degradation — both for natural and socio- natural eco-systems.

The diversity of ecological culture is generated by the diversity of socio-natural eco-systems, which form the global eco-system.

The diversity of natural conditions on the Earth' s surface is enormous. The peculiar character of life-generating nature determines the specific features of culture, which is formed within a specific space, and a special style of the development of the said space by the people living in it. This style determines the hierarchy of values, the forms of man' s activity, through which society reproduces itself and the entire eco-system.

Diverse forms of the reproduction of social life serve as the basis of its stability. Although the laws of nature are universal and single for Russia and Japan, Brazil and Greenland, the diversity of nature requires from peoples the elaboration of a specific culture as a method of interacting with their peculiar part of the biosphere. Uniqueness as the universal quality of nature is also reproduced in the second nature - culture.

The space of life - biological and social - and the life of the entire socio-natural eco-system is integral but not structureless. The poles, opposite and extreme images: "South - North" and "East - West," which first appeared in the natural eco-system and found their most expressive form in the life of culture, can be seen in it.

The division of the socio-cultural space into the East and the West has until recently been discussed more frequently than the division of the global system into the South and the North. This is not accidental. Most of so-called civilized peoples both in the West and in the East were concentrated in the North. They largely were busy with the analysis of their "internal northern" problems. At the same time, in relation to the South, the most barbaric concepts (from the viewpoint of ecological culture) with roots in colonial traditions have continued to dominate almost to this day.

But in the context of the current ecological situation, there is an increasingly evident need not only to produce an assessment proceeding from Europe's centrist positions but also to study profoundly and objectively the problem of the South, the specifics of the reproduction of this most ancient part of human culture.

To understand the South means to understand how society can master boundless space and time. Here the precision of the analysis sometimes looks simply absurd. In comprehending the socio-cultural changes in such temporal and spatial extent, even science is more likely to use the language of the myth than the language of figures.

The relations between the South and the North, the East and the West of the global eco-system are complex and contradictory. But in modern conditions it becomes evident that the deepening asymmetry in this system is fraught with a catastrophe and, consequently, is inadmissible. Each society strives for preserving its diversity and its independence — for self- preservation. At the same time, all the peoples of the world interact; they cannot and most frequently do not seek to fully isolate from each other.

Complex (geo-bio-social) nature of man as the source of the diversity of his ecological roles

Since everything is inter-related in the eco-system, the condition of each of its element reflects the condition of the system as a whole. It is evident that man as a phenomenon comparable by its complexity with the system as a whole reflects the state of the eco-system most comprehensively and completely. That is why the ecological crisis is considered in close relation with the anthropological crisis.

Man is the crossroads, the junction of all relationships fastening the world together. All the contradictory sides in reality conflict and complement each other in it. It is not accidental that ancient people called it micro-cosmos.

Man is a free being. He can act as he considers necessary. This is the main complexity of his role in the life of the eco-system. The main problem in the life of man is how to use this freedom. The ecology of man cannot but touch upon this problem and consider the combination of the principles of submission and independence in man's activity, the principles of freedom and responsibility.

Consequently, the ecological analysis of man is focused, first of all, on considering his inclusion in each of the three basic subsystems of the socio-natural eco-system, the geo-, bio- and socio-subsystems, his adaptation in them and, secondly, the research into his influence on each of the three subsystems and the entire eco-system as a whole.

Man is an earthly being. This seemingly decrepit, customary truth must be comprehended anew today. A man never gives up the "hunt for a change of place." The free search leads him so far away in such improbable micro and macro-worlds that the concept of his own inseparable link with the earth and its geosphere is weakened in his mind. Meanwhile, it was back at the time of the ancient Greek mythology that the image of the pernicious nature of the destruction of the relationship with the earth - Antaes emerged. Giant Antaes, the son of Poseidon and Gaea, remained invincible as long as he could renew his strength by touching the earth but he was defeated by Heracles who held him off the earth. For any person, it is pernicious to "take off the earth."

Man is adapted to life in the specific conditions of height, lightness, humidity and gravitation. Deviations from the pressure typical of the sea level, changes in the partial pressure of gases participating in the breathing process, the high or low level of solar radiation and the lack of gravitation cause the development of a number of adaptive characteristics. In the conditions of zero gravity, man's organism adapts itself to the lack of gravitation, the hydrostatic blood pressure.

Man is a living being, a part of the biosphere. However active his role in the reproduction of life, to understand it, it is necessary to study the biological fundamentals of the social phenomena, to study the biosphere.

Man's influence on the biosphere is extremely ambiguous. In the conditions of the aggravated crisis in the relations between nature and society, negative features become ever more noticeable. Their systematization makes it possible to distinguish the following basic feature: modern man, whether he influences flora or fauna, virtually invariably reduces the diversity of life, standardizes it and singles out monopoly species. The reduction diversity, as we know, is the sign of the weakening and degradation of the system. An ecologically cultured person seeks not to deceive nature - both outside and inside himself; on the contrary, he wants to correspond to it accurately.

Man is a social being. Without society, without the socio-sphere he cannot become a personality, the carrier of culture. This is confirmed not only by abstract considerations but also by real experience. Consequently, man must

adapt himself to the socio-sphere and correspond to it. It is this social adaptation that requires the greatest efforts from man.

Man's adaptation in society is carried out through the transfer of experience and culture to him, i.e. through socialization (socialization is the transfer of the experience of the species to the individual) and through the self-development of individuality.

As the socio-natural eco-system develops, not only the relations of society and nature but also the relations inside society - between people - change. Every person acquires an ever greater number of peculiar features and becomes to a larger extent an individual; he develops his independent behavior and his freedom:

The striving for freedom is typical of a human being. But what does freedom mean from the point of view of ecology? Freedom is the overcoming of dependence, the breaking of chains restraining human activity. Man is a bio-social being. He depends both on nature and society. The desire for freedom often impedes the comprehension of this inevitable dependence.

In striving for freedom, modern man sometimes achieves its limit and gets himself into the situation of full independence, which simultaneously turns into the situation of complete loss and the fall-out of the system of life reproduction. Then man again looks for ties, dependence on others, responsibility for others, his fixed position in the world.

N.A. Berdyaev defined man as "a being capable of outgrowing himself." But the question is - in what direction. Does he become freer or *more* responsible? The way out of the crisis of man and the eco-system is for the person to find the proper combination of the principles of freedom and responsibility as the basic regulators of activity. Once this combination is found, the logic of behavior in every specific situation becomes clear.

The Spheres of the Manifestation of Ecological Culture

The problem of social equality or inequality in culture and in public life has always been paid great attention to. The greatest thinkers of the ancient world and later periods proved that the inequality of people in society is inevitable. But the idea of the unfairness of inequality and the desire for social equality appeared again and again in the minds of people.

This eternal dispute is reproduced today in the field of ecological culture as well. Here it is resolved through the idea of stability. Full equality of the elements of the system is identical to the lack of diversity and, correspondingly, to the reduction of the stability of the said system while full inequality is identical to the complete destruction of the ties between the elements of the system and, consequently, is also a variant of extreme instability.

Today poverty is the source of ecological danger, the same as egoistic wealth. Moreover, developed countries increasingly become ecological debtors while developing nations lend health to the rich ones. The point is that the system of reproduction is most of all loosened and broken precisely in the developed countries. Therefore, in terms of ecology the richest turn out to be least of all stable ecologically. At the same time, however, material wealth, no doubt, gives the possibility to step up the environmental policy and also render assistance to developing countries.

The complex structure of society is reflected in the basic social roles of personality. Labor is man's activity, in the process of which he uses nature to satisfy his needs. Mental work is a form, which is already rather separate from nature (as compared to manual work). At the same time, it is this mental work that reflects man's willingness for creation and perfection of the conditions of culture reproduction, the liberation of cultural creative work from the obtrusive diktat of material requirements, from the chaotic impact of non-governable social movements, from the loss of what has been achieved in culture by ancestors.

The isolation of mental work, its release from the mass of manual work made it possible to sharply intensify human labor as a whole with the help of technology.

Technology facilitates labor. But this facilitation does not always positively influence the essence and the content of labor activity and the purposes of human labor - self-realization.

Today it is ever more clearly seen that the refining of labor and its almost complete riddance from the use of physical, muscular energy of man do harm to the physical and spiritual health of people. From the viewpoint of ecological culture, it is quite obvious that the unlimited growth of requirements (consumption) is harmful for life as a whole. That is why the notion "the quality of life," "worthy life" lose in this respect any sense.

Risk and security in the ecological context

Instability, danger, risk cannot be fully excluded from the process of life reproduction and the development of eco-systems. Any of the three basic subsystems can be the source of instability: non-living nature (an earthquake or a comet, for instance), living nature and the second nature - culture created by people (anthropogenic accidents, catastrophes). However, an ecological danger normally means the probability of the destruction of life turnover which comes from society and errors in human activity. This is understandable. It is humankind that displays the greatest activity in changing the socio-natural ecosystem. And activity is always linked with risk. Striving for improvement, man very often achieves the opposite result.

Why is the result of this actions deplorable and sometimes disastrous even when man is guided by good intentions? This is because he uses the incorrect, narrow or wittingly distorted system of coordinates and the definitions of the good and the bad.

In improving the subsystem and failing in the process to take into account the possibilities of this system we, most likely, increase the instability of the entire system.

Two approaches to the problem of decreasing the ecological risk and ensuring security are singled out. The first and still the most wide-spread method is the struggle not with the causes of the emergence of the super-risk but with its consequences. This mending of holes is a necessary preoccupation but it does not eliminate the source of instability

The second approach - the analysis and the elimination of the reasons of the super-risk - is being formed today. It is based on ecological culture, the actualization and development of conceptions about the systematic nature, integrity of life reproduction and the objective and non-removable dependence of the social life on the state of the living and non-living nature. The necessary increase of the safety of life reproduction can be achieved only with the change of all the forms of social activity based on ecological consciousness.

The Role of Ecological Culture in Ensuring the Perspective of Transition to Sustainable Development

Modern Russian philosopher V.S. Bibler defined culture as the way out of the hopeless peripeteia of human existence.

None of the contradictions of the development of modern society, none of the peripeteia, in which man's modern life has found itself, looks so hopeless, so threatening as the ecological contradiction. It is human activity, culture that has created this contradiction. Only culture - the change of the spiritual foundations of activity, conceptions about the valuable, significant, accidental and inconsiderable — can open the way into harmony with the entire eco-system, out of the current abyss, in which modern humankind has driven itself.

The situation, which within the framework of the old scale of values looks as absolutely hopeless, as the end of history, is presented from the ecological viewpoint as undoubtedly complex but extremely attractive with respect for the possibility and the necessity not simply to repeat what has been done but also to create new forms of culture, new algorithms of its development (given the preservation of the tie with the traditional forms, of course),

The understanding of the ecological conflict itself, the conflict between society and nature is also being changed. It is already considered not simply as a misfortune but as the inevitable condition of the relations between the two

basic subsystems of the socio- natural eco-system at the stage of its transition to a mature state.

Of course, to find a direction of getting out of the crisis and to get out of the crisis is not one and the same thing. A great number of extremely difficult problems will have to be resolved. The most serious, further analysis is needed to study the problem of the combination of laws and the pace of the development of the biological and social life, the problem of the combination of the geological, biological and social time.

So far, one can only guess about the volume of future work which man will be required to do to restore largely broken ties with culture and the eco-system and preserve them. It is clear that this work will require from man great cultural and emotional efforts. In actual fact, this means the formation of intelligence as the determining feature of every individual, i.e. the ability to understand *more* than what is profitable. The form and the content in the formation and activity of a person are inter-dependent; his life and existence, the sphere of everyday interests and the sphere of meanings, external and internal life are directly linked. That is why the assimilation of ecological culture, the culture of thinking inevitably leads to the change of man's individual needs. Thinking ecologically, man will act ecologically as well. So, we cognize ourselves ecologically. And the rest is up to you.

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POLYPARAMETRIC METHOD AS A NEW TECHNOLOGY FOR EVALUATION OF HUMAN HEALTH STATE AND AUTONOMIC STATUS UNDER STRESS

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Objectives

Global transitions of the habitat takes place so fast that a human body has no time to adapt to it, to retain good health and homeostasis. A variety of unfavorable effects upon the organism (environmental stress-factors of physico-chemical nature and psychosocial stress-factors affecting the emotional, behavioral, mental and physiological mechanisms) often surpasses adaptation ability of man and firstly leads to stress-induced functional autonomic disorders and secondly – to psychosomatic illnesses. Initial stress manifestations are associated with dysbalanced interaction of functional systems and autonomic regulatory effects that makes very relevant elaboration

of new technologies for revealing earliest symptoms of maladaptation and distress.

The current knowledge about regulatory mechanisms of visceral functions for understanding of the general functional state of a human organism and development of adaptation processes [2, 15] allows assuming that the balance of interaction of sympathetic and parasympathetic autonomic systems is a primary basic condition for sustaining the adaptation processes and functional state of the organism. Any disorder in this interaction is the earliest signal of the failure of adaptation processes and stress development [5, 9, 13, 14]. Therefore, the assessment of a functional state of the organism as a whole could not be based either on individual indicator or on a number of indicators. Such assessment requires a set of representative signs reflecting the condition of the autonomic system, with simultaneous determination of the functional level of vital systems of the organism [20, 21]. For this purpose the diagnostics of autonomic diseases was developed and extensively practiced with detailed questionnaires as well as unified schemes containing a list of symptoms and pathognomonic signs characteristic of sympathetic and parasympathetic dysfunction [1, 9, 10, 12, 13, 21]. However in the preclinical diagnosis of autonomic dysregulation in the process of adaptation syndrome development the use of pathognomonic signs is limited or completely impossible. It is clear that there is a need to search for new approaches in order to single out objective signs and to describe preclinical states of organism [1, 11, 17]. One of the promising approaches of examining the most complicated dynamic objects is a system approach [19] founded on pattern recognition methods [8]. As is known key elements in pattern recognition are, firstly, the choice of representative signs and, secondly, a decision-making process to obtain the classification results.

In terms of the pattern recognition theory the tasks of research on the functional state and autonomic status of the organism under stress can be formulated in the following way:

- selection of necessary and sufficient amount of adequate signs for the multi-parameter description of the various functional states, verified by a clinical and physiological examination;
- elaboration of decisive rules for classification of polyparametric (multiple) data.

The formulation of such tasks rests on the experience obtained through the use of visualized patterns and graphic modeling of functional states of the organism under activity of physiological substances [6]. To resolve these tasks at the first stage (1) of research the clinical and physiological examination of groups of workers with evaluation of their functional states and autonomic status by clinical physiological and polyparametric methods were carried out. At the second (2) stage the evaluation of autonomic status under different stages of adaptation processes was conducted. At the third stage (3) a

comparative research of a health state of students by polyparametric and clinical physiological methods were carried out.

Methods

1. In the first experimental series 445 employees of the electronic plant (aged 19 to 45) were examined. The clinical examination included a recording of personal characteristics and anthropometric data, registration of ECG in 12 leads. A special procedure of gradation of ECG changes on the preclinical diagnostic principles, without pathognomonic meaning was developed [1, 11, 17, 21]. Cardiologists made a special examination and that of the state of the autonomic system by neuropathologist who applied a unified scheme practiced in medicine [21]. The analysis of the clinical physiological examination results was carried out on the principles of preclinical diagnosis in order to single out the groups with insignificant, substantial and pathognomonic changes of physiological signs. On this basis, four groups of persons were formed according to stages of adaptation syndrome development: stages of satisfactory state, strained, overstrained functional states (premorbid) and failure of adaptation processes – stress stage [1, 15].

The parallel polyparametric examinations (in a span of one–two days) were also conducted: recording of electrocardiogram (ECG, standard leads), rheovasogram (RVG of the forearm), pneumogram (to measure respiratory rate), arterial blood pressure (systolic and diastolic) and body temperature. Registration of all indices was carried out simultaneously for 1 min. The patient was at rest, in a half-lying position in a chair of special design with built in sensors. All tests took place from 11 a.m. till 1 p.m. For a matrix description of the states, a unified set of the most representative amplitude and time electrogram parameters was used (fig. 2). The selection was made on the basis of previous experimental and clinical research and mathematical analysis [6]. To analyze and interpret the results of the researches statistical and classification algorithms of the pattern recognition were applied. The analysis procedure was the following: primary processing of electrograms; their parameterization; matrix description of the state on the basis of the standard set of test parameters; statistical processing and construction of visualized multivectoral spectrum as "a state pattern"; it's classification and interpretation according to constructed model of "ideal functional state".

2. In the second series 79 persons of the electronic plant were tested with the polyparametric method of the evaluation of autonomic status under different stages of adaptation processes. A neuropathologist checked the same 79 persons to assess their autonomic status. The neuropathological, clinical, physiological and polyparametric examinations were made independently and the results were compared by "double blind" method. In cases of discrepancy between polyparametric conclusions and clinical examinations the preference

was given to the latter, frequently with repeated examination by the neuropathologist.

3. At the third stage of research for the aim of approbation and comparison of polyparametric and clinical physiological methods, 250 students (129 women, 121 men, aged 18–24) were examined from 11 a.m. till 2 p.m. at the Polyclinic of the Moscow State University by two diagnostic complexes. Clinical-physiological examinations were carried out by complex «Mediana» (Ukraine). Syndrome analysis of ECG, ECG changes by Minnesota code and the following hemodynamic indices were made in automatic regimen: - stroke volume (SV, ml), cardiac output (CO, l/min), cardiac index (CI, l/min x m²), stroke index (SI, ml/m²), mean dynamic arterial pressure (MDAP, mm Hg), - general peripheral resistance (GPR, din × cm – 5 × sec), specific peripheral resistance (SPR, din × cm – 5 × sec/m²), reographic index (RI, Ohm), anacrote time (An, sec), catacrote time (Ct, sec), time of blood release from the left ventricle (Te, sec).

Statistical description of physiological parameters of the students was carried out by the program “S-Plus 2000 professional” with a definition of the mean and error ones, dispersion, standard deviation, median, quartile. Normal data distribution was controlled by a histogram. To compare values of parameters of different classes of functional states, criterion χ^2 (criterion of agreement) was applied. To assess the quality classification on the basis of patterns recognition and decisive rules a discriminative analysis with a definition of general intercluster Machanalobis distance (D2), level of mean ($p > 0.05$) was used.

Results and Discussion

At the first stage of examination of the clinical and physiological results two groups of persons were singled out: 1) virtually healthy with out significant or pathognomonic signs of dysfunctions, 2) patients with substantial signs and symptoms of neurocirculatory dystonia with hypo- and hypertension and other signs of dysfunction.

The Patterns of Functional States. From the group of healthy persons those with each parameter close to mode (Mo) were selected in a modal class. The level of the functional state of these persons class was satisfactory. Their parameters were taken for the construction of a model standard of the satisfactory state (“ideal” functional state).

Short description of the intelligence imaginative model for the satisfactory functional human state (optimal adaptation to environment)

As alphabet for description of the standard functional human state we have used a unified set of parameters of electrophysiological signs of the modal

class. Absolute quantity parameters are presented as vectors in polar coordinate (fig. 1). Each parameter has its own scale, determined by a modal level (middle circle). A contour limited by maximal and minimal meanings of parameters without pathognomonic signs (extra- and intra circumferences) is an intelligence transformer, making analysis and classification of every parameter and the whole shape in accordance with the principle of multiparametric regulation of homeostatic functional systems [17,18]. The active part of the intelligence transformer also provides additional signs – relationships of parameters with performance of new knowledge about subject, new signs of the preclinical dysfunction connected with autonomic neurosystem of the organism. The changes of sympathetic or parasympathetic regulation are reflected in a displacement of pattern (dotted circumference on fig.1) to the left and to the right accordingly.

A complex of physiological signs is presented to a physician as a visual graph of a functional individual state to make clinical analysis of multi-dimensional data. As example the document of polyparametric examination is presented on fig. 2.

Interpretation of changes in parameters is based on the accumulated data of multifunctional human states [3, 4]. The more detailed description was represented in the monograph [5]. As it turned out, the parameters of all persons with satisfactory functional state were not only within the limits of the ring but the outlines of the multi-vector spectrum had a more or less regular circuit (fig. 2, 1).

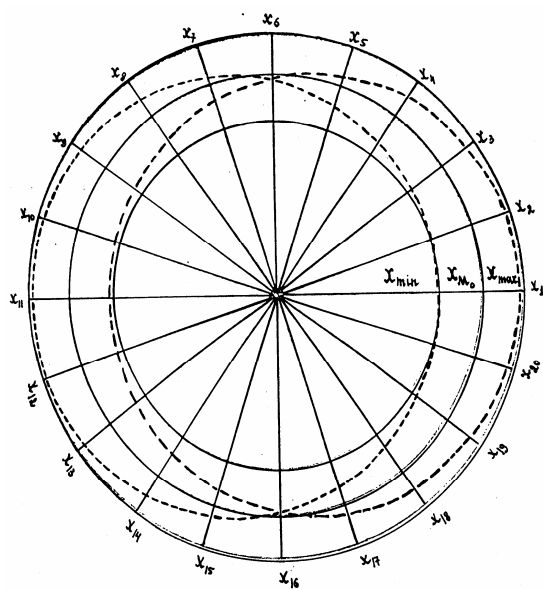


Fig.1. Model of "ideal functional human state". (Vectors $X_1 - X_{20}$ are electrophysiological parameters, marked in the fig. 2; the method of construction – in the text).

Further analysis of a group of persons with insignificant signs of dysfunction (strained functional state) showed that the parameters of the subjects of this group insignificantly differed from the modal class. The vector tips remained within the limits of the ring. However the multi-vector spectra of the people of this class showed some disorders in the correlation of parameters and their outlines. In other words, the state patterns had irregular contours. A typical example of the strained functional state with insignificant deviations of the parameters is illustrated on fig. 2, 2.

The persons of overstrained functional state (the group with substantial change of signs – class 3 – unsatisfactory adaptation stage) had substantial and diverse deviations of parameters from the modal level. These deviations had no pathognomonic meaning from the clinical diagnostic viewpoint. The multivectoral spectra of these subjects were characterized by a considerably greater imbalance in the parameter relationship. A typical example of this kind of test is shown in fig. 2,3.

The class of stress, i.e. adaptation failures, included a group of patients with different symptoms of neuro-circulatory dystonia and initial stages of hypertension. The pattern states of subjects of these groups had multi-vector spectra with sharp imbalance in the relationships of parameters. A typical example is shown in fig. 2,4.

Proceeding from polyparametric examination, every examined person received a geometrical interpretation of his/her state. The distribution of the results of examinations according to the above specifications is given in table 1.

The clinical, physiological and visual analysis of patterns of functional states revealed four main classes corresponding to the stages of adaptation syndrome.

The preservation of a certain correlation of the given set of parameters is an invariant characteristic of the satisfactory state class. Their absolute values remain within the limits of the square ring. This is graphically presented in the form of outlined "pattern state" that is more or less close to the circle.

The deeper the adaptation syndrome the greater the imbalance of the parameters and their pattern state takes a distorted shape. It means that the parametric correlation of indices of vital physiological functions is a supplementary diagnostic sign of changes of a human functional state. On the basis of decisive rules and a set of PC programs, a commercial product "Polyparametric apparatus-program complex" for diagnosis of health state has been elaborated.

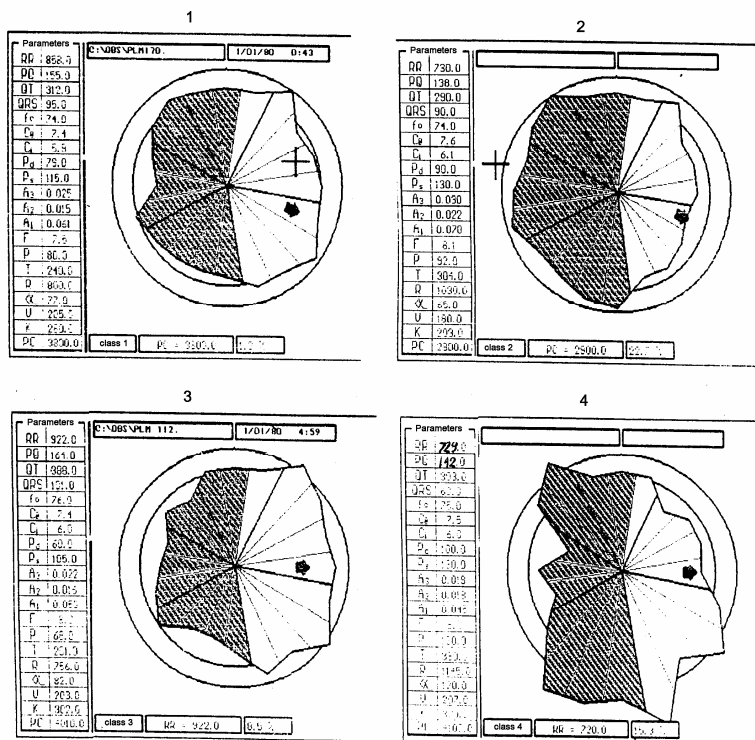


Fig. 2. Patterns of individual functional states (absolute meaning of parameters is presented on the left; time parameters (light vectors) – msec; amplitude (shaded vectors): ECG, EMG – μV ; RVG – Ohm, BPs and BPd – blood pressure systolic and diastolic – mm Hg; Ce and Ci – temperature external and internal, $^{\circ}\text{C}$). Every vector corresponds to one parameter, counted out "three o'clock"). 1 – satisfactory functional state, 2 – strained functional state, 3 – overstrained functional state, 4 – stress. The degree of changes in parameters and their relationships are shown in classes of functional states (below every document).

Table 1
Distribution of examinational results of workers according to classes of functional states and adaptation

	Classes of functional states			
	1	2	3	4
Number of persons	105	102	85	62
Errors of reclassification	0%	12%	15%	6%

Polyparametric Description of Autonomic Status

Since the above parameters allow to characterize the basic autonomic regulatory mechanisms, the multi-vector spectra of different functional states can be regarded as a syndrome complex of patient's autonomic status under environmental stress. The differences in the character of changes in the parametric relationship under various functional states allow the definition of two major types of changes corresponding to two basic types of autonomic syndromes and a few intermediate ones.

The first type of autonomic syndrome is characterized by a decrease of ECG intervals. The amplitudes of *R*, *T*, *P* waves do not change at all or slightly increase against the standard mode level. One can also observe an increase of SBP and DBP, blood saturation rate, and decrease of time of retardation of pulse wave and pneumocycle duration. The body temperature remains at the mode level or can be slightly higher.

In the pre-morbid state the hyper-dynamic signs of hemodynamic dysfunctions are, as a rule, more evident. They are assessed by the total sum of signs including systolic and diastolic blood pressure, duration of blood ejection from the left ventricular, blood vessel saturation rate, retention of pulse wave etc.

The evaluation of these results from the view of sympathoadrenal activation repeatedly described [12, 20] as a strained and overstrained syndrome of sympathetic system allows to single out invariant signs of this type and to form a pattern as a typical syndrome of a sympathetic strain of autonomic nervous system. The reduction of temporal and the increase of amplitude parameters first and foremost, characterize the generalized pattern of this type. It shifts the pattern slightly to the left (fig. 1, dotted circumference). This kind of shift within the limits of the circle and without disproportion can be observed in healthy people under moderate physical and emotional stressors. It corresponds to the hyperdynamic syndrome (in analysis of cardiac cycle).

Under strain such a shift is accompanied by a noticeable imbalance in interparameters relationships (fig.2, 2). The substantial violations of parameters with a graphic shift to the left can be noticed in cases of neurocirculatory dystonia or hypertension.

The second type of changes in parameters and their correlation is quite opposite to the first one. An increase of ECG and RVG temporal parameters and drop of arterial pressure characterize it. The body temperature, as a rule, is on the low level of the norm. The nature of these changes confirms the rising of parasympathetic activity [12, 20]. The typical example for overstrained functional state is given on fig. 2, 3. At the final stages of adaptation syndrome this type of change, is defined as generalized vagotonia, with more or less

distinct hypotension and other hypodynamic signs in haemodynamics.

Although the generalized pattern is rather schematic, it visually reflects the basic direction in changes, which helps to define the nature of autonomic regulation of the main physiological systems.

Various disorders in the interaction of sympathetic and parasympathetic parts, with local predominance can be attributed to the mixed types of autonomic regulation.

One type of syndromes is characterized by deviation of cardiac component towards the increase of the sympathetic influence, while in the vascular component this influence decreases (fig. 2, 4). Another type, vice versa, is characterized by the increase of sympathicotonia in the vascular component and parasympathicotonia in the heart.

The results of the polyparametric analysis of the autonomic status under stress is depicted in table 2. Thus, a conclusion can be made that half of the persons examined suffered from an autonomic misbalance of the local character. There is less difference in the evaluation of the gravity of dysfunction (4 class).

Table 2

The results of clinico-physiological (1) and polyparametric (2) examinations of worker’s autonomic status and the level of adaptation

Functional states		Distribution in %	
		1	2
1 class – satisfactory state	Normotonia (autonomic balance)	13	8
2 class – slight autonomic dysfunction	Sympathicotonia	7	5
	Vagotonia	12	6
	Mixed	6	15
3 class moderate autonomic dysfunction	Sympathicotonia	10	7
	Vagotonia	13	10
	Mixed	9	19
4 class stress, significant autonomic dysfunction	Sympathicotonia	11	6
	Vagotonia	13	7
	Mixed	6	17

The results obtained so far do not allow make a definite conclusion as to the exact role of concrete signs in formation of spectra. It is evident, however, that individual differences of the patterns are significant. It means that the number of combinations of the changed signs and the variants of

various transitions can be high. The analysis of individual pattern variations revealed that they could be satisfactorily systematized into major classes of states in relation to the principal space-time characteristics of a standard model. The understanding of the nature of changes in the vectors enables us to estimate the extent of deviation from the model as from the level of balanced relationship of the sympathetic and parasympathetic parts of autonomic system.

The results of the polyparametric examination of students

The results of the polyparametric examination according to the classes of adaptational states showed that 44% of conditionally healthy students during their semester are in a state of overstrain and 40% in adaptation failure according to the classification of stages of adaptation development process.

It is shown that for all parameters the distribution is normal (or close to normal). The control of differences in absolute values of parameters in the neighboring singled out classes of functional states by χ^2 method showed a statistically significant (when P=0.05) difference in distribution of choices (table 3).

Table 3
Differences in parameters of state classes by criterion χ^2

Classes of functional states	Criteria χ^2	Meaning
4 – 1	113.6	0.001
4 – 2	82.5	0.001
4 – 3	33.95	0.0034
3 – 2	26.35	0.034
3 – 1	44.86	0.001
2* – 1	37.85	0.009
2* – 1	97.25	0.001
2 – 1	14.54	0.48

* – quartile of 2 classes.

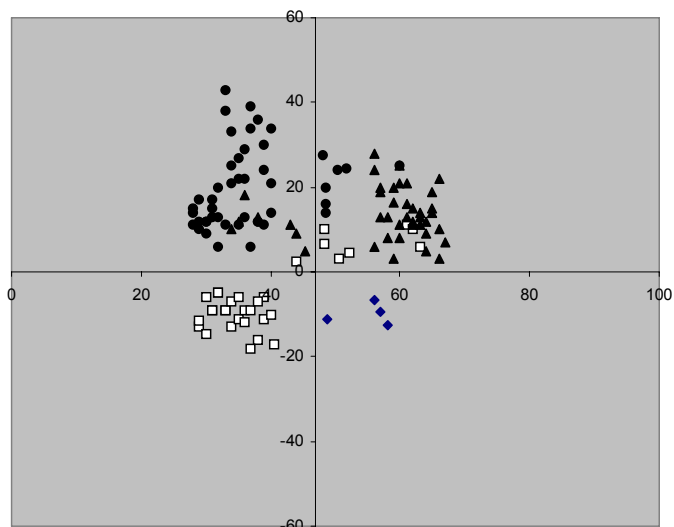


Fig.3. The results of a discriminative analysis of a polyparametric data (◆ – 1 class, □ – 2 class, ▲ – 3 class, ● – 4 class of functional states).

Statistically insignificant difference in parameters by Mo was for the 1st and the 2-d classes ($P=0,48$). It is quite natural as these classes according to decisive rules of polyparametric method differ only by correlation of parameters [7].

Thus, by χ^2 criterion the main stages of adaptation development process have objective differences in values used in examination of parameters. The results of a discriminative analysis of a polyparametric examination used to check up the classification of states on the basis of pattern recognition and decisive rule laid in the polyparametric method are given on fig.3. As one can see all four classes have a good division, natural over-covering of the 3-d and the 4-th classes (12%), for the 3-d and the 2-nd classes – 17% and for the first class the error does not exceed 3%. All that confirms the effectiveness of the classification by the polyparametric method.

The results of clinic-physiological examinations showed that overstrained students have different changes in ECG by Minnesota code (75%) and clinical ECG-syndromes according to the international classification of diagnosis of disorders of cardiovascular activity (41%).

On table 4 a percentage distribution of clinically significant changes of ECG are presented among students testified to the classes of stress (4) and unsatisfactory adaptation (3).

Table 4

The frequency of ECG changes in conditionally healthy students

Signs of ECG changes	%	
	Classes of adaptation	
	4	3
Incomplete blockage of Hiss bundle	29.3	–
Blockage of left Hiss bundle	1.9	–
Ventricular Hypertrophy	17.9	–
Nonspecific changes of ST и T waves	27.4	3
High amplitude of R wave	19	15
High amplitude T wave	10	6
Changes of ECG by Minnesota code	77.4	41

As seen on the table more than two-thirds of students have clinically significant changes of ECG. One-third of students had nonspecific changes of ST and T testified as the disturbance in a coronary blood flow. The frequency of high ECG amplitude T, testified as the potential disorders in metabolism of cardiac muscle is also dangerously high. All these functional changes corresponded to the 4th stage of adaptation syndrome and were regarded as the signs of long-lasting stress and its consequences.

The results of correlation between the polyparametric and clinical-physiological examinations are given on the table 5: the 4-th stage consists mainly of patients with clinically significant deviations in ECG, which in accordance with a “General System of ECG conclusions” (1982) is a clinical syndrome diagnosis of the initial form of cardiac pathology. The 4-th stage is also characterized by a number of haemodynamic abnormalities which significantly differ from other classes, that confirms the objective data by criterion of χ^2 . In the 3-d stage clinical signs are observed in one quarter of cases and have only a functional character: the increase of T or R waves in 10%, signs of ventricular hypertrophy – 10% and physiological blockade of Hiss bundle. In 17% of cases single changes by Minnesota code were registered which had as a rule a functional character. In all these cases the values of hemodynamic signs significantly differ from those of the 2-nd and the 4-th classes that objectively are confirmed by criterion of χ^2 . And at last, in the 2-d stage – a stage of functional strain the changes in ECG are observed only in 6.6% of cases and have only a functional character. The values of hemodynamic signs differ from those of the 1-st class but they are insignificant.

Table 5
Distribution of clinically important symptoms among students according
their polyparametric classes of functional states

Clinical signs	Classes of polyparametric adaptation syndromes			
	1	2	3	4
	M±m	M±m	M±m	M±m
Clinical diagnoses	-	-	24%	80%
Minnesota code of ECG	-	6.6%	41%	97%
CI	3.25±0.12	2.63±0.37	2.59±0.11	2.46±0.11
GPR	1078±8.25	1597±180	1704± 78.5	1721±82.45
MDAP	87.2±2.5	84±3.4	87.7±0.99	87.7±0.96
SBV	88.3±1.7	59.2±5.6	58.45±2.8	62.15±2.6
Te	0.43±0.023	0.2±0.014	0.2±0.013	0.28±0.013
An	0.36±0.023	0.11±0.002	0.133±0.006	0.18±0.011
RI	0.71±0.04	0.58±0.07	0.9±0.06	0.96±0.06

Notes: CI - cardiac index, MDAP - mean dynamic arterial pressure, GPR - general vascular peripheral resistance, RI - reographic index, An - anacrote time, Te - time of blood ejection from the left ventricle.

Thus, the results obtained vividly showed the objective existence of stages of adaptation syndrome in development with insignificant essential and pathognomonic signs. The data received enable us to regard the 3-d stage as a frontier stage between conditionally healthy and pathological state. Though it is necessary to stress that this border is «a floating» one with «a touching» on the one hand at the 2-d and on the other hand the 4-th stages. But it is natural as the classification of stages of adaptation syndrome as any other classification to a considerable extent is conditional as the process of development is uninterrupted and there is always a possibility to reveal transitional states. The correlation of polyparametric and clinical syndrome analysis gives grounds to single out the main syndrome among students of a given population: hyper and hypocardiodynamic with a hypokinetic character of peripheral blood circulation.

This means that prof. V.A.Shidlovsky's concept of "every functional state (health level) has its own autonomic pattern" [1985] has got relevant experimental and theoretical confirmation.

Conclusion

A comparative analysis of polyparametric data (multiple evaluation of relationships between vital system parameters) and clinical functional examinations showed close correlation of the results and made it possible to verify the stages of adaptation syndrome development. Examinations in workers and students revealed that the initial stress manifestations are associated with disbalanced interaction of functional systems and autonomic regulations.

A polyparametric method for human functional diagnostics is based on intelligence and image graphic systems. A human functional state and its dynamics by the method of multiple physiological assessments is determined in accordance with stages of adaptation syndrome development and therefore is reflected in quantitative multidimensional analysis of relationships between homeostatic functional systems.

The polyparametric technology for multiple express – assessment of stress and personal current state of adaptation (health level) in daily life demonstrates some advantages of a system approach in diagnostics of human functional states in normal conditions and under stress:

- a highly effective and economical procedures for the evaluation of individual stress-level and functional state to be used in preventive medicine, epidemiological studies;
- a high degree of correlation between the polyparametric examinations and the practice of clinical and pre-clinical diagnosis;
- unified and highly standartized automated results of the polyparametric examinations which allow to accumulate data banks and to make fast, comparative evaluations of the stress-level in different population groups;
- a possibility for further development (with other sets of physiological parameters) and efficient measures for stress assessments in express-regime and for control of health correction in population groups.

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"SYSTEM-QUANTA" OF THE PSYCHO-EMOTIONAL STRESS OF THE AIR TRAFFIC CONTROL DISPATCHERS

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The nonconformity of the occupationally important psycho-physiological qualities of aviation operational specialists (dispatchers, pilots, etc.) to the increased requirements of the rapid scientific and technical progress in aviation, creates serious prerequisites for the development of the high level psycho-emotional stress in pilots and air traffic control personnel.

This problem, known as the problem of "human factor" in aviation, in many aspects remains sharp and unresolved, has serious negative consequences with respect to not only occupational health of aviation specialists, but to the flight safety as well. Enough to mention that solely psycho-physiological aspects of the "human factor" problem are currently constituting the basic cause of about 80% of aviation incidents.

Studies (Klyuev A.K., Kachalkin A.N., etc.1996) showed that in 51,5% (of 80%) of the above cases the incidents directly linked to the functional state of operators, were caused by the influence of psycho-emotional stress and by the insufficient psycho-emotional stability of a person to the impact of the negative factors of their professional activity, in particular, under the extreme conditions.

In light of the above, the need for the timely control of the psycho-physiological indicators becomes necessary for the purpose of the stress state normalization and flight safety retention.

The resolution of this problem, firstly, requires the scientifically based conceptual approach and secondly the development of methods for organization and implementation of psycho-diagnostic and psycho-corrective measures in this direction.

The use of functional system theory (P.K. Anokhin 1979) and principle of systemic quantization of human behaviour during real occupational activity (Sudakov K.V. 1983, Pashayev A.M., Mamedov A.M. 2000) appears to be highly effective for developing the measures of control and efficient psycho-physiological correction for the positions pointed out above.

The principle of the systemic human quantization behavior consists of the fact that technological or administrative operations carried out by human operator are divided into "quanta", with different stage and eventual results. For e.g., "system - quanta" in ATC dispatchers' professional activity include number of effective activity stages: take-off, climb, approach operations and landing. Herein the output and the analysis of psycho-physiological parameters in dispatcher is achieved in accordance with the separate successful stages of

the "system-quanta" of the air traffic control (Sudakov K.V. 1983).

The problem of timely estimation, control and maintenance of the psycho-physiological indicators of the functional state at the specific level, is extremely urgent and important for providing flight safety, health retention and professional longevity of dispatchers.

Specific features of dispatchers' job nature and absence of direct indices of work fitness (labor productivity, criterion of the quality etc.) lead to the necessity for using indirect psycho-physiological methods for its estimation.

The practical-scientific significance of this problem is reinforced by objective circumstances - quantity of special cases, aviation incidents and their prerequisites through the ATC fault, including functional state decline causes (efficiency) remains substantially large.

Questions for estimation of efficiency are examined from the psycho-physiological indicators point of view. The data analysis of functional state shows that it changes significantly in the work course.

Work activity starts from the "warm-up" period, which is distinguished individually depending on shifts of activity, initial functional state and duration of tentative reactions. Further comes the period of steady work fitness after which accumulated emotional stress and tiredness lead to reduction in efficiency.

The job of dispatchers is of mental nature, that's why emotional stress developed in the course of work is the result of mental overloads.

In connection with this subsequent complex of rehabilitation measures as a whole must bear psycho-physiological nature and contribute to stress prevention and relief.

The discussions deal with organization and conduct of systematic intro-shift psycho-physiological control for the subsequent correction of psycho-emotional stress and functional state during professional activity and influence the efficiency of dispatchers.

Psycho-physiological examinations show that prolonged mental and emotional stress, peculiar to dispatchers' professional activity can serve as the risk factor for the hypertonic disease, atherosclerosis and ischemic disease of heart.

The development of emotional stress can be considered as the prognostically unfavorable, if it flows against the background of complex activities and is accompanied by the high frequency of pulse, increased BP and etc.

The composition of dispatcher diseases is tightly combined with the risk factors, which are not the causes for one or another change, but they reflect close connection with its known manifestations.

It is accepted to divide the factors of risk into two groups. The first group includes socio-cultural, the second - internal factors of risk.

The below are related to the group of socio-cultural factors of risk:

- a) psycho-emotional factors - systematic prolonged mental and emotional stress, connected with the professional activity of dispatchers;
- b) hypodynamia;
- c) smoking and the luxury consumption of high-calorie rich in cholesterol food.

The group of the internal factors of risk includes:

- a) an increase in the arterial pressure;
- b) atherosclerosis of vessels;
- c) hypercholesterolemia;
- d) a change in the coagulability of the blood and etc.

It is possible to avoid the first - group risk factors.

The second - group risk factors testify the violation, first of all, of the psycho-physiological mechanisms of regulation.

For decreasing the negative reaction the second - group risk factors must be revealed in proper time. The second - group risk factors are strengthened with age and duration of employment. The probability of cardiovascular diseases development dispatchers grows every 5 years of professional activity.

2. Research methodology

A number of objective psycho-physiological indicators were used for the preventive determination of dispatchers' psycho-physiological status under varied conditions of professional activity, (electrocardiogram - EKG, blood pressure - BP, pulse, etc.) "system-quanta" (k.V. Sudakov) the dispatchers activity, who control air traffic. Arterial pressure was recorded with the aid of the semiautomatic tonometer (Germany).

As the diagnostic criteria of evaluation of the dispatchers' functional state in accordance with the "system-quanta", of his successful activity, most reliable indicators are those obtained in the course of mathematical calculations.

The variability calculation of R-R cardiac rhythm intervals according to EKG at different stages of working activity makes it possible to evaluate the level of psycho-emotional stress.

$$CV = \frac{\sigma}{M} \cdot 100\%$$

Where the CV is coefficient of variation in the cardiac rhythm;

M - mean arithmetic value R-R of intervals;

σ - mean-square deviation.

The blood pressure (BP) measurements of R-R intervals on EKG were conducted under varied conditions: a) prior to the beginning of work; b) in the

pauses between the different stages of professional activity; c) directly, in the process of real working activity, while conducting air traffic control; d) at the end of the work shift.

The psycho-physiological methods of the state evaluating include also the blank procedures of psychometric testings. The questioning according to the scales of the self-appraisal of Spilberg - Khanin, have been adapted which makes it possible to determine reactive (situational) anxiety. Health, activity and mood were tested with the aid of another psychometric method HAM.

Proof - reading tests also were conducted simultaneously with this. The examinations indicated were conducted with respect to the dispatchers of the air traffic control (ATC) of AZAL air-navigational service.

3. Research results.

The activity of a dispatcher, his intellectual - emotional stress with ATC significantly increases the demands for the blood supply of brain, which are preservable even in the absence of professional load especially in the persons older than 28-30 years, with the length employment in ATC more than 7 years.

At present, the measurement of blood pressure before and after shift is required.

Only with the steadfast BP increase after shift on 15-20 mm subjective complaints of the headache, dispatcher is bound for the additional more thorough examination.

With this approach is missed not only the time and the possibility to fix primary disturbances in BP changes connected with the real professional activity, but the effectiveness, of conducted subsequently therapeutic measures for BP normalization as well.

In connection with this it is necessary to reexamine the approaches and the contents of the existing methods of the dispatchers' examination for the purpose of the timely diagnosis of the advancing chronic overload and tiredness.

Timely estimation in the dispatchers' functional state (factors of risk) and subsequent course conducting of reducing measures contribute to the health maintenance and to an increase in the professional longevity.

It is necessary to organize the intensive observation for dispatchers not only with the length of service of 7 years, but also younger, not only before and after shift, but also in accordance with the systems approach, in different stages of the "quanta" of real professional activity, or in the pauses between them.

In this case more precise and more timely is the BP determination method of systemic "quantization" in the process of direct successful activity and in the pauses between them, which allows preventive, considerably earlier, in the early periods of the disturbances of this parameter to determine tendency and dynamics of the formation of steadfast arterial pressure, increasing thus the

effectiveness of the planned measures of prophylaxis. It is important to note that in this case, emotiogenic stages of successful activity are also revealed which makes it possible to take correction measures.

Registration and calculation of R-R variability of the electrocardiogram (EKG) intervals make it possible to judge the formation of emotional stress, which precedes the establishment of steadfast arterial hypertension with even higher accuracy. In this case, dispatchers' examination showed two fundamental features of the behavior of this cardiac rhythm parameter.

Table 1
“Systemoguenta” of mean values of heart rate variability under direct professional activity and in the pauses among dispatchers of various group

Conditions CV%	Stages of activity and pauses							
	Activity	Pause	Activity	Pause	Activity	Pause	Activity	Pause
I “healthy group”	3,7%±0,21	4,8%±0,22	3,4%±0,17	4,5%±0,17	3,6%±0,19	4,6%±0,29	3,8%±0,23	4,9%±0,24
II “risk group”	2,9%±0,17	2,8%±0,16	2,7%±0,16	2,9%±0,19	3,1%±0,32	3,2%±0,1	2,5%±0,20	2,8%±0,19

(table 1): a) variability reduction of the heart contractions on the initial stages of successful quanta, in the process of direct activity; b) variability growth of cardiac rhythm in proportion to reaching stage and eventual results, and also in the pauses between them.

With the non-attainment or the fulfillment with the stress of any of the stage results, the absence of stage dynamics, the low values of the variability (on the average $\approx CV \leq 2,8\%$) of cardiac rhythm are observed. As a rule, these changes are accompanied by blood pressure increase ($136\pm 6,0$) and other indicators of psycho-emotional stress, which is characterized as high "psycho-emotional price", especially, if it remains in the pauses and the breaks.

Specifically, in these cases timely psycho-correction actions are necessary to avoid arterial hypertension of steady form formation.

Table 2
Changes of mean values of psychophysiological indexes of ATS
dispatchers' state under the influence of correction measures

Indexes	Observation stages before and after correction influence (1,2)		
	Background	1 in a weak	2 in a month
Systolic blood pressure (mm. merc. pil.)	1360± 5,0	126,0 ± 4,0	120,0 ± 6,0
Diastolic blood pressure (mm. merc. pil.)	92,0±3,0	86,0±4,0	81,0±2,0
Frequency of heart rhythm (stroke in minute)	84,0±2,0	78,0±2,0	71,0±2,0
R-R intervals variability (CV%) of heart rhythm	≈3,1%±0,2	≈5,2%±0,38	≈5,8%±0,42
The level of situational anxiety (in points)	45,0±2,0	41,0±1,5	30,0±2,0
HAM – health, activity, mood	≈4,2	≈5	>5,5
Fixing attention (in points)	≈580	1080	≈1200
Volume of handled information for 1 minute (number of non-attendance letter)	240,0±15	320,0±25,0	375,0±32,0
Accuracy of working on text (%)	80,0±3,0	92,0±1,0	98,0±3,0

The comparison of the stage and eventual results of "system-quantum" and the corresponding to them psycho-physiological indicators in dispatchers give the possibility to secrete those, who perform the appropriate working operations without the stress of psycho-physiological functions and who work with the stress, especially in the pauses between the stages, preservable also after work.

Our work experiment showed that the principle of systemic quantization applied to the man activity is very promising.

Actually, dispatchers' control on such psycho-physiological indicators as the frequency of the heart contractions, systolic blood pressure, R-R intervals variability, cardiogram, and also HAM indicators of the level of anxiety and proof-reading test, in accordance with the stage and eventual results under the conditions of real professional activity allow to divide the investigated persons into the groups. In the dispatchers of the first, practically "healthy" group "rhythmical" changes during the activity, and descending in the pauses and after work, having in this case, close relationships with the stage and eventual results "systemquanta" were observed the changes and the cardiac rhythm variability (Fig. 1, tables 1).

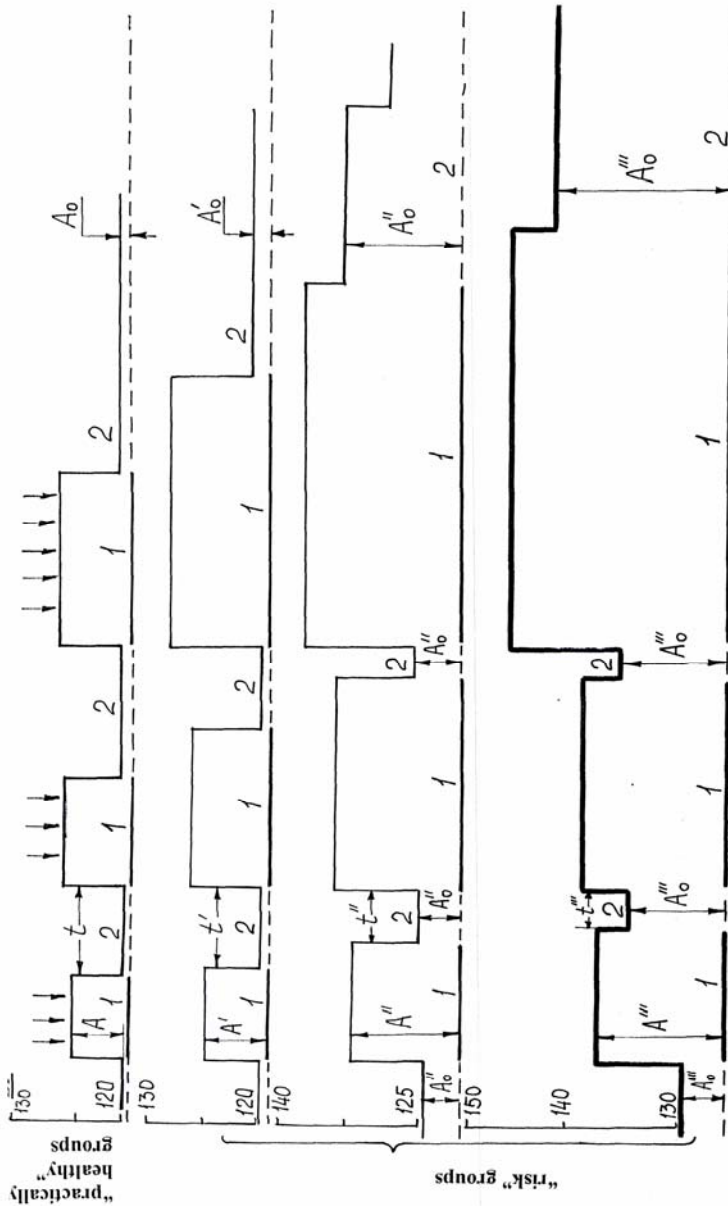


Fig.1. Dynamics of mean values of BP among dispatchers in the course of work (1) and in the pauses (2).
 $t' < t < t'$ decrease of relaxation time in pauses with intensification of emotional stress in "risk groups".
 $A''' > A'' > A' > A$ increase of BP amplitude in the process of work stages implementation in "risk groups".
 $A_0''' > A_0'' > A_0' > A_0$ summarizing of residue BP level in pauses, before and after work.

What indicated changes for those, entering the second "risk" group: increases in the values of BP reached $\approx 147,0 \div 3,0$, was disrupted its "rhythmicity" on the activity of "systemquanta" pauses, and the cardiac rhythm, variability in different stages" of the systemquanta "of activity was reduced on the average" to $\approx 2,6\% \div 3,1\%$, weak manifestation of the stage dynamics of this parameter (table 1) was noted. The most principal in this case is the fact that the stress of psycho-physiological functions to changes of BP in the pauses, between the stages of activity, frequently remained as "residual" BP

which resulted as the stress sum - up prolonged on "congestive" nature. In these persons, the high indicators of emotional stress, situational anxiety (≥ 46), the lower values of the indicators of the concentration of attention ($578 \div 270$), health, activity, mood ($HAM \leq 4$) are more revealed than in the dispatchers of the first group.

The prolonged maintenance of the stressed state in the course of professional activity brings in the final analysis of the functional disturbances, which can be prerequisite for the development of different psychosomatic diseases.

The control problem and maintenance of psycho-physiological indicators mean fitness for work, most sharply, it stands against the dispatchers who work in the night shift. Specifically, dispatchers who work on night shift take it most lasting and severe.

Reduction in the work fitness in the night shift depends on the special psycho-physiological features of the human body related with the biorhythmic activity, age, period, and also from the special features of the professional activity organization. The psycho-physiological special features of those, who work in the night shift, include: the increase in the activity of the parasympathetic section of vegetative nervous system, which leads to shift of processes "excitations - inhibition", retarding of speech - cognitive processes; frequency of heart rates (FHR) decrease, worsening in the blood supply of brain. To the special features of the organization of professional activity in the night time relate also reduction in the intensity of flights, less illumination of work sites, insufficient entering information ("sensory hunger"), hypodynamia. All this in total, leads to the development of specific phase state - monotony, which can very rapidly take dispatcher away from the up state. It is known that for this reason FHR is lowered to 20% and more with the simultaneous decrease of electrocutaneous resistance to 25%, and HAM to 20%.

Efficiency, vigilance and psycho-emotional state of dispatchers undergo significant changes during the night shift. Together with the total, gradual decrease two temporary unfavorable intervals are revealed, when the changes become smallest, and the probability of erroneous effects in personnel grows. These critical states fall at the periods from lam to 2am and from 4am to 5:30am. However, against this "decreased" night shift background, the need for air traffic control appears to be higher thus requiring an increase in the excitability of the sympathetic section of vegetative nervous system, leading to the largest emotional stress.

The special feature of Baku air control center activity is the fact that the peak of workload lies in the period from 4 to 6 am. (i.e. when the work fitness of dispatchers is reduced to the minimum). During this time maximum number of flights occurs above Baku, due to its geographical location.

So, the highest preparedness and vigilance required from night shift

dispatchers correspond to the period (4:00 am - 5:30 am) of maximum decline in the functional state of organism, in accordance with the psycho-physiological special features of an organism in the night shift. Particularly in this period, which can be classified as extreme, the greatest shifts of the psycho-physiological indicators occur, acknowledging the formation of the emotional organism overload.

Here we should emphasize that "risk" group of dispatchers was the most subjected to the negative influences of night shift. (Fig. 2).

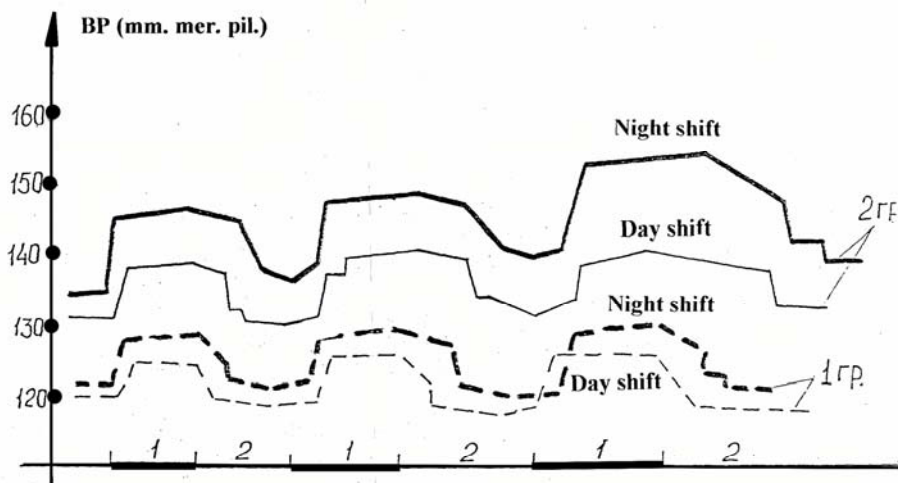


Fig. 2 Dynamics of mean values of blood pressure (BP) among dispatchers (of the first "practically healthy" group and the second "risk" group) in "systemquants" of different stages (A) of activity (1) and pauses (2), in day and night shifts.

The procedure of "quantum" analysis in this period of night shift showed weak rhythmical manifestation and reduction in variability of R-R rhythm intervals. At the same time BP considerably increased in the intense work stages and didn't reduce to normal in the pauses and after work. This means that emotional stress is insignificantly reduced or does not fall after the high activity stages confirming the formation of the emotional stress of "residual" nature for the whole prolongation of shift time. (Fig.2).

Research showed that "risk" group as a rule includes dispatchers with seniority more than 8 years, aged above 35 years, with different cardiovascular diseases (arterial hypertension, transitory phase, and etc.) and disruptions of heart rate R-R intervals variability. (Fig. 2)

Thus, the negative the shifts of psycho-physiological indicators in the "risk" group are considerably aggravated in the night shift, testifying emotional stress increase. Such states sustained for a long period of time are baseline for different kind of functional and somatic disorders. (Fig. 2).

"Risk" groups identification is the starting point for development and

conduct of the timely recovery-correction measures. This serves the purpose of normalization of dispatchers' psycho-physiological shifts in the process of their professional activity (Pashayev A.M., Mamedov A.M. & others 2000).

Complex correction methods were used for "risk" groups - restoration, non-medicamental measures (massage, self-massage of biologically active points, autogenic training, gymnastics and special physical exercises - "systems-training"). The tendency (78% of cases) toward the normalization of the shifts of psycho-physiological indicators (by the $CV \approx 5,2\% \div 6,8$; $BP \approx 126/84 \div 120/80$) was observed after the use of this non-drug therapy. All this testified reduction in emotional stress, who could then be "transferred" from "risk" group into the groups of clinically healthy persons (table 2).

Thus, the principle of the systemic "quantization" of behavior allows to reveal timely the shifts of psycho-physiological indicators and the "psycho-physiological price" of the stage and eventual results of activity under the actual air traffic control conditions and to conduct non-medicamental corrections on this basis - restoration measures with respect to the groups of "risk". These measures normalize changes of the analyzed parameters and emotional stress of the ATC dispatchers.

4. Conclusion

In the conclusion let us note that the research of the psycho-emotional exertion dynamics showed (Fig.1, 2) that "rhythmical" changes in the psycho-physiological indicators of emotional stress were observed in the clinically healthy persons (1-st group of dispatchers) under the conditions of real professional activity. This emotional stress risen in the process of the direct work activity (ensuring activation of the corresponding psycho-physiological functions of organism, which develop high work fitness) and lowering in the pauses (in the interruptions and after work) between the stages of working activity, up to the renewal of sequential successful activity.

This type of "rhythmical" dynamics assumes the natural change of active exertion periods with the periods of passive exertion, which has an important adaptive sense.

However, this "rhythmical" dynamics gradually starts to be disrupted (due to the retention and the summing up in the pauses of the "residual" excitation, which acquires "congestive" nature leading to the increase of general negative psycho-emotional stress) in the 2-nd group of "risk" (especially in the night shift) with the insufficient psycho-emotional stability on the background of shortening relaxation intervals in the pauses and after work. These sorts of changes compose the basis for the formation of different pathologic shifts in the organism.

Thus the proposed approach, based on the principle of systemic "quantization" has great preventive value, it allows timely and accurate revelation of primary functional changes in the organism, permits to define the

level of emotional stress as "physiological price" for the achieved results in different stages of the air traffic control "quanta", and thus efficiently diagnose the professional health status of dispatchers.

"System-quantum" psycho-diagnostics makes it possible to form the complex of the specially selected physical and psycho-physiological exercises, psychos-trainings, directed toward an improvement of the mobility of the cortical processes of brain, which optimize such professionally important psycho-physiological qualities as: will, operating memory, attention, thinking and complex sensor-motor reactions, ability to make correct and balanced decisions in the extreme situations.

The correction- rehabilitation measures held regularly (with respect to the groups of "risk"), normalize psycho-emotional stress and dysfunctions, caused by the occupational activity of dispatchers, and contribute to the retention of health and work fitness, which are reflected in the "flight safety" during of air traffic control.

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EEG OF ONE-YEAR HEALTHY CHILDREN IN ALERT STATE

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Age-related aspects of studies of functional activities of the brain cortex

Gain the most importance due to necessity of detalization of criteria of age-related periodization and getting insight into upper and lower limits of norm to realize correct clinical and physiological correlations. Revealing of children`s organisms development regularities and functioning peculiarities of their brain systems on the early stages of ontogenesis gain much more importance owing to vulnerability of this period and requirements to solve the most important problems of children`s health protection.

The certain relation of frequency characteristics to the age, in the course of children`s development, was revealed by a number of researchers even in the midst of last century (11, 12).

Further studies of brain electric activities of children and teenagers (3-7, 10) of different age-related groups gave grounds for more detalized descriptions of ontogenetic peculiarities of EEG. However, in spite of successes in studies of ontogenetic peculiarities of bioelectric activities of children`s brain, the problem on distribution of the EEG frequency characteristics throughout the brain areas and formation of foci of dominating activity is still remained unraveled. Besides, there are poor evidences on structure, and spatial and temporary organization of EEG reflecting peculiarities of interrelations of different brain cortex areas in children of the early age.

Taking into account the above said, the goal of the present work concludes in the study of peculiarities of bioelectric activities of one-year-old children under different functional alert states.

Methods

24 practically healthy children at the age of one year were subjected to examination. Registration of the brain bioelectric activity was accomplished in the alert state, in relative relaxation in unipolar way from the frontal, central and occipital areas of both hemispheres in open and closed eyes, in darkened room according to international scheme of "10-20" on the electroencephalograph of the "Medicor" company with paralleled recording on the magnitograph "HO-62".

Thereafter artifact-free 10-15-second recording fragments were subjected to computerized amplitude and frequency analysis of bioelectric

activity and percentage indexes of the main EEG rhythms for the analysis epoch were calculated. The data were analyzed on t-Student and Fisher criteria. The data under $p \leq 0.05$ were considered as significant.

Results and Discussion

The conducted analysis of soundness of the main EEG rhythms in healthy one-year-old children in two functional states (in open and closed eyes) revealed the following peculiarities. As it is seen from Fig.1, in the frontal areas in the open eyes the most percent index referred to beta-range (left and right hemispheres – $58.1 \pm 1.5\%$ and $61.9 \pm 2.6\%$, correspondingly). Delta-rhythm had lower values ($6.0 \pm 1.2\%$ and $6.5 \pm 0.8\%$, correspondingly). The present index of theta-rhythm in the frontal area of the left hemisphere was higher than in the right hemisphere ($25.7 \pm 2.2\%$ and $18.2 \pm 2.7\%$, correspondingly). The weight of the alpha-rhythm in the left frontal area relatively to the theta-rhythm was lower ($13.2 \pm 2.5\%$). In the right frontal area the alpha-rhythm values were higher and were identical to the theta-rhythm values ($17.7 \pm 1.0\%$).

In the central areas of both hemispheres the percent distribution of the main EEG rhythms was similar to their structure in the frontal areas, i.e. the most percent index was as well present by theta-rhythm (left and right hemisphere – $31.8 \pm 2.5\%$ and 21.0 ± 3.4 , correspondingly) and beta-rhythm ($46.2 \pm 2.4\%$ and $59.4 \pm 3.1\%$, correspondingly). The delta range has the less index (left hemisphere – $5.8 \pm 4.2\%$, right hemisphere – $5.3 \pm 2.6\%$). The waves of the alpha-specter were as well present with indexes of low values (left hemisphere – 16.1 ± 3.4 , right hemisphere – $6.5 \pm 0.8\%$).

In the occipital areas, as in the central ones, percent index of delta-rhythm had similar values (left and right hemisphere correspondingly: occipital – $7.2 \pm 1.5\%$ and $4.0 \pm 3.2\%$; central $5.8 \pm 4.2\%$ and $5.3 \pm 2.6\%$). The theta-rhythm relatively to the rostral areas had higher percent index (left and right hemispheres, occipital – $40.5 \pm 1.6\%$ and $40.0 \pm 2.7\%$; frontal – $25.7 \pm 2.2\%$ and $18.2 \pm 2.7\%$; central – $31.8 \pm 2.5\%$ and $21.0 \pm 3.4\%$). On the other hand, the percent index of the alpha-range in the left hemisphere was analogous to its index in the left area ($13.5 \pm 1.8\%$ and $16.1 \pm 3.4\%$, correspondingly). As for the right hemisphere, the index of alpha-rhythm in the occipital areas was higher than in the right central area (right – $16.4 \pm 3.7\%$, left – $6.5 \pm 0.8\%$). The strength of the beta-rhythm in the occipital areas was lower than in the frontal and central compartments (left and right hemispheres, correspondingly: occipital area – $38.7 \pm 2.4\%$ and $39.3 \pm 3.1\%$; frontal area – 58.1 ± 1.5 and $61.9 \pm 2.6\%$; central – $46.2 \pm 2.4\%$ and $59.4 \pm 3.1\%$).

In closed eyes in one-year-old children in the frontal areas of both hemispheres delta-rhythm had rather low percent index (left and right hemispheres – $5.9 \pm 1.5\%$ and $3.2 \pm 2.5\%$, correspondingly). The strength of theta-rhythm and beta-rhythm in the left hemisphere had similar values (theta-

rhythm – $36.7 \pm 3.1\%$, beta-rhythm – $38.8 \pm 2.4\%$), while in the right hemisphere the beta-rhythm's index had higher values (beta-rhythm – 46.2 ± 4.1 , theta-rhythm – $32.3 \pm 1.8\%$). The alphas rhythm both in the left and right hemispheres had indexes of equal values ($18.9 \pm 2.3\%$ and $18.3 \pm 1.5\%$, correspondingly).

In the central areas of both hemispheres the index of delta-rhythm was higher than in rostral areas (left and right hemispheres: central areas – $11.1 \pm 2.6\%$ and $8.2 \pm 0.8\%$; frontal – $5.0 \pm 1.5\%$ and $3.2 \pm 2.5\%$, correspondingly). Strength of theta-rhythm in the left hemisphere was lower than in the frontal area (central – $22.0 \pm 1.7\%$, frontal – $36.0 \pm 3.1\%$), while in the right hemisphere its values didn't differ significantly from the frontal area (central – $27.2 \pm 3.4\%$, frontal – $32.5 \pm 1.8\%$). The percent index of the alpha-rhythm in the central areas of both hemispheres didn't differ significantly from the frontal areas (left and right hemispheres, correspondingly: central – $16.3 \pm 1.6\%$ and $15.2 \pm 2.1\%$, frontal – $18.9 \pm 2.3\%$ and $18.3 \pm 1.5\%$). The strength of the beta-rhythm in the left central area was higher than in the left frontal area (central – $50.3 \pm 3.0\%$; frontal – $38.8 \pm 2.4\%$), in the right hemisphere their values was alike (central – $50.4 \pm 2.5\%$, frontal $46.2 \pm 4.1\%$).

In the occipital areas percent index of delta-rhythm had values similar to the values of this activity in the frontal areas, whereas in the left hemisphere it was lower than in the central (left and right hemispheres, correspondingly: occipital – $6.9 \pm 1.7\%$ and $5.9 \pm 1.9\%$, frontal – $5.7 \pm 1.5\%$ and $3.2 \pm 2.5\%$, central – $11.1 \pm 2.6\%$ and $8.2 \pm 0.8\%$). Theta-rhythm had in the occipital areas characteristics similar to the frontal areas in both hemispheres, while compared with the central areas these values were significantly higher (left and right hemispheres correspondingly: occipital – $39.1 \pm 2.7\%$ and $38.2 \pm 4.3\%$; frontal – $36.6 \pm 3.1\%$ and $32.5 \pm 1.8\%$; central $22.0 \pm 1.7\%$ and $27.2 \pm 3.4\%$). The soundness of occipital alpha-range in the left hemisphere had values similar to the frontal areas (occipital – $17.4 \pm 3.1\%$, frontal – $18.9 \pm 2.3\%$, central – $16.3 \pm 1.6\%$). In contrast, in right occipital area the alpha-rhythm index was higher than in the frontal and occipital areas (occipital – $22.0 \pm 2\%$; frontal – $18.3 \pm 1.5\%$; central – $15.2 \pm 2.1\%$). The percent index of beta-rhythm in the left area was similar to its index in the left frontal area (occipital – $36.5 \pm 1.7\%$, frontal – $38.8 \pm 2.4\%$), while in the right hemisphere the values of beta range in the occipital area was lower than in frontal and occipital areas (occipital – $33.8 \pm 2.1\%$, frontal – $46.2 \pm 4.1\%$, central – $50.4 \pm 2.5\%$).

So, as the result of the conducted studies the indexes of main EEG rhythms over different areas of both brain hemispheres were obtained. In this event, the structure of bioelectric activity in the condition with open and close eyes bore certain characteristic peculiarities.

So, in open and closed eyes, beta-rhythm was clearly defined and had the most percent index in the frontal and central areas. In opposite, in occipital areas, soundness of beta-rhythm in the occipital areas was lower and yielded to the theta-rhythm index.

The high values of beta-activity index in the children of early age, considered to be pathology manifestation in children of the older age, were shown by the other researchers (8, 9). It should be emphasized simultaneously that this observation to our data is characteristic to only rostral brain areas. Oppositely, in the caudal areas of both hemispheres, the theta-rhythm comes forward that was as well noticed by other researchers (2, 11, 12). This observation reflects functional differentiation of cortical areas and is precedent of alpha-rhythm, forming in the older age.

In the condition of closed eyes the theta-rhythm focus is shaper in the frontal areas of both hemispheres. This fact reflects the evidence that since one-year-age, two foci of theta activity have been functioning, transferring with growth course, initially into two foci alpha-rhythm, and thereafter into one caudal focus of alpha activity, characteristic to persons of mature age (1).

In interhemispherical sense, the significant differences in percent indexes of frequency ranges both in one and the other stage weren't revealed. The results show that to one-year-old-age, EEGs of rostral and caudal brain areas differ on the rhythm's soundness, reflecting the importance of this period of development and indicating on pre-forming in forthcoming period the rostral-caudal focus of alpha-rhythm.

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HEREDITARY ALTERATIONS OF BEHAVIOR IN VERTEBRATES

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Introduction

Evolutionarily relevant characters such as rate of growth, immunity, components of intelligence, social and learning behavior are highly protected against mutational alterations which could impair their function. Accordingly, most of these characters are embedded into polygenically determined hereditary systems which could not be changed dramatically by single base pair substitutions and/or deletions in their DNA structure. Many vertebrate genes are present as redundant systems in which the lethal mutation of one single gene leading to the loss of its function may be compensated by the second unmutated duplicate gene sufficient for fulfilling the entire gene function (Ohno 1970; Schröder 1971). Thus mutational events concerning behavioral traits are causing rather quantitative than qualitative alterations, i.e. the basic constitution of the behavior in question is not really changed but quantitative alterations may occur. However, in particular the influence of environmental mutagens does not only increase the natural spontaneous mutation rate of 10^{-8} to 10^{-6} mutations per locus, per gamete and per generation but also may affect the kind of mutation. Generally speaking most environmental mutagens such as ionizing radiation, some chemical compounds and higher electromagnetic fields induce mainly "point mutations", i.e. base

pair alterations and/or deletions in DNA-strands. Some particular powerful mutagens predominantly induce chromosomal rearrangements ("chromosomal mutations") or alterations in the number of single chromosomes or chromosome sets ("genome mutations"). The increase in mutation rate roughly corresponds to the dosage of the applied mutagen thereby exhibiting a linear dose-effect relationship with no threshold value. That is to say small dosages produce only a small increase in mutation rate while larger dosages cause more induced mutations. Mutational alterations may affect all possible characters of an organism under mutation pressure. The findings next presented in "Results" only deal with mutation-induced behavioral alterations affecting learning and social behavior of some teleostean fish species and the laboratory rat (*Epimys norvegicus*) and house mouse (*Mus musculus domesticus*). The experiments to obtain these results were carried out during the last four decades.

Results

Increasing hazards by environmental mutagens do not only threaten human health caused by somatic diseases but also induced an increasing mutational load. According to the UNSCEAR-Report 1986, 600,000 carriers of genetic diseases with polygenic inheritance occur among one million live-born children, i.e. 6 out of 10 men are burdened by deleterious genes reducing the health of their carriers. In view of an increasing amount of potentially mutagenic chemical compounds (according to Ehling 1989, Chemical Abstracts registered already in 1983 about 5 millions of chemical compounds 65,725 of which were assumed to be dangerous for human health), and of increasing ionizing radiation, the deterioration of the human genome only can be delayed by ceasing the release of all kinds of mutagens to the biosphere. However, since this would be not the case in the narrow future, we have the only chance to envisage the forthcoming genetic risk to humans and other vertebrates by estimating the induced mutations in experimental animals. While radiation-induced mutations affecting morphological characters were thoroughly investigated, chemically-induced mutations and combination effects of radiation and chemicals were scarcely studied. According to Ehling (1989), only 200 out of 65,725 chemicals suspicious of inducing mutations were checked for mutagenicity. Estimations for the chemogenetic risk are available only for seven (= 0.01%) of these compounds. Although a pre-treatment of mouse spermatogonia with cyclophosphamide 24 hours prior to ionizing radiation with 300 or 600 R induced recessive mutations while the only treatment with cyclophosphamide or irradiation did not induce mutations (Ehling and Neuhäuser-Klaus 1988), possible combined effects of ionizing radiation and chemical compounds are practically no more under investigation!

Completely insufficient is the number of scientific papers dealing with mutations which affect both fitness and behavioral characters such as mental diseases, social (agonistic and reproductive) and learning behavior of vertebrates. Since features like co-operation and aggressiveness as well as learning ability of humans would mainly determine the future world of our children, grand-children and their descendants, in particular under the consequences of atomic disasters like the Chernobyl accident, the following chapters should give a selection of the most important but unpardonably neglected topics of behavioral mutagenesis, a field of research which in the past and present was almost completely disregarded.

Alterations in Social Behavior

Sexual and agonistic behavior characters are here subsumed under social behavior. Since social and learning behavior in vertebrates are at least partially determined by their genetic make-up, the genetic component of innate behavior can be altered mutationally by environmental mutagens.

Intermale Agonistic Behavior Mammals

Aggression and appeasement gestures are normally subsumed under agonistic behavior. While behaviorally dominant males govern the whole territory, the submissive (inferior) male flees thereby exhibiting appeasement gestures. To ensure reproductive success and survival, the biological purpose of agonistic behavior of male competitors consists in the access to females and to other important resources of their habitat.

For the experiments reported here, two males of approximately equal weight and age, viz. one test male and one standard opponent, both unexperienced in fighting and other social contacts since weaning, were put together simultaneously into a new Macrolon cage (25 x 20 x 14 cm³). Video records were taken of the subjects during the first 15 minutes of their encounters with a B/W camera. The video-tapes were then analyzed by at least two persons with the aid of an event recorder. Occurrence and duration of 10 different behavioral activities were measured in multiples of 0.01 min (Schröder 1979a).

In the first part of the experiments (Schröder 1977, 1980b) the pairs of subjects tested for agonistic activities consisted of two F₁ males, one of which was derived from paternal spermatozoa irradiated with 6 Gy (600 R) of gamma-rays, while the other stemmed from a sham-treated father. The F₁

males from irradiated fathers exhibited more aggressive and less defensive activities than their control counterparts. They were then outcrossed with non-related untreated females. The testing of their male progeny revealed rather a strong evidence that low respectively high intermale aggressive behavior was inherited (Schröder 1979b). Subdividing the F₁ male mice into winners and losers irrespective of paternal treatment, the winners were characterized by higher frequencies of attacks and following behavior and lower frequencies of fleeing and defense behavior. Correspondingly, they also spent more or less time for these activities. The sterile and semi-sterile F₁ males of the same experiment, presumed to be translocation heterozygotes, showed higher frequencies and/or duration of exploratory behavior, autogrooming, tail rattling and attacking and lower duration of inactivity and flight than the normally fertile F₁ males.

Keeping in mind that aggressiveness was higher in male mice presumed to be translocation heterozygotes, a second set of experiments was performed comparing agonistic activities of two defined lines of male reciprocal translocation heterozygotes with that of chromosomally normal sibs. One translocation line, X-114, originated from the radiation-induced translocation T(10,13) as a consequence of exposing spermatocytes to 3 Gy of X-rays (Adler 1978). This line subsequently bred with (101xC3H) F₁ hybrid mice over many generations. The second line of translocation carriers, MMS-206, was derived from the methyl-methansulfonate (MMS) induced (20 mg of MMS/kg body weight) translocation T (4,19) and was also propagated through crosses with hybrid mice. Male translocation heterozygotes were always mated to chromosomally normal females producing a progeny which segregated into chromosomally normal and translocation mice. The chromosomes involved in the translocations were identified in air-dried bone marrow preparations by their banding structure (Adler, personal communication). To ensure the inheritance of these translocations, the chromosomes of both lines were checked in each generation.

Again the differences in frequency and duration of the ten behavioral activities mentioned above were analyzed in T (10,13) heterozygotes and chromosomally normal test males. The analysis revealed significantly fewer defense and flight responses in the translocation carriers. There were also significantly more winners among heterozygotes T (10,13) carriers than among chromosomally normal test males (Schröder and Otten 1985).

More information on the agonistic behavior in the translocation line T (4,19) was offered by Palitzsch (1988). He analyzed carefully the encounters between the test subjects, either T (4,19) heterozygotes or chromosomally normal males, with their chromosomally normal standard opponents. There

were more bites and agonistic activities in the translocation carriers than in the chromosomally normal test males. Although the number of latency periods of the agonistic activities and their mean duration was higher in T (4,19) heterozygotes showing more attacks than chromosomally normal males, the time of latencies was shorter in the translocation heterozygotes. Apparently, as a consequence of the translocation, not only the behavior of the translocation carrier itself was altered but also the agonistic response of his standard opponent was affected. The genetic differences between chromosomally normal and translocation males may have influenced the pattern of the fights by reciprocal interaction between the two individual fighters. In the translocation carriers the transitions between the different agonistic activities were also altered. On the other hand, in genetically normal males sharp transitions between offensive and defensive activities did occur only rarely. Translocation carriers, however, often showed a direct transition between offensive and defensive-submissive behavior. Reminding on the susceptibility of the house mouse against stressful assaults (Eibl-Eibesfeldt 1950), the altered structure of agonistic behavior in heterozygous translocation carriers should be considered dysfunctional because normally male mice use agonistic encounters to establish social relationship with a stable rank-order.

Sexual and Intermale Agonistic Behavior of Poeciliid Fishes

The intermale aggressiveness and the courtship activity of male F₂ descendants of irradiated (1000 R of X-rays to spermatogonia and oogonia of newborn guppies, *Poecilia reticulata*) and control guppies of the inbred strain Istanbul were compared. While both the frequency and duration of sigmoid courtship display decreased in postirradiation F₂, the attacks towards male competitors increased in the postirradiation F₂ (Werner and Schröder 1980). There was also a trend to higher intraspecific aggressiveness among postirradiation F₂ males as compared to control males of the platyfish, *Xiphophorus maculatus*, another poeciliid teleostean (Schröder and Heinrich 1985).

Agonistic Behavior of the Convict Cichlids

The agonistic behavior of mated convict cichlids (*Cichlasoma nigrofasciatum*) derived from gonial germ cells which were exposed to 0 (controls), 250, 500, 750, 1000, or 2000 R of X-rays was determined by counting the attacks delivered to subadult conspecifics during the first eight days after spawning and breeding (Jürges et al. 1984). While no day effects and no interactions with sex and radiation dose were found, males were significantly more aggressive in the treatment groups than the corresponding females. The highest aggressiveness appeared with 250 R, and the lowest

aggressiveness occurred in the 500-F₁ group. These two treatment groups differed significantly from each other, whereas no further significant differences could be detected between the other groups. F₁ males derived from gonial X-irradiation with 750 R are not included because they could not be mated successfully. They were so highly aggressive that they would have killed their own female mates if these would not have been removed before spawning.

Social Cohesiveness of the Convict Cichlids

The alterations of male aggressiveness in male convict cichlids reflect reversely the results of changes in social cohesiveness of the same individual F₁ fish (Schröder 1980a), derived from 0 (controls), 250, 500, 750, 1000, or 2000 R of X-rays to both parental spermatogonia and oogonia. The cohesiveness was determined by counting the distribution of each ten fish of every F₁ group among 12 equal squares within a shallow test tank measuring 80 by 60 by 20 cm. While an increase in cohesiveness was detected in F₁ males as compared to the controls after irradiation with 500 R, the cohesiveness of F₁ females decreased after 750 and 2000 R. Thus, the increase in male cohesiveness is associated with a reduction of male aggressiveness and, reversely, a decrease in cohesiveness reflects an increase in intraspecific aggressiveness. Accordingly, mutational events seem to influence both aspects of social behavior as well.

Alterations in Learning Behavior

Maze Learning Ability

Maze learning behavior of rats was impaired by radiation-induced mutations in male germ-cells (Newcombe & McGregor 1964). They were the first authors who found a decrease in maze-learning ability in offspring from rat (*Epimys norvegicus*) populations in which male germ cells have been X-irradiated over as many as 12 successive generations. The incidence of rats with a low error score was higher in the control than in the postirradiation generations and more animals with a high error score were found in the postirradiation generations than in the controls (cf. Fig. 1 in Schröder 1995). Learning response to irradiation demonstrated a linear relationship when the radiation dose, accumulated in 12 generations, was plotted against the ratio of the mean error score in irradiated versus control lines (cf. Fig. 2 in Schröder 1995). These results of Newcombe and McGregor (1964) indicated a decline in maze learning performance comparable on a percentile basis to a decline in mean I.Q. for humans of 5.35 points, i.e. from 100 to 94.65. According to the authors, there was a 70 percent increase in "dull" and a 30 percent decrease in

"bright" animals. With respect to these meanwhile classical results, an own effort was made to find environmentally induced hereditary behavioral alterations also in other vertebrates (Schröder 1988a,b). In the context of this review, only induced mutations affecting operant learning performance and social (agonistic, cohesive, and reproductive) behavior of the house mouse and some teleostean species will be reported here while most of the chemically-induced behavioral genetic alterations (e.g. Ficsor et al. 1988) will not be regarded.

Operant Learning Methods

To assess the learning ability in laboratory mice, the test subjects were required to press a lever in 10 individual Skinner boxes for food reward. A nocturnal test session lasted 10 hours with alternating 30 min of light and 30 min of dark phases. Only in light phases a bar press was rewarded by a food pellet., while lever actions in the dark phase remained unrewarded. The mice had unlimited access to water. Each test cage was equipped with individual custom-built electronic circuitry which controlled the test program and the record of data automatically. Thus, uncontrolled interactions between the experimenter and the test subjects were minimized. Every ten mice were tested simultaneously. The total number of bar presses in light (rewarded) and dark (unrewarded) phases were compared using the approximation of the binomial distribution by the normal distribution with $P = Q = 0.5$. According to the formula given by Sachs (1974), viz. $z = (x - nP)/(\sqrt{nPQ})$, where x = the number of rewarded bar presses and n = the sum of the number of rewarded bar presses + that of unrewarded bar presses, a mouse was designated a learner when the number of rewarded bar presses exceeded significantly that of unrewarded ones, i.e. $z \leq 1.65$.

Inheritance of Operant Learning Performance

To assess the inheritance of different operant learning abilities two isogenic mouse strains (CBA = "bad learners" versus 101 = "good learners") were crossed and backcrossed to produce F_1 , F_2 , and backcross generations. The learning performance data revealed that an approach to a linear model with $Y = a + bX$ would best fit the experimental results (Schröder et al. 1999). The slope (b) of the learning curve revealed a rather good measure for the operant learning performance. A unidirectional additive-dominance model with non-allelic interactions was found to describe the inheritance of operant learning performance. Heritabilities varying between 0.0118 and 0.76 favor the view that operant learning belongs to the characters with a medium to relatively high reproductive fitness. With respect to the inheritance of operant learning performance, the two parental mouse strains under investigation differed by only

one independently segregating unit which perhaps represents one group of closely linked genes.

Translocations Affect Operant Learning Performance

Schröder and Bornhausen (1987) showed that significantly more non-learners and fewer learners occurred in two types of translocation heterozygotes of male mice, viz. T (4,19) and T (10,13), than in their chromosomally normal brothers. Apparently, these translocations decrease the ability to learn in an operant test situation. Furthermore, a correlation between high intermale aggressiveness and low operant learning performance was demonstrated by three agouti (wildtype) inbred strains (101, C3H, CBA) of the house mouse (Schröder and Bornhausen 1990). Here, the regression of percent operant learners on percent won fights fitted a linear model with $Y = (55.14 \pm 1.15) + (-0.42 \pm 0.02) X$ and a correlation coefficient of -0.999. However, the mutant strain C57BL (non-agouti, a/a) was both highly aggressive and a good learner. Accordingly, high aggressiveness correlates to good operant learning and vice versa.

Persistence of Environmentally Induced Mutations

Mammals

An increased rate of human germ-line mutations of people living in the region of the damaged Chernobyl reactor was found (Dubrova et al. 1996; Hillis 1996). Base-pair substitution rates for the mitochondrial cytochrome b gene of free-living, native populations of voles next to reactor 4 at Chernobyl were estimated to be hundred of times greater than those typically found in mitochondria of vertebrates (Baker et al. 1996). These findings agree with the results of Sperling et al. (1994) who observed an increase of trisomy 21 (Down's syndrome) in West Berlin in January 1987, i.e. 9 months after the Chernobyl reactor accident. A cluster of 12 cases occurred as compared with only two or three expected.

After exclusion of all factors that might have explained the increase, including maternal age distribution, only exposure to radiation perhaps induced by I-131 and Cs-137 as a result of the Chernobyl reactor disaster remained. Like trisomy 21, also the loss and gain of one sex-chromosome resulting in X/0 (Turner's) and X/X/Y (Klinefelter's syndromes) genotypes are due to chromosomal nondisjunction. These aneuploidies are associated with either serious mental diseases (trisomy 21) or with mild cognitive defects (X/0 and X/X/Y) and are caused by spindle disorders during meiotic divisions (Vogel and Motulsky, 1986).

As we know from our own laboratory studies in house mice, after gamma-irradiation of germ-cells an increase of exceptional X/0 and X/X/Y animals unexpectedly occurred not only in the first but also in the second postirradiation generation (Schröder and Neubner 1995), which perhaps can be explained by radiation-induced hereditary alterations of the spindle apparatus (cf. Russell 1976). Accordingly, when only F₁ generations after mutagenic treatment are checked for sex-chromosome anomalies, the genetic risk due to this kind of persistent mutations might be underestimated.

Poeciliid Fishes

Long-termed population experiments were performed with the platyfish, *Xiphophorus maculatus* (Schröder and Heinrich 1985), and with the guppy, *Poecilia reticulata* (Schröder 1983; 1993; 2000). In both species, the founder population consisted either of a postirradiation F₂ derived from parental X-irradiation of spermatogonia and oogonia in newborn fish with 1000 R, or of an unirradiated control-F₂ generation. To produce a mild selection pressure, a piscivorous predator was introduced and coexisted permanently with the experimental test fish. Thus, two adult wildtype males of convict cichlids (*Cichlasoma nigrofasciatum*) were added to two experimental populations of platyfish (*X. maculatus*), and every five individual fish of *Rivulus hartii*, a cyprinodontid fish coexisting with the guppy in some natural habitats of Trinidad, were added to the guppy populations subjected to predation. Accordingly, four different types of guppy semi-natural populations were established, viz. 0/0 as controls with no radiation-induced mutations and no predation pressure by *Rivulus hartii*, 0/S with selection (predation) pressure and no mutations, M/0 with mutations and no predation, and M/S with both mutations and selection. At different time intervals since foundation the composition of the populations was analyzed regarding the adult and juvenile fish numbers, sex, anomalies and biomass. Random samples were drawn to compare courtship strategies and other behavioral activities of males and the reproductive success of females. Generally spoken, the mild predation improved the composition of the respective populations related to the parameters mentioned above, while a combination of radiation-induced mutations and predation impaired it. Because the guppy has a generation time of about 100 days at a temperature of ±25°C, the populations may produce approximately 350 successive generations per 10 years which was the total observation time. The reproductive success of the live-bearing guppy females was measured as mean brood-size (Schröder 2000). Again, the selection pressure alone (0/S) exhibited a beneficial effect increasing the mean brood-size, while the combination of selection and mutations (M/S) decreased it. This holds true also for the courtship activity of random samples drawn both ca. 15 and 38 generations after the foundation of the populations.

Conclusions

These results of genetic risk estimations as obtained from experiments with mammals and different fish species tell us that there are many genetic hazards which are still unknown and perhaps permanently may be fixed in the human gene-pool. Allowing four successive human generations per century, 38 generations of guppy fish (*Poecilia reticulata*) would correspond to a human time interval of 950 years. Consequently, mutagenic effects caused by environmental accidents such as the nuclear disaster at Chernobyl should be detectable by innate genetic diseases at least still in the year 2953. Or, the other way around, an environmental accident happened in 1053 could still cause human harm and pain in our days (2003). These hereditary alterations would not only produce material sickness but also mental diseases such as deficits in intelligence due to aberrations in the chromosome number. Normally, translocations are inherited through many generations. Apart from a reduced fertility, many of these translocations do not lead to any visible handicap of their heterozygous carriers. However, as shown by our mouse experiments, translocation carriers are more aggressive and worse learners than their chromosomally normal sibs. Actually, there is no doubt on the inheritance of male aggressive behavior (Kessler et al. 1977) and learning ability (Lassalle et al. 1979; Schröder and Sund 1984) in mammals. Because high intermale aggressiveness of mice improves the access to receptive (oestrus) females, sexual selection favors aggressive dominant males siring more than 90% of the offspring in natural mouse demes (Busser et al. 1974). Thus, the combination of high aggressiveness with good learning performance should be most successful in natural habitats. As shown by present martial conflicts, human aggressiveness normally also will be rewarded by an improved access to economic and environmental resources at the expense of the losers. This reinforcement of and selection for aggressiveness by highly competitive human societies in combination with an increasing amount of potentially environmental mutagens burden future generations with the probability of an increase and subsequent fixation of deleterious genes in the gene pool which are then responsible for anti-social behavior patterns. Since some of these mutations may also be linked together with the deterioration of learning abilities, it seems reasonable to ask the tentatizing question whether or not forthcoming generations would produce an anti-social and violent mankind unable to solve their environmental and social problems in a human society no longer worthwhile of living with.

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OZON DEPLATION AND INCREASED UV-B RADIATION AS AN ENVIROMENTAL STRESS IN PLANTS

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INTRODUCTION

The ozone layer is one of the oldest things on the planet, older than of the ancient creatures. The ozone layer has provided protection for the living components under it for millions of years, and without the ozone layer, we most likely would not be here today. Our evolution would have been cut off millions of years ago without our planet's built in sunscreen.

Ozone is very rare in our atmosphere, averaging about 3 molecules of ozone for every 10 million air molecules. In spite of this small amount, ozone plays vital roles in the atmosphere. Ozone is mainly found in two regions of the Earth's atmosphere. Most ozone (about 90%) resides in a layer that begins between 8 and 18 kilometers above the Earth's surface an extends up to about 50 kilometers. This region of the atmosphere is called the stratosphere. The ozone in this region is commonly known as the ozone layer. The remaining ozone is in the lower region of the atmosphere, which is commonly called the troposphere. The figure 1 shows an example of how ozone is distributed in the atmosphere.

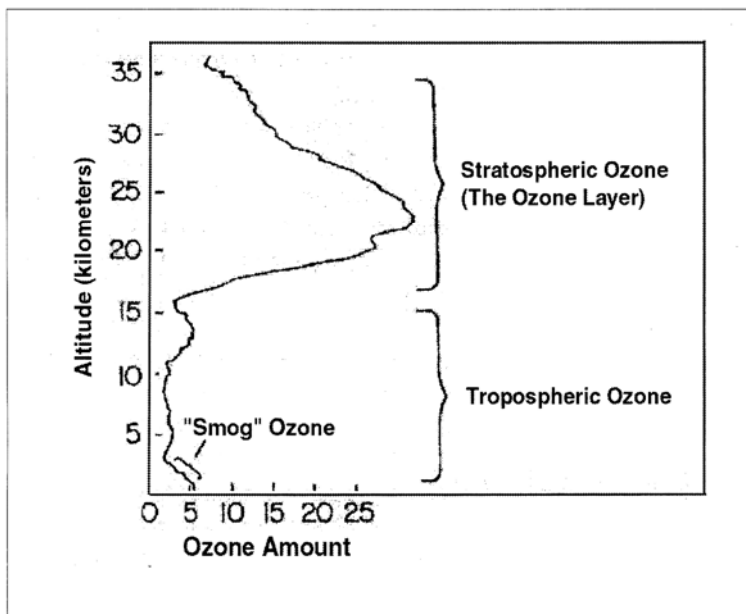


Fig.1 The ozone distribution in the atmosphere

The ozone molecules in these two regions are chemically identical, because they all consist of three oxygen atoms and have the chemical formula O₃. However, they have very different effects on humans and other living beings. Stratospheric ozone plays a beneficial role by absorbing most of the biological damaging ultraviolet sunlight, allowing only a small amount to reach the Earth's surface. The absorption of ultraviolet radiation by ozone creates a source of heat, which actually forms the stratosphere itself. Ozone thus plays a key role in the temperature structure of the Earth's atmosphere. Without the filtering action of the ozone layer, more of the Sun's UV-B radiation would penetrate the atmosphere and would reach the Earth's surface.

Since the 1970's, ground - based and satellite instruments have measured decreases in the amount of stratospheric ozone in our atmosphere. Ozone losses have been observed over large parts of Europe, Asia, Canada, North and South America, Russia. Between 1979 and 1998, ozone levels over these locations showed decreases on the order of 6 to 8%. Decreases in the stratospheric concentration of ozone cause increases in the UV-B radiation that reaches the earth's surface. The effects of this increased UV radiation are not well known. Many experimental studies of plants and animals and clinical studies of humans have shown the harmful effects of excessive exposure to UV-B radiation. Scientists have been studying these impacts and have found links between UV exposure and skin cancer, eye disorders and immune suppression in humans. Exposure to UV-B irradiation causes reduction in the growth and the development of many plant species and phytoplankton's. Out of some 200 agricultural plants tested, more than half show sensitivity to UV-B increases. On exposure to increased levels of UV-B radiation, many plant species exhibit reductions in their net photosynthetic rate and productivity (Salvador Nogues, et al, 1999), Chl synthesis was also inhibited by UV-B, especially at wavelength below 300 nm (Yuichi Takeuchi, et al, 1993). Intensified UV-B radiation can delay flowering and diminish lifetime flower production in a few plants (Blair J.Sampson and James H.Cane, 1999). However, knowledge about the molecular effects and responses of plant cells to UV-B is fragmentary.

Plant cells have many-different UV-sensitive components, among which the membrane system is very important from the viewpoint of the biological significance of UV action. Membranes and their components have also been cited as possible targets because of their importance to cell metabolism. In this paper we shall consider three important questions:

- 1.Does UV-B affect the integrity of plant cell membranes?
- 2.Does UV-B interact directly with membrane components in influencing plant cells?
2. Do changes in membranes caused by UV-B have a significance for the physiology of a whole plant under natural conditions. To achieve the goals the two following approaches are to be taken:

1. Identification of membrane responses to UV-D;
2. electrophysiological characterization and purification of protein factors and smaller organic molecules participating in UV-B signal transmission in membrane.

Materials and Methods

The study was performed on photosynthesizing cells of leaves of the higher water plants Canadian waterweed (*Elodea canadensis* Rich.) and spiral wild celery (*Vallisneria spiralis* L.); cells of underwater leaves of duckweed (*Lemna gibba*); and nonphotosynthesizing cells of Trianea root hairs (*Trianea bogotensis* Karst.). The large cells of these plants make it possible to conduct experiments for a long time without disturbing their physiological state or intactness of the membranes. Waterweed and wild celery were cultured in tap water, Trianea in Hoagland-Arnon nutrient solution - (0.25 N), under laboratory conditions. The solutions were changed once a week.

Leaves of land plants (spiderwort, wheat, corn) were also used in the experiments. Those of wheat and corn were 3-4 weeks old. Despite the possibility of measuring membrane potential for a long time (30-40 min) in cells of these plants, no clear change of membrane potential was observed during exposure to UV at the same dose to which leaves of the water plants were exposed. This is apparently associated with the presence of an epidermis-which greatly weakens UV radiation-in leaves of the land plants. It is known that 90% of UV radiation impinging on the leaf surface is weakened by the epidermal layer before it reaches the mesophyll cell (Caldwell M, et al., 1983). Microelectrodes were inserted into a mesophyll cell in leaves of the land plants in our experiments, and it is likely that no clear change of membrane potential was detected due to the low doses of UV radiation.

Before the experiment, leaves (parts of leaves in the cases of wild celery and the land plants) and roots with well developed hairs were detached and kept in a flow chamber in artificial pond water (APW), whose composition included 1.0 mM NaCl, 0.1 mM KCl, and 0.1 mM CaCl₂. A continuous flow of APW made it possible to preserve the normal physiological state of leaves and roots. The membrane potential and membrane impedance were studying using intracellular microelectrode technology, as described in detail by Aliev et al. (1984). The microelectrodes constitutes a glass capillaries filled with 3M KCl. The main source of UV radiation was a DRT-230 high-pressure mercury lamp, which has a linear emission spectrum. Other types of lamps were also used, namely a BUV-15 bactericide lamp and a DRSh-250 ultrahigh- pressure lamp, which differ in emission spectrum from a DRT-230 lamp. The distance from the lamps to the exposed object was 0.25 m. Radiation intensity was 32 Wm⁻².

Glass filters (UFS and BS) were used in studying the action spectrum of membrane potential depolarization. The UV-transmitting filters (UFS and BS) were obtained from Russian LOMO. The transmittance spectra of these filters are the same as filters of Toshiba Glass Co.Ltd (UV-28, UV-29, UV-30, UV-31, UV-32). Each filter is characterized by reference to the wavelength at which 50% transmittance occurred (WL (T=0.5)). Each experiment is replicates three or five times. Figures show one of them results of these experiments.

The exposure procedure made it possible to register membrane parameters without interruption during exposure and for a long time after stoppage of exposure. Typical recordings of membrane potential registration are presented on the figures.

Results and discussion

The membrane potential of these cells under light in APW attained 300 mV. The value of membrane potential in wild celery cells was commensurate with the membrane potential value in waterweed and constituted 200-250 mV under these conditions. In comparison with leaf cells, cells of Trianea root hairs had a slightly lower membrane potential (120-150 mV).

Irradiation of leaf cells of water plants with UV-B leads to depolarization of the plasma membrane. A complex change of membrane potential was detected (Fig. 1). A fast and strong depolarization of the membrane potential occurred during the first minutes of exposure. Regardless of continuing exposure, the membrane potential returned to the starting level, after which a slow phase of depolarization set in. It is interesting to note that input impedance of the membrane and intercellular electrical couplings (conductance of plasmodesmata) did not change during depolarization development or after repolarization processes.

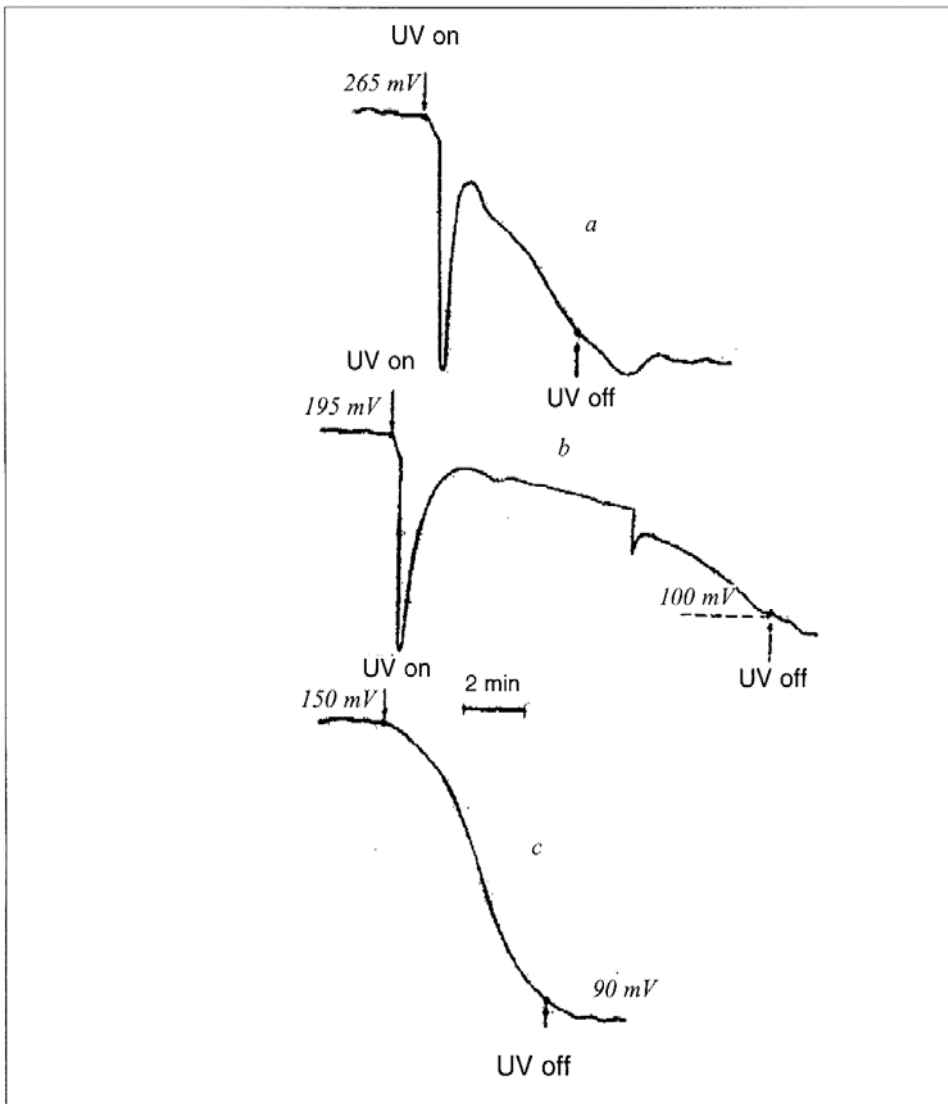


Fig.2 Changes in MP of *Elodea* leaf cells (a), *Vallisneria* leaf cells (b) and *Trianea* root hairs (c) during UV exposure

As can be seen from Fig. 1, the nature of membrane potential changes in photosynthesizing cells of waterweed and wild celery leaves differ from the nature of membrane potential changes in non-photosynthesizing cells of *Trianea* root hairs. Only a slow depolarization phase was registered in *Trianea* root hairs. Thus, UV can evoke two types of depolarization, rapid and reversible depolarization at first, then slow depolarization. It was interesting to study the action spectrum of these two types of depolarization. To this end, we used different sources of UV and UFS and BS glass filters to investigate the kinetics of membrane potential changes during exposure to UV. The action spectrum of the fast UV response lies in the region with wavelength of 300-330 nm, that of the slow depolarization phase in the region of 280-300 nm.

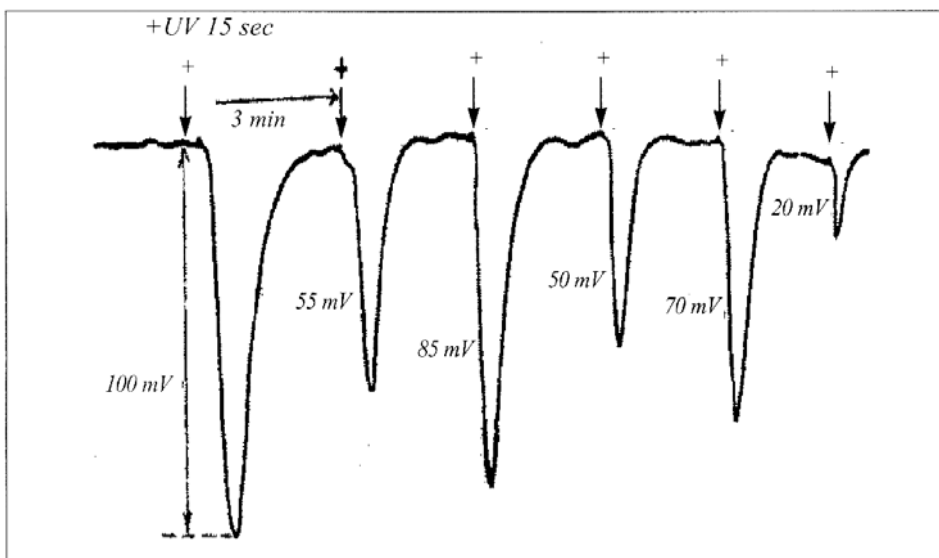


Fig.3 The kinetic of changes in MP of Vallisneria leaf cells during action series UV pulsed (15 sec)

We obtained an interesting response during pulsed action of UV radiation. The common character of response of membrane potential is preserved during pulsed action of UV-radiation. On action series UV -pulsed with duration 15s, by dark interval 3 min, observed no monotonous response of systems on the UV-excitation: the depth of depolarization on the first and the following odd impulses more than on the second and the following even impulses in series. This original character of response develops in the background common monotonous depolarization; obviously, depend on by same reasons, which are during in the continuous irradiation. On shorting interval between impulses in series, as can be seen Fig. 3, the depth of depolarization in response to add impulses decreases still more in comparison with even impulses.

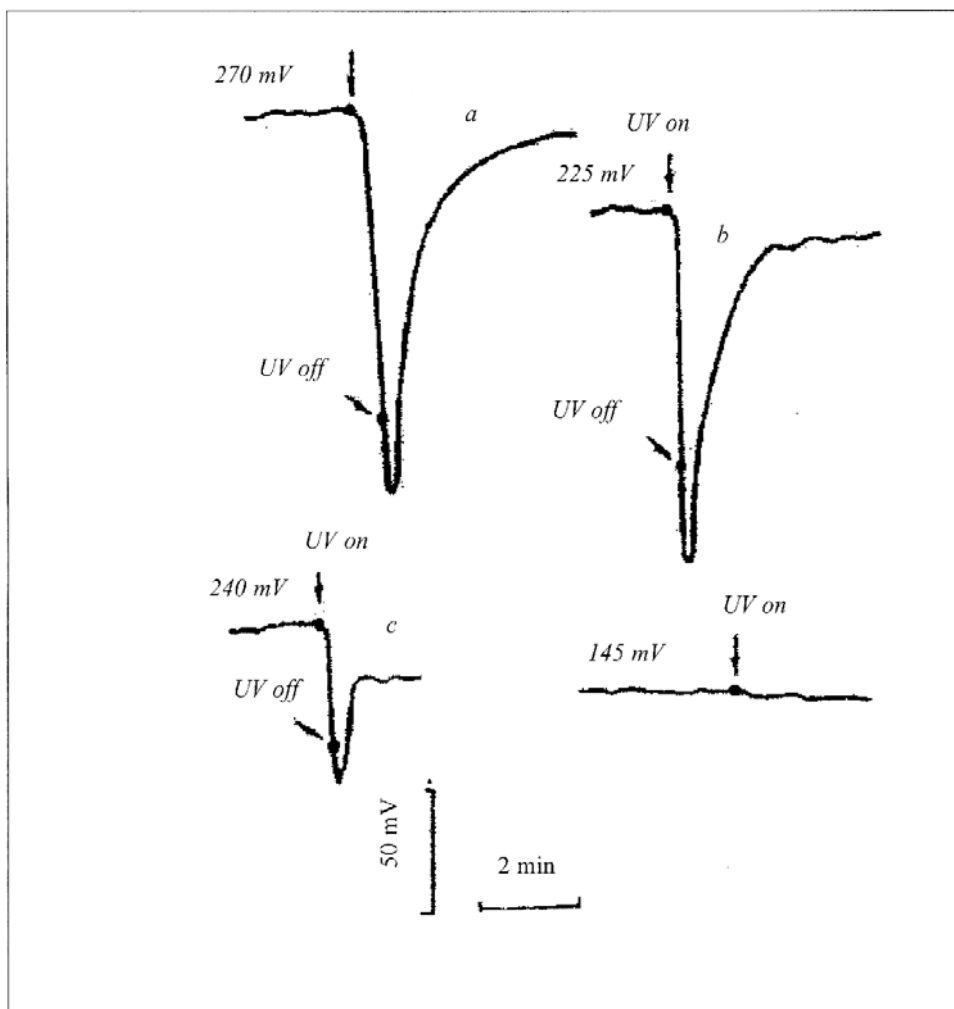


Fig.4 4 Fast UV response of *Elodea* leaf cells (a), *Vallisneria* leaf cells (b), *Lemna* leaf cells (c), and *Trianea* root balers (d).

Experiments show that the fast UV response occurs at relatively low doses of UV radiation and has a special mechanism. Certain aspects of this fast UV response were studied in a previous our work [Aliev et all, 1984]. Detailed study of this fast phase of membrane potential changes indicates that a last and reversible depolarization occurred in cells during brief (15 - 25 sec) exposures to UV with wavelength 300-330 nm. Such a fast UV response was characteristic of photosynthesizing cells and was not discovered in cells of *Trianea* root hairs, which are incapable of photosynthetic activity (Fig 4). Depolarization of the plant cell membrane potential during UV exposure can result from changes in passive transport properties of the membranes, as occurs

in the case of Chara corallina [Doughty and Hope, 1976]. The constancy of membrane input impedance, invariability of intercellular electrical couplings during development of the fast UV response, and independence of its kinetics in relation to the presence and concentration of sodium and potassium in the external medium indicate that exposure to UV in this case does not affect 'passive properties of plant cell membranes.

Adhering to the idea of parallel existence of the H⁺ - ATPase and redox-active types of H⁺-pump on the plant cell plasmalemma, we suggest the following explanation for the effect we obtained during UV exposure. The action spectrum of the fast UV response in the region of 300-330 nm means that UV in this case directly affects to the nonprotein component of the plasmalemma. This may be a component of a redox-chain. Evidently, UV with wavelength of 300-330 nm alters the function or structure of a component of the redox system. This component probably is molecular quinone. We purpose that the molecular of quinone is the initial chromophore in the plasma membrane, which absorb the UV -light. By exciting and altering the form of quinone, UV brings about inactivation of the redox system. Inactivation of the redox system in turn leads to membrane potential depolarization and acidification of the cytoplasm, which stimulates a pH_i-dependent H⁺ - pump of the H⁺-ATPase type. The initial strong membrane potential depolarization during development of the fast UV response therefore undergoes repolarization and returns to the starting level irresjctive of stoppage or continuation of exposure. This can be regarded as an argument for interrelated functioning of the redox system and the H⁺-ATPase type of H⁺-pump. As for the slow depolarization phase in the wavelength region of 280-300 .am, it coincides with the absorption spectrum of protein molecules. It may therefore be assumed that the H⁺-pump of the H⁺-ATPase type is inactivated at the same time as the redox system with continuation of UV exposure. Thus, the results of these experiments are in agreement with the idea that the H⁺-extruding complex of the plant cell plasma membrane consists of two types of interrelated electrogenic H⁺-pumps: an H⁺-pump of redox- active nature and that of the H⁺-ATPase enzyme complex. The approach we suggest makes it possible to exert selective influence on these two mechanisms of the H⁺-extruding complex by employing UV with different wavelengths.

It is concluded that the membrane effects of UV, especially UV-B, is neither lethal nor stressful, but represent a normal mechanism of pump inhibition. The physiological significance of UV-B induced damage to membranes may be its killing plant cells, in changing the function of ion transport in a way that inhibited proton pumps.

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QUANTUM MEDICINE: THE RESULTS AND HOPES

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For today, there is accumulated a powerful enough quantity of exploratory and clinical results, testifying to a beneficent role of electromagnetic radiation in processes, flowing in an alive organism, and in the processes accompanying treatment of different diseases. Moreover, according to the data of the professor Zilov V.G., more than 20 % of the population of Holland and up to 45 % of the inhabitants of France use within the framework of complementary or alternate medicine the technologies of electromagnetic or, in a more comprehensive sense, quantum therapy. Only within 1997 in the world was sold of permanent magnets on more than 2 billion of dollars - and all these magnets were used for treatment of sicknesses of a different etiology.

Probably, only with the beginning of usage of therapeutic lasers (1974), they began to rethink the value of electromagnetic waves of optical range during habitability of live organisms.

The scientific data and the clinical researches obtained in last 10-20 years in many countries and, specially, in Russia, have shown, that the good results at treatment of number of pathological processes can achieve not only at use of laser light, but also at operating with other physical factors:

- * Of radio waves of millimeter range;
- * Radio waves of -cm and decimeter ranges;
- * Visible light of different spectrum;
- * Electromagnetic waves of low frequency;
- * Acoustic waves, etc.

All these miscellaneous researches speak about beneficent operating side of non-polluting electromagnetic fields and its influence on the condition of a biological organism.

On general background of miscellaneous electromagnetic effects, the results reached with the help of laser therapy are stepping out.

But, even if the procession of laser light in medicine was victorious, there is remained and remains still a lot of vague in the researches. The laser stimulation is good, but it is not a panacea. Really, as the originating and developing of life can not, and it is impossible to find, be obliged to anyone, there can not be an unique medicine or, in our case, unique electromagnetic effect, which completely would determine life.

Being grounded on such approach and recognizing a basic role in self-organizing of the alive nature of quantum, electromagnetic processes, we recognize, that combined, polio factor's set of electromagnetic fields is more effective for stabilization processes of habitability, than mono effect any of one electromagnetic treatment, no matter how effective it would be seen.

In our Association of quantum medicine accumulated the ten years' experience of work and broad intrusion in practice of public health services the technologies, founded on application of electromagnetic radiation, with the purpose of preventive maintenance, diagnostic, treatment and after treatment of broad spectrum of diseases. We call these technologies as "Technologies of quantum medicine".

If quantum therapy, preventive maintenance and rehabilitation treatment use the external effect on an organism specially selected electromagnetic fields, the quantum diagnostic is based on the measurement of parameters of an internal electromagnetic condition of an alive organism. Such measurements are easier to make through special "information windows", which are open in biologically active points.

So, the quantum medicine outgoes from an admission of dualistic of a surrounding world (i.e. from the realization that the world consists the matter and the field), and is based on an admission of the extremely relevant role of wave electromagnetic processes in habitability of biological systems. The quantum medicine bases on interconnection and interplay of each cell of an organism with an environment.

Thus, the quantum medicine is a combination of knowledge and methods, founded on targeted usage of natural electromagnetic radiation and wave informational properties of living matter, with the purpose of long time maintenance of harmonic condition of health in a live organism.

It is very important to understand that a human body, as any live organism, always is in a condition of dynamic equilibrium. It permanently resists to those internal and external exposures, those deviancies, which attempts to push it in a condition of illness, i.e. to remove it from the steady, generically given equilibrium state. The customary condition of an organism is a condition of constant self-treatment. The organism in Equilibrium State has enough of forces to support a condition of health, and the best "drugs" against available illnesses are worked out, usually, by an organism. A problem of quantum therapy is the mobilization of internal reserves of an organism on a pure resistance to deviations from stable state. The quantum effect in this sense is a trigger, which starts the internal mechanism of the active mobilization of the organism on struggle with the deviancies.

Built by Association of quantum medicine methods of treatment, preventive maintenance and the after treatments, founded on polio-factor electromagnetic low-energy effect on the patient, have appeared enough universal. The experience of their usage in ten thousand clinics in Russia and many other countries on millions of ill allows to speak about a lot of advantages contrasted to the other kinds of treatment. Namely:

1. The latitude of application and practical independence of the nosological forms. It is difficult to find a direction in today's differentiated medicine, wherever the methods of quantum therapy were not to be used:

- Cardiology,
- Gastroenterology,
- Diseases of OL organs,
- Pulmanology and phtisiology,
- Illnesses of locomotorium,
- Urinology,
- Gynecology,
- Dentology,
- Ophthalmology,
- Surgery,
- Neurology,
- Mental disorders,
- Endocrine diseases,
- Skin diseases,
- Cosmetology,
- Sporting medicine,
- Oncology, etc.

By our Association are designed and widely be used the methodical guidelines on all of these and other directions of medicine.

2. Independence from the age of the patient. The quantum therapy without fear is applied not only to treatment of ill from infantile up to senile age, but also at the beginning of a new life in case of treatment of barrenness. A series of pediatric techniques are designed.
3. The quantum therapy does not know racial borders. The people both black, and white, both red, and yellows equally adequately react to polio factor electromagnetic effect. The one thing that there is necessary to mark, is smaller reflectivity of more dark skin.
4. Independence from the climatic and geographic factors; these technologies work in southern and Northern Hemisphere, on equator and in a distant north.
5. The combined electromagnetic radiation beneficently acts on most miscellaneous animal. The horses and dogs, cows and rabbits, birds and crocodiles - the quantum therapy has helped to all of them to be saved of many diseases. We designed the methodical manuals on application of quantum technologies in a veterinary medicine.
6. The complex electromagnetic effect works on the plants also. It strengthening their life-stability and promoting increase of productivity.
7. Ecological purity and absence of side effects.
8. Simplicity and safety of application, no pain during the procedures and comfort.
9. High economic efficiency.
10. High clinical efficiency - from 70 % up to 98 %.

11. Good compatibility with all known methods of treatment (allopathic, homeopathy, manual therapy, reflex therapy, any physiotherapy).

Asking the question about the cause of such beneficent universality of quantum effect, we come to the answer, that the electromagnetic radiation touches fundamental grounds of life. It is fundamental, because acts on basic processes of habitability, which are universal for all alive. The universality of such mechanisms shows only at the level, on which we earlier seldom looked at: at a level of a cell, inner cellular processes, at a level of molecular and nuclear interplay. It is interesting to note that the living cell is initially universal: it can be as a cell of a bone or cardiac tissue, a cell of a brain, or blood cell. A functional and morphological diversification of cells of a composite organism is conditioned only by the fact, that in miscellaneous in purpose cells are included (i.e. there are in active state) miscellaneous genes, while the genes in charge of other functions, are in a "sleeping" condition.

In this connection it is curious, that if to learn purposely to activate those of "sleeping" genes, it is possible to restore the lost organs. But it is already different subject.

Methods of treatment

The polio factor quantum therapy is carried out, as a rule, by contact, not invasive effect on zones of localization of the pathological part of body, and also on zones of a projection of organs and systems, functionally bound with the hurt part. Often get used over vein and through skin treatment of projection' zones of the large blood vessels; the zones of projection of lymph nodes will sometimes be involved also. In a number of cases, especially at composite and advanced diseases, it is recommended to mate effect on the active points and reflexogenic zones.

Practical results

In Siberia, in the Kemerovo area, during 3 years the preventive courses of quantum therapy to often-sick schoolboys in the season's autumn and spring peaking were conducted. As a result of these preventive actions the level of diseases among the schoolboys, who went through these indicated courses, has decreased in 3,6 times as to compare with the monitoring group.

In Moscow the professor V. Avdoshin designs a technique of treatment of a urolithiasis on the basis of quantum methods of effect, permitting in a number of cases to avoid an operative intrusion.

The treatment of a pulmonary tuberculosis demonstrates, that due to combination of methods of quantum therapy with a method of use of

customary drugs, terms of an elimination of bacilli were reduced in 2,6 times in 100 % of cases, and terms of closing of cavities of decay - in 2 times.

In the Moscow scientific oncology center low intensive quantum therapy since 1994 will be used for treatment of concomitant diseases for oncology ill, and also for decrease of a side effect of radial and chemotherapy of cancer. It is marked that the quantum effect not only does not instigate development of tumoral process, but also increases antitumoral activity of blood cells (stage of experiment).

In those cases when the natural feeding of just born babies by mother's milk is hindered because of the missing function of lactemia, to the aid comes the magnetic infrared laser effect on mammas. Usually 3-5 sessions it is enough for full recovery of functions.

In Ulyanovsk by the professor - podiatrist A. Kusselman the technology of quantum flow focal and total alopecia of children and teens is designed. The same technology will be used for treatment of loss of hair for the women and men. The treatment of this composite disease takes from 3 up to 5 courses with 1,5 month' rests between courses.

The composite pathological processes in an organism, both in female and in man's, bound with the discontinuance of genesial functions in the term of climacterium, can go quite comfortable and painlessly in case of usage of bolstering quantum therapy.

The professor Pretidev Ramdavon (the island of Mauriky) has offered a technique of treatment forms of sugar Diabetes: both, insulin dependent and not dependent. The successful treatment of 60 patients in the age from 3 to 76 years was conducted. The duration of treatment was from 2 weeks to about 4-5 months. In the result for all ill's the sugar was normalized, and the overwhelming majority of them do not use any drugs after treatment.

As the writer of a method considers, he, possibly, managed to wake up the capacity of a pancreas to rebuild the tissues, including Langergans' islands, accountable to an insulin production.

It's good to take attention to the results in application of quantum stimulation in sporting medicine. Affecting with a definite technique on large veins, liver, heart, and muscle in the season of opening-up to important competitions, it is possible essentially to increase the physical and psycho-emotional shape of the sportsman. So, on the grounds of International center " Sports - the XXI century ", that are in the mountains on the border of Austria and Slovenia, was possible, due to usage of such techniques, for less than one year to improve twenty European and national Records in different kinds of sports. The succor team of France actively used these techniques in the season of opening-up and realization of last world championship, where it managed to become the champion.

Horse ranches of Russia with success have begun to use our technologies of quantum stimulation of the sporting horses for achievement of high results on competitions.

Conclusion.

All set forth above - only retiring case history to the broadest and fascinating outlook to capabilities of quantum medicine. Deployment of these capabilities is a general problem to those, who has not lost inquisitiveness and optimism.

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EARTH SCIENCES

ABOUT POSSIBLE REASONS OF VARIATIONS OF GRAVITATIONAL CONSTANT

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By increasing of precision of measurements of values of gravitational constant G , differences between them increase in peculiar way.

For the first time, possibility of variations of gravitational constant was admitted by P.Dirak /1-2/. Consequently, many scientific researches of different scientists were devoted to this problem /3-11/.

Thus, in 1999 team of Russian scientists-Izmaylov V.P., Karagioz O.V. and Parkhomov A.G. published their researches on variations of results of measurements of gravitational constant /5/, insignificantly modernizing classical experience of Kavendish.

Authors /5/ obtained the variations of results of measured G values, significantly exceeding errors of measuring instrument.

Meantime, summing up researches, above mentioned scientists came to the following conclusion: "Analysis of variations of results of measurements of gravitational constant indicates, that they are connected with whole series of cosmic and geophysical phenomena. It is reasonable to suppose that this analysis does not detect variation of value of physical constant-gravitational constant, but action of some factors, not considered by scientists, directly or indirectly influencing on results of measurements. Long-term searches of these factors were not successful. Conducted researches indicated that variations of geomagnetic field, instability of temperature and atmospheric pressure, flows of residual gas in vacuum chamber, variations of inclination of installation can not lead to observed effects. Variations of gravitational field, connected with change of mutual position of the Earth, the Moon and the Sun are too small for direct sensitive influence on results of measurements."

Thus, hitherto two more precious G measurements were obtained by team of scientists from Washington University in Seattle and from International Bureau of Measures and Scales near Paris, and in both cases

errors of experiment were 1/10000, however difference of obtained values significantly exceeds possible errors. Value /12/ was obtained in Seattle:

$$G = (6.674215 \pm 0.000092) \cdot 10^{-11} \text{ m}^3 \cdot \text{kg}^{-1} \cdot \text{s}^{-2}$$

Jean-Paul Mbelek and Mark Lachieze-Ray from French commission on atomic energy stated that they managed understanding the reason of such divergence between experimental values. For this point they had to take into account geographical position of laboratories, where these experiments were conducted. Researchers supposed that interference of gravity and magnetic fields is in the basis of observed divergences.

In their works they presented calculations of expected values of gravitational constant in different regions of planet. As the basis of their calculations, theories suggesting availability of concealed dimensions at space (particularly, theory of strings within which electric magnetic and gravity fields are merging) /13-14/.

It is seen from calculations, that terrestrial gravity will be stronger at those places, where magnetic field is stronger, i.e. maximal values may be expected at regions of Northern and Southern magnetic poles. In their opinion, available experimental data agree with theory rather well, however, conducting of precision measurements is required as at regions of poles itself, so at equatorial regions.

Scientists consider that Sun studies also confirm their suggestions. If one applies the model, where minor value of gravitational constant is applied, then better agreement with experimental data takes place.

Mbelek informed that according to their calculations, during high temperatures, influence of magnetic field on force of gravity is weakening. Thus, in their opinion it is possible to expect that constant G inside the Sun has minor value /13/. Meantime, many scientists do not share conceptions of above mentioned scientists.

It is mentioned in work /15/, that for the last years deviations of measured gravitational constant reached 0,7%. New experiment of team of Swiss physicists from Zurich University allowed obtaining the result differing from French one. Thus, in special cemented cellar near Villigen, Switzerland by means of sensitive laboratory scales they measured differences in mass of two small weights above or under which two gigantic mercury containers with weight of 13 tons /15/ were located. Calculating by supersensitive weights variations of weight of sample masses, researchers measured values of gravitational constant, which is equal:

$$G = (6.6754 \pm 0.0005) \cdot 10^{-11} \text{ m}^3 \cdot \text{kg}^{-1} \cdot \text{s}^{-2}$$

Their data differ from results obtained by team in Seattle and by French scientists.

By that Stephan Schlamminger, chief of Zurich team, considers Paris result, as refuted.

In any case, attempts to specify measurements of G value meantime lead to strengthening of data deviations obtained by different scientists of World. This intensifies some confusion of scientists, as G variations do not agree with main positions of general relativity theory

One may state about errors connected with errors of measurements or with not considered noises, if it were individual cases. Meantime, non-coordination of measured G values is observed in wide scale during last decades, increasing proportionally to increase of precision of measurement systems.

According to GRT gravity field changes spatial-temporary continuum. In accordance with modern representations, transmission of gravity energy to remote distances at large-scale astronomical events, for example during explosion of super new or merging black holes must be accomplished by means of gravitational waves. A. Einstein first predicted gravitational waves, within frames of general relativity theory /16/.

Particularity of gravitational wave is that during passage via space and bodies it does not only deforms them, but also exerts alternate influence on interaction of masses located in the area of space covered by gravitational wave, length of half period of which exceeds distance between centers of mass. Thus, gravitational wave changes amplitude of disturbance of metrics of space η , which ought to lead, accordingly, to alternate moving away and approaching of masses located in the field of passing of gravitational wave.

Namely, this effect of quadrupole influence of gravitational waves on carried masses is applied at modern laser, interferometer, gravity-wave detectors representing several modified interferometers of Michaelson. Works /17-19/ and works of other scientist are devoted to development of detectors of gravitational waves and gravity-wave researches. Let us consider an example of passage of gravitational wave via the Earth, when the length of half-period of wave significantly exceeds the Earth diameter, pic .1

Naturally, interacting masses on the Earth surface, being in the field of passing gravitational wave, will behave in different way depending on orientation of these masses in relation to the wave front.

If masses are oriented, as it is indicated at pic.1., then influence of gravitational wave on their interaction between each other will also take place similarly to pic.1.

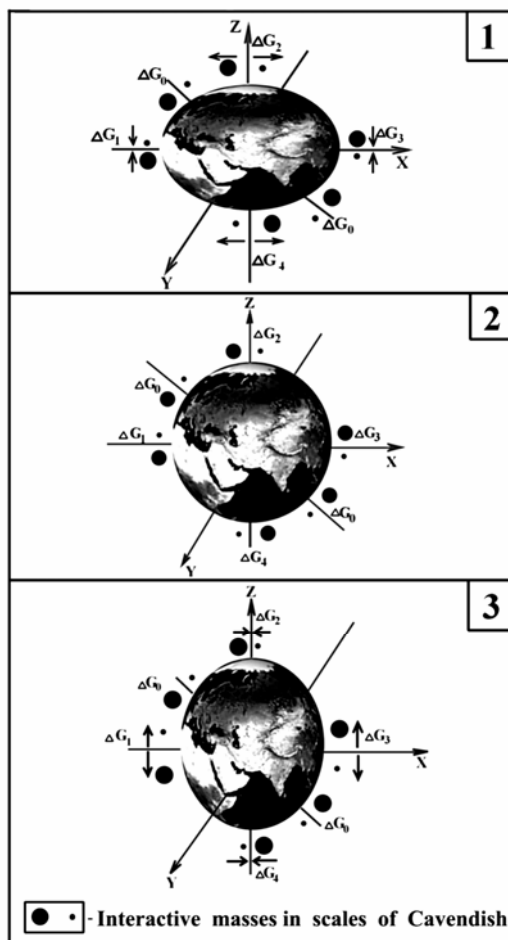
Image of the Earth deformation in pic.1 (1) during passage of the first half period of gravitational wave and reaction of interacting masses on its passage in Kavendish scales. As it is seen, interaction of masses in the region of poles at this orientation will show decrease of value of gravitational constant and its increase in equator. At the same time, at the point of change of half periods of gravitational wave, G value will be almost equal at all areas of the Earth, pic.1 (2). During passage of the second half period of wave masses will interact weaker in the area of equator and in the area of poles-stronger, this will be reflected as decrease of values of gravitational constant measured in the equator zone and its increase in poles pic.1 (3).

However, change of orientation of arms with loads in Kavendish scales in relation to direction of propagation of gravitational wave, will lead to other results of values of gravitational constant.

That is why, process of measurement of true value of gravitational constant must be more complex, than it is made presently. It turned out, not only geographical position of measuring laboratories, but spatial orientation of measuring device in relation to front of propagation of gravitational wave just influences on indications of Kavendish scales. As it was indicated above, G values, obtained by various laboratories, differ significantly from each other. Along with this, J.P.Mbelek and M.Lachieze-Rey made a model in accordance with which, values of gravitational constant increase by approaching to the Earth magnetic pole. According to the work /14/ the coordinates of points of measurement and of measured G values are indicated in table No.1.

At the same time, according to table 1, the charts constructed by us, taken from article J.P.Mbelek and M.Lachieze-Rey /14/ did not confirm conclusions of authors of article about existence of statistically verified dependence of G on latitude and longitude of position of laboratories. During compilation of charts at those points of measurements, where several values G are given, average values were taken as the base. Chart of dependence of G on latitude of location of laboratories is indicated in pic 2.

As it is seen from the chart (pic.2.) rectilinear trend unambiguously indicates that measured G values in this case do not depend on latitude of location of measurements. Insignificant angle of decline of trend is within error.



Pic. 1. Model of influence of super long gravitational waves on deformation of the Earth shape and interaction of masses in Kavendish scales.

1 - Deformation of the Earth shape during passage of the first gravity half – wave;

2 - the Earth acquires natural shape at the point of alteration of the first and second gravity half-wave;

3 - Deformation of the Earth shape during passage of the second gravity half-wave.

$\Delta G_{1...n}$ - declination of gravitational constant from true value as a result of passage of gravitational wave depending on geographical position of Kavendish scales.

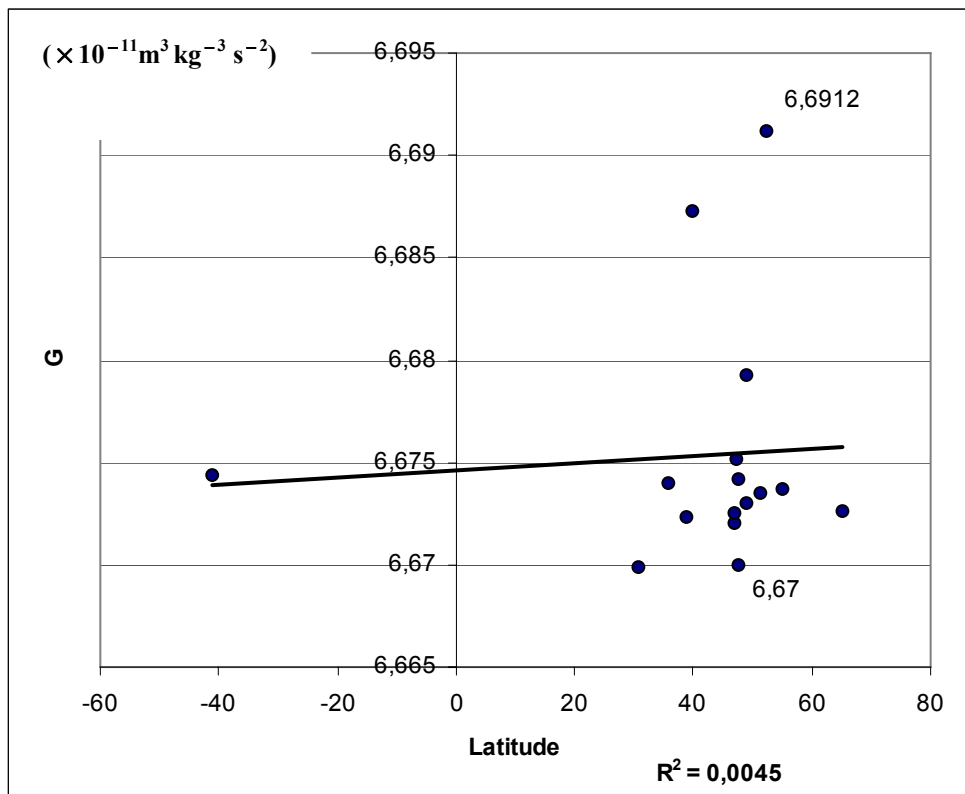
ΔG_0 - true value of gravitational constant must be observed at the point of intermediate geographical position of Kavendish scales between regions with maximal and minimal G deviations.

Moreover, even if one takes artifacts as a basis-the maximal G value ($6.6912 \pm 0,0006$) obtained in Brownschweig (RTV) and minimal G value ($6,67\pm 0,008$) obtained in Budapest, then they are approximately at close

latitudes, correspondingly 47°5' and 52°28' of northern latitude. By that, mean square error of $R^2 = 0,0045$.

Table 1

LOCATION (REFERENCE)	LATITUD E(°)	Longitud e(°)	G _{lab} (10 ⁻¹¹ m ³ kg ⁻¹ s ⁻²)
Lower Hutt (MSL)	-41.2	174.9	6.6742 ± 0.0007 6.6746 ± 0.0010 (6.6744)
Wuhan (HUST)	30.6	106.88	6.6699 ± 0.0007
Los Alamos	35.88	-106.38	6.6740 ± 0.0007
Gaithersburg (NBS)	38.9	-77.02	6.6726 ± 0.0005 6.6720 ± 0.0041 (6.6723)
Boulder (JILA)	40	-105.27	6.6873 ± 0.0094
Gigerwald lake	46.917	9.4	6.669 ± 0.005 6.678 ± 0.007 6.6700 ± 0.0054 (6.672)
Zurich	47.4	8.53	6.6754 ± 0.0005 ± 0.0015 6.6749 ± 0.0014 (6.6752)
Budapest	47.5	19.07	6.670 ± 0.008
Seattle	47.63	-122.33	6.674215 ± 0.000092
Sevres (BIPM)	48.8	2.13	6.67559 ± 0.00027 6.683 ± 0.011 (6.6793)
Fribourg	46.8	7.15	6.6704 ± 0.0048 (Okt.84) 6.6735 ± 0.0068 (Nov.84) 6.6740 ± 0.0053 (Dec.84) 6.6722 ± 0.0051 (Feb.85) (6.6725)
Magny-les-Hameaux	49	2	6.673 ± 0.003
Wuppertal	51.27	7.15	6.6735 ± 0.0011 ± 0.0026
Braunschweig (PTB)	52.28	10.53	6.71540 ± 0.00056 6.667 ± 0.005 (6.6912)
Moscow	55.1	38.85	6.6729 ± 0.0005 6.6745 ± 0.0008 (6.6737)
Dye 3, Greenland	65.19	-43.82	6.6726 ± 0.0027
Lake Brasimone	43.75	11.58	6.688 ± 0.011



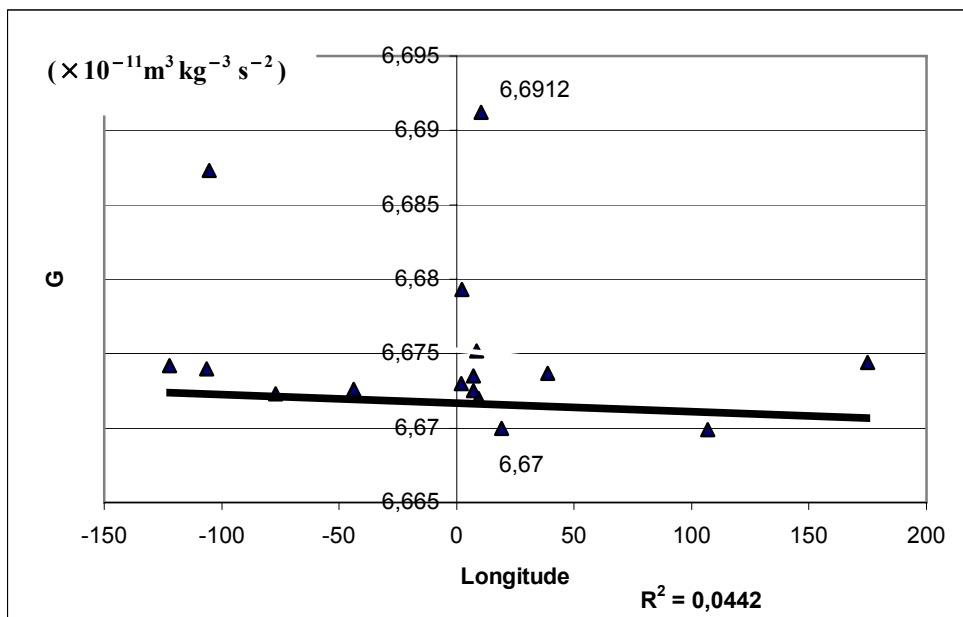
Pic.2 Chart of dependence of gravitational constant on latitude of location of measuring laboratory, according to data /14/.

Considering dependence between longitude and measured G values, we come to similar conclusion. Thus, rectilinear trend reflecting dependence of G values on longitude of location of measurements is indicated in pic.3.

Despite of the point, that trend has insignificant inclination, within limits of errors, declinations of G values points out absence of statistically verified dependence of G on longitude of location of measurements. Minimal G value, obtained in Budapest ($6,67 \pm 0,008$) and maximal G value ($6,6912 \pm 0,0006$), obtained in Brownschweig (RTV) are rather close by longitude, correspondingly at eastern longitude $19^{\circ}07'$ and $10^{\circ}53'$.

Root mean square error during construction of trend was $R^2=0,0442$.

Thus, conducted analysis indicated absence of statistically verified dependence of measured G values on latitude and longitude of location of measuring laboratories.



Pic.3 Chart of dependence of measured values of gravitational constant on latitude of location of measuring laboratory according to data /14/.

At the same time, if one pays attention to G values, measured in Friburg in October, November and December of 1984 and in February of 1985, then it is possible to notice significant variations of G values, starting from the third sign after coma. This fact witnesses about permanent dynamics in variations of measured G values. The authors /14/ mention that despite of the point, that they did not take into consideration variations of geomagnetic field in time, it worth while to mention that variations of geomagnetic field have no correlation with variations of measured G values, which is confirmed by studies /5/.

Possessing facts about significant variations of measured G values concurrently, one may hardly consider comparisons of G values inter parties measured at different time as correct ones.

Even, if one takes into consideration difference of G values measured at the same time, then these values must truly depend on geographical position of laboratories, however they will change permanently due to influence of super long gravitational waves passing via the Earth.

Thus, as it was mentioned above during passage of gravitational wave, amplitude of disturbance of metrics of space η changes:

$$\eta \approx \frac{1}{2} \Delta L/L \tag{1}$$

where

η is amplitude of disturbance of space metrics;

ΔL - is relative displacement of two spatial points in the field of gravitational wave; L - is distance of spatial points between each other

At the same time, measured values of gravitational constant in the field of gravitational wave and beyond it will differ by value ΔG , equal to:

$$\Delta G = G_w - G, \quad (2)$$

where G_w - is gravitational constant, measured in the field of gravitational wave and G - is gravitational constant, measured beyond the field of gravitational wave (true value).

In connection with above mentioned, we introduce coefficient of variation of gravitational constant in the field of passing gravitational wave, defined by formula:

$$\delta = G_w/G, \quad (3)$$

where

δ is coefficient of variation of gravitational constant in the field of passing gravitational wave;

G_w - is gravitational constant, measured in the field of passing gravitational wave;

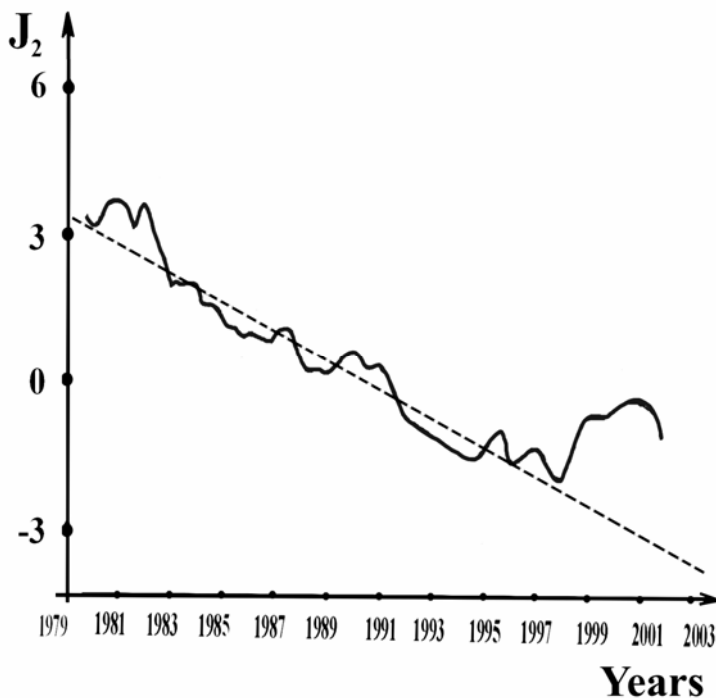
G - is gravitational constant measured beyond the field of passing gravitational wave (true G value).

Therefore, value of gravitational constant G measured in the Earth by means of Kavendish scales in the field of passing gravitational wave will differ from true G value in accordance with coefficient δ . Magnitude and sign of change of measured value of gravitational constant G under influence of gravitational wave will depend on amplitude of gravitational wave and orientation of interacting masses in relation to front of passing wave.

Christopher Cox and Benjamin Chao published articles /26,27/, where it is informed about new and absolutely unexpected result, concerning variations in gravity field of the Earth. They applied data of satellite laser ranging collected during last 25 years for determination of long term variations in zonal coefficient of spherical harmonics of the Earth of second degree, of the so-called coefficient J_2 . As it is accepted to consider, coefficient J_2 reflects dynamics of ratio of equatorial and polar radii of the Earth. For many years coefficient J_2 was decreasing, due to release of water from melted snow from mantle since times of glacial epoch. Meantime, new data indicate, that since 1988 coefficient J_2 began to increase.

Data of satellite laser ranging (SLR) given at pic.4 indicate after some time shifts in change of the Earth oblateness. By this, if since 1980 up to 1997

magnitude of coefficient J_2 was kept approximately permanent at $-2.8 \cdot 10^{-11}$ per year, then it is evident, that starting from 1998 opposite change of $J_2(t)$ accelerated in accordance with some unknown mechanism.



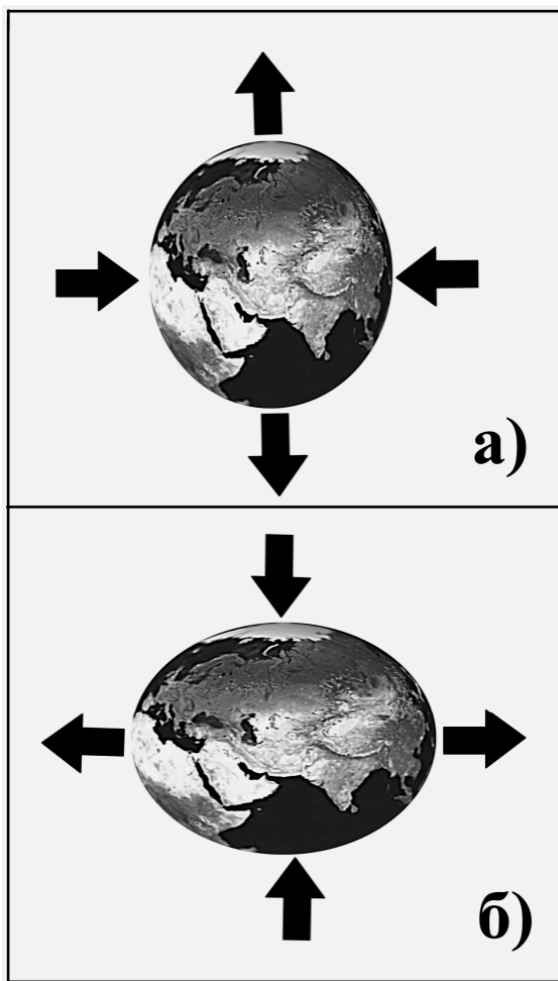
Pic. 4. Chart of long term variations of zonal coefficient of spherical harmonics of the Earth of the second degree J_2 /26,27/. Values of Coefficient J_2 are given by axis of ordinate. Years are indicated by axis of abscissa.

It means according to data of NASA /26,27/, if before 1998 increase of radius of the Earth was occurring in the poles and its decrease in equator, then starting from 1998 this process reflects expansion of the Earth in equator and oblateness in poles, as it is shown in pic. 5.

Specialists of NASA relate declinations of orbits of artificial satellites of the Earth obtained by SLR to global variations of gravity field of the Earth.

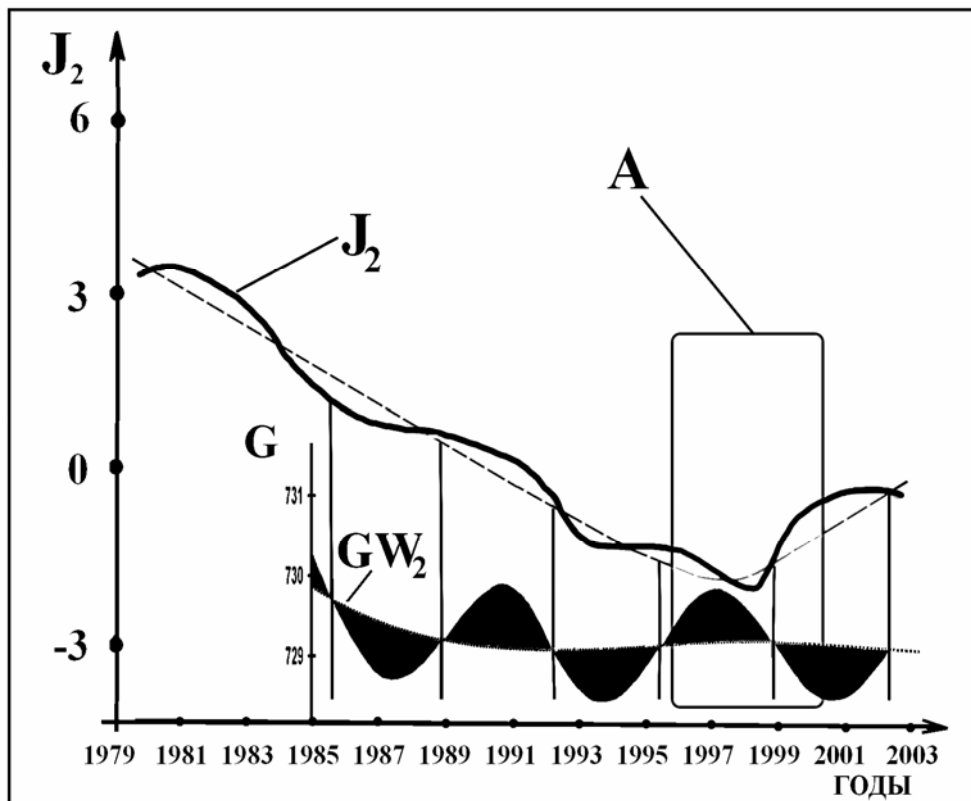
We would like to accentuate attention on the point that these declinations have quadrupole character.

We conducted comparison of the chart of variations of coefficient J_2 correspondingly smoothed by 3 and 5 year moving averages with sinusoidal trend of variations of gravitational constant since 1985 up to 2002 /20,22/, reflecting, in our opinion, passage of super long gravitational waves via the Earth, allowed us obtaining rather interesting result.



Pic. 5. Chart reflecting the character of deformation of the Earth shape according to data of cosmic laser ranging of NASA. a) - character of deformation of the Earth shape 1998; b) – character of deformation of the Earth shape starting from 1998 up to present time.

If one considers the period starting from 1985 up to 1998, then it is possible to state rather high correlation between two charts, having wavy character. However starting from 1998 picture is changing and charts sharply transfer into anti phase. Taking into account that namely from 1998 sharp change in behavior of coefficient J_2 is observed, we presume that consideration, namely, of this fragment of chart given in pic.6 is especially interesting.

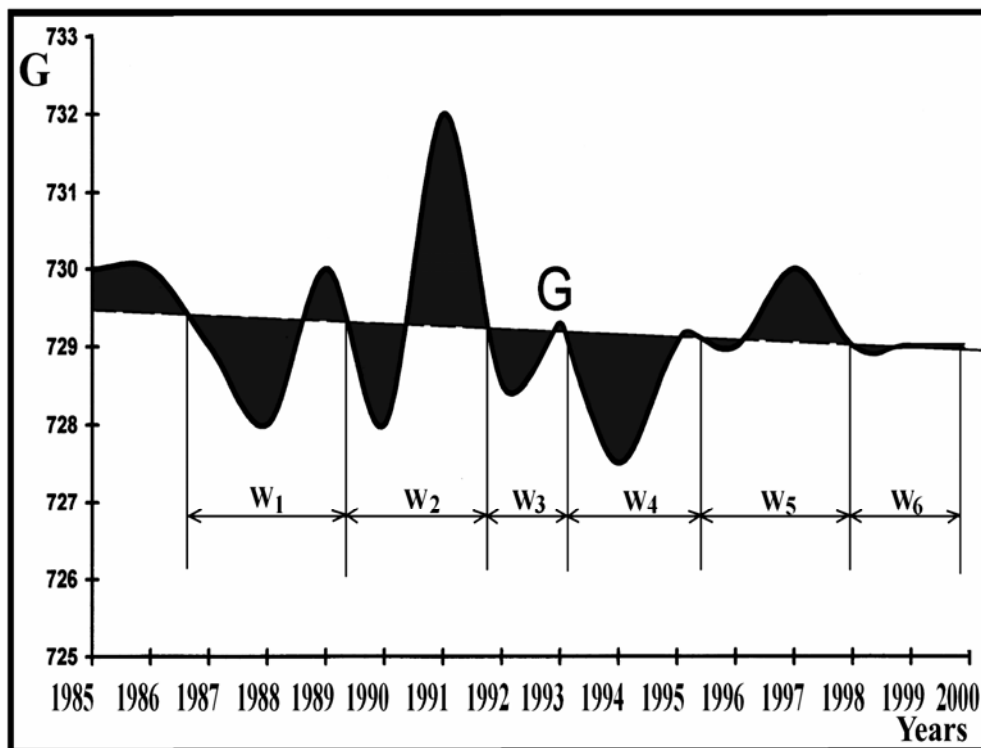


Pic. 6. Comparison of charts of variations of coefficient J_2 and sinusoidal trend of variations of gravitational constant G , reflecting passage of super long gravitational waves via the Earth.

J_2 – chart of variations of zonal coefficient of spherical harmonics of the Earth of the second degree J_2 ;
 GW_2 – sinusoidal trend of variations of gravitational constant reflecting gravitational waves of the second degree.

Comparing chart of J_2 variations with sinusoidal trend G , it becomes evident, that in 1998 serious changes took place in J_2 dynamics, which, at the same time, were not reflected in variations of sinusoidal trend G . It is necessary to take into account that sinusoidal trend may smoothen definite artifacts, taking place during real dynamic processes. That is why for comparison of coefficient J_2 we took also true values of variations G , given at pic.7.

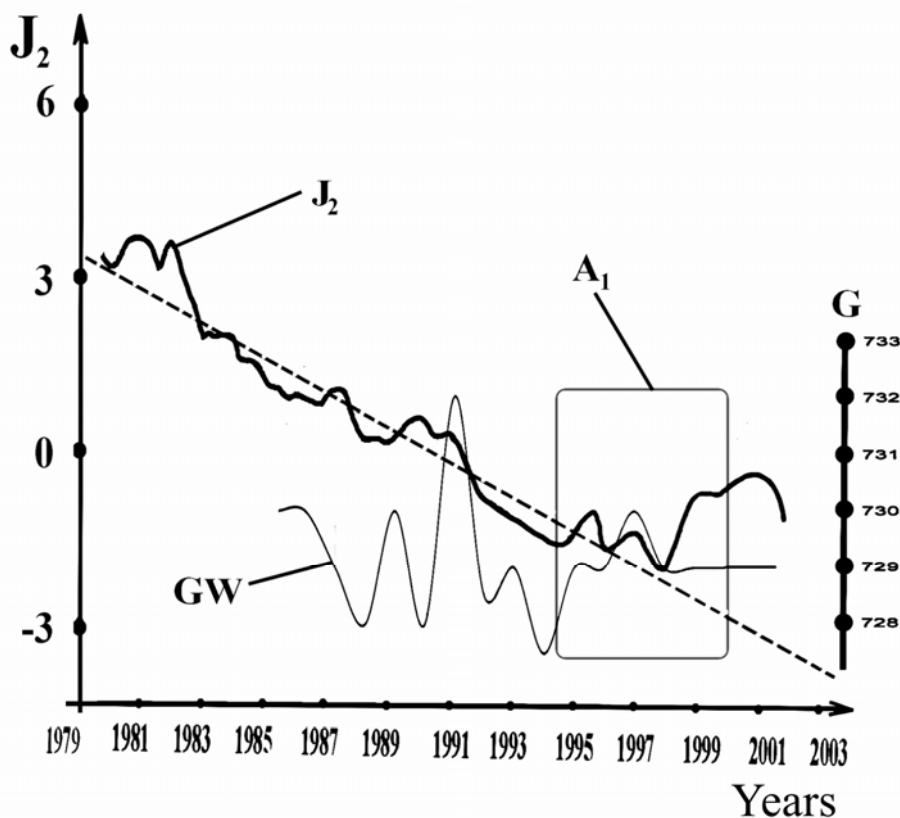
As it is seen from pic.7. G variations have wavy declinations from rectilinear trend, approximately, with equal size of wavelength, period of which, in average, is 2-2,5 years.



Pic. 7 Chart of variations of gravitational constant G starting from 1985 up to 2000 averaged by years according to data /6/. By axis of ordinates, value of gravitational constant starting from the second sign after coma is shown. $W_1 \dots W_n$ -are periods of G wave changes.

Comparison of charts of variations of G and J_2 is indicated at pic.8. Situation is cleared a little bit during attentive consideration of pic.8. Change in character of variations of G values is also observed, starting from 1998, which is reflected in stabilization of G without visible declinations in comparison with previous years. This fact, in our opinion, may be explained by two main causes. The first cause may be passage of other gravitational waves via the Earth, which, as a result of interference with observed wave, compensated amplitude of the first one.

The second cause is probably connected with completion of passage of gravitational-wave impulse, which also led to change of the Earth shape and stabilization G . However, the conclusion is evident- definite correlation is existing between coefficient J_2 and temporary G variations.



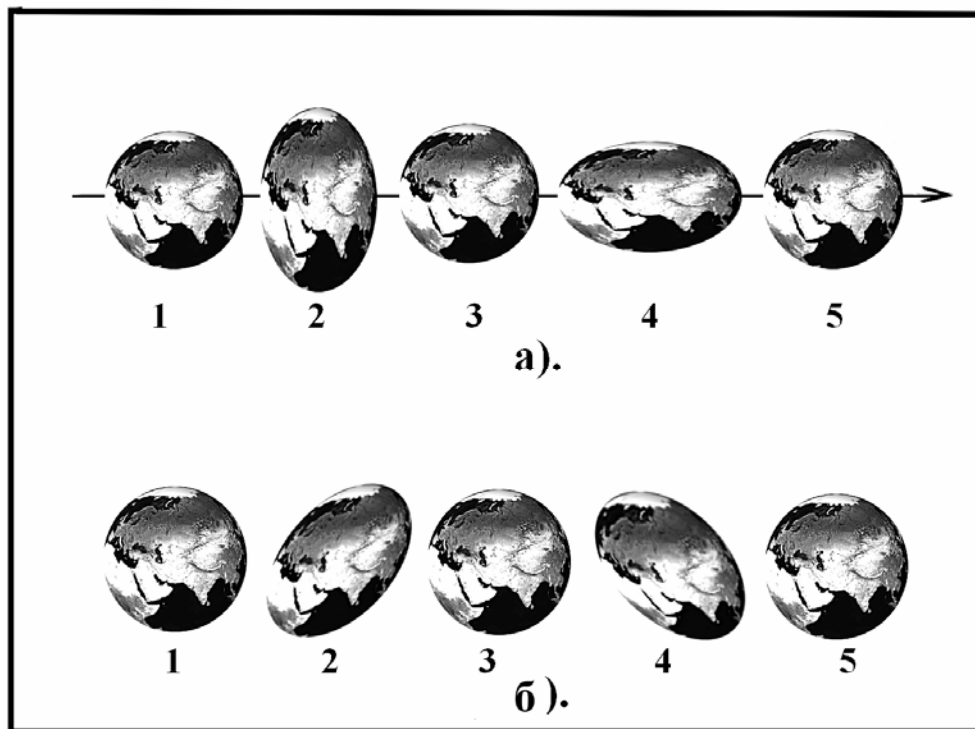
Pic. 8 Comparison of chart of variations J_2 and variations of actually measured values G averaged per year according to data /26,27/.

Examining influence of super long gravitational waves on deformation of the Earth and, as a result, on geo-dynamic processes, it is necessary to mention that this deformation will have rather complex formations. So, the Earth reaction on passage of gravitational wave propagating in direction of pointer a) and perpendicularly to plane of sheet b) is indicated at pic.9.

Proceeding from above mentioned, we come to preliminary conclusion, that observed variations of measured values of gravitational constant G reflect passage via the Earth of super long gravitational waves, causing its quadrupole deformation and influencing on spatial-temporary distribution of geo-dynamic activity of the whole planet.

Thus, J.P.Mbelek and M.Lachieze-Rey intuitively felt dependencies of obtained declinations of gravitational constant on geographical position of laboratories. However, in our opinion they wrongly explained the causes of such dependence, connecting it with influence on measured values G of

geomagnetic field of the earth. Thus our researches really confirm dependence of measured values G on geographical position of laboratories and time of measurements. That is why, the case is more complex, than it is supposed by J.P.Mbelek and M.Lachieze-Rey.



Pic. 9. Chart of character of the Earth deformation during the passage super long gravitational wave via it.

Measured G values depending on geographical position laboratories will change in different way in time. This is connected with orientation of these laboratories in relation to front passing via the Earth of gravitational wave (resulting wave formed by overlapping of different waves, piercing cosmic space).

In our opinion, passage of super long gravitational waves via the Earth forms main cycles of general planetary geo-dynamical activity. Besides, passage of gravitational waves of different frequencies and directions via the earth will lead to complex interference picture, this is also must be reflected in natural processes /20-22/.

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REGULARITY OF SPATIAL-TEMPORARY DISTRIBUTION OF VOLCANO ERUPTIONS

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The results of scientific researches, approved, as the first scientific discovery in the history of Azerbaijan science, are described in this article. Scientific discovery No. 239, dated 15 October 2003, was approved in Moscow

and entered in the international register of discoveries under the name “Regularity of spatial-temporary distribution of volcano eruptions”. The authors of this discovery are: academician of National Academy of Sciences of Azerbaijan, doctor of sciences, professor Sh.F.Mehdiyev, academician of Russian Academy of Sciences, doctor of sciences, professor V.Y.Khain, academician of Russian Academy of Natural Sciences, doctor of sciences, professor T.A.Ismail-Zade and academician of International Academy of Sciences/International Board on Scientific Development, doctor of sciences, professor E.N.Khalilov.

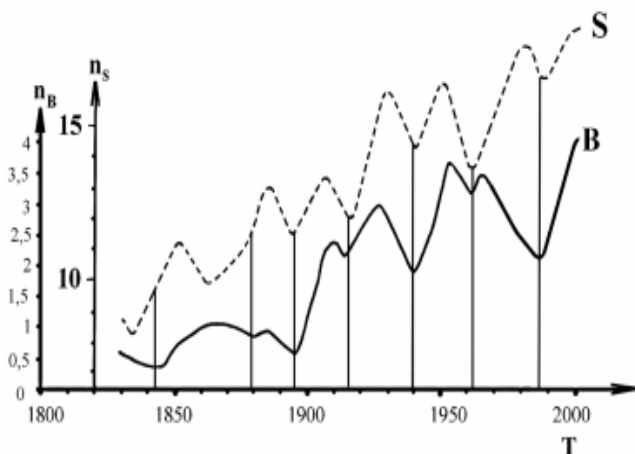
Volcanism and seismicity are main indicators of modern geodynamic activity.

We conducted the researches on volcanic activity for historically observed time interval with aim to obtain statistically reliable results. The time interval from 1850 to 2000 is covered more comprehensively in the catalogues of eruptions of the world volcanoes, probability of information loss has casual character and does not influences significantly on results, during detection of concealed periodicity at increase of activity of abyssal and mud volcanoes of the world.

For conducting of researches on increasing of activity of volcanoes in the areas of the Earth compression and stretching, modern data about borders of lithosphere plates and micro-plates /19/ were applied, all abyssal volcanoes were divided into four geodynamic types- abyssal volcanoes of the Earth compression belts (“S” type), abyssal volcanoes of the oceanic rift areas (“OR” type), abyssal volcanoes of the continental rift areas (“KR” type), intra-plate volcanoes (type “IP”). Mud volcanoes (“B” type) are selected into independent type. This classification was adopted by X Rast /14/ with additions of Sh.F.Mehtiyev, V.Y.Khain etc. /11/.

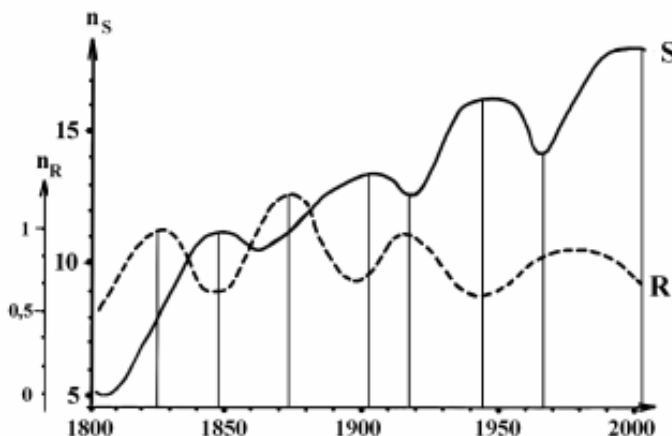
Meantime, taking into account the tasks of the present work we joined all oceanic and continental rift volcanoes into one type- rift volcanoes of “R” type, reflecting the processes of stretching of lithosphere, but intra-plate volcanoes were not considered.

Researches conducted by us, showed that more than 95% of all mud volcanoes of the world are located in the belts of the Earth compression /9/. Comparison of charts of activity of mud volcanoes and abyssal volcanoes of “S” type showed their extremely high similarity (pic.1) and allowed concluding that nature of activity of volcanoes of this type and volcanoes of “S” type, reflects the dynamics of processes of compression of the lithosphere.



Pic. 1 Comparison of charts of abyssal volcanoes of “S” type and mud volcanoes
S - is a chart of activity of abyssal volcanoes of “S” type;
B - is a chart of activity of mud volcanoes;
 n_s - is a number of eruptions of volcanoes of “S” type;
 n_b - is a number of eruptions of volcanoes of “B” type;

Stable concealed periodicity was detected and the charts of increase of activity of volcanoes of “S” and “R” type were made. Comparison of charts is shown in the pic. 2.



Pic. 2. Comparison of charts of activity of volcanoes “S” and “R” type
S-is a chart of activity of abyssal volcanoes of “S” type,
smoothed correspondingly by 11; 9; 9 years old moving means.
R- is a chart of activity of abyssal volcanoes of “R” type,
smoothed correspondingly by 11; 9; 9 years old moving means;
 n_s -is a number of eruptions of volcanoes of “S” type;
 n_r -is a number of eruptions of volcanoes of “R” type;

Pic. 2. shows that the cycles of increasing of activity of volcanoes of “S” and “R” type are in anti-phase. Smaller 22-25 year old cycles are filtrated in the charts of activity of volcanoes of “S” and “R” type, by means of selected windows of smoothing (filters). Cycles of volcanic activity with periods of 44-50 years old for both geo-dynamical types of volcanoes are clearly observed in pic. 2.

From above mentioned it is possible to conclude that periods of stretching do not coincide in time with periods of the Earth compression, and in majority cases the cycles of stretching are replaced by cycles of compression. In the first case the activity of volcanoes of “R” type increases, whereas in the second case –activity of “S” type volcanoes and mud volcanoes increases, and the Earth expansion occurs due to the spreading process, whereas the compression occurs due to subduction and collision.

Thus, the results of conducted researches allow presuming the probability of periodical change of the Earth radius and shape.

Certainly, detected regularities in increasing of activity of volcanoes and earthquakes, witnessing about pulsation of the Earth must be told upon change of its angular speed of rotation.

Irregular fluctuations of the speed of the Earth rotation were observed in the end of last century during the processing of observations of motion of Moon and other bodies of the Solar system. Their existence was proven eventually in the twentieth century /8/. From 1955 they are registered by principally new method, which provides very high precision (Sidorenkov, 1975.)

Oscillations of the world level and melting of polar ice were the first phenomena, by means of which scientists attempted to explain irregular changes of speed of the Earth rotation/8/. But quantitative estimates, made yet in the 9th century by famous English physicist V. Thomson (Thomson 1882), indicated that for explanation of irregular changes of the speed of the Earth rotation, improbably high increments of the level of the World ocean are required.

N.S. Sidorenkov /15/ considers that redistribution of the moisture between the World Ocean and the ice covers changes the components of tensor of the Earth inertia and probably explains inter-yearly changes of the speed of the Earth rotation and secular motion of the North Pole.

U. Mank and G. Mack-Donald underline, that neither the changes of the World Ocean level, nor the motion of continents, nor melting of the snow, nor other observed processes could be the cause of variations of angular speed of the Earth rotation.

N.N. Pariyskiy writes: “Irregular changes of angular speed of the Earth rotation occur after time intervals from 10 to 30 years and more, they have different values and signs, alternating without definite dependence.

Thus, these changes occurring approximately during one year exceed tidal changes of the angular speed of the Earth rotation for 100 years”.

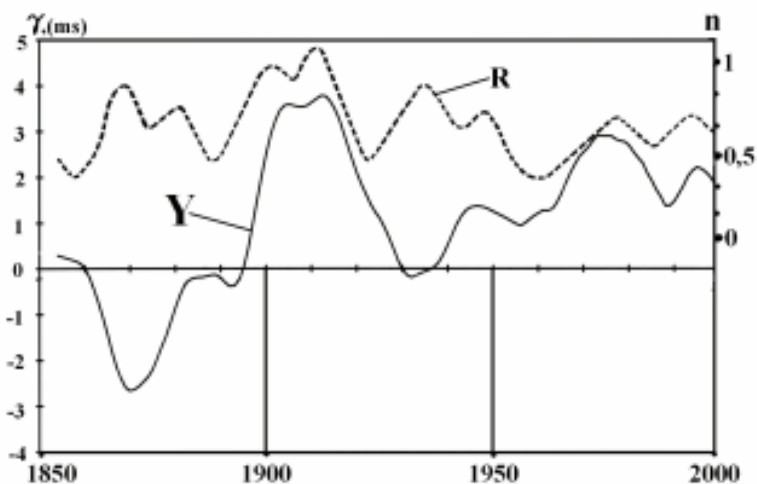
They may not be explained by processes occurring on the surface, because for similar change of the speed, for example, flattening of 4 km height plateau up to sea level, equal size with Tibet (P.N. Kropotkin, 1970.), would be required. Pariyskiy N.N./13/ writes: “One should admit that spasmodic changes of angular speed are connected with changes in deep layers of the Earth or densities, or speeds of undercover streams”.

But P.N. Kropotkin considers, that presumption about quick change of the speed of under layer convectional streams is not well founded. In the opinion of Kropotkin P.N., the variations of the speed of rotation are caused by changes of the inertia point of the solid Earth /5-7/.

Changes of the Earth radius with corresponding increase or decrease of density lead to change of inertia point of the Earth $J=aMr^2$ (M-mass, r-the Earth radius, $a=0,331$), which causes variations of angular speed of its rotation.

The chart of activity of volcanoes of “R” type and chart of variations of diurnal duration of the Earth were compared for detection of probable connection between variations of angular speed of the Earth rotation and increase of activity of volcanoes (pic.3.)

Data on variations of the diurnal duration are taken from /21/.



Pic. 3. Comparison of the chart of activity of abyssal volcanoes of “R” type with chart of variations of diurnal duration.

Y – is a chart of variations of diurnal duration;

Y, - (ms) - are changes of diurnal duration in ms;

R - is a chart of activity of abyssal volcanoes of “R” type, smoothed correspondingly by 5; 9 moving means;

NR – is a number of volcanoes of “R” type.

Pic. 3 shows that 22-24 year old cycles of increase of activity are distinguished in the chart of activity of volcanoes of “R” type. These cycles were smoothed as a result of filtration in pic.2.

Results of comparison allowed discovering the definite similarity of both charts with some time drift in pic.3. Thus, deceleration of the Earth rotation corresponds to increase of activity of volcanoes of “R” type (increase of diurnal duration) and vice-versa.

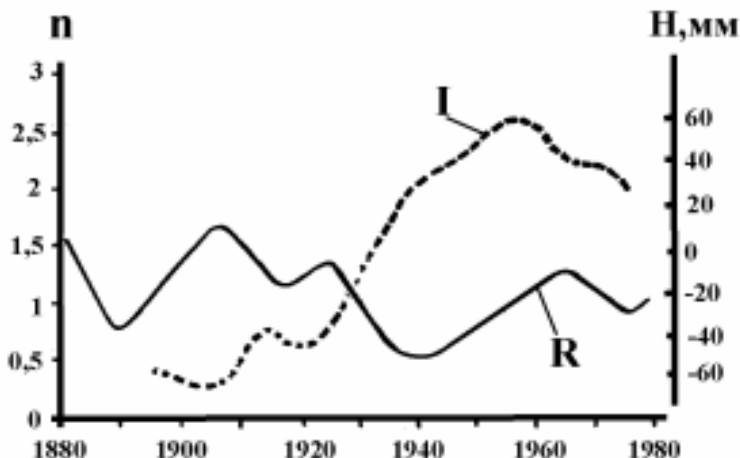
Some “delay” of cycles of the chart of variations of diurnal duration relating to the chart of activity of volcanoes of “R” type may be explained by inertness of events i.e. time passing from point of increase of activity of volcanoes to actual change of the Earth radius, influencing on inertia point of the planet and, as a consequence, on terrestrial diurnal duration.

The variations of the speed of the Earth rotation, as the result of changes of its radius, are quite admissible. Thus, by data of Pariyskiy N.N. the changes of the Earth radius of order $\Delta r/r=n*10^{-8}$ (per 5-10cm) may lead to observed variations of the speed of the Earth of rotation (N.N. Pariyskiy, 1945). P.N. Kropotkin and Y.A. Trapeznikov /5/ come to the same conclusion on the basis of study of correlation between the changes of the speed of the Earth rotation and summary energy of earthquakes.

Meantime it would not be justified to consider, that the change of the Earth radius has equal character on whole planet. Such simplification in understanding of this process may lead to serious errors during calculations and conclusions.

As it was mentioned previously, increase of the Earth radius occurs due to increase of activity of the spreading process i.e. radius increases maximally directly near rift areas, whereas while approaching to the subduction areas, increase of radius becomes less significant. At the same time, decrease of the Earth radius occurs due to increase of activity of the subduction process and decrease of the activity of spreading process, i.e. maximal decrease of the Earth radius is timed directly to the subduction zones, and while approaching to the rift zones, radius must increase.

If such pulsations exist, they must influence on oscillations of the level of the World Ocean. Comparison of the chart of activity of volcanoes of “R” type (increase of activity of which characterizes the Earth expansion due to the spreading process) with chart of change of the level of the World Ocean showed that to the level of increase of activity of volcanoes of “R” type corresponds to lowering of the level of the World Ocean, and vice-versa (pic.4).



**Pic.4 Comparison of the charts of abyssal volcanoes of “R” type and oscillations of the level of the World Ocean by data /4/.
R- is a chart of activity of abyssal volcanoes of “R” type;
NR- is a number of eruptions of volcanoes of “R” type;
II- is a chart of oscillations of the level of the World Ocean;
H, mm- is a level of the World ocean in mm.**

The Earth expansion must actually lead to increase of its area and, as a consequence, to lowering of the level of the World Ocean, this is confirmed in the pic. 4.

Scales of submerging of continents during changes of the Earth radius depend on its closeness to the belts of planetary expansion or compression. Those areas, which are in direct adjacency to subduction zones, must undergo maximal submerging. As we mentioned, this is connected with point that the highest decrease of radius occurs in adjacency to the belts of the Earth compression and the lowest one occurs in the belts of stretching.

If one admits, that amplitude of considered short period changes of the Earth radius may change depending on correlation of influence of cosmic and purely terrestrial factors, then it is possible to presume that variations of radius with periods of cycles ranging from months to hundred million years in corresponding hierarchical order. The role of cyclic recurrence in geology was examined thoroughly in fundamental works /4, 7, 17-19/.

Pariyskiy N.N. conducted the analysis of irregular changes of angular speed of the Earth rotation and showed that apart from changes, conditioned by variations of kinetic point of atmosphere, residual curve of irregular changes of angular speed of the Earth rotation properly correlates with data on irregular changes of gravity, given by Y.D.Bulange. Main conclusion is made that to positive values Δg negative values Δw correspond and not positive ones, as it would be during the general Earth compression. The work /13/ indicates that

given result corresponds to the situation, when general increase of inertia point of the Earth corresponds to the compression of the Earth in the place of measurement, which is possible only if in another part of the terrestrial globe expansion occurs. Deformation in this case has quadrupole character.

Observed effect may occur, if the Terrestrial Globe will be in the field of incidental gravitational wave, the Earth will behave itself as a detector of gravitational waves.

By our mind, one of the most interesting and probable periodical explanations of mechanism of possible periodical changes of the Earth, may be the influence of super long gravitational waves, quadrupolly deforming the Earth during passing through it /20/.

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EVALUATION OF ENVIRONMENT IS ONE OF THE MAIN FACTORS ON DETERMINATION OF ECOLOGICAL SAFETY

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The problems of evaluation of environment, first of all evaluation of natural resources, having global importance, carry regional and local character for former Soviet republics, which are in the period of transition. These countries including Azerbaijan must bring to the forefront new creation of economics, using achievements of scientific and technological advances, rejection of central planning and forecasting, changing extensive forms of production to intensive forms, priority solving of problems on ecological crisis, remained from the past.

But unfortunately being in the structure of the Soviet Union, Azerbaijan was the region where natural resources were used extensively, and the main attention was attracted to industry and agriculture, ignoring conditions under which human health and environment couldn't be protected properly. And this fact became a reason for gradual worsening of the ecological condition.

During the Soviet Union many remote regions were used as the places of experiments for various fields. As an example we can show Garadag cement works built in fifties, aluminum works built in Gandja, works on the first

treatment of wool in Yevlakh, enterprises producing chlorine and hydrate of sodium in Sumgayit, tube-casting plant, legendary oil rocks etc.

Sumgayit was the only industrial town in the Soviet Union, where 3 works producing chlorine and more than 30 other enterprises, which are unhealthy from the ecological point of view, came upon a little square (0,08 thousand square km).

Azerbaijan Republic was one of the regions where the most quantity of mineral fertilizers and chemicals were used against vermin in agriculture. So at present approximately 13-15 % of soil in Azerbaijan, especially agricultural districts, is exposed to chemical pollution.

In Apsheron Peninsula until now 1,4 milliard ton of oil was produced and as a result of it 20-25 thousand hectare of area was polluted. At the same time in spite of the fact that Baku oil was very important for II World war, central government should have assigned means for revegetation.

The quantity of industrial refuse in Azerbaijan is very large because of using unimproved technologies. So the quantity of waste products of Gandja aluminum works and enterprises of industrial complex on ore dressing in Dashkasan is accordingly near 9,0 million ton (7,5 million ton alunite sludge and 1,5 million ton bauxite sludge) and 20 million ton (after ore dressing). The quantity of open-hearth slag of tube-casting plant in Sumgayit is 2,6 million ton.

According to the report of State Statistic Committee concerning the totals of 2001, the quantity of toxic refuse gathered on the territory of enterprises is 29,5 million ton. 191,6 thousand ton of them contains mercury and its compounds.

The quantity of refuse of Apsheron lime-pit, which is the part of enterprises of building materials industry, is more than 100 million ton. During the Soviet Union only 8 % of industrial refuse was used.

Ecological tension in the field of water resources in our republic also remained from the past. Among the transcaucasian republics Azerbaijan is the area with a little water resources. Only 30 % of water resources forms in Azerbaijan and other 70 % comes from neighbour republics (Turkey, Georgia, and Armenia). At the same time land water resources in Azerbaijan are partitioned irregularly in regard to area and climate. In Azerbaijan water resource per man in comparison with the former USSR is less in 9,6 times, with Georgia is less in 6 times, with Armenia is less in 7,7 times. At the same time the main water objects (Caspian Sea, Kura River and Araz River, their inflows and some reservoirs) are being exposed to serious pollution. Naturally, the main reason of the pollution of Caspian Sea is Volga River. Kura River and Araz River and their inflows come to our republic from neighbour republics, being already polluted. Before 600-700 million cubes meter of polluted waters ran into Kura River every year. Domestic waste and industrial refuse of such cities as Tbilisi, Rustavi, Barjomi, Khashauri, Mskheti, Akhmeto, Telavi,

Sinandeli, Sinori, Sitanexi, Kazareli (Georgia), Berd, Ichevan, Dilichan, Alaverdi, Kirovakan, Ayrum, Kanakert, Gafan, Gacharan (Armenia) extremely polluted Kura River and Araz River.

Kura River, Araz River and their inflows are being polluted also in Azerbaijan. There are more than 80 towns, regional centers and town-type settlements in our republic and only 30-35 of them have drainage system, and only 20-22 of them have equipment, cleaning drainage waste. Most of this equipment work irrationally. The cleaning equipment with rated capacity of 940 thousand cubes m. per day, building of which began in 1972 in Baku, is still under construction. The work at many objects, which were planned to build in Gandja, Ali-Bayramli, Nakhchivan, Mingachevir, Sumgayit, Sabirabad, Barda etc. stopped. As a result of it every day 0,8-1,1 million cubes m. waste water run from Apsheron and Kura River into Caspian Sea. Suffice it to say that none of the 125 measures, concerning the cleaning of water, mentioned in decree dated of October 13, 1987, was realized. So at the most part of Caspian Sea (Baku bay, Shikhov beach, coastal waters of Sumgayit, zone of oil rocks etc.) pollution level concerning oil products and phenol exceed norms in 10-12 and 11-17 times. In spite of the fact that pollution in Caspian Sea was decreased, risk of pollution is still in existence because of accidents.

In the former Soviet Union Baku, Sumgayit, Gandja were considered to be unsatisfactory cities because of the level of free air pollution. Ali-Bayramli and Mingachevir were also planned to fall into the list of “unsatisfactory cities”. But at that time those cities used natural gas in power stations. Now they use fuel oil instead of gas.

Taking into consideration the fact that in the main, Azerbaijan is the mountainous country and located on seismotectonic zone, modern exogenous geological processes (landslides, erosion, deflation, rock failures, flows, aeolian processes, abrasion, marshes, flood, inundation etc.) take place here frequently. These processes, which take place every year cause damage to environment. Landslides that took place in Baku city and Bayil slope during last century damaged city economy seriously. And as a result of large landslide that took place on 6-7 March 2000 more than 310 administrative and apartment houses were damaged and became disabled. At present risk zones where landslides may occur is area of Ahmadli, Zig, Garachukhur in Baku and Guba, Zagatala, Shamakhi, Ismayilli, Leric districts and their villages. The sum of prejudice caused by fluctuation of Caspian Sea level is counted by million dollars. In many highlands flows and landslides intensified in 2002-2003 because of floods and precipitation that was above norm in 2-2,5 times.

After Armenian occupation and capture of 20 % of our lands, ecological conditions in occupied regions can be estimated as very stressed. 1,2 million hectare of sown areas, 18 thousand hectare of homestead lands, 260 thousand

of forests, more than 100 mineral beds, 2 national reserves, 4 national sanctuaries, more than 40 public monuments were destroyed and out of action.

Taking into account the existent quality of environment and emergency situation in ecology of our country, ecological problems can be divided into three parts:

1. In the period of the former USSR central planning of measures for nature protection, allotment of capital assets by the principle of “remains”, extensive exploitation of natural resources, gratuitous using of natural resources, superiority of management interests over territorial possessions etc.

2. Ecological problems in the period of independence of Azerbaijan Republic and ecological problems of occupied regions;

3. Problems connected with the estimation of future influence upon environment because of economical activity in the sphere of integration of Azerbaijan into world economy, its participation in international and regional ecological programs, conclusion of large contracts and realization of joint projects.

The first group includes such problems as cleaning of Baku bay, revegetation of Apsheron soils polluted by oil, cleaning and rehabilitation of polluted relic lakes, bury industrial refuse containing mercury, utilization of industrial refuse in Baku, Gandja, Dashkasan cities, pulling out sunk ships and out-of operation hydroengineering equipment (platforms, piers, rod posts, towers etc.) from Caspian Sea, their utilization, reconstruction of water canals with the working coefficient of 0,5-0,6, which were built before without lining, rendering safe of agricultural preparations, which lost their quality and became disabled, construction of cleansing equipment, enhancement of 15 % of area which is polluted by chemicals and heavy metals etc.

The second group includes such problems as restitution of ecological, social and economical situation in the occupied regions, restoration of lost consistency concerned with the fluctuation of Caspian Sea level, installations that do not meet international standards, are harmful from the ecological point of view must be taken out of exploitation, moved to another place or be reconstructed taking into account ecological interests, and also there must be ecological control of economic objects etc. The problems concerning damages, which modern exogenous geological processes do to national and agricultural economy, city and village buildings are also related to this group.

The third group includes organizational, legal, economical and ecological activity concerning the estimation of influence of economical objects upon environment as a result of integration of Azerbaijan to international economic world and realization of joint contracts. It contains documents estimating the influence of projects, such as “Contract of the Century” signed in 1994 and others upon environment; ecological passports, drawing up documents, reflecting possible refuse (rejection, pouring, placing) as a consequence of enterprise activity, their ecological examination,

realization of measures connected with plans and programs of national activity, realization of monitoring systems, organization of automatized control and management systems etc. The dioxin problem, which is the most dangerous problem from ecological point of view and carries global character, is also related to third group.

Using and management of environment claims first of all observance of norms and rules in the activity connected with the changing of natural processes under the wish of people, rational using of natural resources and reduction of harm influence upon environment.

It is necessary to note two aspects in the management of environment. First of all management must be done by means of economical mechanism. On the other hand it is necessary to have an influence upon environment objects and use them for common weal. The aim of this influence is the scientific and technical development, realization of laws of nature, protection and improvement of environment.

In the period of the USSR economical methods were foremost in the management of economical activity, but the management of environment objects was based on the contrary on administrative or organizational-lawful methods. The government controlled environmental condition by these methods. At that time interrelation between environment and economics was very weak.

In the period of the USSR State Plan Committee of Azerbaijan SSR was engaged in forecasting and planning of measures concerning environment protection. In general planning was realized in "vertical" direction, i.e. by sector principles (ministries). That time "horizontal" direction, i.e. territorial interest was in the background.

Now, in the period of independence, when there are no ministries subordinate to Union, situation has not changed for the better. 0,3-0,5 % of the value of gross domestic product was laid out for environment protection, and this is a very little sum according to the claims of sustainable development conception (5-15%).

Rational use of nature and rationality of the measures for environment protection demand exact ecological calculation. Expenses for nature protection are necessary charges to keep stably the quality of living conditions of people. These expenses include the following:

1. Expenses for reduction of the quantity of refuse, rejected and poured to environment (construction of cleansing equipment, improvement of technologies, complex using of raw materials, neutralization and utilization of refuse etc.);
2. Expenses for the keeping of natural resource potential (creation of specially protected natural areas, reproduction of reestablished natural resources);

3. Expenses for social development (provision with the demand for recreation, aesthetics).

Study of the above-mentioned facts shows that there is very little achievements in this direction. It is necessary to note that construction of the equipment that cleans water and air runs slower than in the period of the USSR. More than 90 % of polluted areas is related to Baku, Gandja, Mingachevir, Ali-Bayramli. But in spite of this fact there is no achievement in the activity concerning the cleaning of domestic waters.

In 90-80-th of the last century funds laid out for environment protection formed 0,3-0,5 % of the funds laid out for economic development and as a rule annual plans were fulfilled in 50-70 %. Naturally, the unspent sum was lost at the end of each year. It is enough to note that the funds for construction of waste water cleaning equipment exceeded its budget costs in 2-3 times. It was planned to complete the construction for 3-5 years, but it took 10-15 years. So taking into account the arid climate of Azerbaijan, these construction objects became useless by the time of completion.

It is possible to observe some liveliness in the organization of special protected areas and objects by the initiative of new-formed Ministry on Ecology and Natural Resources and with the moneyed assistance of foreign investors. Special effort has been made in the sphere of creation of national parks (Shahdag, Shirvan, Goygol, Astara etc.). But there are a lot of works to do in the future in order to provide representativeness of reserves, their territorial integrity, to solve many problems remained from the past.

Along with the successfully realization of measures for environment protection it is necessary to raise the level of environment monitoring up to modern requests and prepare economical mechanism of nature using.

Ministry of Ecology and Natural Resources has already prepared, or rather reestablished a system of monitoring services (monitoring of Caspian Sea, Kura River, Araz River, monitoring of free air, monitoring of exogenous geological processes, monitoring of earthquakes etc.). The monitoring of Caspian Sea, Kura River and also monitoring of free air and soils was carried out in the former USSR too. But this monitoring was carried out nondirectively, i.e. concrete sources of harmful materials, which spoil the quality of natural resources, were not determined exactly. So they carry out directional monitoring of concrete objects. For example, observations under and near flare were organized in the industrial zones of Baku and Sumgayit, or group of observations took refuse examples from the tubes of aspiration system and drainage system of enterprises and carried out analysis in the laboratory. But after the breakdown of the USSR, it seems to us that control authorities and monitoring services of enterprises for some reason forgot about directional monitoring (except for Caspian Sea).

An independent country must have its system of ecological and health norms in accordance with local conditions. But during 10 years of our

independence no work has been prepared concerning new harmful materials, radiation, or “allowable density limit” of ecosystem, “allowable level limit”, limits of ecological capacity etc. At present our country uses the norms and standards, remained from the Soviet Union. But they do not meet international standards, and also they do not reflect features of local ecological conditions.

It is necessary to have sustainable economical activity in order to provide ecological safety of population and preserve genetic fund. So the quality of environment must be satisfactory i.e. sustainable and invariable. The quality of environment means conditions when natural elements and ecological system distribute the energy and process of metabolism among man and nature in such way that living factor is satisfactory. Conditions of environment are recovered by means of self-restorability. “Production cycle” of the nature is organized on the base of wasteless principle, because final product must play a part of a raw material in the next stage. But men’s production facilities, in contrast to nature, act on the base of waste technologies.

Quality norms of environment are determined by allowable limit of influence upon environment. Allowable limit norms are in fact like original compromise between economics and nature, and besides, it is forced compromise. This compromise develops economics on the base of mutual interests, preserves living activity and common weal. The base of quality norms consists of three indexes: (medical, technological, scientific-technical).

The quality norms of environment are divided into three groups:

1. Health norms (allowed density limit of harmful materials – chemical, biological and physical influence etc.). These norms must conform to men’s health.

2. Ecological norms. These norms are allowed limits of harmful materials rejected (poured) to environment. These norms set up claims to pollution sources.

3. Auxiliary norms and rules (organizational and legal).

For the first time, the norms of density limit for potable water were determined in the USSR in 1939. In 1991 those norms for water were determined at 1925 harmful materials. The norms of density limit for atmosphere have been used since 1951. In 1991 the quantity of these norms was determined for 479 materials. The norms for soil have been used since 1980 and at present their quantity is 109. Allowed norms of density determine ecological and health estimation of environment (regions, ecosystems), but they do not show the sources of ill effects.

Unfortunately, the methods for calculation of total damaging that influences upon environment (water, air, soil, plants, animals and people) do not meet the modern requests in our country. Paid norms were calculated on the base of prices of 1990 and approved by the Cabinet of Ministers in 1992. Really, in 1995, because of inflation, they were raised in 10 times. But in fact they must be raised in 470-500 times. It might have increased the resources of

natural fund and responsibility of nature users, and besides it might have used as a resource for financing of measures for nature protection.

Besides the improvement of the structure in the management of environment protection, it was necessary to improve such fields as science and techniques, administration, organization, economy, method systems, normative-legal sphere, manpower policy, economical encouragement, information, automation, modernization etc. Besides, the formation of a new ministry takes some time.

Until now the ministry plays an efficient part in management. First of all they must manage properly the manpower policy, strengthen normative-legal and methodical base, develop the works in scientific-research and scientific-monitoring fields, refuse multistage systems, parallelism, and repetition while monitoring environment. There is a need to improve local (regional) departments of ecology and natural resources, meteorological, geological-exploration, ecological and geocological monitoring services. At the present time both environment condition and irrational using of natural resources request monitoring system based on scientific baseline.

It is necessary to note that before setting up monitoring on natural resources, there is need to estimate their importance between strategic areas. It is necessary to use economical and administrative methods for prevention of forest felling. For comparison there is need to note that as a result of burning of gas-mazut-bituminous coal, the ration of refuses rejected to air is 1:5:25. We do not want to speak about the harm of solid refuses remained from bituminous coal. Before all industry enterprises were advised to use natural gas, at that time mazut was used in emergency. Our country must stride forward to provide sustainable development. In order to protect forests it is necessary to liquidate tree-chopping workshops, provide order in natural gas industry.

Under the conditions of market economy prices must play invigorative role. Enterprises produced pollution-free products must be awarded with credits, prizes, compensations. But enterprises produced products, which are harmful from ecological point of view, must pay additional taxes, and their products must not be admitted to overturn.

One of the economical aspects of environment management is improvement in the field of determination of payments for natural resources. This determination may be formed by using the charges method, outcome method and recovery method. The method of charges is especially applied in water using. In this case we have in mind expenses for water extraction, assimilation and using. Taking into consideration the fact that the XXI century is the "century of water", and there is lack of water in Azerbaijan, it is necessary first of all to fix the price for water (as for gold, oil) and then to add expenses for delivery to consumers.

Besides water, there is payment for using the bowels of the earth, for increasing the mineral and raw materials sources, forest tax, land tax, payment for hunting, payment for nature using etc.

The amount of income to the state budget for nature using usually must exceed expenses for ecological aims. For example in Russia these figures was 1,98 % for income and 1,03 % for expenses (in 1995). But in Azerbaijan these figures have not been determined yet.

There is also payment for the right to use natural resources and it consists of two parts:

- for the using within the norm limits;
- for the using above the norms.

The first part is paid by consumers, but the second part must be paid by producers at the expense of their incomes, because this amount can not be include in the cost price of products.

As a whole the prices for natural resources is very low in Azerbaijan. And this requests indexing. There are no prices, extraction limits for many natural resources.

It is impossible to provide for ecological safety without economical basis and sustainable development in the country.

The aim of payments for environment pollution is to increase responsibilities of subjects (enterprises) which use nature on the base of infringement of rules. With the help of this payments expenses for production come to real prices of public expenses. The history of these payments began from 1990 and in general they were put forward by the State Plan Committees of Azerbaijan and Baltic countries. For the first time payment for environment pollution was paid as an experiment in Estonia and since 1991-1992 this activity was realized in other Soviet Republics. The prices of this payment were prepared on the base of two methods: 1) on the base of real damage to environment; 2) on the base of necessary expenses fixed for each republic to realize nature protection measures. But at that time it was ascertained that state statistical data were inaccurate and many enterprises were not ready to observe the rules for environment protection. So they used combined method for determination of normative prices for payment. The methods of payment for rejection of harmful materials to environment are put into practice the following principles:

- encouragement of realization of measures for environment protection;
- determination of payments for each ingredient of refuse (rejected, poured in area);
- approach by intersectorial complex;
- taking into account regional features (using coefficients of ecological condition and ecological importance);
- simplification of payment collection.

As provided by norms, outpayments for harmful materials rejected to environment must be added to cost price of production and taxable sum must be directed to the nature recovery. Payment for the refuses that exceed fixed norms must be collected from enterprise incomes (in five-ten multiple sum) and must be used for removal of damaging.

Unfortunately, in accordance with the studies these payments do not carry out their direct obligations. Indexing of money was not done and in spite of the fact that money is still losing its value, increasing factor of payments have not been changed. Along with it there is no chance to determine an exact quantity of harmful materials rejected to environment. Ecological monitoring do not still give exact information. Maybe it is possible to determine quantitatively background pollution, but it is difficult to fix these data separately for each enterprise. In these conditions the best method to determination is a balance method, which based on the principle of “raw material-product-loss”. It requests the realization of long research works. Groups, which pollute environment, are not interested in it, but Ministry of Ecology and Natural Resources has limited financial capacity as performance of these works in thousands of enterprises of our country requests large amount of money. Such documents as “Allowed limit for rejection (pouring)” and “Ecological passport” were prepared on the base of inexact information and so they do not meet the requirements.

There is no norm limits for harmful ingredients rejected to environment and as a result of it the norms of payment have not been fixed yet. For example, in our republic neither volume nor level for daily pollution as a result of electromagnetic raying, radiation, noise level in filling stations, travelling systems (motortransport, railway, aviation) was determined. However, there are thousands of cars, hundreds of filling stations, tens of noise sources in our country.

There is no economic incentive for applying of modern technologies from ecological point of view, and also for encouragement of ecological activity. At the present time it is encouraged to realize ecological experiments and to draw up documents for estimation of the influence of the projected economical activities upon environment and social-economical surroundings. It is very rational step on the way of ecological safety. Now making experiments it is necessary not only to estimate the influence of economical activity upon environment, but also to estimate the influence of environment upon economical activities. In short, ecological experiment must be carried out by three principles: preventive, complex and democratic method.

The preventive method means realization of ecological estimation before the fulfillment of decree concerning the planned activity. The complex method means interference between environment elements and other areas and estimation of their advantage to each other. The democratic method means not only scientific and technical researches, but also passing of joint decrees.

Ecological leasing may play a positive role in the management of environment. So in fact leasing (renting of ecological equipment by enterprises) can take the place of long-term credit. From this point of view most of the inactive enterprises of engineering industry can change their profile and begin to produce ecological equipment. But they need first of all either government help or any preferential credit.

Under the conditions of market economy enterprise must keep leading position. The environment protection must be the highest priority (main tasks) in the enterprise activity. These tasks should include ecological safety, improvement of integrated management, development of education, ecological generality, initial estimation, ecological products and ecological service, advice for consumers etc. Realization of these purposeful works is very important in our country.

The most important factors of providing the ecological safety in the country is changing the direction of environmental processes and turn it to the society profit. In this case with the help of the activity of nature users it is possible to manage the environmental objects. As it was noted management may be realized on the base of sustainable development of ecological-social regularities, its understanding and rational using. During the management of nature use, the efficiency of administrative, economic and ideological methods is higher. From this point of view the first steps of the new created ministry give hopes. During the Soviet Union a large amount of such documents as “Programs”, “Main schemes”, “Measure plans” were prepared, but they were kept only on shelves. Their inventory must be the most important requests of the day. If the recommendations, mentioned in the documents, had been realized in time, our country would not have had to meet with natural calamity in the conditions of climate changeability and would not be in the state of emergency. As an example we can tell about river floods that began in the spring of 2003 and as a result of it the level of Kura River was raised and the nearby areas were flooded completely and this damaged seriously agriculture areas and buildings. As a result of economic and moral indifference “Mother Kura” and “Child Kura” were silted and the capacity of Kura River was diminished.

The last aim of the management of nature use is to achieve the optimal condition for the environment quality and rational using of natural resources.

The state management system of nature use is a united constitution, which consists of an interrelated subordination system. This constitution has rights of organization, general management, operative administrative ability, approval and using of standard acts, forecasting, planning, communication, registration, control and checking.

In that way, all parallelisms and repetitions concerning nature use and environment protection that were in the past must be improved. At the present time the fate of Azerbaijan nature depends on the central executive institution,

which will use the help of high-qualified specialists and intellectual owners who base their activities on the scientific-technical achievements in the sphere of nature use and environment protection, who are guided by normative-legal and ecological-sanitary-hygienic values based on economical, ecological-economical methods, and at last who face the requirements of laws of nature. Perhaps this new executive institution will provide with ecological safety in our republic by correct organization of nature use and using the economical-ecological methods which are the most progressive

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UPGRADING OF HMPULSE NEUTRON LOG TECHNIQUE APPLIED FOR OIL AND GAS FIELDS DEVELOPMENT

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For about 50 years techniques of nuclear geophysics play a major role in exploring for oil and gas. These techniques (neutron techniques in particular) are speedily upgraded and today broadly applied in practice.

Extensive scale of exploring for oil and development of discovered oil fields with carbonate deposits pushed forward upgrading of neutron tools. Conventional electric log techniques are not applied to study carbonate rocks, especially in case of complex porosity. If lime-bitumen or oil based mud used while drilling, when electric log techniques (except for induction log) are not applied.

Today neutron techniques allow to solve the following tasks of exploration and development [1]:

- section segregation on the basis of lithology and water-oil-gas content
- correlation of well section
- quantitative evaluation of reservoir properties of rocks and initial, current and residual oil-saturation
- studies of bed water migration, flooded intervals and oil-water contact area
- absorbing and unrecoverable beds outlining
- control over hydrodynamic, chemical, thermal and acoustic techniques impact on beds and well testing
- control over technical state of wells, etc.

In every well neutron tools are used for more accurate study of bed lithology and to outline oil and gas reservoirs.

At present one of the crucial tasks in oil-field geophysics consists in quantitative evaluation of oil content while pumping water to oil beds.

To provide increased oil output from mature fields there is a need for control over development, detailed geologic studies and evaluation of oil-saturation in producing beds.

Oil content evaluation reservoir beds in cased wells and control over production are generally performed by use of Hmpulse Neutron log (HNL) techniques.

HNL tools has two basic versions:

Hmpulse Neytron log based on thermal neutrons average life span (HNL-T) and carbon-oxygen Hmpulse Neytron log (HNL-C/O). or time-span of gamma-radiation caused by thermal neutrons capture (HNGL) [2].

The second version (INL-C/O) is based on non elastic distribution of speedy neutrons due to radiation from high-frequency generators and spectrometry of gamma-radiation caused by radiation damping (GRNED and GRRD). [2]. From various INL versions available, only INNLL (Impulse Neytron-Neytron Log) is widely used across Azerbaijan. Despite of geologic setting of oil-gas fields in Azerbaijan and reservoir properties of producing beds are not favourable for INNLL application, continous studies allowed to solve field development problems and some technical problems. On this basis AzerGeofizika ETI's experts have developed several techniques for oil saturation evaluation.

These are the following:

In 1988 the techniqe has been developed for evaluation of current oil saturation coefficient in cased wells. In 1992 - tool to ontlne oil beds within poorly mineralized water beds (oxygen log), in 1996 - tool to outline oil and gas beds in cased wells, in 1998 - tool to outline oil borders in producing horizons, etc.

These tools have been continuously used in wells across oil fields in Absheron and some good results were gained after perforation of beds for which oil saturation was evaluated.

Until 1996 geophysical survey in Azerbaijan used one-sonde INNLL tool jointly with gamma log (GL). Acquired data were interpreted and resulted in evaluation.

Later this technique has been upgraded and used to evaluate oil content in reservoir beds with simple geologic structure.

Since application of tool is restricted there were no accurate results in some sections (oil beds and poorly saline bed water).

The tool makes it possible to quantitatively evaluate by diffusion parameters of thermal neutrons, i.e. average life span τ of neutrons and distribution of neutrons in volume - diffusion coefficient D , the oil-qas saturation and porosity coefficient in reservoirs.

Perforation in some wells shows that evaluation of oil saturation by this technique jointly applied with INNLL is not true. Beds predicted as oil beds produce water soon after production starts. In this case INNLL should cover the whole area, i.e. it should be applied in nearby wells and thus define oil saturation of bed for some area. Latest INNLL applications show that the technique is efficient in cases of bed water mineralization exceeding 30 g/l and rock porosity more than 10%.

Studies performed by AzerGeofizika ETI's experts in 1992-1993 by use of oxygen log of INNLL (activation of oxygen atoms by speedy neutrons) in sections with mineralized bed water give controversial results. Some technical and economic impediments hampered performed studies and studies trend has not been chosen correctly. There are a lot of poorly mineralized water beds in oil fields and today the correct evaluation of oil saturation in reservoir beds is one of the pivotal tasks.

Technique widely applied around the world is spectral method of INL-carbon-oxygen log (INL-C/O).

Currently applied INL-C/O devices developed by foreign companies cover small radius ($R \leq 25\text{m}$) of area and have complex design, which restricts their application. Due to the abovementioned, at present, for oil content evaluation in complex reservoirs with poorly mineralized bed waters two sonde version of INNLL is used and good results were acquired.

If under normal condition neutron parameters of oil and fresh water (τ and D) coincide, they distinguish depending on thermobaric conditions in reality.

As gas content in oil rises this distinction also increases. Study of neutron parameters variation depending on gas content in oil beds makes it possible to evaluate oil saturation of complex reservoirs in sections with poorly mineralized bed water. Studies of Geologic setting of oil fields in Azerbaijan, reservoir properties and chemical composition of bed fluids require further investigations by INNLL.

Azerbaijan's oil fields, those onshore in particular, are at final stage of development and most of them are flooded for 96-98%. Bed water contain 25-30 l/e Na Cl (at lower portion of Productive Series - Gyrmaky Gyrmakyalty, series). On the other hand, oil in these beds is highly viscous and contains heavy hydrocarbon components (paraffin, asphaltene, pitch) and has non-Newtonian nature.

INNLL data acquired in recent years showed that in some wells in intervals chosen based on oil saturation evaluation the predictions made are false. Beds predicted as oil. This takes place generally in Gyrmaky and Gyrmakyalty beds, which are at final stage of development and fluids in these layers having characteristic composition influence the INNLL results. Since

INNL covers small radius of area ($r \leq 0,5\text{m}$) oil content is evaluated by saturation nature in area nearby to borehole.

Studies show that durable production from thin non-conductive series of beds and unequal distribution of pressure cause hydrodynamic relation between beds and due to this fluid (oil-water) flows from non-perforated intervals into perforated bed.

Hydrodynamic links are mostly displayed in depression areas of beds, i.e. in borehole bottom area. The area also stands out by temperature drop and this causes sedimentation of heavy components of oil and water or mud grouting area. In practice, in this area critical pressure and temperature values for deposition of paraffin, asphaltene, pitch, salt and other heavy components. Depression radius around the well covers 0.5-1.0 m area and this is the area where effects to gain increased output should be applied.

Since INNL carried out by modern devices cover no more than 0.5 m area, it can be supposed that INNL data acquired in sections with heavy, non-Newtonian oil beds do not reflect real oil and water saturation.

Presumably this is due to heavy components deposition on porous area in bottomhole zone or separate portions of rocks. Therefore new upgraded INNL technique has been proposed to study mature fields with heavy, non-Newtonian oil containing paraffin, asphaltene and pitch. [3].

The technique is intended for use to evaluate bed saturation, clean beds perforated or planned for perforation by existed techniques for thermal or thermal-chemical impact.

Another vital task is to enhance efficiency of INNL application in poorly mineralized (with small NaCl content) bed water. INNL applied in recent years displays its efficiency in bed water with NaCl exceeding 25-30 g/l and rock porosity more than 10%. The task of correct oil saturation evaluation in sections with poorly mineralized bed water by Impulse neutron Log or other geophysical tools has not been solved until now. In this case applied technique is based on activation of oxygen atoms by speedy neutrons and definition of their spectra (oxygen log) [4]. Unfortunately due to technical and economic obstacles caused by application of this tool the studies have not been conducted on proper level and their trend was chosen incorrectly.

Recent studies at foreign geophysical companies prove spectral version of INL, i.e. carbon-oxygen log (INL C/O) as a most reliable tool for oil evaluation in sections with poorly mineralized bed water [5].

However because of complex design and high prices of devices developed by foreign companies, INL C/O application is much cost and time consuming.

To enhance INNL efficiency in perforated intervals with poorly mineralized bed water it is proposed to artificially increase bed water mineralization in nearborehole area (0.5 m distance from INNL effect area)

prior to INNLL application. [6]. Proposed technique is simple and can be successfully applied for in-field studies.

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TO THE DECISION OF A PROBLEM OF WATER-INFLOW AND SAND FLOWS IN OIL WELLS (BY THE EXAMPLE OF OIL DEPOSITS OF AZERBAIJAN)

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The important role in maintenance of successful economic development of Azerbaijan is played by oil-extracting branch. Therefore, alongside with opening of new deposits, stabilization of the achieved level of an oil recovery and steady perfection of technologies and technics of operation on old deposits of Apsheron get now paramount value.

Prominent feature of productive thickness of Apsheron is weak cementation of collectors and the phenomenon connected to its sand flows and plug flows while wells exploiting, and also water cut, watering the majority of deposits on the average makes 90%. The operation of the oil deposits complicated with the specified phenomena, represents rather a challenge as the majority of deposits of Apsheron tens years are developed and are characterized low bedded by pressure.

One of methods of decrease in intensity of receipt of sand, and also restriction of water-inflow from a layer in to well is fastening breed of a layer by various knitting materials /2, 5/.

Formation sandy a proside and isolation of water-inflows in wells is a major factor reducing the between-repairs period of work (BRPW). In this connection, struggle against restriction of water-inflow, sand flows and plug flows in a late stage of operation of oil deposits remains to one of the basic conditions promoting increase of an oil recovery and increase of factor of operation of wells. If to take into account, that the increase in quantity of repairs results in the big economic expenses clearly what great value has increase BRPW oil well. A number of theoretical and practical researches /1, 3, 4/ is devoted to this question.

Carrying out of actions of fastening of near bottom zone of wells without taking into account above mentioned results in an investment of additional means, that results in increase of the cost price of extracted production.

The analysis of technological processes on fastening near bottom zone with simultaneous restriction of water-inflow lead for last years shows, that success of works on fastening by a cement mortal with various additives does not exceed 50-60-%. Used in conditions high drained of layers and low formation pressure the cement mortal, possessing high density, cannot capture all layer on capacity in because of consequence of leaving of a cement mortal in a layer on most drained stringer. Efficiency of ways of struggle against the mentioned above phenomena is estimated on number of successful processings, duration BRPW and cost prices of processing.

Proceeding from the above-stated requirements the technology of fastening new compose has been developed by the structures, allowing essentially to increase duration BRPW of wells at preservation of permeability near bottom zones, close to natural. In this connection laboratory researches with use of diesel an alkaline waste (the DAW-INDUSTRIAL rest of oil refining factories) have been carried out, 15 %-s solution CaCl_2 and in quality fill is thin ground sawdust and a shell rock.

The essence of proposed a way of fastening of near bottom zones is that in near bottom zone the nontight barrier from a mix 15 of %-s CaCl_2 +DAW+sawdust or a shell rock, for increase in volume of the fastening weight and maintenance of completeness of scope drained near bottom zones of a layer taken in the certain parity is created. For creation of high permeability sawdust, and also cockleshells were moistened DAW, and then in the given solution added electrolit. At mixing electrolit to a sawdust-liquid or shelly mix there is a reaction of hardening.

For definition of an optimum parity of the components providing permeability and stability of the created barrier, series of laboratory experiments have been carried out. For research have been submitted CaCl_2 -

DAW-sawdust to a mix with a parity accordingly 1:0,06; 1:0,05: 1:0,04: 1:0,025, prepared by hashing for 5 minutes. The made samples subjected to research for definition of permeability and stability to filtrational washout. Average values of results experiments are resulted in table 1 from which it is visible, that samples prepared at a volumetric parity 1:0,06, collapsed under influence of a gradient of pressure.

Table 1

The disperse environment in a volumetric parity		Disperse phase, %	Temperature, °C	A condition of a sample after filtered washout	Permeability, MKM^2
15%CaCl	DAW				
1	1	2,5	20	It is not dim	0,115
1	1	4	20	Not significant washout	0,125
1	1	5	20	It is destroyed	0,140
1	1	6	20	It is strongly destroyed	0,165

Samples prepared in the ratio components 1:0,025 and 1:0,04, are steady against filtrational washout and permeability of them changes in limits $0,115 \div 0,125 \text{ MKM}^2$, that corresponds to permeability of the majority of layers and provides a normal filtration of a liquid in a well.

Offered ways have been tested on experimental installation collected in laboratory conditions.

The length of model of a layer makes 90 sm, diameter 40mm, the volume of model made $V=1130\text{sm}^3$. Action has been carried out on a site of model of a layer in length 30sm and volume 480sm^3 , it has been filled and stamped by sand with fractional structure in the following proportions; 0,5-210gr, 0,8-270gr, 1,6-230gr.

After carrying out of a filtration of formation water for research of permeability had been received the data resulted in table 2.

The volume before fastening made fur of impurity of the filtered liquid 1,5gr on liter. Being based on the received experimental data optimum parity DAW+sawdust in the ratio 1:0,04 has been chosen.

The ambassador wetting of sawdust in DAW (0,04+150gr), and intensive hashing for 5 minutes, the received mix was under pressure pumped in model of a layer, after its procrush after it was pumped CaCl_2 (150gr). Then the model has been let alone at 24 hours.

The received results of fastening of model are resulted below in table 2 and on the schedule.

Table 2

Filtering liquid	Temperature of environment °C	Pressure MPa	Volume of filtered liquid V _{SM} ³	Time t,sec	The charge of a liquid Q _{SM} ³ /sec
Before restriction of water-inflow					
Formation water	20	0,05	255	600	0,31
	20	0,1	635	600	1,06
	20	0,15	1325	600	2,21
	20	0,2	2220	600	3,7
	20	0,22	2634	600	4,39
	20	0,24	3078	600	5,13
	20	0,26	3552	600	5,92
	20	0,28	4056	600	6,76
	20	0,3	4590	600	7,65
After restriction of water-inflow					
Formation water	20	0,05	200	600	0,33
	20	0,1	545	600	0,91
	20	0,15	820	600	1,37
	20	0,2	1506	600	2,51
	20	0,22	1698	600	2,83
	20	0,24	1896	600	3,16
	20	0,26	2100	600	3,5
	20	0,28	2298	600	3,83
	20	0,3	2502	600	4,17

Apparently from the schedule and the received data, after fastening inflow of a liquid has decreased for 55-60 %, and the output has made fur of an impurity 1gr on litter.

Plastic properties and low density of researched structure, and also ability of sawdust to swell in the disperse environment, can considerably improve scope of a layer on thickness and fastening properties of a material at fastening near bottom zones.

Further laboratory researches with use of diesel alkaline waste (DAW)-15-%-s' solution CaCl₂ and in quality filler a shell rock have been carried out.

We shall note, that diesel alkaline waste products (DAW) at contact to a water solution of technical chloride calcium (CaCl₂) form in pores, and also on a surface of grains filler the firm products of reaction possessing high adhesive properties promoting aggregatization of fine particles, in larger and simultaneously representing waterisalation weight.

At the first stage 10 % cockleshells from total amount of model that makes 70gr cockleshells then this volume was tasty in DAW (150gr) have been taken and intensively mixed up for 5 minutes. Further the received mix was under pressure pumped in model of a layer, after its procrush after it was pumped 15 %-s' solution CaCl₂ (150gr). Then the model has been let alone at 24 hours.

At consecutive pumping the specified working liquids with the purpose of prevention of loss of products directly in pipes, the dividing liquid in volume 0,1÷0,5 m³ is used. The received result after carrying out of action on restriction of water-inflow is resulted in table 3.

Table 3

Filtering liquid	Temperature of environment °C	Pressure MPa	Volume of filtered liquid V _{SM} ³	Time t,sec	The charge of a liquid Q _{SM} ³ /sec	Permeability K, MKM ²
Before restriction of water-inflow						
Formation water	20	0,05	65	600	0,1	0,14
	20	0,1	140	600	0,23	0,16
	20	0,15	240	600	0,4	0,19
After restriction of water-inflow						
Formation water	20	0,05	60	600	0,1	0,14
	20	0,1	135	600	0,225	0,16
	20	0,15	235	600	0,4	0,19

Apparently from the received data, the given model of a layer had high permeability that contradicted a principle of isolation.

At the second stage 20 % cockleshells from total amount of model have been taken. Then action in the same sequence, as at 1-st stage has been carried out.

From the received data followed that, permeability of a layer on water has decreased for 20 %.

At the third stage 30 % cockleshells have been taken. The received results of restriction of water-inflow are resulted below in table 4 and on the schedule.

Apparently from the schedule and the received data, after carrying out of action inflow of a liquid has decreased for 65 %.

Having based on the carried out series of experiments and the received data, at carrying out insulating works, parity DAW+30 of % cockleshells of +15 % solution CaCl₂ has been chosen as the optimal.

Conclusions

1. The new technology of fastening with application of electrolit (15%CaCl₂-DAW) a shell rock and sawdust mixes in quality filler is developed.

2. During laboratory researches it is established, that for industrial experiences by the most rational structure mix (DAW+sawdust) in the ratio 1:0,04, and a shell rock in the ratio DAW+30 % cockleshells +15% solution CaCl₂ is.

3. New compose the structure, having considerably low density and ability of sawdust to swell in the liquid environment covers the most part of a layer on capacity, and the shell rock creates a reliable barrier to isolation of water-inflows to wells.

4. Application of the offered structure provides economic benefit as a result of use of cheaper components and reduction of quantity of repairs connected with sand flows and isolation of water-inflows.

5. Offered compose the structure does not represent ecological danger to an environment.

Table 4

Filtering liquid	T-ra of environment °C	Pressure MPa	Volume of filtered liquid V _{SM} ³	Time t,sec	The charge of a liquid Q _{SM} ³ /sec
Before restriction of water-inflow					
Formation water	20	0,05	115	600	0,19
	20	0,1	390	600	0,65
	20	0,15	670	600	1,12
	20	0,2	1260	600	2,1
	20	0,22	1470	600	2,45
	20	0,24	1680	600	2,8
	20	0,26	1908	600	3,18
	20	0,28	2148	600	3,58
	20	0,3	2394	600	3,99
After restriction of water-inflow					
Formation water	20	0,05	70	600	0,11
	20	0,1	155	600	0,26
	20	0,15	300	600	0,5
	20	0,2	450	600	0,75
	20	0,22	528	600	0,88
	20	0,24	600	600	1
	20	0,26	672	600	1,12
	20	0,28	750	600	1,25
	20	0,3	828	600	1,38

Dependence of water filtration before and after model fastening(30%cockleshells)
15%CaCl₂-DAW

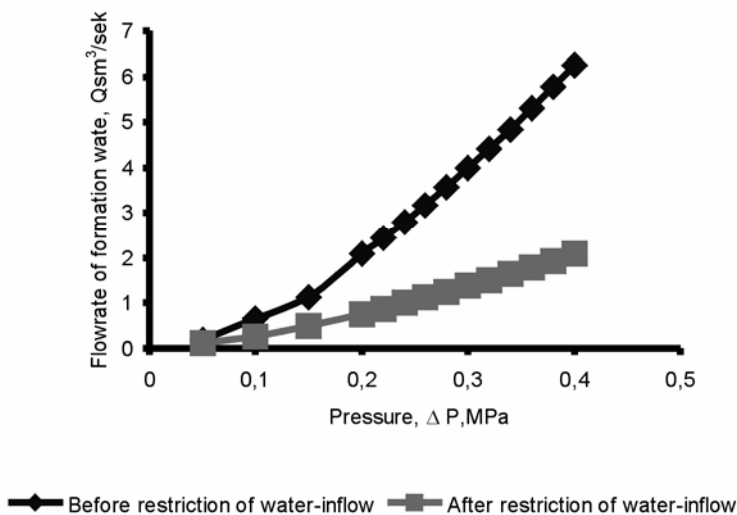


Fig.1

Dependence of water filtration before and after model fasteningq 15%CaCl₂-DAW-
sawdust mixture

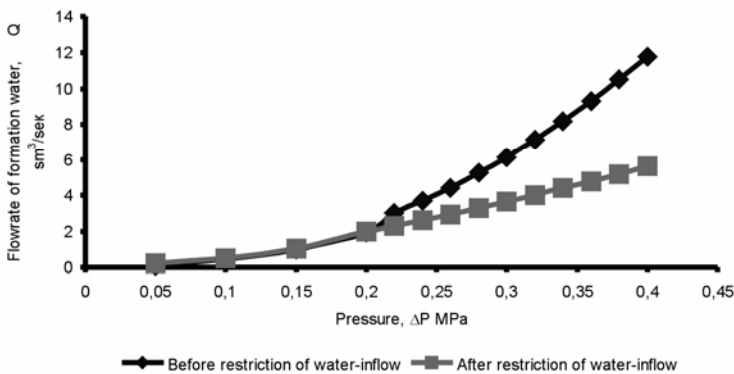


Fig.2

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SOME ASPECTS OF SPATIAL STRUCTURE OF ZONE OF BENYOF IN THE CASPIAN REGION

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Discovering of zone of Benyof has important scientific and practical meaning. Determining of spatial structure of seismofocal plane allows to more effectively solve such problems as seismic zoning, evaluation of perspectives of oil-and-gas content and others. In the series of works was determined the zone of Benyof in Caucasus (Khalilov E.N., 1982; Murzagaliyev D.M., 1998, Ulomov V.I., 1999; J.Jackson and others 2002) /1-7/.

With purpose of constructing the spatial computer pattern of zone of Benyof, we used the complex geophysical cuts, created by E.N.Khalilov (E.N.Khalilov, 1982) and catalogues of the earthquakes, in which were selected the deep-focus earthquakes with magnitude $M \geq 6$. As during last 20 years, in connection with improvement of recording apparatus and application of new methods of data processing, the seismological observations have become more

detailed and reliable than they were earlier, we covered this period for selection of the earthquakes.

We divided the construction of spatial pattern into two stages: the stage of processing of geological data and the stage of visualization of these data.

On the first stage we used ArcView Program Software, in particular, the modules Geostatistical analyst and 3D analyst. Using of these modules allowed us to locate the hypocenters of the earthquakes with exact coordinate binding, to do spatial data processing and to reveal the spatial location of zone of Benyof, fig.1.

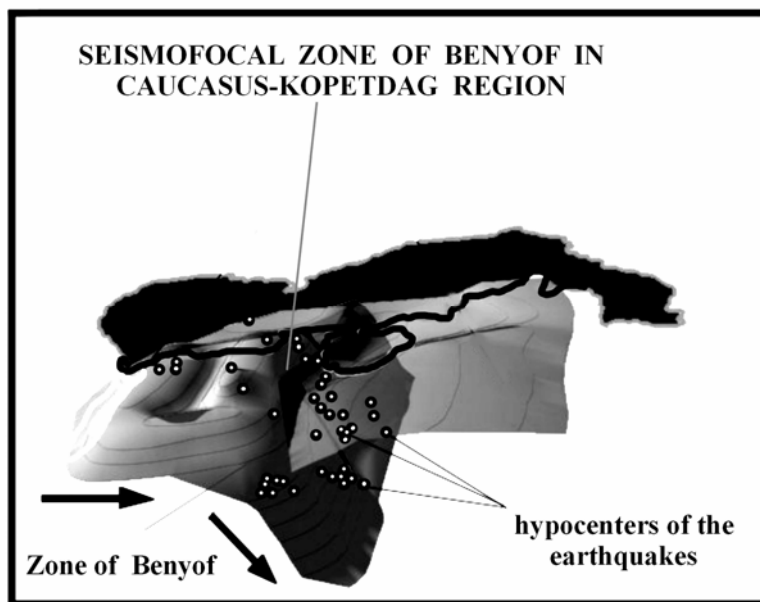


fig.1. Zone of Benyof in Caspian Sea.

On the second stage we used Degreeed program software for posterior import of data, with purpose of demonstrable visualization of spatial pattern of zone of Benyof.

Three-dimensional computer modeling of hypocenters of the earthquakes showed the sinking of centers into the upper mantle under the middle part of the Caspian Sea at angle of, approximately, $40-45^{\circ}$.

Creating of three-dimensional model of seismofocal plane gave us the opportunity to have clear idea about the character of sinking of relic of oceanic plane into the upper mantle.

In the constructing model are marked out three parts of sinking: Western (Eastern part of Caucasus), Central (South-Caspian cavity) and Eastern (South-Western part of Turkmenistan).

In Western part of zone of Benyof there is observed the sinking of lithospheric plate into the upper mantle at large angle (approximately 60°). The reason of such steep angle of sinking, most likely, is the beginning of collision in the area of seismofocal plane in the result of clash of Iranian plate with the Scythian. This collision is also confirmed by orogeny in Caucasus.

In Central part of zone Benyof the angle of sinking is approximately 40° . The absence of granite layer in the region of South Caspian Sea and relatively small angle of sinking of oceanic plate, speak about availability of subduction. Though judging from the recession of seismic activity of this region, the process of subduction here came up to finishing stage. The oceanic plate is curved during entering the zone of Benyof, lifting a little the edge of continental plate, forming the deep-water gutter, filled with sedimentary rocks to a considerable degree.

In Eastern part of zone of Benyof, the latitudinal strike is changed on close meridional one, at that the angle of sinking of oceanic plate here is about 60° . The process of orogeny in Western Turkmenistan and the character of zone of Benyof indicate on beginning of collision in this region.

Summarizing these three parts of spatial pattern, is seen the picture of stage of transition from subduction to collision. In the result of this process occurred the dividing of zone of Benyof into three segments: Caucasian, South-Caspian and South-Western Turkmenian.

The relevancy of this conclusion confirms the availability of deep breaks: from West – Western-Caspian, and from East – Aladag-Missirian, which, practically, divide the underground structures of Big Caucasus and South-Western Turkmenistan from South-Caspian cavity.

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PHYSICS, MATHEMATICS, ASROPHYSICS

POSITION-BINARY TECHNOLOGY OF ANALYSIS OF CYCLIC PROCESSES AND NOISES

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1. SPECIAL FEATURES OF CYCLIC PROCESSES

It is known that the spectral methods are usually used for the experimental analysis of cyclic processes. For example, continuous and discrete technological processes, oil extraction, biological processes, etc. are cyclic processes and the spectral methods and algorithms are widely used for their experimental researches. But the signals obtained from many cyclic objects as a rule have complicated form and are accompanied by considerable noise and so the application of the spectral method for solving the problem of diagnostics, identification, etc. in some cases is not effective enough. For an adequate description of these processes in most cases it is necessary to use the great number of harmonic components with corresponding amplitudes and frequencies that considerable complicates the analysis and the application of obtained results for solving the corresponding problems. Thus, in solving the different experimental problems for the considered class of objects there is a need for the development of methods and algorithms allowing us at the same time to decrease the number of components of 'spectrum' and also to increase the reliability of obtained results in comparison with the spectral method.

Let us discuss the difficulties of the application of the spectral method in more detail.

It is known that in applying the algorithms of this method to describe the periodic signals $x(t)$ with bounded spectrum, one must decompose the signals on the harmonic components by means of expression (5.10). Let us recall the formula mentioned above:

$$x(t) = \frac{a_0}{2} + \sum_{n=1}^{\infty} (a_n \cos n\omega t + b_n \sin n\omega t). \quad (1)$$

As mentioned above, in expression (1) a_n, b_n are the amplitudes of the sinusoid and cosinusoid with the frequency $n\omega$ which are considered as the informative signs in solving the diagnostics problems.

To provide accuracy in the restoration of the signal $x(t)$ it is necessary that the following inequality apply:

$$\sum_{i=1}^n \lambda_i^2 \leq S, \tag{2}$$

where λ_i^2 are the squares of the deviations between the sum on the right-hand side of equality (1) and the samples of the signal $x(t)$ in the moments of sampling $t_0, t_1, \dots, t_i, \dots, t_n$ with the step Δt ; S is a permissible value of mean-root-square deviation.

Decreasing the value S in accordance with equality (1) leads to sharp increase of the number of harmonic components that correspondingly complicates the processing of the experimental data. For the case when measuring information consists of the mixture of the useful signal $x(t)$ and the noise $\varepsilon(t)$, the implementation of condition (2) to a certain degree depends on the value of noise $\varepsilon(t)$. In the existing methods in equality (1) the influence of the noise is omitted and the error caused by the noise $\varepsilon(t)$ is taken equal to zero. But for many cyclic processes the influence of the noise on the accuracy of the restoration of the initial signal $x(t)$ is considerable and must be taken into account.

In these cases to provide the necessary degree of the accuracy of the restoration it is necessary to determine the variance and the frequency characteristics of the noise $\varepsilon(t)$. In this connection it is expedient to consider the algorithms allowing us to increase the accuracy of the restoration by means of decreasing the mean-root-square deviation S down to the given value and to determine the variance and the frequency characteristic of the noise $\varepsilon(t)$ of the measuring information without the complication of the procedure of solving the considered problem. As will be shown below the solution of these questions is very important for many problems of experimental analysis.

2. POSITION-BINARY TECHNOLOGY OF ANALYSIS OF CYCLIC SIGNALS

In practice, in measuring the signals $x(t)$ there is a minimal value of increment which can be provided by the applied device and depends on its resolution. Let us denote this minimal increment by the symbol Δx . It follows that in changing the signal, the number of its discrete values is equal to

$$m = x / \Delta x + 1 . \tag{3}$$

The amplitude quantization takes place in each sampling step Δt in the process of analog–digital conversion of the periodic signal $x(t)$, i.e., the range of all possible changes of the signal is divided into m intervals of quantization and the value of that signal in the m -th interval for

$$m\Delta x - \Delta x / 2 \leq x(t) \leq m\Delta x + \Delta x / 2 \tag{4}$$

corresponds to the center of the interval $m\Delta x$. In this case the values of binary codes of the corresponding digits q_k for the samples x_i of the signal $x(i\Delta t)$ with the sampling step Δt are determined on the basis of the following algorithm:

$$q_k(i\Delta t) = \begin{cases} 1 & \text{for } x_{rem(k)}(i\Delta t) \geq \Delta x 2^k, \\ 0 & \text{for } x_{rem(k)}(i\Delta t) < \Delta x 2^k, \end{cases} \tag{5}$$

$$x_{rem(k)}(i\Delta t) = x_k(i\Delta t) - [q_{k+1}(i\Delta t) + q_{k+2}(i\Delta t) + \dots + q_{(n-1)}(i\Delta t)],$$

where $x(i\Delta t) < 2^n$, $x_{rem(n-1)}(i\Delta t) = x(i\Delta t)$, $n \geq \log \frac{x_{max}}{\Delta x}$, $k = n-1, n-2, \dots, 1, 0$.

In accordance with this algorithm, first in each sampling step Δt the equality $x_{rem(n-1)}(i\Delta t) = x(i\Delta t)$ is used and in the iterative process the signals $q_k(i\Delta t)$ are formed as the code 1 or 0 by means of condition (5). Here in the first step the $x(i\Delta t)$ is compared with the value $2^{n-1} \Delta x$. In accordance with (5) if $x(i\Delta t) \geq 2^{n-1} \Delta x$, the value $q_{n-1}(i\Delta t)$ is taken equal to one and the value of the remainder $x_{rem(n-2)}$ is determined by the difference $x_{rem(n-2)} = x(i\Delta t) - 2^{n-1} \Delta x$. In the case when $x(i\Delta t) < 2^{n-1} \Delta x$, the value $q_{n-1}(i\Delta t)$ is taken equal to zero and the difference is not changed. In the next iteration this process is repeated. As a result, during the cycle T_c with the sampling step Δt the signal $x(i\Delta t)$ is divided into the signals $q_k(i\Delta t)$ which are equal to 1 or 0 and have a weight in accordance with their positions. Here, these codes are not changed if the value of initial signal $x(i\Delta t)$ is not changed. Further these signals will be called position-binary-impulse signals (PBIS). The position-binary technology is the combinations of the procedures of processing by means of the decomposition of continuous signal by the PBIS.

According to algorithm (5) the width of PBIS is in proportion to quantity Δt in the case when $q_k(i\Delta t)$ remains constant. One and the same signal $q_k(i\Delta t)$

can change its sign several times after certain intervals of time depending on the form of $x(i\Delta t)$ during one cycle. Of course, if the state of the object is constant the combinations of the interval of time $T_{k1}, T_{k0}, T_{k1}, T_{k0}, \dots$ of PBIS are constants in each cycle and hence they will be repeated. Otherwise, they will change, too. The fact of changing these combinations permit us to use them as information signs in diagnosing the cyclic objects. Let us note that T_{k1}, T_{k1}, \dots correspond to those intervals of time when the condition $q_k(i\Delta t) = 2^k (\Delta x = 1)$ occurs; T_{k0}, T_{k0}, \dots correspond to those intervals of time when the condition $q_k(i\Delta t) = 2^k (\Delta x = 0)$ occurs.

For example, let us assume that the time of cycle of the analyzed signal is equal to 15 microseconds, the sampling step is equal to 1 microsecond, i.e., $T_c = 15 \text{ ms}, \Delta t = 1 \text{ ms}$. Let us assume that the PBIS $q_3(i\Delta t)$ has the following states in one cycle: 000111100110000. In this case the parameters of signal $q_3(i\Delta t)$ are represented as: 3,0; 4,1; 2,0; 2,1; 4,0. This means that the width of the unit state and zero state of the signal $q_3(i\Delta t)$ has the following intervals of time during the cycle: 3 ms-0, 4 ms-1, 2 ms-0, 2 ms-1, 4 ms-0 correspondingly. It is obvious that in each cycle the sum of all PBIS is equal to the initial signal:

$$x(i\Delta t) \approx q_{n-1}(i\Delta t) + q_{n-2}(i\Delta t) + \dots + q_1(i\Delta t) + q_0(i\Delta t) = x^*(i\Delta t) \quad (6)$$

The signals $q_k(i\Delta t)$ can be used to determine the dependence between the input and output of the object of control. For this purpose it is expedient to consider the intervals of time when the signals q_k are in the unit state as the independent PBIS. Here several cyclic signals $q_k(i\Delta t)$ with the same positions $q_{kj}(i\Delta t)$ are formed. These PBIS are the periodic rectangular pulses with the period T_c which has the corresponding unit half-period T_1 and zero half-period T_0 . In this case the sum of $q_{kj}(i\Delta t)$ forms the signal in k -th position, i.e.,

$$q_k(i\Delta t) = \sum_{j=1}^i q_{kj}(i\Delta t),$$

and the sum of their half-periods forms their period, i.e.,

$$T_{0qj} + T_{1qj} = T_{qj},$$

where T_{1q_j} is that interval of time when the condition $q_k(i\Delta t) = 2^k$ ($\Delta x = 1$) holds; T_{0q_j} are those intervals of time when the condition $q_k(i\Delta t) = 0$ ($\Delta x = 0$) holds.

Let us note that the decomposition of the centered signals in PBIS differs from the last case only by the fact that in this case the initial signal is represented as the sum of the positive and negative PBIS $q_k(i\Delta t)$. Here the signals $\overset{\circ}{x}(t)$ and $\overset{\circ}{y}(t)$ are represented as the periodic PBIS having two polarities and their sum is also equal to the initial signal $x(i\Delta t)$.

In this case each PBIS can be represented in the analytical form as a function of Walsh, i.e.,

$$q_k(t) = \sum_{n=1}^N (q_k \operatorname{sgn} \sin n\omega t + q_k \operatorname{sgn} \cos n\omega t).$$

If we assume that there is only one PBIS in each position, the input signal $x(t)$ can be represented as follows:

$$x(t) \approx \sum_{k=1}^m \sum_{n=1}^N (q_k \operatorname{sgn} \sin n\omega t + b_k \operatorname{sgn} \cos n\omega t).$$

The output signal $y(t)$ can be represented similarly. When there are several PBIS in each position $x(t)$ or $y(t)$, each of them is represented as the sum. Here the initial signal is represented as the set of their sums. Let us note that there is the opportunity to represent the positional signals with given accuracy for periodic objects. Due to this fact the opportunity to describe input–output signals $x(t)$, $y(t)$ of these objects as the sum of Walsh functions has appeared. That is the matter of theoretical and practical interest.

In representing the initial signal $x(i\Delta t)$ as the sum of $q_k(i\Delta t)$ in the moments of time t_i the difference between the real value of the initial signal $x(t)$ and the sum of PBIS is equal to

$$x(i\Delta t) - x^*(i\Delta t) = \lambda(i\Delta t). \tag{7}$$

Taking into consideration the value (4), it is possible to write the following inequality: $\lambda(i\Delta t) \leq \Delta x / 2$.

For stationary random processes with normal distribution law it is possible to assume that in forming the signals $q_k(i\Delta t)$ the value of error $\lambda(i\Delta t)$

obeys the equiprobable distribution law and therefore, it is possible to assume that the following equality holds:

$$P\left[\lambda_i < \frac{\Delta x}{2}\right] \approx P\left[\lambda_i > \frac{\Delta x}{2}\right], \tag{8}$$

where P is the sign of probability.

Considering (7), (8) it is possible to assume that the sum of the squares of the deviations λ_i at the moments $t_0, t_1, \dots, t_i, \dots$ in view of their signs is near zero and due to this, inequality (2) can be represented as follows:

$$\sum_{i=1}^n \lambda^2(i\Delta t) \leq \Delta x.$$

In accordance with the inequality in representing the signal $x(t)$ as the sum of PBIS the mean-root-square deviation is less than Δx which allows us to recover it with high accuracy. For example, in solving the diagnostics problem if the change of the state of the object leads to the change of the corresponding technological parameters by the value, which is greater than Δx , then it is reflected on corresponding parameters $q_k(i\Delta t)$. Here even in the initial stage of the change of the state of the object in forming the parameters as the combinations of the corresponding signals $q_{n-1}(i\Delta t), q_{n-2}(i\Delta t), \dots, q_0(i\Delta t)$ of the corresponding cycle, the difference between the analogous parameters in preceding cycles is detected. That allows us to form and represent the information about the change of the state of the controlled object. Thus, it is possible to detect even the microchanges of the state of the object by choosing the value Δx by means of the position-binary technology that usually precedes serious failures and breakdowns.

3. POSITION-SELECTIVE FILTERING OF NOISE

It is known that when the measuring information is the sum of the useful signal $x(i\Delta t)$ and the noise $\varepsilon(i\Delta t)$, to filter the noise one can use the various, in general, hard realized algorithms. At the same time when there are hundreds or thousands of signals, the process of the initial processing of the signals becomes complicated. Thus, it is expedient to create algorithms suitable for experimental research. From this point of view it is expedient to use PBIS for the filtering of signals.

Proceeding from this, let us consider the question of the binary-selective filtering of the continuous signals by means of the PBIS. As the realized researches show, if after the analog–digital conversion the signal $x(i\Delta t) + \varepsilon(i\Delta t)$

is not filtered, then the component $\varepsilon(i\Delta t)$ exerts influence on PBIS which is represented as $q_k(i\Delta t) + q_k^\varepsilon(i\Delta t)$. This influence $q_k^\varepsilon(i\Delta t)$ is manifested in the short-time pulses the duration of which is much less than the periods of positional signals. Due to this, the filtering of that noise $q_k^\varepsilon(i\Delta t)$ by means of both visual observation and algorithms can be easily realized. This reflects the fact that during the analog–digital conversion one can choose such a sampling step Δt that the high-frequency noise $q_k^\varepsilon(i\Delta t)$ could exert influence on the change of the level only within the limits of the one sampling step. In this case $q_k(i\Delta t)$ can be filtered from $q_k^\varepsilon(i\Delta t)$ by means of the following expression:

$$q_{\varepsilon k}(i\Delta t) = \begin{cases} 1, & \text{for } q_k((i-1)\Delta t) = 0, q_k(i\Delta t) = 1, q_k((i+1)\Delta t) = 0; \\ 0, & \text{for } q_k((i-1)\Delta t) = q_k(i\Delta t) = q_k((i+1)\Delta t); \\ -1, & \text{for } q_k((i-1)\Delta t) = 1, q_k(i\Delta t) = 0, q_k((i+1)\Delta t) = 1. \end{cases} \quad (9)$$

After that selective filtering with respect to $q_k^\varepsilon(i\Delta t)$ the obtained positional signals $q_k(i\Delta t)$ are the summands the sum of which is equal to the filtered initial signal. The advantage of this filtering is that it is easily realized by means of the soft- and hardware.

For example, after the process of analog–digital conversion and positional filtering the random function $g(t) = x(i\Delta t) + \varepsilon(i\Delta t)$ containing the noise $\varepsilon(i\Delta t)$ can be represented as follows:

$$\varepsilon(i\Delta t) = q_{\varepsilon 0}(i\Delta t) + q_{\varepsilon 1}(i\Delta t) + q_{\varepsilon 2}(i\Delta t) + \dots + q_{\varepsilon k}(i\Delta t) + \dots + q_{\varepsilon(m-1)}(i\Delta t) = \sum_{k=0}^{m-1} q_{\varepsilon k}(i\Delta t), \quad (10)$$

$$x(i\Delta t) = g(i\Delta t) - \varepsilon(i\Delta t) = g(i\Delta t) - \sum_{k=1}^{m-1} q_{\varepsilon k}(i\Delta t). \quad (11)$$

Thus, in the course of analog–digital conversion each positional signal is subjected to selective filtration which results in clearing away the influence of noise on positional signals. As a result the sum of these positional signals represents the filtered initial signal $x(i\Delta t)$.

To check the reliability of the results obtained from the realization of expressions (9)–(11), it is advisable to determine the variance of the noise of the noisy signal $g(i\Delta t)$ both by formula

$$D_\varepsilon^* = \frac{1}{N} \sum_{i=1}^N \left[\sum_{k=0}^{m-1} q_{\varepsilon k}(i\Delta t) \right]^2,$$

and by formula

$$D_{\varepsilon} \approx \frac{1}{N} \sum_{i=1}^N \overset{\circ}{g}^2(i\Delta t) + \overset{\circ}{g}(i\Delta t) \overset{\circ}{g}((i+2)\Delta t) - 2 \overset{\circ}{g}(i\Delta t) \overset{\circ}{g}((i+1)\Delta t).$$

The fact that the obtained estimates

$$D_{\varepsilon} \approx D_{\varepsilon}^*$$

are equal can be accepted as proof of the reliability of the obtained results.

The technology mentioned above was confirmed by a great number of computer experiments. The digital noisy signal $g(i\Delta t)$ (Figure 1b) which is the sum of the useful signal $x(i\Delta t)$ and the noise $\varepsilon(i\Delta t)$ (Figure 1a) was subjected to the position-selective filtering. Here from each PBIS of the noisy signal (Figure 1c) the PBIS of the noise (Figure 1d) and the PBIS of the useful signal (Figure 1e) were separated by means of the methods mentioned. Eventually from the obtained PBIS the filtered signal $x^*(t)$ (Figure 1f) and the noise $\varepsilon^*(t)$ (Figure 1g) were respectively formed where

$$g(t) = x^*(t) + \varepsilon^*(t).$$

In analyzing Figure 1f visually, the efficiency of the suggested technology becomes obvious when the filtered signal coincides with the useful one practically:

$$x^*(i\Delta t) \approx x(i\Delta t).$$

We can arrive at the same conclusion by comparing Figures 1a and 1g from which one can see that there are no substantial differences between the given noise and the noise separated from the noisy signal during the process of position-binary filtering

$$\varepsilon^*(i\Delta t) \approx \varepsilon(i\Delta t).$$

4. POSITION-BINARY TECHNOLOGY OF ANALYSIS OF NOISE

It is clear that the determination of the samples of the noise by expressions (7) and (10) opens wide possibilities for analysis of the noise. Here the estimates of the variance and the spectral characteristics of the noise, cross correlation function, and the coefficient of the correlation between the noise and the useful signal can be determined by the following expressions:

$$D^p_\varepsilon = \frac{1}{N} \sum_{i=0}^N \varepsilon^2(i\Delta t) \approx \frac{1}{N} \sum_{i=0}^N \left[\sum_{k=0}^m q_{\varepsilon k}(i\Delta t) \right]^2, \quad (12)$$

$$R^p_{x\varepsilon}(0) = R^p_{g\varepsilon}(0) = \frac{1}{N} \sum_{i=0}^N g(i\Delta t)\varepsilon(i\Delta t) \approx \frac{1}{N} \sum_{i=0}^N \left[g(i\Delta t) \sum_{k=0}^m q_{\varepsilon k}(i\Delta t) \right], \quad (13)$$

$$r^p_{x\varepsilon} = \frac{R_{x\varepsilon}(0)}{\sqrt{D_\varepsilon R_{x\varepsilon}(0)}} \approx \frac{R_{g\varepsilon}(0)}{\sqrt{D_\varepsilon R_{g\varepsilon}(0)}} \approx \frac{\sum_{i=0}^N \left[g(i\Delta t) \sum_{k=0}^m q_{\varepsilon k}(i\Delta t) \right]}{\sqrt{\sum_{i=0}^N \left[\sum_{k=0}^m q_{\varepsilon k}(i\Delta t) \right]^2 \sum_{i=0}^N \left[g(i\Delta t) \sum_{k=0}^m q_{\varepsilon k}(i\Delta t) \right]}}, \quad (14)$$

$$\lambda^p_{a_n} = \frac{2}{N} \sum_{i=1}^N \varepsilon(i\Delta t) \cos n\omega(i\Delta t) \approx \frac{2}{N} \sum_{i=1}^N \left[\sum_{k=0}^m q_{\varepsilon k}(i\Delta t) \right] \cos n\omega(i\Delta t), \quad (15)$$

$$\lambda^p_{b_n} = \frac{2}{N} \sum_{i=1}^N \varepsilon(i\Delta t) \sin n\omega(i\Delta t) \approx \frac{2}{N} \sum_{i=1}^N \left[\sum_{k=0}^m q_{\varepsilon k}(i\Delta t) \right] \sin n\omega(i\Delta t). \quad (16)$$

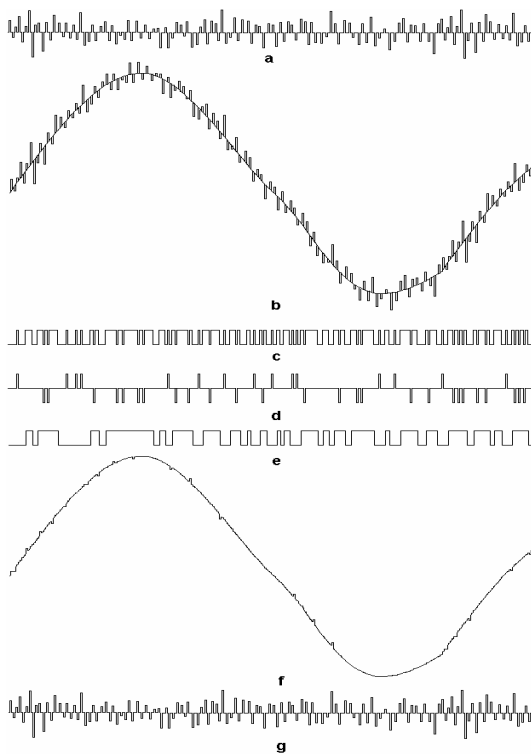


Fig. 1. The noise (a), the noisy signal (b), the fragment of one of the PBIS of the noisy signal (c), separated PBIS of the noise (d) and the useful signal (e), the filtered signal $x^*(i\Delta t)$ (f), and the separated noise $\varepsilon^*(i\Delta t)$ (g).

The technology under consideration analyzes the noise of the noisy signals and opens wide possibilities for solving a great number of applied problems.

The investigations carried out showed that there is generally a relationship between the noise of the measuring information and the hidden microchanges which precede the beginning of the failure stages on real objects. For this reason a microchange in the object condition will be reflected in the estimates of the PBIS of the noise $\varepsilon(i\Delta t)$ which are determined by expressions (12)–(16). Therefore, due to the relationship between the microchanges and noise and due to the estimates $D_\varepsilon^p, R_{g\varepsilon}^p(0), R_{g\varepsilon}^p(\mu), r_{g\varepsilon}^p, \lambda_{a_n}^p$, and $\lambda_{b_n}^p$ obtained by position-binary technology, a possibility of forecasting the tendency of the microchanges which can lead to the failure condition of the diagnosed object appears. Here as distinct from the traditional solutions, in the solution under consideration for eliminating the risk of possible failures a method is suggested which consists of deparallelizing the processes of forecasting (in using the noise) and the diagnostics of the changes of condition of the controlled objects. For this purpose by means of analyzing the signals $g_1(i\Delta t), g_2(i\Delta t), \dots, g_n(i\Delta t)$, the estimates of the noise characteristics are determined, i.e., $D_\varepsilon, R_{g\varepsilon}(0), R_{g\varepsilon}(\mu), r_{g\varepsilon}, \lambda_{a_n}, \lambda_{b_n}, D_\varepsilon^p, R_{g\varepsilon}^p(0), R_{g\varepsilon}^p(\mu), r_{g\varepsilon}^p, \lambda_{a_n}^p$, and $\lambda_{b_n}^p$. These estimates are also used for providing the robustness of the statistical estimates of the signals obtained by traditional algorithms, i.e., $D_g^R = D_g - D_\varepsilon, R_g^R = R_g(0) - R_{g\varepsilon}(0), \dots, a_n^R = a_n - \lambda_{a_n}, b_n^R = b_n - \lambda_{b_n}$ ¹⁰. As a result the relation between these estimates and the noise is eliminated, and this the reliability of the results of the diagnostics increases. It is natural that these magnitudes will be stable when the condition of the object is stable. They will be stable too at the beginning of the processes leading to the microchanges of the object condition. However, the estimates of the total noise will be liable to changes. At the same time when the process of all possible changes of the object from one condition into another acquires a clearly defined character, it will be reflected in the estimates of the total signals which can be used for solving the problems of diagnostics.

Thus, due to the mentioned technology as distinct from the traditional technologies a new possibility appears. This is the possibility not only to diagnose but also to forecast the change of the object into a new condition beforehand.

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HYPOTHESIS ON TRANSNEPTUNIAN PLANET AND OBJECT 2001 KX 76

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The discovery of kuiper bodies in 1990 extended the astronomers knowledge about the periphery of solar system significantly. The forecasts and prognoses of some specialists (Whipple, Ejevort, Eneev, Drobishevsky and so on) who assumed the existence of whole small body belt were exact. The number of discovery in this zone might be much more today if the observers were more careful to these forecasts.

The discovery of biggest kuiper body 2001 KX 76 was an extraordinary event even in the phone of existence kuiper belt of comet-asteroid bodies. Why the body with such size has been remained latent for observers in the past. Was the object surprise for specialists? Answering these reasonable questions it is necessary to note that some astronomers have assumed the existence of such celestial bodies in their works. The author of this work is one of them.

In this article we'll remind the essence of author's cycle of works [1-5] devoted to forecast of unknown planet body in the region Neptune-Pluto and analyze parameters kuiper body 2001 KX 76 .

In 1986 we [1] found the effect in the distribution of the aphelions of the so-called "Neptunian family" comets (these are comets having aphelion distances commensurable with Neptune heliocentric one) and associated it with the unknown planet body in the region of Neptune-Pluto. At first we remind the essence of our method of approach. Let the coordinates of the perihelion of some number comets are known. We try to determinate the optimal plane relatively which the perihelions of comets have minimum dispersion. We have to transfer ecliptically spherical coordinates to rectangular ones for this aim

$$X = \cos B \cos L$$

$$Y = \cos B \sin L$$

$$Z = \sin B$$

where L and R are ecliptically longitude and latitude of a perihelion accordingly.

It is possible to calculate a plane equation reduced to normal view by totality of values X, Y, Z . $Ax + By + Cz = 0$ (1)

The equation (1) can be produced in a view

$$Z = ax + by \quad (2)$$

The coefficients a and b are found by the minimization conditions

$$\partial f(a,b) / \partial a = 0; \quad \partial f(a,b) / \partial b = 0$$

where the function $f(a,b)$ is a sum of the equation (2) errors. After determination of values a and b we can easily calculate spherical parameters of the plane (2)

$$\cos I' = 1 / \sqrt{a^2 + b^2 + 1}; \quad \cos \Omega = a / \sqrt{a^2 + b^2} \quad (3)$$

Applying these calculations to so-called "Neptune family" in 1986 we [1-2] found most of Neptunian comets aphelion was concentrated nearly large circle with considerable inclination to the ecliptic. At the same time it was found out that measure of the chaotic of discovered concentration is far for framework of random. That fact directed us to the idea about existence of the planet body with almost Plutos mass and size moving in the plane of the large circle. Besides it was found some eccentricity in the arrangement of the Neptunian comet aphelion. We assumed the hypothetical planet had following parameters on the base of it:

$$a = 36,2 a.u.; \quad e = 0,11; \quad i = 30,5^\circ; \quad \Omega = 287,3^\circ; \quad \omega = 289^\circ \quad (2)$$

We pointed in the quoted papers that described calculations had to be repeated after each discovery of “Neptunian” comets. For example after discovery of comet D/1989 A3 the effect was saved - Ω and I in (1) it has been changed comparatively little.

$$i = 25,6^\circ ; \Omega = 285,6^\circ$$

For the last years the nominated group of comets has been replenished by new members and consists a followings objects: P/-239 K1; 13P/1815 E1; D/1827 M1; 122P/1846 D1; 23P/1847 O1; 20D/1852 O1; D/1942 EA; D/1989 A3; D/1942 EA; C/1999 E1; C/1999 S3; C/1999XS87; P/2001Q6; C/2001M10; C/2002 K4; C/2002A1; C/2002A2. It is possible to include to the list the object 1992 AD comet nature of which has not been proved.

Our calculations show that optimal plane has a following parameters:

$$i = 25,4^\circ ; \Omega = 279,4^\circ$$

Besides aphelion distances of considered comets is extended from 29 up to 48 a.u. It means the eccentricity of a hypothetical planet can be about 0.25.

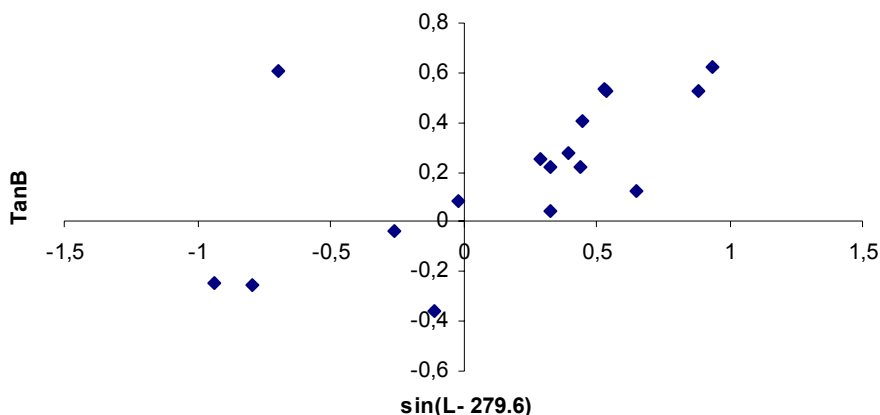
We used probabilistic scheme of test Bernoulli for determination of a degree of concentration of points perihelions near to a plane in the work [3]. However in the present work we'll use correlation analysis between separate parameters of comets for the same purpose. The essence of this analysis is reduced to following. If the perihelions are strictly distributed in the plane with parameters Ω' and I' must be strictly linear dependence between parameters $L' = L - \Omega'$ and B

$$\tan B = \sin(L - \Omega') \sin I'$$

And if there is simply concentration of perihelions near to that plane should be a significant correlation relation between values $\tan B$ and $\sin(L - \Omega')$

The relation between the indicated values for all 18 of “Neptune family» comets is represented in the fig. 1. Without resorting to special statistical criteria at all it is possible to suppose that there is definite statistical connection here. However there is a necessity more strictly to evaluate veracity of suspected interdependence. Only after that the comets can be divided to "local" and “another” ones.

Рис.1. The dependence of values of $\sin(L- 279.6)$ и $\tan(B)$ for "neptunian" comets



The correlation coefficient between values $\tan B$ and $\sin (L-\Omega')$ makes 0.61, and its significance is 0.95 approximately. As it is seen from figure, 14 from 18 points are concentrated close some line (at a correlation coefficient 0.96). As for another comets calculation of their sifting is described in the work [3].

Thus our hypothesis has kept the basic arguments at almost twice increasing of Neptune "family comets" number. In this respect the kuiper objects introduce of considerable interest too. The largest of them with number 2001 KX76 and the diameter about 1400 kms introduces especially greatest interest in this respect.

The object 2001 KX76 has following characteristics:

$$q = 29.69 \text{ a.e.}; \quad e = 0.245; \quad \omega = 300.9^\circ; \quad \Omega = 71^\circ; \quad i = 19.7^\circ; \quad H = 3.2^m$$

The majority of parameters of these objects is agreed well to our hypothesis. The sharp difference is observed in parameter Ω . Thus the sum of two values Ω is almost equal to 360° . We present one of possible explanations of this difference below. The unit of a plane of a hypothetical planet motion was determined in our calculations from expression (3) through functions a \cos . In such approach it is necessary to make selection between two values: $\Omega = 72.7^\circ$ and $\Omega = 287.3^\circ$. We have made selection for the benefit of the second value, as it gives more effective concentration. However if to compute a position of plane through functions \tan it is necessary to select the first value. Then the conformity between hypothesis and data of the object becomes much more.

Table 1.
Some data of “Neptune family” comets

<i>Comets</i>	q	E	ω	Ω	I	L	B
C/2002 A1	4,6985	0,7435	19,17	82,08	14,156	100,71	4,60
1P/-239 K1	0,5854	0,9676	88,11	30,81	163,47	303,78	16,52
23P/1847 O1	0,4879	0,9721	129,34	311,98	19,15	82,93	14,70
C/2001 W2	1,0496	0,9365	142,23	113,34	115,34	311,69	33,61
122 P	0,6594	0,9625	12,99	79,59	85,57	80,61	12,95
D/1989 A3	0,4202	0,9777	194,74	28,44	83,07	210,25	- 14,63
D/1827 M1	0,8065	0,9458	19,19	320,02	136,46	305,87	13,09
C/2002 A2	4,6985	0,7435	19,17	82,08	14,16	100,71	4,61
D/1942 EA	1,2871	0,9336	335,22	172,29	38,00	152,30	- 14,95
20D/1852 O1	1,2499	0,9195	57,03	348,24	40,94	37,59	33,35
C/2002 K4	2,7645	0,8423	24,43	308,10	94,06	306,26	24,37
C/1999 E1	3,9200	0,7600	329,76	127,83	46,89	106,11	- 21,57
C/1999 S3	1,8950	0,9000	44,12	11,88	70,56	29,77	41,04
C/1999 XS87	2,7718	0,8410	151,35	266,73	14,84	58,89	7,06
13 P	1,2129	0,9317	65,59	86,03	44,50	143,56	39,66
C/2001 M10	5,3029	0,8015	5,47	293,92	28,08	298,74	2,57
P/2001Q6	1,0501	0,9408	142,10	113,35	115,92	312,15	33,54
1992 AD	8,6860	0,5756	354,89	119,38	24,69	114,74	-2,13

However it is only one of possible explanations. It is possible another unknown planet body much more associated to our forecast will be discovered in future.

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ABOUT SOME RESULTS OF GRAVITY QUANT EXPERIMENTS

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For the last years the researches in the area of quantum theory of gravitation acquire increasing actuality. Because of extreme weakness of gravity interactions, there is opinion about high complexity of conducting of correct experiments for study of gravitaty quantum effects.

For study of gravity quantum effects, we developed and produced the special installation G-QUANTUM, where interactions of four masses are studied. As main mass, influencing by means of its gravitational field on other auxiliary masses, the Earth is used. Variable masses with weight of 30 tons are applied, as auxiliary masses in installation G-QUANTUM. Mass with weight of several grams, placed in high-precision quartz gravimeters, is applied as sample mass.

For correctness of experiment simultaneously three high-precision quartz gravimeters GNU-KV (made in USSR) were applied. First, all three gravimeters were synchronized in such manner, that differences in its indications at simultaneous measurement would not exceed 0,01 mGal.

At the first stage of experiment possible influences of cosmic and geologic factors on indications of gravimeters were established: lunisolar tides, tideless variations of gravity, connected with geodynamic processes. Special method, which allows excluding influence of zero drift on gravimeter indications, was developed.

Two tanks with water, one of which is located on the Earth surface and another at the height of 2.5 meters above the first tank, are applied, as variable masses in installation G-QUANTUM. A special room, where measurements were conducted by means of high-precision quartz gravimeters, is located between 2 tanks.



Photo of installation G-QUANTUM

Reference point of measurements, where independent measurements of time variations of gravity were conducted, is located at distance of 15 meters from tanks. These variations were considered during conducting of experiments at installation. Wide band seismic station, registering all seismic

vibrations, proceeding from earthquakes and microseisms, considered during experiments, is also located in this room.

Two gravimeters are placed in the room of installation of G-QUANTUM, in the centre, between upper and lower tanks. Between tanks, simultaneously with gravimeters, high-precision electronic weights were placed, by means of which the weight of sample mass, about 150gr. with precision up to 0,0001gr. was continuously measured. During the experiment, upper and lower tanks were filled and emptied in certain sequence, using different options. At each option, gravity values and variations of weight of sample mass were measured. Variations of gravity, connected with seismic noise and geodynamic processes, were subtracted from obtained values.

Statistically reliable deviations of results of experiment from theoretically calculated values were established, at that, these deviations exceed errors of gravimeters by 10 times. In the opinion of the author of this work differences between actual and theoretical values of gravity witness about existence of gravity quant effects.

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POSSIBLE DEPENDENCE OF COMPLICATIONS OF VARIOUS TYPES OF ARRHYTHMIA FROM CHANGE OF SECTORAL STRUCTURE OF INTERPLANETARY MAGNETIC FIELD

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keywords: arrhythmia, IMF, Holter's ECG monitoring, Solar activity.

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Abstract

The reports of the 905 patients in the age from 30 to 75, who underwent the Holter- monitoring in 1983-1984 and 1989-1990 years, were investigated with the purpose of determination of a possible correlation between the divert type of arrhythmia and the interplanetary magnetic field sector structure's polarity changes (IMFSPC) in the dependence of the 11-years solar cycle's phases. The

data collected were compared with the IMFSPC in the days of the sign's shift from negative to positive and vice versa. In the maximum of the cycle, as well as on the descending part of the solar activity, the significant influence of the IMFSPC on the incidence of the different type of the arrhythmia has been determined.

1. INTRODUCTION

Recently actively is investigating the influence of the solar activity on the biosphere, particularly on an individual health and various diseases. The so-called carrier of the solar activity onto the earth is the interplanetary magnetic field (IMF) which effects the geomagnetic field (GF) and forms its rhythms, similar to those of solar activity, and possibly rhythms in biosphere binding cosmos with an individual through the timing-informational interchange. IMF has the complex sector structure. During its movement the earth is exposed to the different sectors of IMF with opposite orientation of a magnetic field. When the power of the magnetic tension of IMF is directed oppositely regarding to GF, on the border of IMF and GF arise areas of fields' intersection through which the streams of the solar plasma in the form of high energy protons penetrate and cause a magnetic storms on the earth [6]. In the maximum of 11-year solar cycle the 2-sector structure of IMF with 14^d harmonics is observed, in the phase of a decline – 4 sectors with 7^d harmonics. In the minimum of a cycle the sector structure either disappears or becomes 2-sector and remains the same right up to the next maximum [2].

On the base of the foregoing it is possible to assume that the variations of the IMF's sector orientations in the different phases of the solar cycle perhaps reflect in different ways on the clinical course and complications of cardiologic diseases. Some authors indicate on the aggravation of the clinical course of Coronary Heart Disease (CHD) and Essential Hypertension (EH) in correlation with the polarity of IMF but independently of the solar cycle's phases [1,4].

The investigation aimed to determine the possible coherence of different types of arrhythmia with the dynamic of IMF sector structure variability in diverse phases of the solar activity.

2. THE MATERIALS AND METHODS

The 905 patients from 30 to 75 year-old had been investigated with Holter's monitor. The 638 patients were with CHD, 267 – with EH. The characteristics of IMF polarity changes are taken from the Internet site "National Space Sentence Data Center, Mail code 633, NASA, November 1999, NEP". The medical and heliogeophysical data have been processed by the method of superposed epochs [3] and by the test of χ^2 [5]. In case of processing with data

by use of former method As a zero (critical) days we have selected 10 days from each investigating year when well-defined changes of IMF's sector polarity from negative to positive and conversely happened. For each type of arrhythmia the appropriate tables are constructed by the investigating years. By means of the tables the average values of the arrhythmia's intensity within 9 days have been received. For the confidentiality of the results the material was processed with test χ^2 . The total amount of the days in 1983-84 composed 731, in 1989-90 – 730. From these days we have excluded the days (W) when there were no observations of IMF. For the period of 1983-84 W=259, and for the 1989-90 – W=264. The total number of all so-called critical days when the changes of the polarity from negative to positive and vice-versa were clear enough in 1983-84 was 78, and in 1989-90 – 79.

3. RESULTS AND DISCUSSION

The period from 1983 to 1984 corresponded to the declining phase of the cycle, 1989-1990 – to the maximum.

In the Table 1 are shown the distribution of the arrhythmia in critical days by the method of superposed epoch.

Table 1
Quantity and ratio in percents of arrhythmia in days of IMF sectors' polarity changes.

Symbols: S – supraventricular extrasystoles, P_s – supraventricular paroxysmal tachycardia, V₁ – ventricular single extrasystoles, V_m – ventricular multiple extrasystoles.

Arrhythmia	1983-1984			1989-1990		
	Total quantity	In the critical days	%	Total quantity	In the critical days	%
S	111	72	65	80	43	54
P _s	85	41	48	83	37	44.4
V ₁	169	47	28	182	77	44.3
V _m	90	52	58	48	33	69

In the Figures 1, 2 are shown the distribution of different types of arrhythmias received by the method of superposed epochs.

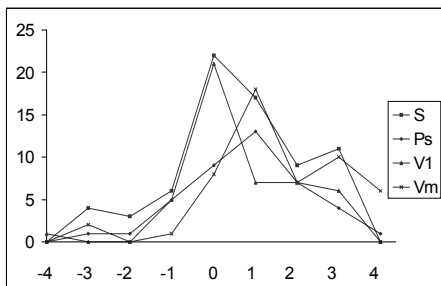


Figure 1

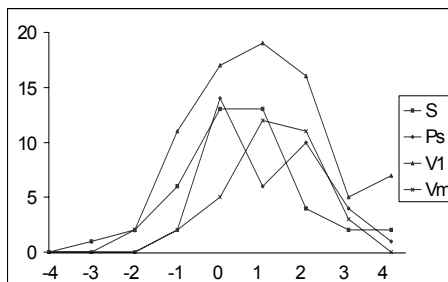


Figure 2

Distribution of different types of arrhythmias during 1983-84.	Distribution of different types of arrhythmias during 1989-90.
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From the Table 1 and Figures 1 and 2 follows that during the changes of the IMF sectors polarity in 1983-84 the arrhythmia arose in ~ 50-60 % of cases (except V₁); the maximal cases are shown to be in the zero day or just on the next day (P_s, V_m, according to our observations in the most cases V_m was preceded by P_s). In 1989-90, in the period of the cycle's maximum, the maximum cases of the arrhythmia are revealed, from which most were V_m ~ 69% (Table 2). For all types of arrhythmia the maximums have been registered in the zero day (P_s, S) or on the next day (V₁, V_m).

The probability of accidental arrhythmia independently of solar cycle is $P_1=78/(731-259)=0.165$ for 1983-84, and $P_2=79/(730-264)=0.169$ for 1989-90.

In the table 2 are shown all cases of arrhythmia in the critical and ordinal days.

Table 2

The quantity of arrhythmia in the critical and ordinal days.

Arrhythmia	1983-1984		1989-1990	
	Total quantity	In the critical days	Total quantity	In the critical days
S	16	48	20	45
P _s	18	34	18	24
V ₁	28	62	23	59
V _m	12	38	19	35

In the Table 3 are shown the results of processing of the material by the method of χ^2 :

$$\chi^2 = (v_1 - nP_1)^2 / nP_1 + (v_2 - nP_2)^2 / nP_2 = (v_1 - nP_1)^2 / nP_1(1 - P_1), \quad \text{where}$$

$$v_2 = n - v_1, P_2 = 1 - P_1.$$

Table 3

The meaning of χ^2 for the each type of arrhythmia. Symbols: v_1 – number of arrhythmia in critical days, n – total number of arrhythmia, P_1 – probability of arrhythmia accident.

Arrhythmia	1983-1984				1989-1990			
	v_1	n	np_1	χ^2	v_1	n	np_1	χ^2
S	16	64	10.24	3.86	20	65	11.05	8.73
P _s	18	52	8.32	13.46	18	42	7.14	19.9
V ₁	28	90	14.4	15.28	23	82	13.24	7.09
V _m	12	50	8	2.38	19	54	9.18	12.65

With the use of the test χ^2 it is possible to assert with the high confidentiality that the coincidence of the arrhythmia with the days of the polarity changes is not accidental.

As follows from the Table 3 the confidential index of V_m arrhythmia in the declining phase corresponds to 90%, and in the phase of maximum it is close to 100%, as for the P_s .

From these follows that in the phase of the solar cycle's maximum the change of IMF sector's polarity influences indeed the frequency of the complex arrhythmia.

On the descending branch of the solar activity the influence of a polarity changes on arrhythmia also is significant. At that, in percentage the most are S and V_m arrhythmia, but in comparison with the maximum phase for V_m these indices are rather low.

The data determined could be explained by the fact that on condition of 2 sectors structure of magnetosphere there is cumulated more energy than in case of 4 sectors. But this hypothesis needs further more thorough investigations. As our opinion, a sick organism for the reason of diminished adaptation potentialities is more inert in comparison of a healthy one.

Perhaps, this is why it reacts stronger on the alteration of the polarity after prolonged (14^d) exposition to the field of the one sign (2-sector structure) than in the condition of a polarity's frequent (7^d) alterations (4-sector structure).

4. Conclusions:

1. The alterations of the IMF's sector structure's polarity can cause the various arrhythmias in CHD and EH that is revealed in the phase of the solar maximal activity (to a greater extend) as well as on the descending branch immediately in the day of the polarity alteration and on the next day.

2. The most frequency of the fatal multiple ventricular extrasystoles are determined in the phase of the solar activity maximum.

Acknowledgements

The authors would like to thank Prof. Franz Halberg and Dr. Germaine Cornelissen for useful comments related to the current work.

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TWO FOCAL MIRROR SYSTEM FOR COMPENSATION OF THE MOVING IMAGE OF AN INFRARED TELESCOPE

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Abstract.

For the first time, the variants of the mirror systems on the basis of classical mirror systems with additional main and secondary mirrors are developed for carrying out of synchronous astrophysical observation. These additional mirrors with central apertures of large or equal diameters as compared to the dimension of the main and secondary mirrors are co-axially involved in optical circuit of a telescope that allow to create the image of the observed object in two independent focuses.

A special photo-tracking system for prompting and tracking of the target has been developed for this infrared telescope system. The photo-tracking system is placed in one of focuses and make use of a star radiation which is otherwise lost due to cutting off part of the radiation flow by the entrance slit of the spectrometer equipment of a telescope.

Introduction

It is known that the different types of construction of the optical circuit^[1] on the basis of classical mirror systems of telescopes are used for realisation of synchronous observation. It is the one-, two- and complex - mirror systems distinguished by variety types of mirrors, exploiting for achievement of the certain purpose. The requirement to a system of spatial modulation of a telescope developed for SIRTf (Shuttle Infrared Telescope Facility) is analysed in the paper^[2]. It was shown that the simultaneous application of secondary mirror of a telescope in system of spatial modulation and exact guiding are complex technical task. For existing optical systems of a telescope, these requirements are discrepant and have not simple solution, because all of these have one fixed focus independently of numbers of the used mirrors. For realisation of infrared observation it is necessary to construct such optical system, which would allow to receive the image of observed object in two independent working focuses. Then, the modulated infrared measurements would be carried out in one of focus, but the other focus would be used for guiding.

Optical system

A new type of optical circuit on the basis of classical mirror systems of a telescope allowing to construct the image of observable object in two independent focuses was developed for realisation of synchronous astrophysical observation^[3]. It is attained by using of additional main and secondary mirrors, which have central apertures that have greater (or equal) diameter as compared to the basic mirrors. These additional mirrors are established co-axially above of the main and secondary mirrors of a telescope.

The examples of such systems are shown in the Fig.1. Here the flow of radiation from observable object falls on the main and secondary mirrors simultaneously. As shown in Fig.1a, the beams from observed object construct the image on secondary (5) focus of the classical system of Cassegrain being reflected from main (1) and secondary (3) mirrors, then reflecting from an additional main mirror (2), build the image of object in primary focus. The image on secondary focus (5) of the Cassegrain classical system (Fig.1b) are constructed by the beams from object which reflect from main (1), secondary (3) and pass through aperture of a plane mirror build (7). Then, being reflected from an additional main (2), additional secondary (4) and flat (7) mirrors, the beams build image of the observed object in an additional secondary focus (6). According to Fig.1c, the beam from observable object being reflected from main, secondary and plane mirrors form the image of object in focus (6) of Coude classical system, but the beams being reflected from additional main,

additional secondary mirrors construct the second image of object in additional secondary focus (5) of Cassegrain classical system.

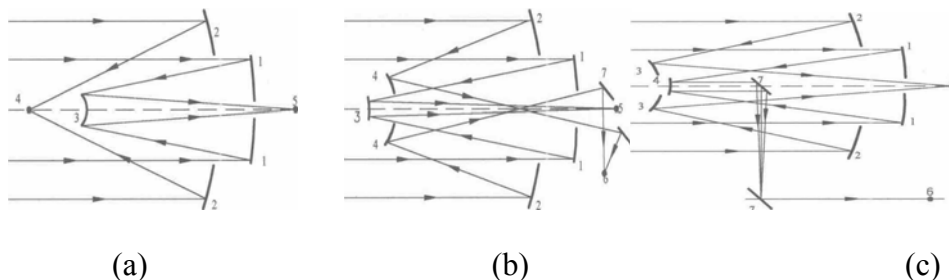


Fig.1 Mirror systems: a) - system with main and Cassegrain focuses; b) - the double Cassegrain mirror system; c) - Cassegrain and Coude mirrors system

So, two independent equivalent focuses are created in each of considered mirror systems. It allows to increase facilities of a telescope under realisation of various synchronous astrophysical observations. Really, such optical circuits can ensure construction of the image of heavenly object in two different and independent equivalent focuses of one instrument. In this case, for example, one of focus can be used for infrared observation, but other is used for the guiding, or, both focuses can be used for synchronous astrophysical observation of the same heavenly object in several spectral ranges, simultaneously. If the radiation flow collected by main mirror of diameter D_I is assigned as F_N , the necessary diameter D_{1^1} of an additional main mirror for collecting of the radiation flow F_N^1 is defined by the expression:

$$D_{1^1} = D_I [(F_N^1 / F_N) + 1]^{1/2} \tag{1}$$

For collecting of identical quantity of radiation flow ($F_N = F_N^1$) the diameters of mirrors should satisfy the following condition:

$$D_{1^1} = 1,41 D_I \tag{2}$$

The basic parameters of optical system of the model sample of a space infrared telescope, which are constructed, according to Fig.1a, are following: the diameter of the basic main mirror is 300 mm, the diameter of an additional main mirror is 345 mm, the diameter of a secondary mirror is 82 mm, the focal length of the basic mirror is 433 mm, the equivalent focus of the basic mirror is 1466 mm, the focus of an additional mirror is 515 mm, the back piece is 150 mm. The astrophysical observation by the frequency of spatial modulation of 15 Hz and amplitude of modulation of ± 20 Arc minutes in the field of vision of a telescope of 47 Arc minute could be carried out by such optical system.

System of compensation of the moving image.

Earlier by the Lorell ^[4] was shown that general requirements for obtaining of the maximum efficiency of infrared telescope are following: the optical axis of telescope must directed not less than one angular second, while the stability of the image in a focal plane should not exceed 0,1 angular seconds. The satisfaction of such rigid requirements on accuracy of orientation and stability of the instrument is a complex technical task even in ideal conditions.

In the simplified design of a control and directing system of the Cassegrain type telescope of SIRTIF ^[5], the infrared radiation from observed object by means of rotating dichroic mirror is directed to one of six focal devices, but the visible radiation of object is directed on CCD matrix. The CC matrix is used for detection and capture of the target and also for exact directing, while the secondary mirror is used for spatial modulation and stabilisation of the image, being an important part of the system. An essential lack of a tracking system in such design is weakening of the observed object radiation due to introduction of dichroic mirror in the optical circuit. Usually, about 4% of the object's radiation are selected for tracking aim under introduction of an additional semitransparent mirror in focal plane of a telescope. Besides, up to 4 % of radiation is taken away from system for absorption and dispersion of radiation on this mirror.

As result, about 8% of the radiation will be lost with using of rejecting mirror that is very essential at carrying out of astrophysical observations. That is way such photo-tracking system is not able to ensure tracking of very weakly radiating objects, but using high sensitive photoreceivers is required for tracking of bright objects.

It should be noted, that two-axial compensation of the image motion ^[6,7] could not ensure necessary level of stability of the space based infrared telescopes for realisation exact infrared measurements, because the control system of ones should act during all time on secondary mirror for compensation of the motion of a telescope.

However, the mirror system proposed on Fig.1a allows to except two axial compensation scheme, as far as we have second equivalent focus in plane of which is possible to arrange less complex and reliable system for compensation of motion image.

It is known the diameter of the image of observed object in a telescope exceeds the width of slit of the spectrometer equipment due to turbulent motions in an atmosphere. This unused part of radiation can be applied in developed photo-tracking systems ^[8].

For this aim four photoreceivers have been arranged on cheeks of an entrance slit of spectrograph of the telescope. Outputs of these devices are connected couple on bridge scheme - that is the shaper of mismatch signals.

Essentially the proposed scheme works as follows. If the observed object is on an axis of system, its image projects on an interval, dividing sensitive areas of photoreceivers, or the light flow uniform distributes on each photoreceiver. In this case the signal on an output of the shaper is equal to zero, then the executive device does not act and correction of a telescope directing not required. The displacement of the observed object from an optical axis of a telescope is accompanied by leaving of the image from zone of uniform lighting of photoreceivers - one of them is illuminated more than others. Positive or negative potential of the mismatch will be formed on an output of the shaper depending on direction of displacement of the observed object. Then this potential amplifies and feeds to the executive device. Depending on polarity of mismatch signal, the executive device act on precise correction of pipe of a telescope so far uniform illumination of photo-receivers will not be restored again.

Conclusions.

The original photo-tracking system of directing and tracking of the target have been developed for mirror system with two independent focuses. This photo-tracking system is arranged in one of focuses of space based infrared telescope and the photoreceivers, which are placed on cheeks of an entrance slit of the spectrometric apparatus collecting the radiation of observed object that cut off by slit of the spectrometer equipment.

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CHEMICAL AND OIL INDUSTRY

PROGRESS IN SYNTHESIS OF ACETHYLENE 1,4-DIOXANE

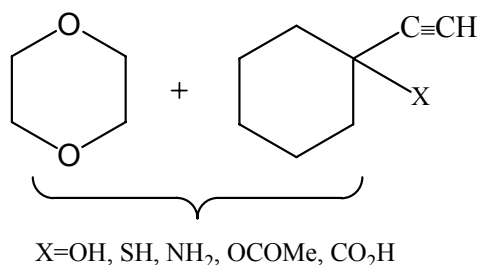
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About a quarter of century ago it became known, that 1,4-dioxane and its mechanical mixtures with ethynyl derivative functional cyclohexanes which is possible to use as inhibitors corrosion of metals in mineral acids



These mixtures are effective in a temperature interval $+65 \div +80^{\circ}$ C, and maximal degree of protection of metal by them at 80° C makes up 93,4 %. Let's notice, that the accent on functional derivative cyclohexane, is scarcely justified, because by that time it was also known, that among monoacetylene compounds, at other identical structural elements, advantage on anticorrosive parameters, for unsaturated - preferable aromatic cycles, for having the additional π -centre adsorption they brake acid corrosion of metal more effectively.

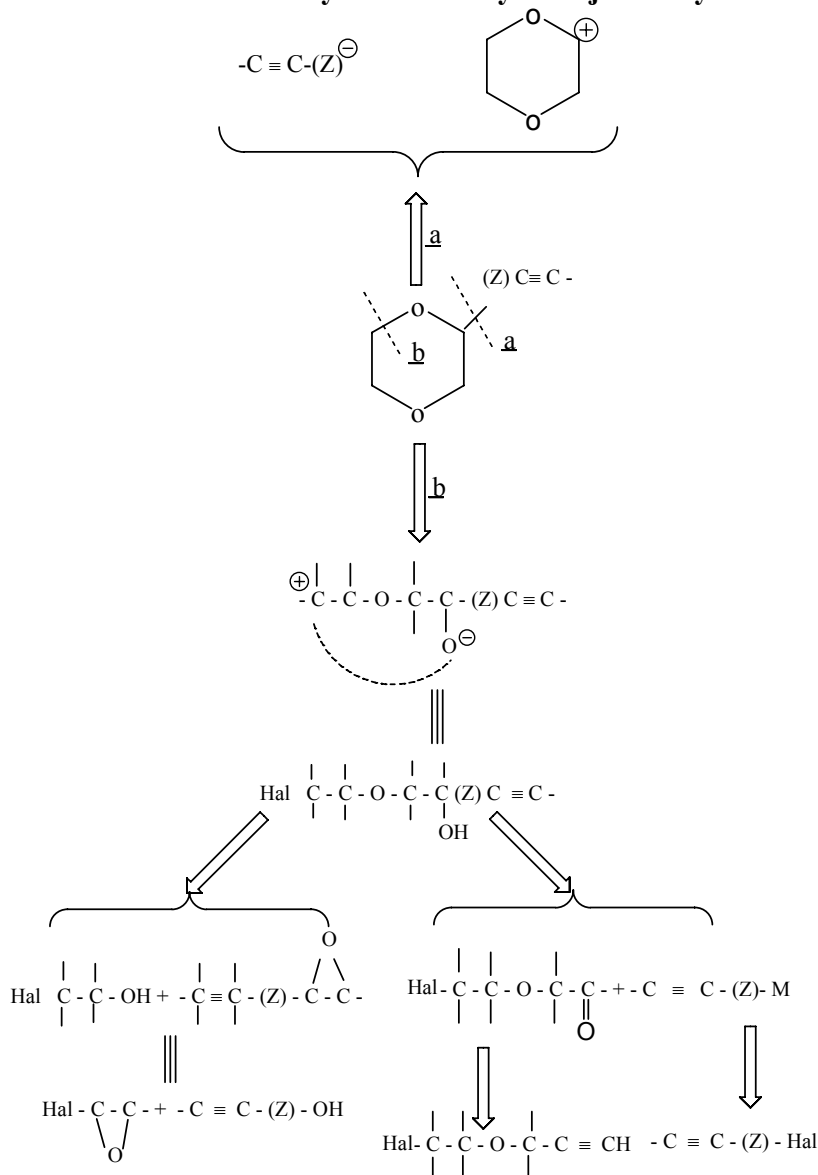
At the same time this fact has served as the generator of occurrence of tempting idea of the directed synthesis of substances with the beforehand given properties: i.e compounds combining both structural elements in a molecule – heterocyclic ring and terminal acetylene grouping.

Naturally, the beginning of realization of this idea became retrosynthetic analysis of target model (scheme 1), disassembly of which on two key connections points out on approached schemes synthesis of desirable compounds (a and b)

Despite of seeming evidence and simplicity of way (a), its experimental realization with appreciable yields of individually clean compounds is with

difficulty realizable. For example, at alkylation 1,4-dioxane alkynelhalogenides (+100÷120⁰C) at the presence of Lewis acids, besides possible polyalkynelderivatives, being a consequence unselectivity of process, the regrouping of terminal threefold bond, and also formation of acetylene products “zipper” takes place.

Scheme 1
Retrosynthetic analysis object of synthesis

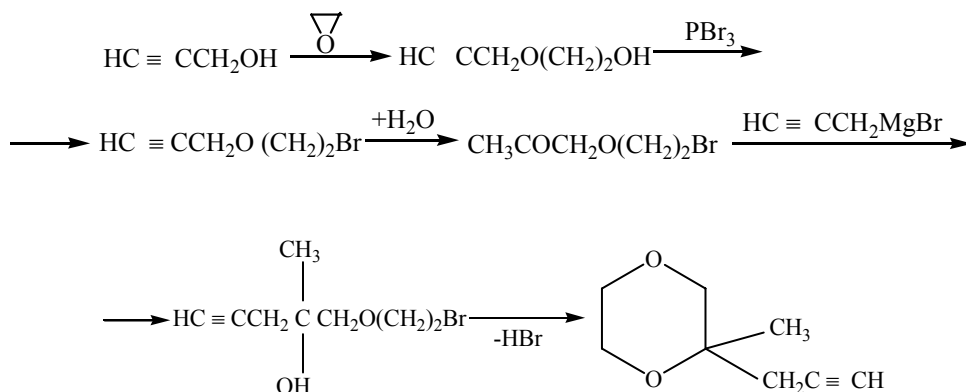


The way b (scheme 1) concluding in intramolecular cyclization bifunctional acetylene compounds containing in 1,6-state of functional groups, acceptable to interaction, at all external exoticism, is capable to ensure individual purification of target compounds. It is not difficult to notice, that this key fragment represents synton, which synthetic equivalent is halogen containing acetylene etheralcohol, construction of which is possible:

- either by condensation of β -ketoether of β -halogenalcohol with acetylene metalloorganic compounds;
- or disclosing of a cycle acetylene oxirane by action β -halogenhidrine, or its counter variant - interaction of halogen containing epoxyether with alkylnols.

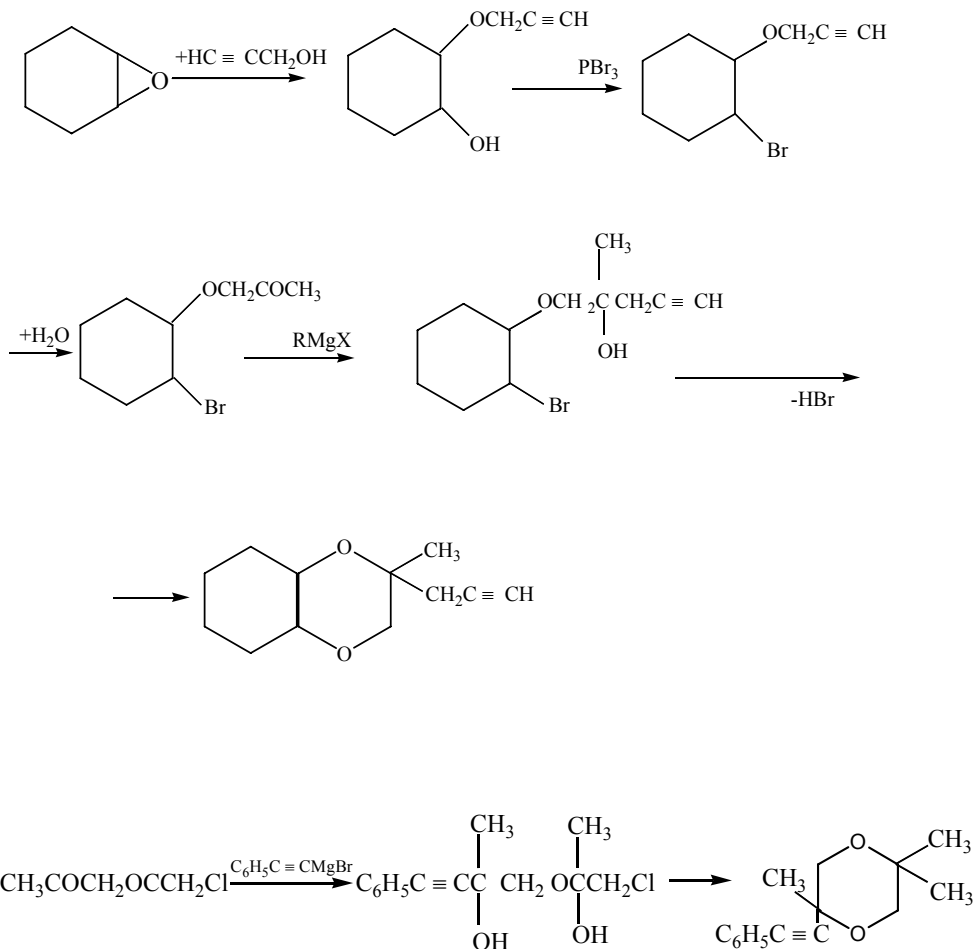
Thus strategy of synthesis acetylene 1,4-dioxane was foreseeing two alternative ways (scheme 1), the choice of tactics for each type of these compounds must have been dictated by concrete structural nuances, by availability of initial substances and by degree of simplicity of experimental realization.

In chronological aspect, the first representative of acetylene 1,4-dioxane, synthesis of which (with an yield 52 %) managed to be carried out in five stages was 2-methyl-2-propargyl-1,4-dioxane



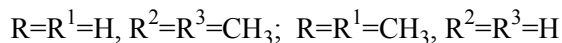
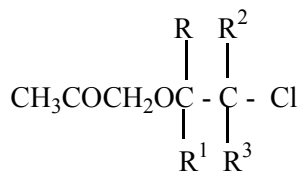
Evidently this synthesis is based on initial use oxide ethylene and propargyl alcohol with key stage of condensation ketobromineether with acetylene Grinyar reagent.

It is necessary to note, that the generality of this way was confirmed by other examples, and as with use of cyclic ketobromineether, and cyclic organomagnesium compounds, that proves to be true by syntheses-analogues 1,4-dioxanes with anil 6-parts carbocycle and with phenylacetylene substitute

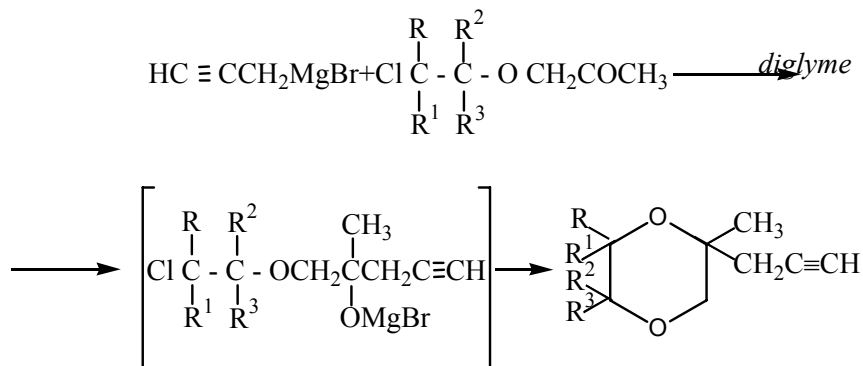


At the same time, it became obvious, that as halogen containing component of key stage of this way instead of bromine derivatives it is expedient to apply chlorine analogue.

In this connection the special research was undertaken directed on development of method reception β -chlorinealkyl ethers oxyacetone, displayed by the general formula

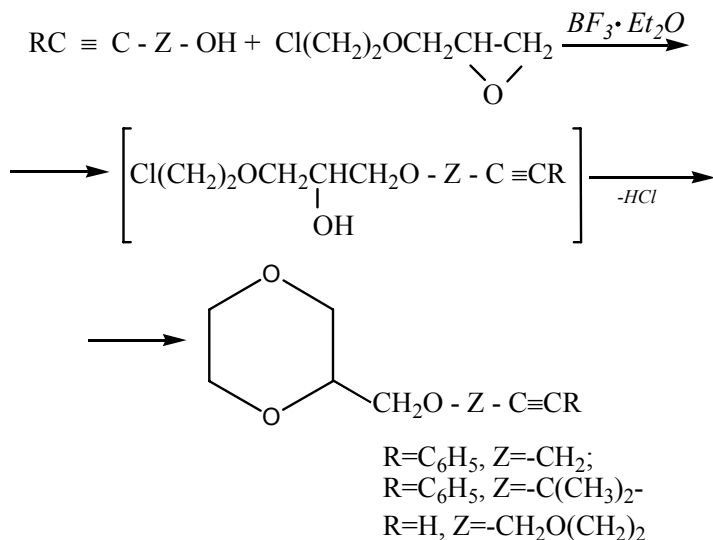


Having at disposal series of β -chlorinealkyl of ethers oxyacetone we have carried out direct synthesis of a number of replaced 2-methyl-2-propargyl-1,4-dioxanes (with an yield 65-70 %) interaction with propargylmagnesiumbromine in diglyme environment. By methodical advantage of this donor solvent use was the exception of stage of allocation halogenhydrine component

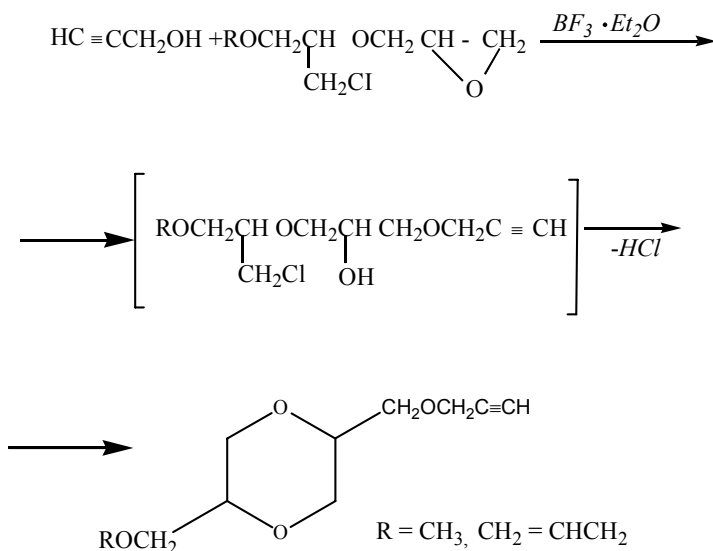


For synthesis of dioxane containing the additional π -centre, i.e the atom of oxygen in the acetylene assistant, a way foreseeing disclosing of cycle halogen containing epoxyethers by alkynols was used.

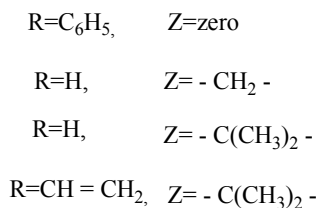
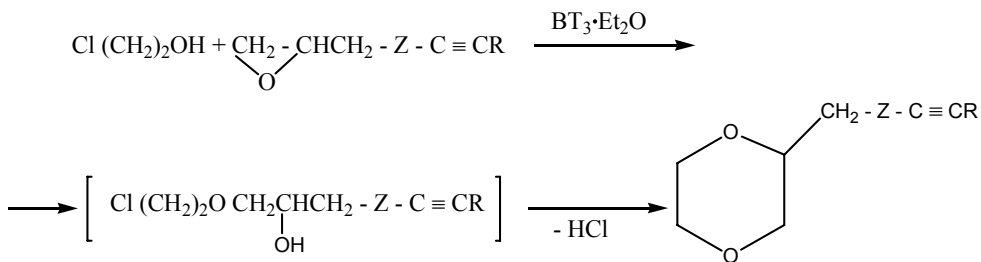
Realized by us synthesis of monoreplaced 1,4-dioxane with alkyniloxymethyl substitutes showing that β -chloroethane an ether glycidol and various alkynols-convenient initial substances for these constructions are given below.



This version of synthesis can be developed for reception 5-alkoxymethyl substituted by analogues, if instead of epichlorohydrin to use its alkoxymethyl derivatives. In particular we showed easiness of reception propargyloxymethyl dioxanes with metoximethyl and allyloxymethyl assistants in a 5-state (output up to 45 %).



Using of acetylene α -oxide and ethylene chlorohydrin allows to realize synthesis of series of acetylene dioxanes with other structure of lateral chain. The application of such approach allows to pass to γ -phenylpropargyl-1,4-dioxane (yield 63 %), and also alkyniloxymethyl substituted dioxane with terminal or internal threefold bonds (yield 45-55%)



Thus it was realized synthesis of new heterocyclic -acetylene dioxane, and also the new way of tetramerization propinol is offered which resulting to synthesis of the important known representative 2,5-dimethyl-2,5-bispropargyloxy-1,4 dioxane

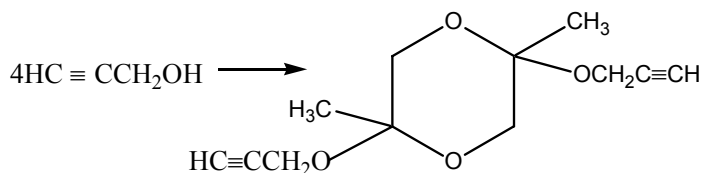


Table 1
Parameters of processes reception
2,5- dimethyl -2,5- bispropargylhydroxy -1,4-dioxane

Pro-cess	Temperature, °C	Duration (hour)	Cocatalyst (mol)	Yield, %
a)	-10 ÷ 22 ⁰	5	BF ₃ · Et ₂ O (1,5)	57
b)	0 ÷ +5 ⁰	3,5	H ₃ PW ₁₂ O ₄₀ · 24 H ₂ O (0,22)	82

In the table 2 the spectral characteristics of synthesized 1,4-dioxanes, found during the proof of their structure are given.

Table 2

Structural fragment	IRS (cm^{-1})	NMR ^1H δ , p.p.m
dioxaneheterocycle	1100 - 1140 four strips	3,45-3,62
- C \equiv C - H	3300,2120	2,15 - 2,32
- OCH ₂ C \equiv C -	1445 - 1460	4,05 - 4,20

Table 3 illustrates revealed by us inhibitor properties of acetylene 1,4-dioxanes at corrosion of steel (CT-10) in 4-N water solution of hydrochloric acid. As it is seen, as a whole, all tested compounds enough effectively brake acid corrosion. Especially it is necessary to emphasize their high efficiency at high temperatures i.e. in conditions, when the mechanical mixtures 1,4-dioxane with alkynes are inefficient.

In this number 1,4-dioxane with two terminal acetylene groups and raised contents of oxygen is more effective i.e. symmetric 2,5-dimethyl-2,5-bispropargyloxy-1,4-dioxane. The synthesis of last tetramerization propinol at presence oxide of mercury for the first time is described in the publications (J.org.chem. (SU). 1983, v19, №7.p.1579), results of which are reflected in the table 1 by process (a).

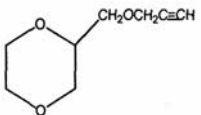
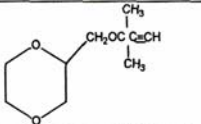
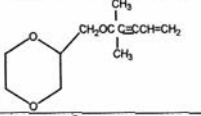
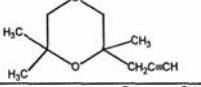
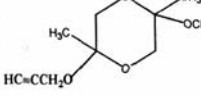
A new way of this compounds reception concluding in using, as an acid component of the catalyst let out in industrial scale phosphorwolfram acid, that provides realization of process (table 1, (b)) in more soft conditions and essential increase of target product yield has been offered.

In summary it would be desirable to pay attention to the fact interesting to the technologists and consisting in wide use propargyl alcohol in researches, carried out by us.

Supposing, the occurrence of a question about their trial realization, it is necessary to notice that chemical industry of the leading countries (USA, Germany, France) has mastered multitonnage manufacture of this alcohol for the last century.

In conditions of our country it is possible to use ready technology catalytic reception of propargyl alcohol from industrially accessible epichlorohydrin, combining processes dehydrochlorination and isomerization.

Table 3
Inhibitor properties of the additives (0.45 % from weight of environment)
Acetylene 1,4-dioxanes in a water solution (4 -N) of hydrochloric acid

Compound	Speed of corrosion, ρ g/m ² · h in t ⁰ C			Inhibitor effect γ			Degree of protection, Z %		
	60	80	100	60	80	100	60	80	100
	6,2	7,8	12,7	14,53	32,20	171,26	93,1	96,9	99,42
	6,5	8,1	13,3	13,86	31,01	163,53	92,8	96,8	99,39
	15,7	27,4	36,2	5,74	9,17	60,08	82,58	89,09	98,33
	4,50	4,52	4,35	20,0	55,6	500,0	95,00	98,20	99,80
	2,0	1,92	1,44	45,05	130,83	1510,42	97,78	99,23	99,93
Control without inhibitor	90,1	251,2	2175						

The article is presented on 07.09.2003

ROLE OF SPATIAL EFFECT IN DIELS-ALDER REACTINGS OF HEXACHLOROCYCLOPENTADIENE WITH ANHYDRIDES AND IMIDES OF TETRAHYDROPHTHALIC ACIDS

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The diene adducts on the basis of hexachlorocyclopentadiene (HCCPD) and anhydrides, imides or their N-substituted derivatives find a broad application as monomers in synthesis of self-extinguishing fire-resistant polymer materials /1/, growth regulators of plants, pesticides etc. /2/.

The complex properties of these compounds are determined by their structural and stereochemical features, availability of a large number of chlorine atoms, anhydride and imide groups in a molecule.

The convenient method of preparation of the polychlorinated alicyclic anhydrides and imides is served by diene condensation of polychlorocyclopentadienes with anhydrides and imides of unsaturated cyclic acids. Such anhydrides involve the diene adduct of HCCPD with maleic anhydride, known as a chlorendic anhydride /3/, the high contents of chlorine in which provides self-extinguishing and higher adhesion strength /4/ of polymer material. However polymer on its base has a low light- and heat-stability stipulated by structural feature - availability in its molecule – CCI-CH-CO-fragments, favoring easy splitting of hydrogen chloride /5/.

This circumstance demanded finding of routes of synthesis of more stable compounds, on the basis of diene condensation HCCPD with anhydrides and imides of 4-cyclohexene-1,2-dicarboxylic acid (4-CHDA), simultaneously possessing necessary valuable properties /6-10/.

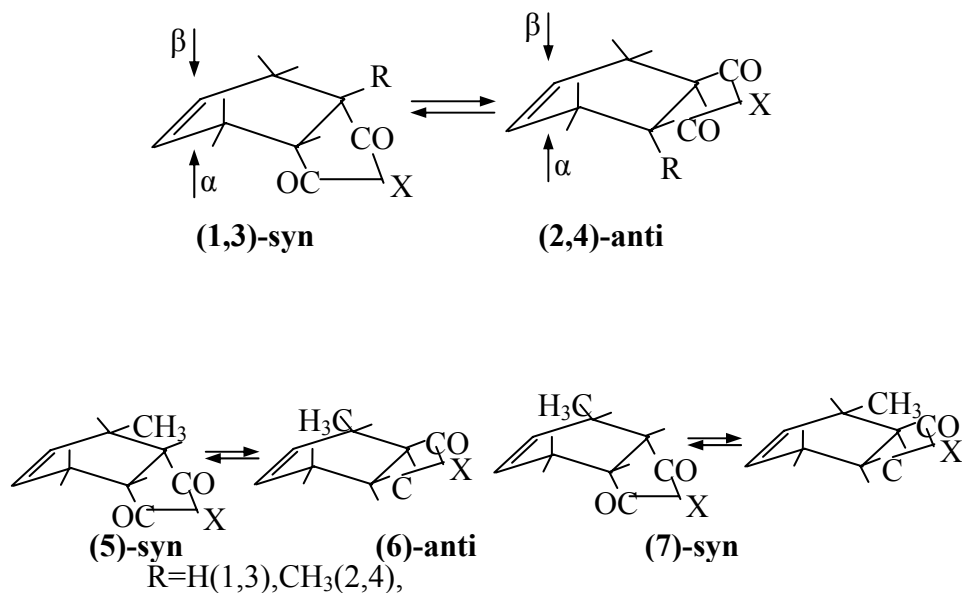
For the first time about synthesis of such adduct and use it for preparation of self-extinguishing polyester resins was reported at the International symposium in Los Angeles in 1963 /11,12/. We have simultaneously studied this reaction /13-15 /, and later on it has been spread for more broad audience of dienophiles /16-27/.

All this has put forward a task of comprehensive investigations of a stereochemical feature of Diels-Alder reaction of HCCPD and its derivatives with anhydrides and imides of a series of 4-CHDA and bicyclo-[2.2.1]-heptene-2,3-dicarboxylic acid.

The reaction of HCCPD with dienophiles of a series of 4-CHDA, as follows from consideration of models – interaction of a plan - symmetrical diene with plan - asymmetrical dienophile with formation of an intermediate complex, orientating dienophile to diene only on the one hand, that results

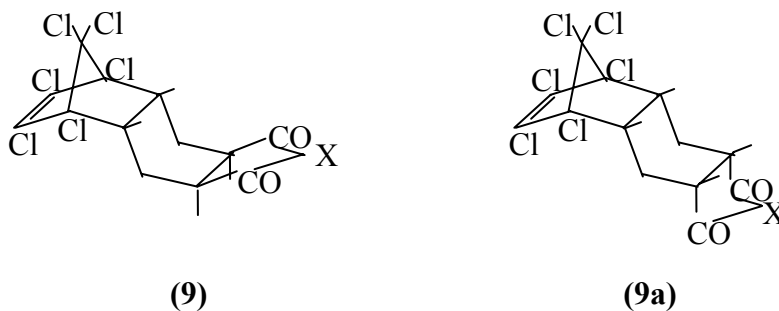
in reduction of a number of possible stereoisomers and increase of a stereospecificity of reaction /28/.

It was established /29 / that anhydrides, imides of cis-4-CHDA and their methylsubstituted derivatives undergo the diene condensation reaction with HCCPD in their syn (1,3,5,7) and anti- (2,4,6,8) boat – conformation forms:

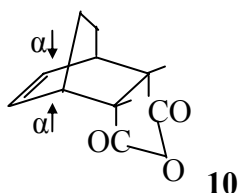


On syn- and anti-boat-conformation of cyclohexene ring of anhydride of cis – 4-CHDA (1) and endo-or exo-attack of diene with α - or β -side of dienophile the formation of eight stereoisomers is theoretically possible.

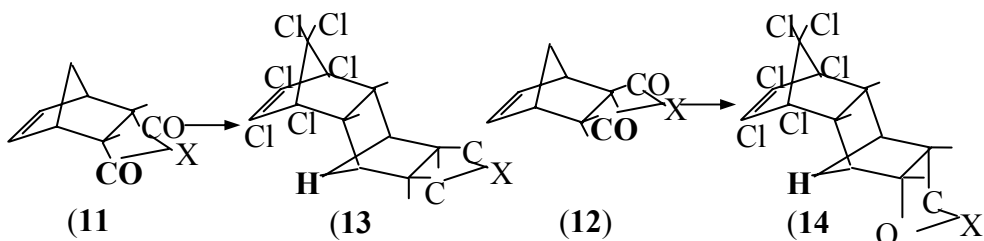
Severe stereoselectivity of reaction leading to preparation of one endo-exo-isomer (9) in a case of cis-CHDA and endo-endo- in a case of trans-CHDA (9a) has been experimentally shown.



It has been established on the other hand on an example of an anhydride of bicyclo-/2.2.2/-5-octene-2,3-dicarboxylic acid (**10**), modeling α -area of anhydride of cis - 4-CHDA that this side is inaccessible for attack of HCCPD /28-30/.



While anhydrides and imides of endo (**11**)-exo-bicyclo-[2.2.1]-heptene-1,2-dicarboxylic acid (**12**) easily form the appropriate endo-exo (**13**) and endo-endo-adducts (**14**), that indicates to absence of a steric obstacle from the side methylene bridge /31/.

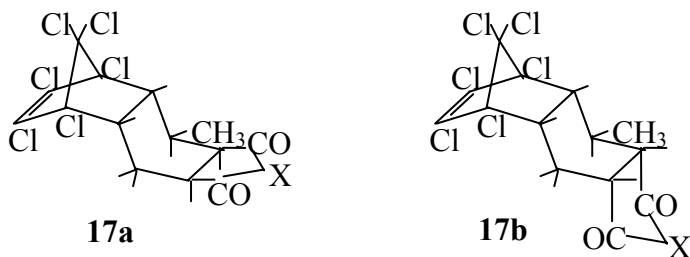


Nevertheless, in the presence of syn-CH₃ in such dienophiles (**15**) in virtue of spatial effect created by CH₃-group for formation of oriented complex the dienophile activity of anhydrides and imides of BHDA is amounted to zero what once more indirectly confirms an accessibility of β -side of cyclohexene ring for formation of such complex between diene and dienophile /32/.

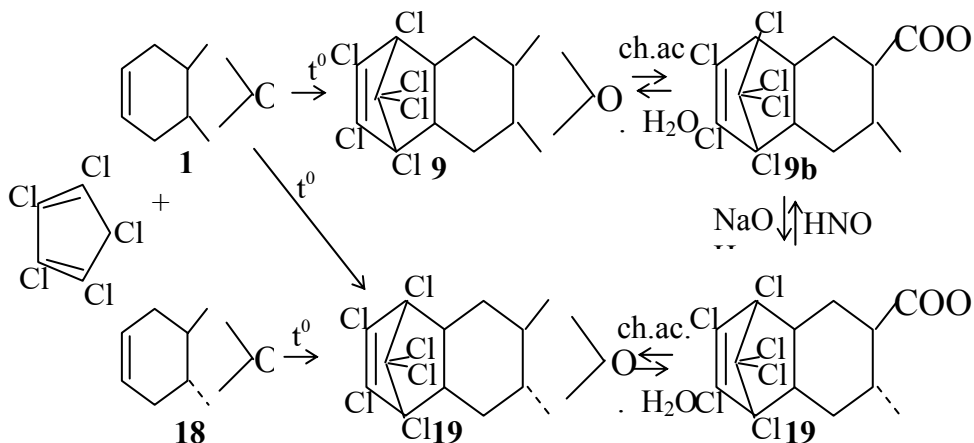


The observed regularity is saved and for anhydride of cis, cis - 3-methyl-4-CHDA (**8**), since in both cases for attack the conformation having quasiequatorial methyl group and (**8-anti**), reacting in an anti-boat

conformation form will be only accessible that leads to the formation of endo-endo- adduct (**17b**) from (**8-anti**). By virtue of it, the number of possible stereoisomers is reduced up to four, and at observance of endo-rule of diene synthesis - up to two. It has been experimentally established that these isomers are endo-exo- (**17a**) and endo-endo (**17b**)-structures. And the relative dienophile activity of 3-methyl-CHDA is higher in comparison with 4-CHDA /33/ that has been connected with positive inductive effect of CH₃-group for an activation of double bond of dienophile.



At the same conditions the condensation of HCCPD with trans-4-CHDA (**18**) leads to appropriate trans-HCTCUDA (**19**).

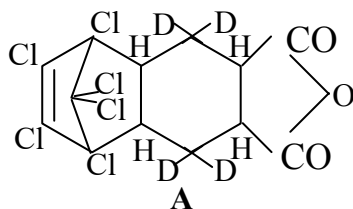


The temperature rise of reaction produces cis-trans- and trans-cis-isomerization of anhydride groups which basically depends on such factors, as duration of reaction and molar conformity of diene to dienophile /15,16,34-36/. It was established that the observed isomerization is the result of change of configuration of groups both in initial dienophile and in the prepared adduct /20-22,37-40/. It has been established that under action of the alkaline agent the acid (**9b**) is isomerized in a trans - acid (**19a**), and the

trans-acid (**19a**) in turn in the presence of inorganic acids at heating is isomerized in a cis-acid (**9b**). The mutual cis-trans- and trans-cis-epimerization of isomeric acids (**9b** and **19a**) and definition of their ionization constant /41/ witnesses about uniformity of an articulation in them of bicycloheptene and cyclohexane fragments /42/.

The additional reference of structure of endo-exo-HCTCUDA (**9**) was made on the base of PMR-spectra of its deuterated analogue (**A**) /44/.

Endo-exo-Structure (**9**) with syn-boat-conformation of a six-membered ring was confirmed by the data of dipole moment, for which one the value μ_{exp} . equal 4,32 D has closely coincided with an estimated value ($\mu_{\text{est.}} = 5,03 \text{ D}$), whereas for endo-endo- (**9a**) anti-conformation of six-membered calculations give value $\mu_{\text{est.}} = 2,54 \text{ D}$ /44/.



The stereochemistry of diene condensation reaction of HCCPD with anhydrides of stereoisomeric 1-methyl-4-CHDA (**3,4**) /30,31/ was similarly studied.

The stereochemistry of diene condensation reaction of anhydride of cis-1-methyl-4-CHDA (**3-syn**) can differ from a stereochemistry of anhydrides of 4-CHDA (**1-syn**) and 3-Me-4-CHDA (**5-syn**), since in endo-oriented complex (**3-syn**) and (**4-anti**) – the conformers because of competitive spatial influence of methyl group can participate in an equal measure.

Thus it has been shown that the availability of methyl group in different positions of cyclohexene ring of anhydrides and imides of cis-4-CHDA, can change a reactivity of double bonds and stereospecificity of diene condensation reaction with HCCPD /40/.

The investigations showed that the dienophile activity of methylsubstituted anhydrides 4-CHDA essentially depends on arrangement of methyl group in cyclohexene ring /33/.

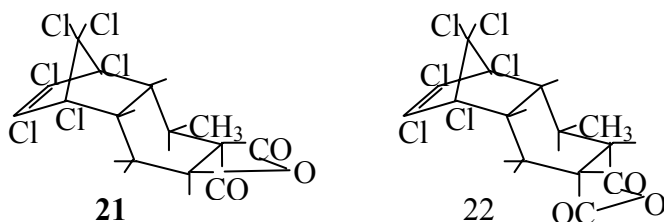
The incapacity of anhydrides of cis- and trans-4-methyl-4-CHDA to react with HCCPD has been connected with a spatial obstacle created by methyl group of dienophile on approach of components of reaction up to distance necessary for formation of intermediate complex on endo-attack.

The transportation of methyl group to position 3 reduces a spatial obstacle created by it, in consequence of which apparently the dienophile activity increases. Besides, such increase of activity is stipulated by increase of electrophilicity of dienophile at the expense of inductive influence of

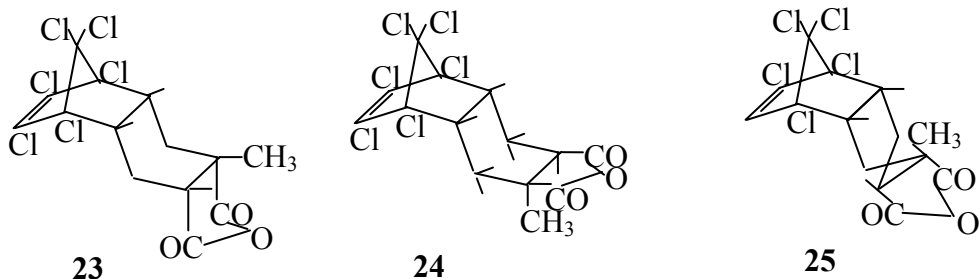
methyl group to which HCCPD shows large sensitivity as component, depletion by electrons.

Such explanation is also agreed with reduction of dienophile activity of anhydride of cis-1-methyl-4-CHDA (**syn-3**) for which owing to remoteness of methyl group from reaction center the transfer of inductive influence through a frame of a molecule is even more reduced.

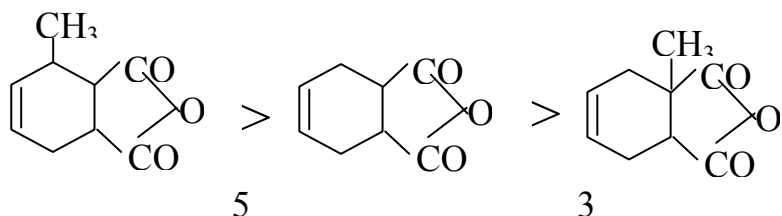
Thus, a position of methyl group, and also its configuration renders essential influence on stereoisomeric composition of adducts, prepared on their base. It was shown that the anhydride (**21**) has cis, cis-endo-exo-configuration, and anhydride (**22**) – trans, cis-endo-endo-configuration.



For adduct of HCCPD with anhydride of 1-methyl-4-CHDA on the base of epimerization of appropriate cis- and trans of acids and dipole moments endo-endo (**23**) and endo-exo (**24**) and endo-trans-configuration (**25**) /46/ have been established.



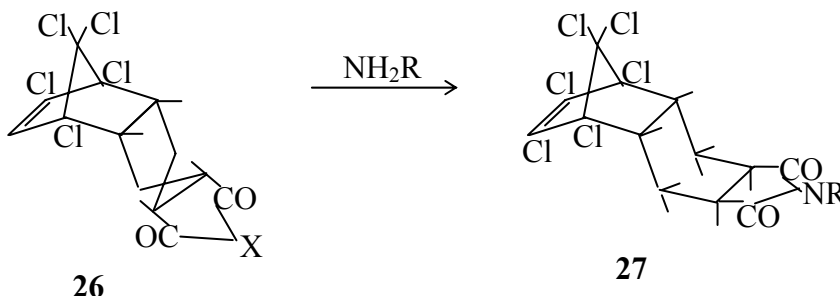
With introduction of methyl group in position 1- or 3-cyclohexene ring not only yield, but also the isomeric composition of forming adducts /43/ is changed and anhydride cis, cis-3-methyl-4-CHDA (**5-syn**) is the very active from mentioned dienophile. On activity they can be arranged in a following series:



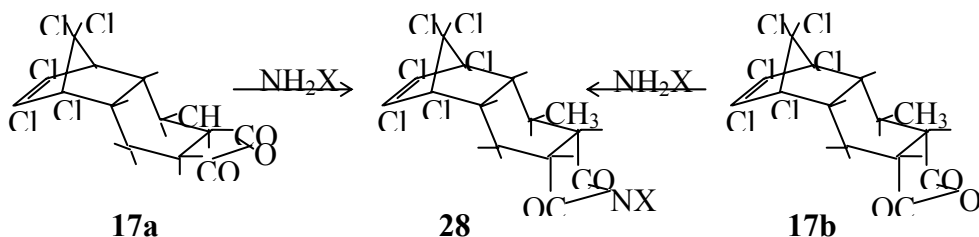
In practical relation most perspective are the imides of HCTCUDA of prepared on the base of imides - 4-CHDA and 3-methyl-4-CHDA or their

N-substituted derivatives for which the stereochemical uniformity of reaction with anhydrides in interaction with HCCPD /47-51/ has been shown.

It was found at contrary syntheses /52,53/ that imidation of endo-trans-anhydride (**26**) is accompanied by trans-cis-isomerization, with formation of endo-exo-imide (**27**).

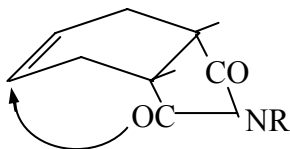


Imidation of endo-exo (**17a**) and endo-endo-anhydride (**17b**) as a rule, leads to the formation of endo-endo-imides (**28**).



X=H , (CH₂)₂OH , CH₂COOH , C₆H₄R : R=H , OCH₃ , CH₃ , COOH, Cl

The change of N-substituent in imides allowed to reveal a role of the electronic factors in their reactivity, i.e. influence of N-substituent on a reactive center through a field effect stipulated by syn-boat conformation of imide /52-54/.



In the presence of such influence the electron-donor (OH, OCH₃, CH₃) N-substituents increase a reactivity of dienophile, and electron-acceptor (COOH, Cl, Br, NO₂) – decrease, since HCCPD in diene synthesis reaction shows properties of diene - acceptor. On the other hand, the field effect rendering by imide ring absent for imides of trans, cis-3-methyl-4-

CHDA (**syn-5**) because of the introduction them in reaction with HCCPD in the form of anti-boat (**8-anti**)-conformation /33/.

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ALTERNATIVE WAYS OF NATURAL GAS SUPPLY OF AZERBAIJAN REPUBLIC

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Presently, 5.5-6.0 bln m³ of natural and associated gas is produced in our republic. Part of this volume is consumed for technological needs, and balance part is used at communal-general and industrial sectors of gas supply. Deficit of fuel gas in these sectors is 9-11 bln m³ per year. Part of this deficit in amount of 4.5-5,0 bln m³ per year is covered at the cost of supply of gas from Russian federation.

In the nearest future, at the cost of putting into operation in the Republic of the biggest gas condensate field "Shah-Deniz" not only gas deficit will be covered, but Azerbaijan Republic will turn into the gas exporter. After putting into operation of new industrial objects and rehabilitation of the systems of gas supply of liberated settlements and also continuous gas supply of the rural regions and settlements located in the difficult of access mountainous areas, development and introduction of alternative methods of gas supply, applying local and portable gas mixer plants and gas producing generators, will be required.

Technical-economical calculations proved that continuous and reliable gas supply of settlements is more effective by means of establishment and putting into operation of local and portable gas mixer plants, applying propane-butane fraction, as fuel gas (1).

By this end, the first problem is the optimization of topological structure, step by step reconstruction of pipeline transportation of gas, and also creation of scientifically justified theoretical basis for optimal supervisory control transportation of gas by pipeline.

For increase of effectiveness of application of gas resources of Azerbaijan Republic, the radical reconstruction of systems of gas supply with application of alternative methods of gas supply, using newest achievements of the world science and technology will be required. These methods are of particular privilege in rural area and in the difficult of access mountainous areas, located far from gas main pipeline and regional gas distribution stations.

For solution of this task, first of all, construction of new gas processing plant or reconstruction of already existing one, including drying unit with capacity of processing of approximately 10 bln m³ of gas and 1.3 mln tons of gas condensate per year, is required.

For economical and rational application of liquefied gas obtained at Azerbaijan gas processing plant (AZGPZ), it is necessary to develop and introduce local and portable automatic plants for obtaining of air-gas mixtures on development of AZNIPIGas. Introduction of such plants will allow s providing complete gas supply of big settlements of Azerbaijan, located in the difficult of access mountainous areas with cold climactic conditions, not changing existing systems of network gas pipelines and gas consuming device.

Another source of obtaining of gas fuel is- oil refineries of the republic. These plants have possibility producing this gas by obtaining of propane-polypropylene butane-butylenes fraction of optimal composition. By means of rational application of these fractions, it is possible to improve gas supply for many cities and settlements of our Republic; this will stop extermination of forests, their usage as fuel in communal-general sector of gas supply and will significantly improve ecological condition.

The following source of obtaining of gas fuel is residual oil of depleted fields of Azerbaijan.

Oil is not extracted completely in oil fields, based on free oil inflow. Oil losses in entrails are 40-60%. To increase oil recovery of stratum, quite a lot of different methods are developed: pumping of hot and cold air, gas, water, smoke etc -all these efforts did not bring to desired results. This is explained by the point that viscosity of oil at these methods does not change significantly and its own fluidity either does not increase.

Under influence of these factors oil is compressed to the operational wells only in insignificant quantities. Thermal method either did not give positive result.

Intensive works on development of thermal-catalytic methods on extraction of residual oil by means of its splitting in the conditions of the stratum are conducted. In many developed countries of the world gas fuel, substituting natural gas, is obtained by means of gasification of coal, peat, oil shale and other oil containing rocks, (2).

We propose to subject residual oil to partial oxidation of atmosphere by oxygen directly in the stratum, by obtaining of "synthesis of gas", consisting of dioxide and monoxide of carbon, hydrogen and water vapor. This gas is the most valuable raw material for obtaining of spirits aldehydes, ketones, hydrocarbons. Taking into account practically inexhaustible reserves of residual oil in entrails of old fields, realization of this method will allow obtaining of huge amount of fuel gas and valuable hydrocarbons.

Production and application of biogas of vegetative and animal origin with application of biogas plants is prospective and alternative method for our republic. By data of A.S. Isserlin (3) total amount of biomass, forming every year in the planet, exceeds by several times summative production of all types of fuel by several times. In the case of creation of difficulty of gas

supply in rural location, transformation of organic agricultural waste into biogas as gaseous energy carrier may play significant role.

As it is known, biogas is the product of anaerobic decay of organic substances by microorganisms, and 60-80% of it consists, mainly, of methane, carbonic acid (CO₂)- up to 20-40%. Heat of combustion of biogas is 6500 kilocalories/m³. Depending on quality of biomass, 450-500 m³ of fuel gas is obtained from one ton of dry biomass. Development and putting into operation of biogas plants may solve not only energetic problems, but ecological issue, because odorless organic fertilizers are obtained from residue of biogas. By preliminary calculations cattle breeding complex consisting of 100 thousand heads of cattle, may produce annually more than 7.5 mln m³ of biogas, which is equivalent to 5 thousand u.t. As it was mentioned above, production of biogas takes place in airless environment, and carbon dioxide, obtained in the process of decay, may be applied in the composition of biogas without any technical difficulties.

Tens of thousands of biogas plants are constructed and operated all over the world, and more than 400 of them operate in Europe. The most powerful biogas plants operate in Germany-4, Czechia-2, Poland-1, Hungary-1, Bulgaria-1, etc. More than 8 million of biogas plants of different capacity operating operate in China, India, Turkmenistan and other Asian countries.

Presently, biogas plant with capacity of 280 m³ of gas per 1 hour operates in Latvian cattle breeding farm "Ogre". Biogas plants on production of fuel gas with low heat of combustion up to 6,000 kilocalories/m³, were constructed and presently are under construction in Latvia, Estonia, Russian Federation (Moscow oblast), Ukraine (Zaporogh oblast) and Turkmenistan etc. Deployed fermented mass is applied as disinfected organic fertilizer. Obtained biogas is applied for heating, hot water supply and also as liquefied fuel for engines of traffic vehicles and tractors.

On the basis of isolated generating plants APES-14, developed in VNIIGaz (c.Vidnoye, Moscow oblast), biogas is deployed as a fuel gas. Before supplying of obtained biogas to gas diesel, it is subjected to purification and partially deployed for own needs, and it is directed to gasholder, which simultaneously is accumulator of gas and pressure regulator in the circuit.

According to preliminary calculations the cost of methane obtained at biogas plants is significantly lower than the cost of the natural gas extracted from the well. An amount of obtained biogas depends on type and amount of animal. The following exemplary dependencies are established between the amount of dung and produced biogas (3):

$$V_{b.g.}=0,17G \text{ for cattle and}$$

$$V_{b.g.}=0,25G \text{ of other types of domestic animals}$$

where $V_{b.g.}$ –is volumetric output of biogas m^3 per 24 hours;

G -is an amount of dry substance in liquid mass

For acceleration of fermentation process, biomass is to be heated up to 15-25° C (mesophile area). In the conditions of Azerbaijan Republic average annual temperature is below 15° and while widely applying distributed mesophile area for technical accomplishment of the process of obtaining of biogas, low heating energy, defined by following equation, is required (3)

$$W=(G+G')(t_{\phi}-t_M) C_m/86400$$

where G - is an amount of dried substance in liquid mass, kg

G' -is an amount of water in liquid mass, kg

t_{ϕ} -is temperature of fermentation, °C

t_M -is temperature of mass at the entrance into fermenter, °C

C_m –is specific heat of liquid mass kkal/kg, °C.

Biogas plants may be successfully applied at summer cottages in difficult to access rural and mountainous areas located at remote distance from gas-main pipeline, where practically inexhaustible raw materials are available, as waste of cattle farms and other agricultural wastes of vegetative and animal origin.

For safe functioning of systems of gas supply, a continuous odorization of fuel gas communal-general and industrial purpose is required. Hitherto, odorization of this gas was accomplished by imported ethyl merkaptan, due to which for last years definite difficulties were arisen. As a result of exploration and research-scientific works conducted by us, the possibility of application for these purposes of strongly odorous, ecologically and physiologically not harmful component, obtained as by-product at Sumgait plant “Ethylene-Propylene”, is detected. The cost of this product is by 20-25 times cheaper than ethyl-mercaptan at the same conditions of operation. Presently, SS “Azerigas” concluded agreement with Sumgait plant “Ethylene-Propylene” about procurement of this product for its application in the process of odorization of fuel gas of communal-general and industrial purpose.

Economical effectiveness and ecological indicators of gas industry of the Republic are determined significantly by losses of gas at all stages of production, transportation, storage and application.

As a result of conducted field observations, it is established that during transportation of gas by gas-main pipelines to far distances, due to the phase transformation, the condensation of heavy hydrocarbons in

pipeline takes place, which eventually leads to the loss of some part of gas, as condensate.

For the last years [1992-2002] as a result of adopted technical and technological measures, it was possible to decrease significantly gas losses, which had tendency of growing.

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ARCHITECTURE AND CONSTRUCTION

THE TEMPLES OF SHEKI REGION

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Azerbaijan has been known traditionally as Moslem country. But one of major stages of Azerbaijan history was the period of existence of the Christian State — Caucasian Albania. Since, from the beginning of the 4-century the Albanian tsar Urnair declared Christianity as official religion of the country an active cult construction work began in Albania. Even now one can see numerous dilapidated buildings of churches, chapels and cloister complexes.

The Christian cult architecture, as all the Caucasus Albanian architecture is the integral part of architectural heritage of Azerbaijan. Thus, research works on the architecture of Caucasus Albania was not drawn enough attention long time. It created the possibilities for alien people to add illegally to their culture Azerbaijan Albanian's monuments locatting in the historcal Azerbaijan territory. We should remember that Early Middle Aged Azerbaijan's culture was firstly presented with the wonderful Christian cult monuments.

In spite of Christian religion officially was accepted as a State religion in the IV century, but at the beginning of the 1-century A.D. there were already the roots of Christianity in Albania. Even during Arab invasion in Azerbaijan (in the 7-8 th centuries) the Albanian church was so strong that the new religion (Islam) could not eradicate its influence, but only weakened its position.

The architecture of Caucasian Albania is one of the badly known stages of the history of Azerbaijan architecture. Many aspects of these themeS were study in scientific works, which were published during last 10 years. But inspite of that this period of history of Azerbaijan culture and architecture were still less known among scientists in abroad. The more important component of this big subject is the Christian cult architecture, which presents itself the more numerous and artistic-worth part of architectural heritage of Albania.

All the best compositional ideas, the boldest and advanced decisions, high professional skills of Albanian architects were incarnate in the cult

architecture. The study and scientific research of the cult monuments should be the main step in the creation of general architecture's picture of Caucasian Albania and attract the especial attention to the restoration and preservation problems.

Complex studying of numerous Albanian monuments of antique and Middle aged Azerbaijan is very important. Preserved up-to-day architectural constructions present themselves valuable material, permitting us to trace the way of development of Albanian architecture. Such kind of investigations have to bring to light sources of formation of local artistic traditions, to expose the roots of originality and variety of Azerbaijan architecture, to establish relations and intercommunications with contiguous countries.

Phenomenality of Azerbaijan culture concludes that for many centuries it was formed under influence of various religions existing simultaneously in the bounds of one country and single ethnic people. Christianity changing heathenism in the 4 century did not eradicate it, but lived together and fought against zoroastrism. Then Islam came to Azerbaijan. It propagated its own religion among the great part of population, but it was not against Christianity. One could find tracks of various religious in the traditions and rituals of Azerbaijan. By centuries Islam was in neighbourly relation with Christianity, Zoroastrism, Judaism and formed the toleration and peaceful character of people, rich and variety culture.

Thus feature of historical fate of Azerbaijan promoted interinfluence to architectural and constructional methods in cult architecture of various religions. Thus original and unique cult architecture of Azerbaijan was formed.

One of the vivid examples of the Albanian architecture reflecting the ancient history and rich cultural traditions is the church in the Kish village of Shaky region - "the mother of the Albanian churches". It is the unequal historical value that makes it in the row with the most distinguished monuments of architectural heritage not only of Azerbaijan but also of all the regions.

The region of Shaky was one of the left-side regions of the Caucasian Albania. It occupied foothill territory bordering on the regions of Kabala, Kambisena and Lpinia. In 3-8-th centuries Shaky region was the political administrative unit and one of the centres of textile industry. In the 6-8-th centuries the region became church-administrative place, too. Accordance to the works'of the Arabian authors such as Balaguri, Al-Tabari, Al-Asira that in the 6-8-th centuries Shaky region was attacked by the Khazars. Persian tsar Kavad, the First (446-531) having undertaken drastic measures against the Khazars strengthened the district. In the 8-century the Arabs conquered Shaky, as well as other Albanian districts [1]. Before the Arabian Khalifat Shaky district was a part of Arran, form it was according to the numerous

information of the Arabian authors. Al-Istakhri and Ibn Khaukal called Shaky among the cities of Arran (Albania). Al- Mukaddasi (the 10 th century) informed that the majority of the population of Shaky was Christians but muslims lived there, too.

The historians testify that at the beginning of the 13-th century Shaky and Kabala temporarily were under the influence of Georgia. But, according to Nasavi's evidence Jalal ad-Din soon took Shaky back from Georgia and appointed Safi-ad-Din as a vizier to Shaky and Kabala (cities of Shirvan). Then Shaky region remained under the control of Shirvan, but sometimes (after 30th years of 14-th century) it became independent [2].

In 17-th century the Shaky khanat emerged and strengthened there and it played an important role in the development of Azerbaijanian culture. In 1772 strong village torrent destroyed Shaky. Consequently a new ci was built on both banks of the river.

The village of Kish where St. Eliseus church is situated is connected with this ancient Azerbaijanian city with its history and culture. In comparison with Shaky Kish has got more suitable geographical location. The mud-torrent having gone through the bed of the Kish River did not damage the village, which was located in the eminence. The mountains and gorges surrounding the village made better defensive condition for it. There is information that the rulers of Shaky sheltered in the fortress of Kish during the attacks of enemies.

Moise from Kalankatuk left valuable information about the history of the church in the Kish village in his book "History of the Caucasian Albanians" [3]. The historian connects its construction with the name of the priest of Aibania-apostle Eliseus.

"...After the martyrdom of Grigoris, catholicos of Albania, the barbarous people of the eastern regions fell once more into heathen idolatry, and making many vows to the fire temples, brought persecution upon Christians. One of the first vardapets (St. Eliseus), who by the grace of Holy Spirit invented letters for the three people, namely, The Armenians, Albanians and Georgians, subsequently went to Jerusalem on a pilgrimage, and returning thence with his disciples and silver cross plated with gold in which was a piece of the Cross of Christ, he passed through Armenia into the eastern regions to the provinces of Uti; and he dwelt among marshy places and moss-covered swamps in the place of Gis... built a church and made a bloodless sacrifice. The first church, our metropolis and enlightenment was established in this place...[3]

Traditionally "the place of Gis" is identified with the village of Kish of Shaky region and the church was built by Eliseus identified with the church situated in the Kish village.

. The archaeological excavations carried out on the territory of the church also confirmed this notion. The ancient foundations, religious burial and utensils found out by the archaeologists show that modern church stands on the territory where has been considered the place for worshipping since olden days. The most ancient foundation of the church belonged to the 1-3-th centuries A.D. They were built on the place of the older right angled building which remainders were discovered in the front of the western wall of the church. In the eastern part of this structure, under the floor of the modern church in the depth of 1, 5 metres the burial place was found out. The archaeologists date that foundation belongs to the 2-1 centuries B.C.[4].

The church is located on the bank of Kish river. Elder generation of Kish residents hold that in the past there was a complex of numerous buildings and a stone fence around the church. Note that both the church and adjoining territory have long since been revered by the Moslem population as sacred place, specifically, ancient Albanian object of worship. This accounts for safekeeping of the temple up till now.

It has to be kept in mind that the temple of St. Eliseus is a domical hall with protruding semi-circular apse in the east. The layout is typical for Albanian hall churches. An elongated meeting-room is divided into two parts by a pair of pilasters. Adjoining to the eastern part of the hall is an altar apse. A girth-shaped ogival arch is thrown over T-shaped pilasters. The same geometry is typical for triumphal arch of the apse. Deep pressed portions of side walls between the pilasters and the apse are framed with two-stepped arches of identical outlines. Formed by four arches, a rectangle with the help of spheric pendentives is transformed into an oval foundation of the drum with the dome rising above it. Note that the drum of the dome has six windows, illuminating the internal space of the church.

A distinctive feature of the church is a semi-cylindrical mass of the altar apse which comes out of the rectangular space of the meeting-room. Another important feature of the design is a small triangular elevation in the sub-domical part of side walls which forms gables in the form of transept of cross-domical temple. Such a “pseudo transept” is a unique phenomenon in the architecture of Albanian and Caucasian domical halls.

The church is built of big lime quadres. Window openings are equipped with profiled liners and three fillets, the middle of which is as twice wider as lateral ones. A cylindrical volume of the drum at the foundation and slightly below the cornice has a semicircular profiling.

During the implementation of the joint Azerbaijanian-Norwegian project “Kish”, which provided for architectural-archaeological and historical research into the monument, its restoration and museumification, experts obtained interesting information about the historical stages of the monument established major construction periods. Archaeological excavations demonstrated that Kish temple was founded as far back as in the

1 century in place of the previous ancient area which preserved remains of Bronze and Early Iron epochs. The layout of the present building of the church, which ranged from a rectangular type erection without apse to its current image, had been shaped in the 4-5 centuries, when a lower space with the protruding altar apse was erected. Later, there emerged a dome of the church.

An interesting architectural monument is a temple in the village of Orta Zeyzit, located in the northern outskirts of the village. As compared with Kish temple, the one in Zeyzit is mere elegant and decorative to meet increased aesthetic needs. This small cross-shaped erection has rectangular apse is placed in the eastern sleeve. The length of the western sleeve is slightly over the eastern one and has a doorway. Corners of middle cross are supplied with pilasters and rectangular capital plate. Four semicircular arches support a round belt, above which there rise an unswived drum and the dome. Transition from sub-domical space to the dome had once been performed with the help of conic pendentives.

From the outside, the altar part is shaped as pentahedron with three window openings; other sleeves have openings too. Overlapping of sleeves from the outside is slightly elevated in the middle part which imitates a basilica silhouette. Over the vaults, there are small empty rooms. Walls of the construction are made of trimmed quadres of limestone shirindash with rubble concrete aggregate. Windows on the outside are equipped with profiled fillets of three beads. On the western wall of the southern sleeve there is a superficial bay decorated with arch. The temple of Zeyzit is noted for its elegance and ornamentalism. The monument is dated by the 11-12 centuries.

A small monument is located on the mountain, to the south-east from the village of Zeyzit. It is a usual vaulted hall, but its apse on the eastern wall is of particular interest. Small chapels are located in the corners of the apse, in the thickness of the northern and southern walls. This makes the church similar to the one nave basilica of Khotavank cult complex, Kelbadjar region. Vaulted churches of this type, i.e. with side-typically Albanian, bearing no resemblance to other churches in neighboring countries.

In the northern outskirts of the village of Bideiz, Sheki region, there is a half-destroyed, small Albanian church. The vaulted hall is built of large cobblestone. Outward walls and some constructive elements, including the altar arch and fillet of the door, are faced with trimmed stone. The technique of construction, typical for early Middle Ages, horseshoe-shaped forms of arches and altar apse make it possible to date the church by the 5-7 centuries.

Not far from the village of Bideiz, in the outskirts of the village of Bash Kyungyut, there is another monument of this architectural type. The

temple of Kyungyut, like many monuments of the region, is built of shirindash. Despite its half-destroyed conditions it is evident that the ceiling was based on semicircular vault. The interior is decorated with arches and bays. From the northern side of the apse, there was a small auxiliary room. This feature, characteristic of the monuments of the 5-6 centuries, makes the church similar to other Albanian monuments of Azerbaijan – temples in Mingchevir, Gyavurgala (Aghdam region), etc.

The analysis of the above-listed architectural monuments, which form an insignificant part of architectural heritage of the region makes us to infer that throughout its century-long history the town of Sheki, silkworm breeding and commercial center of Azerbaijan, has not lost ancient traditions of popular construction which found their parallel in numerous public and cult buildings, palace erections and residential houses. Survived buildings are illustrative of the highest engineering mastery, skilful use of local building materials, peculiar methods of architectural design.

This ancient land, located in the wonderful region of Azerbaijan, attracting numerous tourists from all over the world, is sure to be inscribed on the international tourist itineraries. Main task now is to preserve historical environment of Sheki, protect it against negative effect of contemporary development process. For this to happen, it is essential to revive previously seething life in this architecturally abundant town, bring the spirit of Middle Ages back, turn nearly monuments, including “Mother of Churches” – Kish temple, into the center of tourism.

Thus, our major mission is to protect our century-long architectural-artistic national wealth, pass it over to the generations to come.

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MAIN DIRECTIONS OF RESEARCHES ON WORKING OUT OF NORMATIVE-LEGAL BASE IN EMERGENCY SITUATIONS OF NATURAL AND MAN-CAUSED CHARACTER

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In conditions of excess concentration of producing of higher risk, further developing of economy is impossible without cardinal solving of problems of preventing accidents and catastrophes of man-caused, natural and natural-man-caused character, bringing to death of people and of many milliard economical losses, making social-political tension and doing irreplaceable damage to environment.

Stable periodicity of ES is explained by the fact that complex technical systems, representing a danger for people and environment, were created, as a rule, on basis of using of traditional rules of projecting and simplest engineering analysis and tests, don't meet in full measure the requirements to providing of safety of such systems. For a long time fundamental scientific and applied elaboration headed for achievement of scientific-technical progress without taking into account the risk of occurring accidents and catastrophes. Accidents on ChNPP, in USA, India, Mexico, Iran revealed reasonable role and concernment of scientific elaboration of theory of catastrophes and theory of safety. Biggest man-caused accidents and catastrophes occur, as a rule, in consequence of mistakes of operator, low maintenance ability of technical systems, different objects of higher danger. Permanent risk of occurring ES exists also in the result of the fact that in the territory of Azerbaijan Republic functionates powerful net of main gas-oil-product pipelines, are transported hundreds of thousands of tons of dangerously explosive products and toxic agents. In the Republic didn't yet organized united national scientific-technical policy in the sphere of safety. Carried out single researches on branch, regional and local levels have one-purpose character, aim at solving of private tasks, are not coordinated on single scientifically established conceptual framework. In theses conditions, it should be featured the elaboration of methodological, scientific-technical, normative-legal and social-economical basics of national policy in the sphere of safety of population and territory and environment, functioning of the objects of economy taking into account the risk of occurring of natural, man-caused and natural-man-caused accidents and catastrophes with regional and global, economical ecological consequences. Creating and mastering of new generations of technologies, materials, machines, engineering installations and objects of special techniques with using of legislative basics and criteria of safety will allow to

turn to realizing of national and international projects for preventing the catastrophes. In the form of concrete results should be received: the projects of legislative acts on the most important directions of providing of safety in the sphere of economy, the system of single methodical materials for training and re-training of the specialists in the sphere of safety. Principally new approach realized in the given conception, consist in the fact that real providing of man safety, complex technical systems and environment is possible only on ways of organization and solving on national, regional and international levels of the following base problems:

- Fundamental researches on theory of safety of complex systems;
- Researches on decreasing of damage from natural, man-caused and natural-man-caused catastrophes;
- Researches on providing of safety of functioning and development of objects of economy, transport systems, elaboration of norms and demands on safety and steadiness in industry;
- Researches on protection of population and liquidation of consequences of catastrophes;
- Researches on legal and economical regulation of safety;
- Experimental researches on solving of regional problems of safety.

According to the first direction, there should be carried out the elaboration of fundamental basics of the theory of man-caused and natural accidents and catastrophes, theory of defence and safety. There should be formed republican and regional target programs on creating of systems of preventing of man from accidents and catastrophes. To the solving of fundamental problems of safety will promote the elaboration of classification of accidents and catastrophes with account of character and dimension of their consequences and main strike factors. On the basis of that classification is realized the elaboration of nomenclature of the most dangerous working processes, technologies, materials and basics of scientific-technical examination. For potentially dangerous processes and objects is worked out the system of normal and limiting states. Application of results of applied elaboration and fundamental researches on safety of complex technical systems will allow to form the system of administrative solutions for providing of safety of population, cities and settlements, industrial and civic objects, buildings, constructions and engineering systems of life support from possible accidents. For realization of the given problems will promote:

- Elaboration of republican documents on theory, methods and means of analysis of catastrophes with global and national consequences for hypothetical emergency situations;
- Making of data bank on accidents and catastrophes, including emergency situations;

Elaboration of republican atlas of danger and risk of natural and natural-man-caused catastrophes with global and national social-economical and ecological consequences. Elaboration of single recommendations on constructing of regional maps of dangers;

Elaboration of basic normative-technical documents for analysis, evaluating, defence and examination of potentially danger technical systems. On this base – to create the complex of single republican normative-technical documents for providing of safety of newly created and exploited industrial objects.

The purpose of the given work is addition and correcting of present normative acts to put them in consequence with forming national general conception and ideology of safety and world standards. There must be worked out of unitized recommendations for prolonging of resource of exploiting of the most dangerous objects for protection of staff and technical objects. To the number of the most important of them, one can refer the works connected with evaluating of the activity and behavior of the operators to work in extreme conditions. The other side of this problem is shown up through determining the elasticity of operator after extreme situations. It should be also worked out the methods of adaptation and take away the stressful works of the population in the period of liquidation of consequences of the accidents and catastrophes. The second direction of the work for decreasing of damage from natural, natural-man-caused catastrophes includes the researches in the sphere of fundamental aspects of analysis and development of ES, decreasing of negative consequences with purpose of elaboration of method of evaluation and danger and drawing-up of suggestions for solving the tasks, first of all, the engineering preventing of territories. At the heart of the third direction should be the researches on turning to projecting, creating and exploitation of complex technical systems of objects on new criteria and norms of safety, elaboration of methods and means of functional, strict and combined prevention. In structure of the mentioned works are marked out three directions, distinguished by branch specialization:

For elaboration of normative-legislative documents, evaluation of factors of risk, creation of systems of diagnostics and prevention of accidents on industrial enterprises of chemical, metallurgical, machine-building, transport complexes, including safety of delivery pipeline systems and other potentially dangerous objects;

For elaboration of normative-legislative documents, regulating the organization of works with account of natural and man-caused influences on objects of civic engineering, connected with danger for the population;

For elaboration of normative, organizational-technical and technological providing of safety of destroying and utilization of objects of special equipment.

The works for protecting the population and liquidation of consequences of disasters are directed to the elaboration of the projects of legal, directive and normative documents, methodical and reference materials, model complexes of measures for protecting of population, its life support and carrying out of wrecking. One of the most important tasks is the researches on legal and economical regulation of safety in the Republic. It is necessary to create the definite normative-legislative base in the Republic for prevention and actions in ES of natural and man-caused character. It is necessary to prepare and pass a great number of normative documents: laws, decrees of the government, heads of administrations and other normative-legislative acts (instructions, rules, regulations and so on). They should take into account, to a considerable degree, the peculiarities of the regions (towns), particularly, the presence on their territory the potentially dangerous objects.

Passing of normative-legislative acts will considerably supplement the juridical base of safety supplying, protection of the population and territories from disasters of different kinds, what will allow "to start" mechanism of legal regulation of relations in this sphere. In the Republic there is no sphere of system of laws, regulating the questions of safety in industry. During last time, in series of interested organizations, the projects of separate legislative acts, concerning this sphere, are elaborated. These projects were created in absence of general conception of legislation in the sphere of industrial safety, in consequence of which, the series of questions, demanded the legislative regulation, remained outside of mentioned acts.

Top-priority questions of development and improvement of legislation in the given sphere should be considered the elaboration of normative-legal acts on the following questions: protection of population and territories from emergency situations of natural and man-caused character; creation of conditions for keeping ready and for using all power and means for preventing and liquidating of emergency situations; creation and using of reserves of material and finance resources for liquidation of emergency situations; organizing of preparing of the population to the actions in emergency situations and propaganda of knowledge in this sphere; organizing of state inspectorate of fulfilling of measures for preventing and liquidation of emergency situations; increasing of steadiness of functioning of the objects of economic and social purpose in conditions of emergency situations.

In the result of realizing of these measures must formed in its base the complex branches of legislation, regulating the relations, connected with providing of safety and protection of population, objects of economic and other purpose and environment from emergency situations of natural and man-caused character, which in its aggregate represent the second (lower) level of legislation of the country in the given sphere. What to the first

(higher) level, the works on legal and economic regulation of safety should be directed to scientific basis of fundamentals and elements of state legal and economical policy in sphere of safety. It should be elaborated the project of conception of legal regulating of ministries, departments and territories of the republic, relations, occurring in realizing of protection of the population and territories from ES of natural and man-caused character. The project represents the system of view on aims, principles of realizing, the main directions and consecution of realizing of suggested measures for improving of the activity of ministries, departments and territories of republic and increasing of the role of control.

Conception of legislation about ES takes into account the degree of danger, strength of influence of different kinds of factors, formed the complex notion “ES” and “safety”. Different in its origin directions, to the range of participants and victims, to the consequences – all of them are united with generic signs – range, mass character, suddenness. Therefore, the main conception of legislation about ES should be synthetic approach, absorbing prolonging actions (inactivity), concentrated attention not so much on the fact of occurred event itself, as on possibility of preventing (precautions) and potential consequences of such class of events. Theory and practice of modern legislation have not yet elaborated enough material for theoretical summarizing of all factors, creating harmonious conception, however, rate of occurred events, abruptly increased danger from different type of anthropogenic and natural catastrophes, demand singling out of these events in a single whole, and working out of sufficiently whole conception of legislation of ES. Among main top-priority results of legal regulation should become: elaboration of “Conception of legislation in sphere of safety of the population and territories in ES, preparing of “Main legislation of Azerbaijan Republic about safety of population and territory in ES”. Mentioned documents are basic gel-forming bases of development and improvement of legal regulation of questions of safety in ES and should be used in activity of SC of Azerbaijan Republic on ES, CD, almost all ministries and departments in forming of systems of legislating regulation in showed sphere of legal relationships. Practical result of works should become the elaboration and application of considerable number of projects of laws, normative, methods, technologies, programs, in particular:

- Of structure of legislation, improvement of normative base for preventing and actions in ES;
- Of projects of systems of normative documents, providing stable functioning of cities and settlements in ES;
- Of settlements in ES.

During elaboration of normative documents should be used summary map of risk for population and the most dangerous industrial objects.

Showed directions, being, in definite degree, independent, in their cohere fulfilling, allow to create initial base for solving problems on criteria of safety. In absence of legislative basis, is necessary the base law, which would regulate and establish the conditions for preventing the population and territories from ES. “Fundamentals of legislation of Azerbaijan Republic about safety of population and territories in ES” should serve to these purposes. The most important regulations of conception of legislation about ES should find their reflection in this law. The law should take a central place in the system of norms, directed to legal regulation of relations in sphere of supporting of safety and life of population, territories, economy and resources of the country. It should determine the public policy in this sphere. The law should examine, in particular, general principles and regulations, bases of organizational, legal and economical mechanism of preventing and liquidation of ES. Special attention should be paid to establishing of procedure of training and permit of staff to work, in the system of measures of preventing and actions in ES, requirements of professional selection, character of interaction of staff, leaders, supervising agencies, in providing of safety of exploitation of special dangerous objects, responsibility for infringement of rules. Principles of forming and establishing of single system of preparing of specialists on problems of safety should be elaborated in this direction. The main aim of perfecting of organizing of studying with different categories and groups of population, legislation for providing of preventing of population and territories from ES, is increasing of level of sense of justice of all living in lower territory, forming of deep understanding of original sense and exact interpretation of legal norms in different normative legal acts in the name of exact and correct fulfilling of legal establishments, consolidation of law and order in the given sphere, of population, first of all, of management of executive power agencies, agencies of local government, enterprises, institutions and organizations of specialists in sphere of preventing from ES.

Thereupon, is necessary:

- to introduce necessary clarity to programs of training of different categories and groups of population in sphere of prevention from ES, providing for compulsory studying with them the matter of main laws and other normative acts, and, formulated the task of forming of trainees of the high sense of justice in these questions;
- to provide the increasing of qualification of teachers on legal questions of all forms of preparing of population in sphere of preventing of population from ES;
- to organize the elaboration and publishing in sufficient quantity the teaching and methodic books of legal questions, including

posters, albums, film strips and so on, for providing with them of all interested persons on legal territory;

- to take necessary measures on fundamental improving of printed oral propaganda in sphere of providing of safety and preventing from ES, including using of mass communication media;
- to provide appropriate control by authorized for that agencies for realizing of legal studying and education in system of preparing of population in sphere of preventing from ES.

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DEVELOPMENT OF THE COMPOSITION OF GROUTING MORTAR LIGHTENED ON THE BASIS OF AYDAG ZEOLITE ROCK

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ABSTRACT: As a result of carried out researches, it was determined that using Aydag zeolite rock enables to get lightened grouting mortar with specific weight of 1460 kg/m³ and ultimate strength of 2,3-4,7 MPa after 2 days under compression. Increasing ultimate strength under compression is connected with the fact that while using Aydag zeolite rock there is an interaction between portland cement hydration products and minerals of zeolite rock, and thereby new cementing compounds are created. At high temperature creation of new cementing compounds passes in high speed. Thus, being under compression, ultimate strength of grouting mortars, based on zeolite rock, with the density of 1460-1560 kg/m³ is 10-12 MPa. Besides, Aydag zeolite rock lets get corrosion-resisting grouting mortar.

During the cementing of deep pits it is necessary to raise up sufficiently cement solution in the hole clearance. But because of the high density of cement solutions, it is difficult to implement this operation. So

lowering of the density of cement solutions, in other words making of lightened grouting mortar is one of the most actual tasks of petroleum industry.

There are a few methods to make lightened grouting mortar (1,2,3). One of the efficient methods is to lower density by means of increasing the water-cement ratio using bentonite (4). It has been ascertained that each percent of bentonite addition increases water needs until 4 % and respectively lowers its density. But while using bentonite it is observed the solution strength degraation. It is necessary to take into account that the lower concentration of solid phase in total volume of cementing material with identical strength, the lower strength of cement stone. In other words the higher water-cement ratio the lower strength of cement stone respectively.

Researchers have ascertained that when the percentage of benotine in the structure of cement is about 6 %, the density of solution falls from 1860-2000 kg/m³ till 1620-1750 kg/m³ (5). When the percentage of benotine is about 20 %, in spite of the fact that the density of solution falls from 1380-1520 kg/m³, the ultimate strength of cement stone lowers till 7 MPa.

It was necessary to study special additives in order to eliminate above-mentioned shortcoming, i.e. to lower density, keeping in norm strength. For the purpose of partial elimination of this shortcoming, the present research work used Aydag zeolite rock as a simplistic additive.

While using zeolite rock in the research work, at first it was ground with the laboratory ball-mill until its surface was 3000 cm²/g. At first the ground zeolite was mixed thoroughly with Portland cement of different proportions and then the water-cement ratio of solution with normal fluidity was determined. The results of the experiments are shown in Table 1.

Table 1

Influence of zeolite rock upon the water-cement ratio of grouting mortar

N	The composition of grouting mortar in %		The fluidity of solution, mm	Water-cement ratio
	Portland cement	Zeolite		
1	100	--	180	0,62
2	80	20	180	0,82
3	60	40	182	0,95
4	40	60	180	1,05

As is obvious from the table the larger quantity of zeolite added in to cement the larger water-cement ratio. If we add 20, 40 and 60 % zeolite rock, the water-cement ratio of grouting mortar will increase respectively till

22,4 %, 42 % and 56 %. As a result of addition of zeolite into cement, setting time of the solution slows down. If we add 20, 40 and 60 % zeolite, setting time slows down respectively till 18, 38 and 56 minutes.

Increase of the water-cement ratio sets conditions for lowering the density of solution. While studying the influence of zeolite upon the density of grouting mortar, it was determined that the larger quantity of zeolite the lower density of solution (Table 2).

Table 2
Influence of zeolite rock upon the density of grouting mortar

N	The composition of grouting mortar in %		The density of solution kg/m ³
	Portland cement	Zeolite	
1	100	--	1730
2	80	20	1560
3	60	40	1520
4	40	60	1460

It is known that the deeper drill well the higher area temperature. So while studying the influence of zeolite upon the strength of grouting mortar, the experiments were made both at normal temperature, and in steam conditions.

The results of the experiments are shown in table 3. As is obvious from Table 3 when we use zeolite rock in comparison with bentonite at the equal density of solution, the strength of solution is high. In normal conditions strength in comparison with bentonite is 3 times as much, and at the temperature of 75°C it is 25 % as much. During using zeolite the strength is increasing, because zeolite adsorbs a part of water and cement is hydrated with little water.

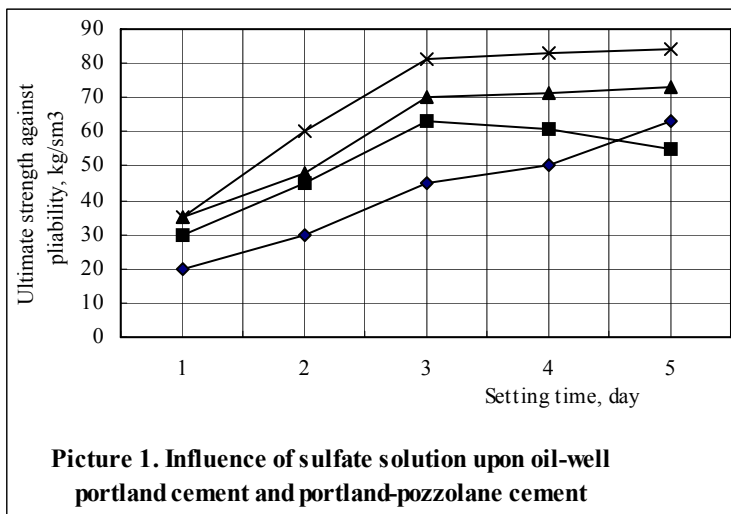
Table 3
Influence of zeolite rock upon the grouting mortar features

N	The composition of grouting mortar in %			Water cement ratio	Densitiy, kg/m ³	2 days later ultimate strength against compression, MPa	
	Portland cement	Zeolite	Bentonite			in normal conditions	75°C

1	100	--	--	0,65	1860	5,9	12,0
2	80	20	--	0,75	1620	4,7	14,0
3	60	40	--	0,95	1560	4,3	12,0
4	40	60	--	1,10	1460	2,3	10,0
5	90	--	10	1,15	1560	0,7	0,9

Furthermore zeolite reacts with hydration and hydrolytic materials of portland cement and creates new hydro-silicates and hydro-aluminates. At high temperature creation of these new compounds passes in high speed.

Researchers have ascertained that in order to increase corrosion-resistance of cement it is necessary to use igneous rocks named pozzolan (4). Because mineralized subsoil waters, obtained during drillings, demolish cement stone. So it is important to study corrosion-resistance of grouting mortar, obtained using zeolite. The influence of mineral additives upon corrosion-resistance of cement is explained as follow. As a result of interference of mineral-active additives and calcium oxide, formed during hydration of cement minerals, the quantity of easy-soluble components in cement stone falls to minimum. The absence of free calcium hydroxide sets conditions for lowering pH-value and the density of calcium ion in liquid phase. And this complicates crystallization process of gypsum and hydrosulfate-aluminate and respectively increases corrosion resistance of cement. We used natrium sulfate solution with the density of 3000 mg/l as a corrosive solution in order to determine the influence of Aydag zeolite rock upon sulfate-resistance ability of grouting mortar. Then induration process of specimens, made from portland cement solution with normal density and portland cement solution with pozzolan, was carried out both in common water and sulfate solution. During experiment the composition of grouting mortar, based on zeolite, was as follow: zeolite: portland cement = 50 : 50. The results of the essay were shown on Picture 1.



Picture 1. Influence of sulfate solution upon oil-well portland cement and portland-pozzolane cement

- X 1 – in common water (oil-well cement)
- 2 – oil-well cement in sulfate water
- ◆ 3 – in common water (portland cement with pozzolan)
- ▲ 4 – in sulfate water (portland cement with pozzolan)

As is obvious from Picture 1 zeolite rock noticeably increases sulfate-resistance ability of oil-well cement. And this enables to use zeolite rock in the making of corrosion-resisting grouting mortar with pozzolan additives.

Thus, as a result of carried out researches, it was determined that using Aydag zeolite rock it is possible to prepare lightened, corrosion-resisting grouting mortar which meets the requirements of the standard.

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ACTUAL SCIENCE OF DIRECTIONS OF ARCHITECTURE AND CONSTRUCTION IN AZERBAIJAN – METHODOLOGICAL PROBLEMS

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(Produced by the Academician of IAS G. Mammadova)

Organizing of education on the spheres, meeting the requirements of time, has special meaning among strategic interests of Azerbaijan nowadays. Azerbaijan, being one of important countries in context of geopolitical – economical interests of the world, from one hand, must provide the integration into world community in the level with developed countries of the world, and from another hand – must pay special attention to development of science and education, with purpose of avoiding the dependence from other leading countries of the world. In the first place, it can give the opportunity to Azerbaijan to join to world market with its economical interests, at the expense of creating of production spheres, based on its scientific-technical potential. It should be noted with regret, that present situation in this direction is not on proper level. It is explained not only with the facts of filling up Azerbaijan market with the imported production, but also with cases of export of local goods as various imported production. Such situation continues to embrace either agrarian, or small – large industrial sectors of Azerbaijan. In addition to above-stated, if to take into consideration the fact that only in oil industry of Azerbaijan are invested milliards of dollar, then become obvious the reasons and inadmissibility of such situation. To our opinion, the important reason is wrong organization of education on the spheres, which do not correspond to strategic interests of the country. In connection with it, during last years in the country are being made the reforms, connected with passing of higher education on to 3-stepped system, which gradually bear their fruits in many directions. But in spite of the fact, that there exist a number of problems in questions of organizing of education, corresponding to world standards. Together with present objective reasons, it also can be explained by the fact that the system of education (against a background of weak material and technical basis) does not sufficiently use internal resources of the country.

The architecture, creating the planned-spatial, volume-spatial system of surrounding, regulates life relations of human and society. And thereby, it is the sphere, playing the important role in physical and spiritual condition of society. Therefore, it is naturally, that architecture from one hand is

considered the sphere of art, but from another hand – is represented as technical sphere. Samples of architecture and town-planning may be accepted as fossilized displaying of human mind, human relations, national and world development. It should be noted also in development of education in sphere of national architecture. It is not by accident, that national architecture is considered the most valuable contribution of our people – the carrier of cultural heritage. In contrast to many spheres, the architecture depends on regional, national-cultural, social—psychological originality in frames of human and world values. Architectural education must have scientific-theoretical conception, supplying the development and using of national values.

It is not by accident, that during last two years, because of absence of fundamental scientific-theoretical researches on national architecture, the scientific, training and constructing practice of our architecture stayed in the gripe of regional laws of empires, loosing many valuable national traditions. Today the work of many designed, scientific-research and educational centres is not interfacing. And it considerably complicates elucidation of actual architectural problems, which have deep cultural, social-psychological and moral meaning. From this aspect the architectural education of nowadays must turn into the center, making the unity of science and practice. Particularly this education should provide the conditions for preparation of alternative, national-strategic conceptions by means of carrying out of new scientific-methodological experiments. Basing of the above-stated, the scientific education on architecture and design should be built on basis of the following methodological conditions:

1. To achieve the elaboration of original educational conception in the frames of 3-stage educational system for national architecture, built on human, national and world values.
2. To provide the preparation of scientific-methodological training programs, answered the individual peculiarities, typical to dynamics, adroitness and creation at the expense of using of existing progressing scientific-practical achievements.
3. To give the advantage of organizing of actual mobile workshops, which are the methodological basis of education on architecture and design.
4. Participation in international competitions in order to compare the scientific-methodic creative results with world standards and connection of individual thought with collective creation.
5. To pay special attention to organizing of creative exhibitions, scientific-methodic seminars, publication of significant results in order to develop and producing of national architecture.
6. To achieve the organizing of purposeful scientific-methodological non-educational experiments taking into account the actual

demands of national State organization, architectural and constructing culture.

7. To organize meetings on actual theme with famous scientists, poets and art workers in order to deep studying of secrets of national culture.

Creative, teaching and methodological works on directing of organizing of education, meeting modern requirements, carrying out on the faculty of architecture of Azerbaijan Architectural-Constructing University during last years, deserve special attention. Methodological foundations, created on basis of unity of science – education and practice in the given sphere continue to give positive results. Contacts, made with progressive scientific and industrial spheres of chair, including individual scientists-specialists, and realization of these connections in frames of concrete methodological principles, had positive influence on development of architectural and designing education on different spheres. The following results of “Design” chair deserve the approval:

- Holding of I and II Republican conferences on the theme “actual problems of architectural and designing education”, degree works of the students, produced in international competitions were more than once awarded to higher degree rewards. Now “Design” chair and created by it the architectural-designing center “Shams-Elm”, one might say, turned into the deserving attention scientific-creative center. Already from 1994, after opening in chair of architectural compositions the specialty “design of environment”, acting till now center work at a quantity of projects, in number of which also is included the project of complex on place of pilgrimage “Bibi heybat”. Many of these projects were realized and took worthy place in modern planning and spatial pattern of Baku. The chair began the preparation of specialists on specialty “design of environment”. and from this moment in accordance with ratified curriculum, a special attention was paid to methodological principles of interfacing teaching of specialized subjects, were elaborated work plans with mobile-flexible abilities, taking into account the methods of individual approach. The basis of directions of scientific-professional development of chair interfacing researching of scientific themes of long-term conceptual character.

- Among priority-driven themes may be noted such as “Actual problems of studying and education in sphere of architecture and design”, “Regularities of geometrical harmony in creation of visual-artistic forms“, “Scientific fundamental basis of creation of artistic forms – elements, system grouping”, “Humanization of environment“.

It should be noted, that it is impossible to see the work on preparation of specialists in sphere of architecture and design separately from real industrial process. As in most cases the technological processes, development and changes of using equipment and materials occur with big

speed. And in this result, gap in process of studying becomes everyday occurrence. To our opinion, the process of studying in some degree should outstrip the reality, rushing together with science to perspective development.

From this point of view, science and education on different spheres, taking into consideration local peculiarities, should always pay special attention to leading directions of the world and not to miss the opportunity of their using. Because of it, during organization of studying process, together with participation in international symposiums and competitions, it is necessary to use world scientific-technical inventions and possibilities. In this case, it is naturally, that preparation of specialists for any sphere, and organizing of studying process exceeds the bounds of activity of University and takes national significance.

In process of studying of architectural design, it is necessary to take importance and predominance of following methodological conditions:

1. Relations between teacher and student must be founded on strongly professional, moral, psychological basis, taking into account all stages of education, in frames of inter-conformity, interests and chance of choice. Individual interests and abilities of student should make conditions for increasing of theoretical and practical knowledge of teacher and for using of universal methodical possibilities. Besides multistage and duration, the relations of teacher and student should be on such stages as acquaintance, closeness, attachment. The basis of process of attachment of teacher and student should be the system of mutual questions, leading to big question. In reality, the relations of teacher and student in education carry the paramount motive contradiction, creative duality.

2. To our opinion, at the heart of education and development, in all, should be creative scientific-methodological essence of the question.

3. Architectural education should be built in conditions of exact science, education and project-constructing experience. It will not only provide the advantage of education over teaching for teachers and students, but will make conditions for permanent development of scientific-methodical development of education as a whole.

4. Teaching of subjects, connected with history and theory of architecture, elucidating modern actual questions, should make conditions for elaborating of utilitarian design statements of experimental character.

5. Particularized subjects, constructed interdependently, should help to work of projection and breadboarding, corresponding modelling, forming of idea and collecting of information, connected with the question.

6. Principle methodological consecution of architectural and design education should be consisted from such parts as putting question, determining of theoretical principles, elaboration of experimental creative variants, selection, result, registration and report.

7. Architectural creative process in education should be completed with turning of structure into the model, the model - into the project; at that there is not excluded the intuitive approach.

Architectural designing creation, the kernel of which is IDEA, being created between abstract and systemic corpuscular thought, should be regulated by scientific-theoretical laws. Artistic and esthetic creation of forms should be explained by compositional and geometrically harmonized regularity, should be connected with peculiarities of building materials, should be compared with demands of real building constructions, should pave the way for education of new actual constructions.

The aim of putting of mentioned methodological conditions is creation of conditions for carrying out fundamentally theoretical, experimental-applied researches, providing leading social, economical, cultural significance, scientific character and modernity of architecture.

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SEISMIC RESISTANT SPECIAL BLOCKS FOR RESIDENTIAL AND INDUSTRIAL OBJECTS

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Presently, the construction of seismic resistant residential and industrial objects is one of problems, which not yet solved completely. The certain amount of work has been done in this direction in many countries (Japan, USA etc.) These works have specific positive and negative factors. The positive factor is blocks are resistant to strong earthquakes. The negative factor is, construction of such blocks is expensive. Due to this point researches were conducted in this direction and blocks of optimal form and measurements were developed and produced. Along with theoretical substantiation, every measurement of block was experimentally tested.

Seismic resistant construction blocks are developed at Scientific-Research Institute on Prediction and Study of Earthquake and patented in RST. The author of this invention is the Doctor, the Professor Elchin Khalilov.

Generally, two raw materials are applied for production of block. Detection of optimal proportional ratio of components is one of the main tasks. Besides, dispersion of one of components influences much on quality

of the finished product. Thus, while increasing of relatively bigger particles, tensile strength of block is decreasing (Fig. 1). It is possible to state the size of the biggest particle of component must be by 5-7 times smaller than the size of the smallest and/or thinnest part of the block. This happens, because during development, falling of some part of big particles onto one and the same place, does not allow reaching of that density in this part, which is available in other part of the block.

As a result of conducted experiments, approximate amount of dispersion in ratio is defined. Thus, the biggest part is 20-30%, average size is 55-60% and the smallest size is 15-25%. It does not mean at all, that component consists of these three sizes.

Even, if the mould of block remains stable, when its main dimensions change, percentage rate and dimension of dispersion may change too. This is established by means of test.

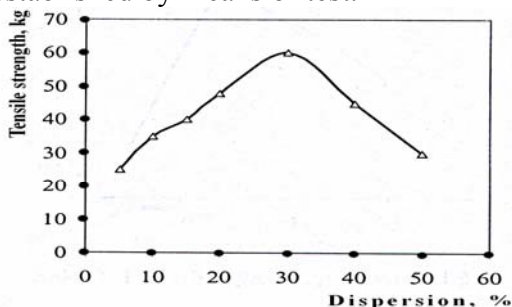


Fig.1 Dependence of tensile strength on dispersion

These blocks are dried in natural conditions and after certain period it becomes solid.

As a result of tests, it became known, these blocks are seismic resistant by quality and produce expected results

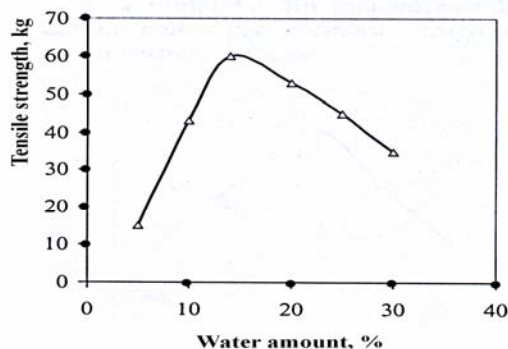


Fig.2 Dependence of tensile strength on water amount

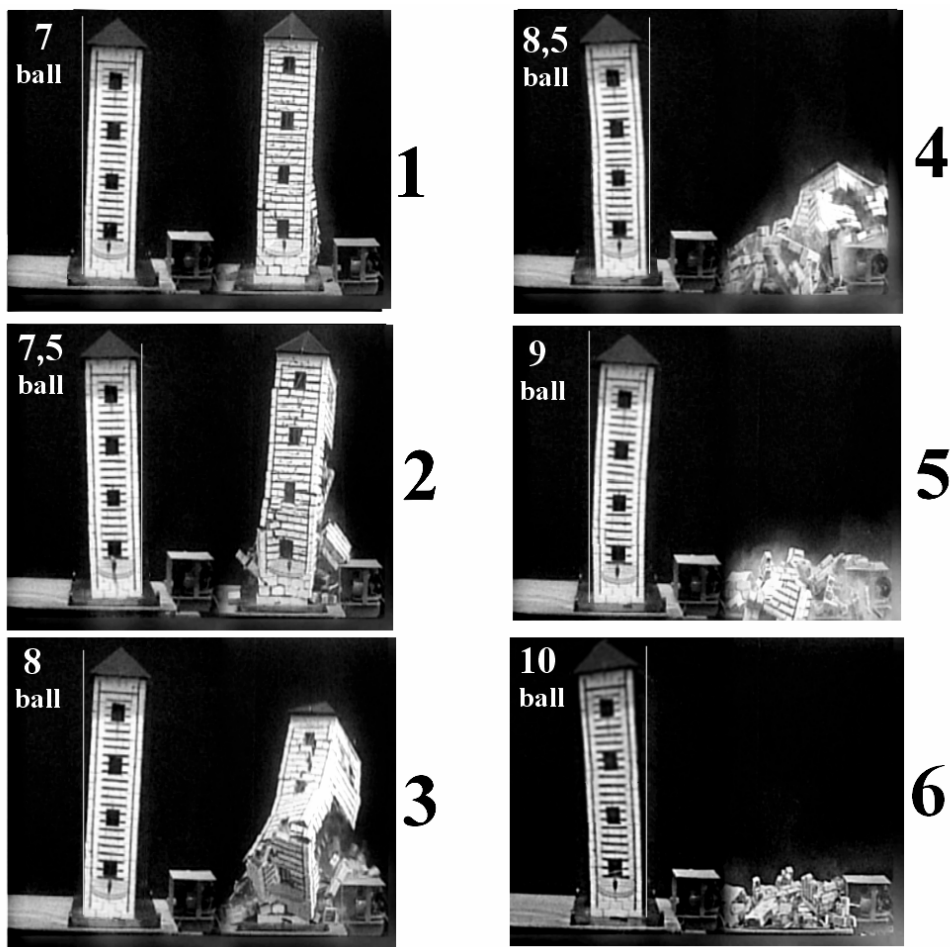


Fig. 3. Testing, on the seismostand of models of buildings on the scale 1:10, of being built from standard construction blocks (on the right) and a seismic resistant construction blocks, created by Prof. E.N. Khalilov (on the left), Baku, 2003.

As it is seen in the picture, the building from standard construction blocks begins to be destroyed during exceeding the intensity of the earthquakes of 7 (on the 12-scored scale), but the building from a seismic resistant blocks are not destroyed in the intensity of the earthquakes of 10, in spite of big deformations of the building.

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SOCIAL AND ECONOMICAL SCIENCES

ABOUT SOME RELIGIOUS FAITHS IN ANCIENT AZERBAIJAN

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Zoroastrism is the most ancient from world religions of revelation, very closely connected with Azerbaijan reality. At one time, one considered that the founder of this religion Zaratushra was born and lived in Azerbaijan. To tell the truth, many scientists now reject this point of view. But nobody denies very evident connection of zoroastrism with Azerbaijan.

In areas of West Midiya, in particular, in zone of future Minor one, or Atropat's Midiya, already, apparently, in first centuries of I millenium B.C. were propagated different mazdaistic doctrines. The positions of mazdaistic doctrines or, even, possibly, properly zoroastric mazdaism in areas of future Atropatena must be, undoubtedly, strengthened after Midiyan conquest of Manna.

The main book of zoroastrism is Avesta. This monument, in that condition which we have it now, is a small part of sainted under Sasanids as a state religion of code of holy books. And there are not so many the zoroastrians themselves. After Arabian conquest of and downfall of Sasanid power only small part of zoroastrians remained their faith. They are usually called "parses" (one who live in India), "gebrs" (one who live in Iran; "gebr" – awry from Arabian "kafir", i.e. "unfaithful"), "fire-worshippers" (in view of great role of fire in zoroastrism faiths and rites). The fate scattered the zoroastrians about all over the world. They live in Iran, India, Pakistan, USA, England, Austria, Canada, Sri Lanka, Yemen, China and other countries. Nowadays in all over the world there are no more than 130 thousand of zoroastrians.

Under Sasanids Avesta was codified several times – in III, IV and even in VI and VII centuries. Namely in Sasanids' epoch, epoch of rebirth of zoroastrism, for clear, reproducing the shades recording of holy texts of Avesta, was created on basis of pehlevian one (in its turn going back to aramean writing) the special type with great number of symbols. Sainted

text of Avesta was supplied with translation into pehlevi (written language of Sasanids' Iran – Middle Persian) and with comments.

Avesta in former times represented gigantic code of religious and ritual establishments, cosmogonical and eschatological notions, holy hymns, devoted to different deities, the different prayers, ethical norms, mythological, epic, legendary and other materials.

Already in Parthian times equally with verbal traditions collected, restored and again were being written down namely written fragments of holy books, existed in former centuries, one copy of which was burnt by Alexander Macedonian.

So, written Avesta (or its different parts), including (as Greek authors considered) two million lines, or, as affirmed zoroastrian tradition and later Arabic- and Persian-language authors, Avesta, written in 12 000 bull (cow) skins or boards with gold letters, existed long before Alexander Macedonian.

Parthian tsar Arshakid Vologez (possibly, Vologez I) tried to restore namely this Avesta, lost during Greek-Macedonian conquest and during several centuries remaining more in verbal reproduction (it is possible, that were remained the separate written fragments from books too).

More actively the Avesta was collected and restored in the time of the first Sasanid tsar Ardashir Papagan (225-240 years). In IV century Avesta was canonized, as it seems, in Atropatena, becoming before the mentioned time the state sanctuary of the empire.

After the last editing, getting thin very much, the Avesta consisted of 21 nask (book). However, this Avesta too did not rich us completely. We know, that during Arabic conquest, the manuscripts of Avesta, as other not Islamic literature, were mercilessly burnt, about what, in particular, Biruni tells.

Now from zoroastrian books, restored in the time of Arshakids and Sasanids, remained that which we used to call Avesta, and namely: three incomplete books (nasks) of Yashta, Yasna, Visprat and and one comparatively complete – Videvdat, and so-called Minor Avesta.

Name and argument of twenty (from twenty-one) books, restored in the time of Sasanids, are known for us by Dencart, zoroastrian writing of IX century. At that, it should be noted that the resume of these books was made not through the text of Avesta itself, but through its Pehlevian translation.

Firstly in Europe the Avesta was created in 1771 by Frenchman Anquetele Duperrone (1731-1805), for many years lived in India and studied the holy books with the help of Parsian priests.

Reached us Avesta is consisted of Yasna, Yashta, Visprat, Videvdat and Minor Avesta.

Yasna (“homage”, “worship”, “sacrifice”) is the most voluminous part of Avesta, consisting of 72 parts and containing the separate prayers,

reading during divine service, performing different rites, rituals and during sacrifice. Its most important part (17 parts) are Gats (“hymns”, “motets”), composed in metrical form, and resembling on character the speeches of biblical prophets.

Very valuable and interesting, in ideology and literary-artistic relation, part of Avesta are Yashtas (“worship”, “praise”), consisting of 22 laudatory prayers, devoted to different deities.

Visprat (“All ratus”; “ratu” – “lord”, “judge”, “deity”. So, - “All studios”, “All lords”, “All deities”) is entirely priestly, prayerful book, consisting of 24 parts (their number in different manuscripts is hesitated), representing prayerful treatments to different deities with showing of homage. Visprat in essence is the addition to Yasna and on its character a little coincides with biblical book “Levit”. Videvdat (also is used an awry Vendidat) now is translated not simply “Law against devs”, as it was till recently, so to speak, with clarity – “Rejection of former deities”.

Videvdat is first of all code of laws and orders about what one may, what may not, what is permitted, what is not permitted. This book, consisting of 22 parts (afgard or fargards), contains the rules of ritual clarification, rules of making of rites. There it is said about taking care of fire and other elements, necessity of taking care of dogs and other useful animals, about rules of agriculture, is quoted the list of sins and virtues, is given the orders on the question of redeeming of faults, some religious-juridical regulations, elements of civic and criminal law and so on.

In so-called “Geographical poem”, with which begins the I fargard of Videvdat, there are a few plots, going back to great antiquity. There it is narrated about creating by Axura Mazda the inhabited countries, the first of which is called Aryanam Vaychah – “Aryan expanse”, which is, probably, being the original motherland of Aryans, is characterized as the best country in the world, where, however, later, appeared the devastators, created by spirit of darkness and evil Angra Manyu (Ahriman).

“Geographical poem” testifies the latitude of geographical horizon of Avesta. In Videvdat, as in generally, in whole Minor Avesta, there are a few very late on content and origin of material. But, undoubtedly, there are remained many and explicitly archaic ones.

Turning to general appraisal of Avesta, it should be noted that this monument is diversified, with incredible quantity of stratification, arising in different time and in different places.

The most ancient stratum in Avesta is, of course, popular elements, reflected in particular, in epic songs and in other parts of the monument. They were being appeared no later than I millenium B.C. Some of them, probably, go back to II millenium, but probably, to the earlier times. The most ancient epic songs are remained in different parts of Yasna and Yashta. The song “Theft of cattle”, songs of Mihr Yashta, myth about Yim are

related to it. The reasonable archaism blows from “Soul of bull” – central figure of zaratushtra’s Gats. However, these elements in Avesta are very interlaced with considerably later priestly ideas, trying to subjugate them to canonized doctrine.

Today’s Avesta is usually divided into two parts – Gatic (Senior) Avesta and Minor Avesta. To Senior Avesta, except Gat, are related also some other parts of Yasna. Everything else is related to Minor Avesta.

Speaking about Gats, one can’t help noting that they are to a considerable degree the product of reformatory activity, about what testifies the fact that there are a few contradictions with traditional Indo-European views.

Reforming of Gats follows also from the fact that they, according to authoritative opinion of specialists, did not come from public faiths, and they were addressed, in contrast to Minor Avesta, in general oriented on relatively wide mass, religious elite.

Zoroastrism appeared in the period of appearing of earlier state formations, is an ideology of that epoch. Sermon of Zaratushtra, expounded by him in Gats, was directed against tribal leaders and old priestly. He fights for reorganizations of way of life of people, for triumph of agricultural labour and settled cattle-breeding, for political unification on basis of powerful power. Not in vain, in Gats there is the appeal to peaceful life and prosperity under the patronage of powerful lords for fight with intestine war and incursions, against hostile rulers and priests of antipodes of the truth. For religious-philosophical system of zoroastrism is the most typical dualism, expressed in contraposition of two origins – Good and Evil, Truth and Lie, Light and Dark, fight among which, acquiring the cosmic scales and concentrated in one common world conflict, is the containing of all world process, where the active role features to the human. At the head of powers of Good is Ahura Mazda (later – Ahuramazda, Ormuzd), powers of Evil – Anhra Manyu (later Ahriman). To deyv (dev, div) – ancient naturalistic deities, taken into the camp of Evil, - are opposed the ahurs – deities, possessed a supreme power. The whole world in doctrine of Zaratushtra is considered as divided into two spheres: real, earthy, corporal and spiritual, the beyond, imaginary. Much attention is paid to earthy world. Dualism of Zaratushtra serves to the statement of its social and economic ideal. The ideas about life in the Earth transferred overall Universe. Dualism in the heavens is only the projection of dualism, earthy antagonisms. According to optimistic doctrine of zoroastrism, owing to mutual efforts of adherents of veritable faith, finally, the good wins. New world comes, represented the triumph of forces of Good. In this fight, the considerable place takes the free in his selection the man (in this fight the man may be on any side). The man must actively assist the victory of Good, Truth and Light over Evil, Lie and Dark. The main tool of the man in this fight is “good

thought”, “good word”, “good work”. As it appears from spirit of doctrine, the man must promote the victory over Evil not so much with rites and prayers, as way of life – increasing of material welfare by means of diligent engaging in agriculture, zealous tillage, careful attitude to cattle. According to Avesta, growing of bread causes the damage to evil origin and promotes the Good as well as saying 10 000 prayers. There were provided usual virtues – liberality, honesty, and adherence to agreement. Asceticism always was alien to zoroastrism. Celibacy was considered the most severe sin.

Viewing the conception of man in Gats, it should be noted with all distinctness, that in them the man - landowner and nomad – inoperative subject, standing in the center of artistic imagination; he is only present, being only the object of influence of deities, which are in center of attraction of composer of Gats.

In Avesta, to a considerable degree was reflected the engendered in epoch of formation of State organization, the dream of the people about kind lord. In Gats it is being spoken about kind rulers, the dept of which is to drive out the enemies, making raids on landowning areas and “to bring peace for joyful settlements”. The deity Mitra (literary: “treaty”, “agreement”) from Avestian pantheon had a great popularity. Later, cult of Mitra was spread very wide, even in West.

Considerable popularity had also Ardivisura Anahita (“Strong, chaste Ardivi”), Veretragna, Mah and other deities.

Ardivisura Anahita, goddess of water and fertility, is described in Avesta as strong, beautiful maid, giving the fertility to soil and prolificacy to cattle and people.

Veretragna (Varhran – in Pehlevi, Bahram – in Persian) - God of war and victory – goes back to epoch of IndoIranian community.

Mah was deity of Moon.

As a deity was represented Sense, Peace, zoroastrian Faith itself (“daina”, from here “din”, i.e. “faith”, “religion”).

The great popularity in zoroastrism had cult of Fire, coming from the greatest antiquity. Fire (Atar, later – Azar) was considered as expression or symbol of divine justice – Arta (Asha – in Avesta).

Concluding our arguments about doctrines of Zaratushtra, it should be noted with all distinctness, that passing with red thread in whole Avesta and permeating all ideology of zoroastrism, the dualism, coming from old mazdaistic faiths, spread in west spheres of Iran plateau, in particular in South Azerbaijan too, already in the early I millenium B.C. is combined in reformed religious system of Zaratushtra, which is stated in Gats, with evidently showed tendency to monotheism, expressed in faith in high God Ahura Mazda, who became, essentially, the only god. Therefore, Zaratushtra possibly may be considered as one of the first in history of humanity, the

preacher of ideas of monotheism, and Gat's zoroastrism – as one of the first attempts of creating of monotheistic religion.

Zoroastrism and connected with it the religious-philosophical systems, undoubtedly, had certain influence on Judaism and earlier Christianity, adopted from them a few “dominant” conceptions, and considerable influence – of many representatives of Greek philosophical thought.

Zoroastrism is finally formed as state and dogmatic religion in the time of Sasanids, when was undertaken the codification of texts of Avesta.

Late zoroastric tradition asserts that Zaratushtra was a South Azerbaijanian by origin. The motherland of prophet is called Azerbaijan and many medieval Moslem authors.

The reason of localization of motherland of Zaratushtra in Azerbaijan should be explained with that considerable role, which played Atropatena. Under Sasanids, in spite of all possible shocks, one of main state sanctuaries of all Iran (temple of fire Adurgushnasp – temple of tsar and class of soldiers, where tsars must go on a pilgrimage) was in South Azerbaijan. Here was concentrated also many other temples, with their “ablaze coals” and “numerous magi”. All this facts testify the enormous role and significance of zoroastric South Azerbaijan in mentioned, and may be in earlier time. Exactly in Atropatens period started the notion “Azerbaijan” and connected with it phenomena and circumstances of ethno-cultural character.

During 3-4 centuries after Arabic conquests, zoroastrism played a considerable role too. Exactly in this time were written many works of zoroastric literature in Pehlevi, in particular, original encyclopedia of zoroastrism Dencart. Ideas of zoroastrism made considerable influence on ideology of mazdakits and babekits. The problems of zoroastrism stirred and stir wits of scientists of new time too.

Nearly sacred culture of Turks of Azerbaijan to a definite degree was in the closest way connected with Atropatena, its sacred culture, with zoroastrism. All our folklore, quite often to the details, was permeated with zoroastric ideas, zoroastric myths, characters.

Avestian doctrine about resistance of two alternative cosmic principles – sharp dualism, good and evil, light and dark, righteousness and lie, heat and coldness, life and death and so on – was deeply reflected in life and faiths of Azerbaijanians.

Together with ethnic dualism in life of our people, the important role played also gnoseological: Khormuz and kind forces, Ahriman and malicious forces, devs, Adji-Dakhaka. All these come from Avesta, from zoroastrism. From here also come bird Simurg, peri, worship to perpetual Fire, Water, Ground.

Widely spread among our people the cult of water deity Aban, in honour of whom were composed numerous songs, goes back, undoubtedly,

to Avestian Apam Napata (“descendant of water”, “offspring of water”; Central Iranian Aban). In Iran mythology he is good god of water.

Nahid, of course, goes back to Avestian Ardivisura Anahita (central Iranian Abahid), water god.

Backgrounds of our “women’s holiday” Isfendermez go back to Spandarmat. In Iranian mythology Spandarmat is embodiment of tillage, plants and religious godliness, progenitress of life. She is beautiful, judicious woman with musky rose in her hand. This character goes back to before-zoroastrian mother-land, afterwards – Spenta Armatay, Armatay - is one of deities Amesha Spenta.

Isfendermez (till recent times for us) is big women’s holiday, holiday of flowers. Especially was respected the flower in the hand of this goddess, either in antiquitytime, or in new time. As our sources mark, in this day the men must give presents to their wives.

Thanks to only Atropatena, the snatches of Old Iranian epos reached us.

At last, national holiday “Novruz: directly goes back to Avesta.

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THE FALL OF AZERBAIJAN DEMOCRATIC REPUBLIC AND POLITICAL EMIGRATION

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Azerbaijan Democratic Republic is 85 years old: 85 years ago a group of patriots, people of advanced democratic views established Azerbaijan Democratic Republic, giving Azerbaijan its independence. Azerbaijan Democratic Republic lived a short while in our history but it set up principles of public administration leaving rich legacy. Those principles and traditions are being kept and continued by the present republic of Azerbaijan thanks to a very big extent to Heydar Aliyev.

Nowadays there is a great demand for the political thought and experience of the period of 1918-1920. Heydar Aliyev considers the establishment of Azerbaijan Democratic Republic as one of the most important events of the XX century that influenced the history of our people to be established and analysed. For the past years considerable work has been carried out to implement this recommendation. Still, there is much to be done.

A number of problems have not been studied yet, some of the matters have been touched upon superficially, some events and problems have not been approached objectively, others have been given a wrong interpretation.

Clarification of the most essential problems of the period, some of them being the causes that led Azerbaijan Democratic Republic to its fall, is of utmost importance.

The overthrow of Azerbaijan Democratic Republic is the most tragic, complicated event in the history of this country which makes it even more important to analyse. The invasion of April 1920 resulting in the disappearance of most documents and other materials made the research of the period more difficult. However, there are some writings, memoirs, documents and other materials that give the researchers a possibility to search, study and analyse certain true facts and events. Studying the period of emigration we should bear in mind that there is no complete history of Azerbaijan without that period.

The history of emigration is an important and integral part of our history as well as the activity of certain political figures in exile. However the politicians' lives, their political activity have not been the object of thorough research yet. Apart from "M.E. Rasul-zadeh and Azerbaijani Legionaries" by N. Yagubov, "Azerbaijani Political Emigration" by H. Ibrahimli, several research papers, essays, newspaper and magazine articles there is nothing else worth mentioning. This period has not been reflected very well in the foreign publications either. Again here are a few writings by M.E. Rasul-zadeh, Husseyn Baykaran's. "The history of Azerbaijan's fight for Independence" but nothing else.

Today there arise a great number of questions connected with the period of the People's Republic to which only a few answers have been given. It is obvious that to answer them all not only the archives of Azerbaijan are to be studied but also those that are abroad as well as hundreds of documents in personal possession.

What made things worse in the period of the People's Republic was the lack of organization in the administration offices, the use of the Russian language, unfriendly attitude of the police and other problems that were discussed in the "Azerbaijan" newspaper of 29 October 1918, February and 1 August 1919. The government failed to organize trade in the country. The local raw material was not used properly. The "Azerbaijan" newspaper wrote that crude oil was secretly transported to Astrakhan, while Iran got the cotton of Azerbaijan and the silk of Sheki was sold to Georgia. The financial situation was not good either. Inflation was high, living standards were getting low. The most basic needs of the population were not satisfied. The "Azerbaijan" newspaper of 24 November 1918 and 3 February 1920 blamed the Bolsheviks and other internal enemies for the price rise and called for more active resistance.

Researchers studying the foreign policy of the People's Republic point out that the authorities carried out the right activity taking into account a very complicated situation not only in Azerbaijan but also in the Caucasus which made the invasion of the area almost inevitable.

One of the factors facilitating the overthrow of the PRA was the unsatisfactory preparation of the national consciousness for the idea of independence. M.E. Rasul-zadeh wrote in 1918 that masses of people in Azerbaijan were not ready for life in the independent state. "The older population accepted the event of 1918 as something unexpected". Later in 1925 in his work "The Idea of Independence and the Youth" he noted again that the concept of independence was still new in Azerbaijan. One of emigrants M.Sh. Efendizadeh said, "Having lost all political essence under Russian administration people had a weak national idea. Facing independence without any experience the government had to deal with a number of serious problems. The government of Azerbaijan underwent serious crisis due to frequent resignations in its structure, too. Being aware of the importance of some resolute steps in the sphere of national security the Government was not able to make any considerable changes. Later M.E. Rasul-zadeh wrote, "In those critical days the Parliament of Azerbaijan standing on the liberal position was dissolved by F. Khoyski who supported the idea of a state governed by a single body. The exhausting war, the party split, the subversive activity and the sabotage of bolsheviks, menshiviks and esers made extraordinary measures most essential. Later M.E Rasul-zadeh shared the decision to dissolve the parliament and to establish a single body government, which under those conditions could save the situation.

The occupation following the event of April 1920 was the result of the activity of local communists, Russian, Turkish communists, too who considered Baku to be the most suitable location of their activity. Azerbaijan newspaper (issue N63 1920) wrote of the massive propaganda among workers, peasants and soldiers long before the Bolsheviks arrived in Baku.

The Turkish communists under Mustafa Subhi succeeded in spreading their propaganda in Azerbaijan. The Parliament parties faced difficulties too because such parties as "The Union", "Socialists", "Ahrar" and "National Azlig" did not have independence as their goal. The only party to declare independence, as their goal was "Musavat". It enjoyed certain authority and was supported by the young Army of Azerbaijan which itself was at the point of split. All these were the causes of the fall of the People's Republic. It is true the Musavat managed to restore to its former position after the fall of the People's Republic. However during the first months and years of the new government the resentment and resistance of the people toward the party was mostly caused by serious mistakes and chauvinistic policy. Other obstacles the new government faced were

numerous attacks on the borders by Armenians, unrest in Karabakh, Ganja and Ghazah, the lack of resolute actions of the army “The Ittihad (the Union) party trying to overthrow “Musavat” took the way of opposition and called for the union with the Soviet Russia and fight against Antanta together with the Turkish army.

In the Turkish nationalist military structures Khalil Pasha, Fuad bey and others supported this opinion advocating the union with the Soviet Russia. The left wing of Musavat criticised the home and foreign policy of the new government. The head of the parliamentary group Behbut Khan Javanshir and the ex-Musavat member Maddad Hassan Hajinski supported the idea of the union with Bolsheviks.

The role of the national Army in the fall of the PRA should be mentioned too. As the XI Army approached Azerbaijan from the territory of Afghanistan the problem of foreign invasion was not considered properly. According to the Turkish historian Erel the Ministry of Defence gave the order not to offer any resistance to the approaching Red Army. (Sh. Erel. *The Policy of Azerbaijan*. Istanbul 1968). So the mistakes made in the defence of the country are connected with drawbacks in the leadership of the army and the government as a whole. There was certain separation among various sections of the Republic. As Sh. Erel states in the same work no military forces were sent to the North of Azerbaijan.

One of the well known emigrants Jeyhun Hajibeyli points out that the Caucasus and Northern Caucasus are linked historically but Azerbaijan and other countries of the area did not give Northern Caucasus a hand. (J. Hajibeyli. *Northern Caucasus and Azerbaijan*. “Kafkaz Almanaci”, Istanbul, 1936).

The issue of “The Caucasus Union” was being ignored or considered unsatisfactorily but it was discussed very often by the political emigration. Expressing the general opinion J.Hajibeyli blames the failure of the idea of the Caucasus Union because of the lack of mutual support.

On the other hand the war waged against Armenia, Azerbaijan and Georgia prevented the formation of the Union and gave way to the intervention.

After the intervention of April 1920 and the fall of the Republic there were a number of publications in Turkey intending to split the opinion. M. E. Rasulzadeh wrote that in Turkey there was no distinction between the national Azerbaijan and present-day Azerbaijan. Some people in Turkey believe that Bolsheviks were actually asked to come to Azerbaijan. In 1937 he wrote, “The British-oriented Musavat party gave all kinds of deceitful information about the sovereignty of Azerbaijan” and noted that it led to the weakening of the relations between these two friendly countries. (Rasulzadeh M.E. *Muhitin birgen gore Azerbajan-Turkiye munasibeti*. “Kurtulush”, N36, 1937). At that time Ali Amir, the Turkish politician

wrote, “Azerbaijan is not connected to Turkey, it fell because of the independence”. But Azerbaijani emigration’s opinion was caused by the fact it was not joined with the republics of Caucasus and opposed the views of Ali Amir. In Azerbaijan some politicians thought that Turkey was worried by the southern buffer of the Caucasus independence. Alongside with these views the Armenians and a number of Russian emigrants argued that the leaders of PRA had an objective to join the whole territory of Caucasus to Turkey. This propaganda was much supported by Armenians abroad. However many analysts, (Muhiddin Bergen and others) openly said that Azerbaijan’s independence as well as the whole of Caucasus was to the benefit of Turkey as it created a southern security buffer. M.E. Rasulzadeh wrote in his work “Asrimisi Sayavushu” that Azerbaijan’s independence was of benefit not only to Turkey but also to Iran. He showed that ethnically Azerbaijan was close to Turkey and culturally it was related to Iran. So Azerbaijan played a role of a kind of a bridge between these two countries. Yet Erel and some other politicians claimed that M.E. Rasulzadeh F.Khoyski, N. Yusifbeyli and other governments members, calling the PRA Azerbaijan, separated it from other Turks of the Caucasus which was obviously a mistake.

On the international arena in 1920 the situation was complicated. Traditionally hostile Russia and Turkey were forced to have closer relations. It is true there were certain forces also wanted the Russian army to go to Anatolia. At the same time the presence of the Russian army in the Caucasus played an important part in the foreign policy of Turkey. The independence of Azerbaijan as well as other countries of the Caucasus was nor a priority for Turkey. Another important factor in this complicated international situation was a belief that the Bolshevik regime was not gong to last long. Turkey was engaged in the war and was not able to come to Azerbaijan’s rescue. It protected itself.

The emigration publications blamed the corruption in the upper circles of the government of Azerbaijan. They also noted that naming the country Azerbaijan disintegrated the Turks of South and North Caucasus. For example, M. Efendiazdeh in his work “Azerbaijan and its Revolution” clearly says that the fall of the Republic was caused by the mistakes in the management of Azerbaijan, personnel management, localistic tendencies and corruption. The other said, “Those who wanted to seize power of Ganja aristocracy just wanted to grab the country” (Efendizadeh M.E. Azerbaijan and its Revolution – Turk Dunyasi arasholirmallari, N7, 1995).

In our opinion it is essential to reveal the smallest facts connected with the period of the loss of Azerbaijan’s independence in 1920, to analyse the experience of the period preceding. It will strengthen and consolidate the national independence gained again.

Political terror and arrests that followed the fall of PRA forced the leaders of the Republic, a large number of politicians and statesmen to leave the country. Fatali Khan Khoyski, Mustafa Vakilli, Shafi Rustambeyli, Nadhi Cheysamil and others had left for Georgia a short time before. Hassan bey Agayev who was at the head of the delegation to the Transcaucasus Republics Conference did not return from Tbilisi. Those were the first emigrants. To make the situation known to the outer world they published an official declaration. Soon after that Fatali Khan Khoyski and Hassan bey Agayev were killed in Tbilisi.

M.E. Rasulzadeh and A. Kazimzadeh who were trying to cross the border of Georgia were arrested and some time later were released by Stalin and sent to Moscow. (The National Security Ministry Archives, file PR – 19877, p. 53) In 1922 M.E. Rasulzadeh fled first to Finland and later to Turkey. In 1919 Ali Mardan bey Topshibashov who was at the head of the delegation to the conference in Paris and some of its members had to stay in Europe.

On 8 September 1920 they addressed an appeal to the League of Nations in Paris. Later on November A. M. Topshibashov participating in the meeting of the League of Nations in Geneva officially declared of the invasion of Azerbaijan and its capture. After that he took part in the conferences held in Lasagne, Geneva, London and declared that Bolsheviks who came to power by illegal violent means are not entitled to represent Azerbaijan internationally. On 8 May 1921 on A.M. Topshibashev's initiative the Caucasus emigration discussed the views on the Caucasus Confederation with the PRA representatives in Paris. On 10 June 1921 the first meeting of the Caucasus Republic's authorised representatives chaired by Topshibashev came to a decision to create their union. On 7 July 1921 the first joint meeting of the officials representing the Caucasus Republic and Russia took place. The emigrants addressed their appeal to the government to France which later next year decided to provide financial assistance to the authorities of the Caucasus Republic as the French government were inclined to provide assistance to antibolshevik forces. A.M. Topchibashov who was presiding at the meeting and representing Azerbaijan spoke in favour of the Turkey and Caucasus confederation and pointed out that the Turkish-Bolsheviks agreement was going to be short-lived because the Bolshevik ideas contradicted the traditions of Islam. Ataturk emphasised that "... today the Soviet Union is our friend, our neighbour, our ally. We need this friendship, however no one knows or predicts what can happen tomorrow. This union can disintegrate like the Osmons, like Austria-Hungary. The nation it is holding tight in its fist can flee. Among these nations there are those of the same faith, the same religion. We are to be prepared to lend support". Topshibashov's protective attitude towards Turkey was looked at with suspicion by France and

Armenia. The meeting failed to come to any agreement. Yet Topshibashov did not give up his attempts to change the western opinion on Turkey and to establish the Caucasus Nations Confederation. Topshibashov also tried to turn the only of the organisation of the emigration – AMM - into a solid body. Both Topshibashov and M.E. Rasulzadeh played a historical role here. Topshibashov's role is most important in signing the Caucasus Confederation Pact and creation of the Caucasus Confederation Council.

It should be noted though that the first political organisation of the emigration was formed in 1923, after M.E. Rasulzadeh arrived in Turkey. It was called the Foreign Nations Bureau of the Musavat Party in Istanbul.

The leaders of the Party and the Bureau kept in touch with the underground Musavat Party in Azerbaijan. Besides the Bureau and the Central Committee the main issues of the party were dealt with by its leaders: M. E. Rasulzadeh, Khalil khashmandarov and MamedSadikh Akhndzadeh. Only they knew the members of the underground Central Committee of the Musavat party in Azerbaijan and gave orders to them. M.E. Rasulzadeh organised the publication of "Yeni Gafgazia" magazine. The head of the party reported to the Central Committee monthly reporting of the situation in Azerbaijan and giving general information. At that time the Youth Union of Azerbaijan was created representing the interests of all emigrants of Azerbaijan. M.E. Rasulzadeh and Topshibashov tried hard to create the Union of all Caucasus emigrants. "Yeni Gafgazia" published materials discussing the tragic events that happened in Azerbaijan under the Soviet occupation and unmasked the bolcheviks' policy. The magazine was brought to Azerbaijan secretly as well as to Iran, Egypt, Afghanistan where it was accepted with interest. All this worried the soviet government. The central communist newspapers in Baku and Tbilisi, the communist leaders' speeches at conferences and meetings clearly reveal it. The Soviet Foreign Minister, Chicherin pointed out to Ordjonikidze, who was responsible for the Caucasus affairs, that the Musavats in Turkey were being very active and Turkey was encouraged to express their protest. "The Communist" newspaper published the open call of Mirjafar Bagirov, the National Security head, to crash the local supporters of the nationalists abroad.

At that time the Turkish government increased its pressure on the Musavat limiting their political and publication activity which was done under the influence of the Soviet Government. The Turkish government had to sustain friendly relations with the Soviets due to a number of the agreements signed: 16 March 1921; 13 October 1921 – the joint agreement of Azerbaijan, Georgia and Armenia, the non-aggression Pact of 1925.

As a result Turkey banned the publication of "Yeni Gafgazia" in 1927. However in 1928 "Azeri Turk", "Odlu Yurd" in 1929-193, "The Bildirish" Weekly, "The Istiglal" newspaper in Berlin, "Gurtulush" magazine published materials based mostly on the "Yeni Gafgazia" 's program. So,

even after “Yeni Gafgazia” had been closed, the new press continued its activity.

However in 1932 the Istanbul period of Musavat and its publications was over and the European period started. In 1930 M.E. Rasulzadeh was invited to Warsaw in connection with the Caucasus matters (The National Security Ministry Archives, Fund 1, File 39, p. 98). In view of this the Foreign Bureau supported the suggestion to transfer the Caucasus Istiglal Committee to Warsaw on condition that its branch should be functioning in Istanbul (Ibid. p.99). After M.E. Rasulzadeh left for Warsaw Turkey announced that it could not allow a hostile-oriented organisation to operate in the country to which M.E. Rasulzadeh strongly protested. He was refused an entry visa to Turkey. He married Pilsudsky’s close relative, established relations with the Poland’s Foreign Affairs Eastern Department and thus stayed in Poland. One of the Musavat leaders Rustambeyov and some others met a number of Turkish officials, among them the head of the Foreign Ministry Political Section Rajay bey and declared their objective to free Azerbaijani people. It was also announced that the Istanbul Foreign Bureau of the Party and the National Centre of Azerbaijan were functioning in Istanbul and Iran through the Embassies of Turkey and Poland, the latter giving them financial support. Rajay bey stated that the official friendly relation with Russia prevented Turkey from contacting the national liberation movement. On the other hand Rajay bey noticed the disagreements and arguments among the emigrants who spread mean rumours about Rasulzadeh and others and strongly recommended to put away with these unpleasant facts. Ismet Pasha shared his opinion, too. Still M.E. Rasulzadeh was not be able to return to Turkey. According to the documents of archive Rasulzadeh prepared an address to Ataturk which the Central Bureau discussed and recommended to be sent. (The National Security Ministry Archives, fund 1, file N3). In his address M. E. Rasulzadeh explained that Azerbaijani emigrants’ objective was to fight and liberate Azerbaijan. He also noted that he had given six years of his life to this deed, thus could not help expressing his negative reaction to some civil servants who refused to grant him a visa. Finally he requested to allow his entry to Turkey (The National Security Ministry Archives, F1, file 1,N3). The early 30s were the period of severe conflicts mostly among the National Centre and the Musavat party Foreign Bureau. Discord and arguments led to a split in the Party. In 1925 Sh. Rustambetyli and Mustafa Vekilli who were for western-oriented policy condemned M.E. Rasulzadeh for limiting the activity of the National Centre of Azerbaijan and the Musavat Foreign Bureau within the borders of Turkey. Yet later they blamed him for being too pro-western oriented and forgetting Turkey. A group of emigrants in Paris – A. Sheikhlislam, J. Hajibeyli and others joined this criticism. M.E. Rasulzadeh arrived in Paris in 1928 and had

lengthy discussions with A. Topshibashov, that is the Paris group, resulting in some agreement. The Paris group included Mir Yahub Mehdiyev, the ex-parliament member and representative of PRA at Versailles conference, Aga Sheykhulislamov, who had been a member of one of the socialist parties in the parliament; Maherrramov, representing the right-wing parliamentary group called “Hummet”, Jeyhun Hajebeyov the secretary of the group at the Versailles Conference. M.E. Rasulzadeh headed the Istanbul group that included a member of emigrants, among them Musa Rafiyev and others. (The National Security Ministry Archives, fund 1, file 1525, p. 145). Some time later, thanks to some influential people’s efforts, the disintegration of the Istanbul branch of the Musavat party was temporarily stopped. About this period M. Rasulzadeh wrote, “Khalil bey and Shafi bey make it up with us only in words not in actions”. Khalil bey criticised Shafi bey in “Falling Idols” and “We and They”, M.Rasulzadeh wrote a critical work “Shashibeyism”. Thus in 1928-1934 deep contradiction among emigrants resulted in complete split and formation of hostile groupings. In 1930-31 the publication of most Musavat newspapers and magazines was stopped, the leader of the Musavat Party left Turkey and all this led to acute contradictions among emigrants. Some emigrants initiated bolshevism-oriented international unions, the two of them being “The Caucasus Confederation Council” and the “Prometey” “nationalists. Among the members of the “Prometey” were Armenians, Russians and the nationalists who emigrated from the USSR. “The Prometey” was organised by M.Rasulzadeh who associated Azerbaijan and the Caucasus with “Prometey” blaming Russia for their miserable conditions. The union published a magazine under the same name. In 1936 (May 31-June 1) a conference was held in Warsaw representing the nations of “The Prometey” where the main issues discussed and criticised were the alphabet reform in the USSR and language problems. One of the main areas of “The Prometey”’s activity was financial support to other emigrants organisations’ newspapers and magazines and the conference decided to offer support to the Paris, Warsaw and Berlin head offices of emigrants’ publications.

The Russian emigrants organisation headed by Kerensky and Milyukov was in strong opposition to “The Prometey”, to the idea of non-Russian national independence. The organisation of Turkey-based emigrants’ Unions was their concern, leading, in their opinion, to panturkism and panislamism that could rock Russia’s fate. In 1939 after the occupation of Poland “The Prometey” was no longer functioning.

In 1927 the organisation uniting Azerbaijan, Georgia and Northern Caucasus called The Caucasus Independence Committee was formed on the “three-one” principle: the three Caucasus Republics plus Poland. Poland was supposed to correlate the activity of these three republics and offer financial and other assistance. However, the Committee encountered serious

difficulties due to the Georgians' separatist approach. As a result Poland organised a meeting of the Committee in Warsaw in 1930 with the participation of the representatives of the Georgian faction - Ramishvili, Zurabishvili, Salakaya, Daghistani, Mammed Ghirneybey and two others. From Azerbaijani faction there were M.E. Rasulzadeh and two others who arrived from Paris. Poland was represented by Golovkła, Shetsel and a few others who were from the Ministry of Foreign Affairs and the military. (The National Security Ministry Archives, f.1, file 39, p.158).

The heated arguments on the Georgia representatives' opinion about the danger from the North as well as from the South (the new Turkey) and their negative reaction to panturkism were met by Poland's and Azerbaijan's strong criticism. However the meeting raised a number of problems interfering with the Union of the Caucasus. It was decided to transfer the Committee from Istanbul to Warsaw (Ibid. p. 162). It was noted that Azerbaijan was to take special efforts to facilitate the Caucasus Union and the activity of Independence Committee Istanbul Branch (Ibid. p. 167). I would like to draw attention to the letter sent to M.E. Rasulzadeh to the National Centre in Istanbul in which among other issues he says that A.M. Topchibashov sharply protested against not having been invited to the meeting which he had all the authority to attend. Answering his claims to represent a separate organisation Rasulzadeh remarked that Poland recognised only the National Centre as such.

At that time there were serious discussions and criticism on the issue of the Caucasus Union among the Azerbaijani emigrants, too. Alongside with the Georgian faction, the Dagestan group headed by Shamilov joined actively in the criticism and debates. Thus at the joint meeting of the National Centre and the Musavat party faction held on 9 November 1930 Mirza Bala Kazizadeh and M.E. Rasulzadeh speaking on behalf of M.E. Rasulzadeh called to clean the Shamilov group of such people like Bicherakhov and to create a new, sound force with which close relation could be held. Khasmammedov, Vekilov and Rustambeyov called to break all relations with that group representing Daghestan. They stated the group harmed not only to the Musavat but also to M.E. Rasulzadeh himself, noting that Shamilov had suspicious contacts with the English. (The National Security Ministry Archives, fund 1, file 3, p. 80).

The Daghestan faction located in Paris split into three groups. Shamilov was at the head of one of these, Chernoyev-Bammat headed the other, the leader of the third group was general Khakandakov. A.M. Topchibashov made several attempts to reconcile the three groups. (ibid. p. 162)

Being influenced by the criticism and arguments some emigrants tried again and again to stir up discord between Rasulzadeh and Topchibachov. In 1928 Sh. Rustambeyoli, Kh. Khashmandarov and Sadik bey presented the

fact of Rasulzadeh going to Paris with Topchibashov and coming to an agreement with him as his surrender. Other emigrants created tension between these two people calling Topchibashov a person of great value, from whose hands the power was taken and given to M.E. Rasulzadeh.

In June 1952 a letter "Bitter truth" was published in the National Union's organ, "Azerbaijan" magazine that came out in Munich, signed by seven Azerbaijani emigrants. The letter claimed that the Musavat Party had been split since 1934, it had long lost its original influence and Rasulzadeh was entitled to speak only on his own behalf, not as a member of the National Council of Azerbaijan. Those who signed the letter (Sh. Rustambeyli among them) announced that on May 26 1918 the Transcaucasus Seym was dismissed and the Turk faction of the Seym headed by Hassan Aga oglu gathered in the "Orient" hotel in Tbilisi announced the organisation of "the National Council" and declared to the whole world the independence of Azerbaijan. This council (faction) held a one-hour meeting in Gandja with the aim of creating a new Government. M.E. Rasulzadeh chaired only this one-hour meeting of the National Council. On what occasions then M.E. Rasulzadeh calls himself the chairman of the National Council? Those around him presented Rasulzadeh as the president of the National Republic of Azerbaijan. Such accusations in the time of Azerbaijan's fight for independence were very serious for Rasulzadeh who resisted them.

In this period the Caucasus Union tried to involve the Armenians in the Council. However, the Armenians preferred the union with the Russian emigrants and put forward territory claims to Azerbaijan and Georgia in Russian press. In spite of the Armenians negative activity the emigrants signed the Caucasus Confederation on June 14 1934 in Brussels and on 14 February 1935 the conference was held which announced the creation of the Caucasus Confederation Council. This event was A.M. Topchibashov's dream that came true at last. Unfortunately he did not live to see it as he died in 1934. The Council was summoned on a regular basis, political issues referring to the Caucasus were discussed and perspectives put. Azerbaijan was represented in the Council by M.E. Rasulzadeh who chaired the National Centre.

Unfortunately after the Caucasus Confederation Pact was signed the arguments and contradictions among the Azerbaijani emigrants did not give up. They did not criticise the ideas of the Confederation but the people who signed the Pact and the leaders of the Council. M.E. Rasulzadeh was severely criticised for his co-operation with the former tsarist general, Osetian by nationality, Lazar Bicherakhov who used to do a lot of harm to Azerbaijan and had to be represented with him in the Caucasus Confederation. His opponents blamed him for the occupation of Azerbaijan

finding him responsible for a number of problems and declared that he had no authority to represent the country abroad.

Shafi bey wrote blaming Rasalzadeh that “his real friends are Georgian socialists, Armenian dashnacks, his natural allies are the Cassaks and Ukrain”. (Kalladin Ibrahimli. the Political Emigration of Azerbaijan. “Elm”, 1996).

During World War II the emigrants who joined the Caucasus Confederation Council individually and as unions had discussions with Germany’s official circles about the liberation of their countries.

On 11-16 December 1952 the “Caucasus Jumhuriyyat” members held the all-Caucasus Conference in Munich. The declaration was signed by M.E. Rasalzadeh, the chairman of the National Centre of Azerbaijan, N. Jordania, the chairman of the National Political Centre of Georgia and prof. Akhmed Maghoma , the head of the National Committee of Northern Caucasus. This was the last joint session of the Caucasus emigrants (Kh. Ibrahimli. The Political Emigration of Azerbaijan. “”Elm”, 21966).

When World War II started M.E. Rasalzadeh and Hilal Myushi established the National Azerbaijani Committee in Berlin, that played an important role in the formation of the Azerbaijani legionaries. In 1945 another organisation headed by M.E. Rasalzadeh was set up. It was Azerbaijani Democratic Union and after the war it helped the Azerbaijani legionaries who suffered difficulties to settle in different countries.

In 1943, Major Fatalibeyli-Dudanginski who went over to the Germans, set up a political organisation called “The National Unity of Azerbaijan” that tried hard to convince Germany to recognise Azerbaijan’s independence. After the war a number of new emigrants, among them A. Sheikhulislam, J. Hajibeyeli, I. Akber, J. Kazimbey and others were in opposition to the Musavat Foreign States Bureau and the National Centre of Azerbaijan. After the war Fatalibeyli was at the head of the Azerbaijani Department of the “Gurtulush Radio”, located in Minich and financed by Americans. In 1954 Fatalibeyli was killed by a Soviet spy and “The National Centre of Azerbaijan” ceased to exist. In 1947 the Azerbaijani emigrants settled in Europe, M.E. Rasalzadeh among them, returned to Turkey. In February 1949 Azerbaijani Cultural Society headed by M.E. Rasalzadeh was set up in Ankara that united the Azerbaijani emigrants, the Musavat members, as well as various emigrants.

Even though the emigrants were as active as they used to be they continued their activity during the following years and published their own newspapers and magazines in Paris, Berlin., Ankara and other cities until 1960. Their great patriotism and fight for the liberation of their native land was not in vain, it left its legacy and will be a model to the future generations.

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ON COGNITION IN SCIENCE AND EVERYDAY LIFE

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Summary

The position held in this article is both constructivist and evolutionary. If the concept of cognition is extended in a broader way science can be seen as a knowledge gaining process that does not basically deviate from everyday cognition but just gradually. The possibilities and impossibilities

demonstrate the scope of science: it is the intersubjectively experienced reality (consensus reality) that can be studied in its principal relations.

Science is described as luxury of reality that is not essential for the survival of the human species but certainly it is of high relevance for a particular consensus reality.

The evolution of organisms is seen as an evolution of constructs that have co-evolved in a harmonious way.

1. The Problem

In a first approach man is a realist both in science and common thinking. He is accepting the world as a real entity (structure) that seems to be accessible and cognizable to him “as it really is”. This acceptance is correlating with the seemingly coherence and repeatability of his perceptual processes and with his successful acting.

On the basis of this understanding science becomes the rational approach of man to explain himself and the world and to give us an accurate representation of this world.

This naive approach of common-sense and scientific realism is met with opposition. Two and a half thousand years of traditional western philosophy demonstrate that the rejection of such an epistemological position does have a long history. In this time period several alternative concepts have been developed. Today the discussion is in a state of considerable ferment and has regained topicality as new findings and theories have enriched many scientific disciplines such as brain research, quantum physics, and cosmology.

For the scientist who is reflecting his work this discussion may lead to a feeling of insecurity. The question arises what counts as science, what type of knowledge can he find and in which direction does his scientific work fundamentally aim. Therefore he is demanding an epistemological concept that answers his questions for his own position and the reliability of his statements. In addition such a concept should also include the field of applied sciences e. g. medicine or technology and should take into consideration the conditions of human everyday life with its biological, physical and social circumstances. And from a principal point of view it should demonstrate what is possible in science and what is not.

2. Basic considerations

2.1 Is objective knowledge possible?

In this article the basic assumption is held that the human mind is not able to find an objective distance to itself. Therefore there is no final justification for human thinking. As we cannot leave this field of human thinking and cognition we cannot give an objective statement on a possibly

existing world and about ourselves. Therefore all our statements have to include the idea that everything that can be said (also in this article) is said by a human individual, it is the product and the construct of a human mind. Man always is part of his statements.

In epistemological considerations the situation should just be the same. Again the acting of the human mind without any presuppositions is not possible. To describe an objective world, or in other words, to describe the world objectively, would need observations without an observer being involved. Therefore it becomes necessary to produce a cognitive construct on the basis of knowledge that cannot be objectified ultimately. This construct will then become the explanatory basis for all the past and future knowledge gaining processes. So a **circular procedure** is indispensable the moment we negate the possibility of objective knowledge.

The interpretation of certain scientific theories and results will guide us in the same direction:

- (1) Biological science tells us that organismic evolution has been taking place and still is, producing a permanent change of the systems of our world. The conclusion may be drawn that also the cognitive faculty of organisms has been and still is subject to this process. Therefore the product of knowledge gaining processes has always been changing and will always change.
- (2) Perceptual constancy seems to be out of question only as long as it is unreflected. But if we go into depth the idea cannot be upheld neither for a single person nor even less for a group of persons. The use of technical aids does not change this fact in principle.

These two arguments do also reject the concept of objective cognition for man or any other living thing.

2.2 Does the world exist?

As the existence of the world cannot be proved it can be questioned. For the scientist and for man in his everyday thinking this philosophical speculation is of no relevance. For both of them the existence of the world including man is evident. Which reason should they have for such a doubt? It would take away the basis of their own acting. So in this article the term „world“ is comprising whatever may exist no matter whether it is observable or not.

2.3 Which conclusions can be drawn?

If we accept the existence of the world we also accept the existence of ourselves as parts of this world. Therefore our further considerations should not exclude this world, otherwise our primary assumption of its existence

would have made no sense. The necessary and important restriction that we should not forget is, that we cannot make any objectively qualifying statements about the world. The product of our cognitive processes than is a subjective construct which cannot be separated from the structures and the faculties of our organism. It is referred to as **reality**. Reality is what an organism makes out of the world.

We, therefore, have to find a circular construct of internal coherence which will guide us to a subjective concept of cognition. In addition it should also permit communication based on intersubjective knowledge and cognition. This construct should adopt both scientific and everyday knowledge in a coherent framework and it would be realistic in the sense that it was produced on the assumption of an existing world.

3. Reality – cognition - knowledge

3.1 The construction of reality

On the basis of our experiences, which we do not question for the time being, our reality presents itself as an evolving and dynamic structure. In our thinking we can distinguish between interconnected components (single systems) of different levels of order (e. g. electrons, molecules, crystals, cells, human beings, social systems, solar systems). We experience ourselves as acting parts in this reality. The relations between the systems are seen to be cybernetic ones, they are circular, the feedback may be positive or negative, and the systems are never isolated. We find a hierarchical order underlying this network of systems.

Scientific findings support the assumption that each living organism is able to react on causes (or stimuli), that originate in other systems, only in a way that corresponds to its own structural state. This state is highly determined by its previous experiences. Consequently there is no cause or information per se. Different causes always lead to system-depending reactions, they are processed into system-depending information. Therefore seemingly identical causes may produce different reactions in different systems and vice versa.

The observing person is deciding what a system is and where to draw the line between it and the surrounding systems. We constantly use systems terms in science and everyday life referring to unities that we define and provide with characteristic features. We split up most of these systems into various subsystems and they all are parts of a network of relations. The simplest systems in this hierarchy that cannot be traced back to smaller subsystems are subject to physical research today.

The foregoing statements on cause and information can be applied to all types of systems and their relationship. For instance the same dose of

ultraviolet radiation may be lethal to some bacteria, in the human skin it may induce the production of melanin and vitamin D and it may also influence the immune system. Similar examples could be found in all fields of science and humanities.

The effect „death of bacterium“ or „production of melanin“ may be explained with the cause „ultraviolet radiation“. We trace back ultraviolet radiation to other causes in the sun and so on. We may go back as far as we want to and as we are able to, each description of a cause will actually be a description of an effect on another level and in a new context effect will become a cause. In the end we invent final or basic causes (concepts, axioms) like forces, energy and fields. Horizontal interrelations between the systems of a specific level of organisation are added to these vertical causalities. All in all the concept of cause and effect becomes blurred and the use of causation only makes sense in a limited field of this network.

These ideas and examples can be transformed into a principal statement. The specific effects that occur in a living system represent characteristic **qualities** for this system. The system produces these qualities depending on its own faculties. The qualities are individual constructs of the system. So the response to external or internal causes is an active, system-dependent process based upon its structural state which is the result of its ontogenetic and phylogenetic history. Therefore this process never is a presuppositionless one. It produces with the help of above named effects (qualities) an individual reality, which represents the sum and association of the system's constructs. So the system is cognizing on the basis of qualities set by system-dependent standards. This enables it to discriminate, to compare, to evaluate and to select. The constructs become **meaningful** for the system. Constructing qualities represents the utmost brink of the cognitive faculty which is constantly changing in the flux of the system's history and cannot be traced back to final causes in the world.

Following these ideas **a person's reality** is the world he creates with the help of his experience and cognitive faculty according to his own standards on the basis of interrelations with other systems. It comes into being during ontogenesis, changing constantly, being built upon the already existing reality constructs and the individual phylogenetic preconditions. As a **subjective** reality it is also an **intersubjective** one, right from the beginning of the individual life, as a consequence of its genesis.

Cognizing the world is changing into constructing reality. Therefore the question how the world „really“ is, does not make sense. The moment qualities are produced and assigned a subject-dependent reality is created. A „final“, „true“ or „objective“ reality would have no qualities, it would not be accessible to any observer in principle. So man's reality is an individual human reality. The use of technical aids with the intention to objectivate

cognition does not change this statement at all, as these aids are materialized products of the human constructive faculty.

In summary human reality can be described to be **limited** and **circular** within the bounds of man's cognitive faculty, it is **dynamic** as a consequence of constantly changing cognitive conditions, it is **structured** and **ordered** to some extent by his forms of thought. It is at the same time a **subjective** and **intersubjective** reality. We may **change** it by acting and it is changing us.

3.2 The extended concept of cognition

Man can be described as a living system which is made up of interconnected subsystems. These subsystems (e.g. organs or cells) are without exception interdependent in their functions. The construction process, therefore, of „cognizing“ cannot be reduced to the sole activity of a single subsystem, the so-called „cognitive apparatus“, consisting of sense organs and the evaluating components of the nervous system. Effects in other subsystems that do not become conscious are also a production and processing of qualities, they are also constructs. Consequently both the complete system „man“ and each of his subsystems are capable to cognize.

This statement can also be derived from an evolutionary point of view. The evolutionary tree of all multicellular organisms may be traced back to unicellular organisms. These first living things were, just as we are today, parts of their world. Their relationship with their world should, in principle, be corresponding with man's relationship with his world, just on another level. They also had to produce qualities for the construction of their own reality. This early cognitive faculty was not lost with the integration into multicellular organisms, it just had to be adapted to the new framework. In the course of cell differentiation and the following division of labour within the organism the cognitive faculties became modulated, but no cell lost this basic faculty. A multicellular organism is made up of organs, tissues, cells and smaller units which all possess their specific cognitive faculty. The connection of these constructs produces cognition of the organism as a whole.

This extension of the cognitive concept as a performance of the whole system can be applied to all living things on the globe including human beings. Man lives in this reality, he acts in this reality. It determines the particulars of his ontogenesis and his phylogenesis. Human cognizing of the world may be described as constructing reality by man as a whole, it may be referred to as **general cognitive faculty**.

If we describe man's reality as the cognitive world of the whole organism we gain a concept that covers all sorts of experiences like delusions, illusions, pain, illness, bodily damages, joy, love and so on. This

extension of the cognitive faculty of organisms is gaining that importance which should have been crucial in their evolution.

In the course of evolution many species developed specific cognitive organs which are able to produce a more or less sophisticated world of imagination. Their **specific cognitive faculty** is completing and extending in a harmonious way the already existing general cognitive faculty of older phylogenetic origins. It is based on it. In this field of brain and sense organ activities an extensive production of construct networks and hierarchies takes place, the own organism becomes part of the individual world. Intellectual and conscious cognition becomes possible, reflective thinking is questioning experiences and the cognitive process itself.

3.3 Living systems have different realities

If we accept that reality is system-dependending we may also accept the assumption that identical causes lead to different realities in different living things. That means that all living things are living in their own individual reality. The construction of reality creates a corresponding and concrete acting of the individual. If different realities are overlapping at least partly, a collective and networked reality system may come into being including the option of parallelized acting (see **consensus reality**).

Some of the realities of living organisms are differing considerably mainly as a result of their different biological structure. Still, their common and successful acting and coexistence can be observed in our reality for a limited time period. Biological disciplines demonstrate clearly – though using another terminology - that these reality constructs „function“, they „fit“. This is an observable fact both in the horizontal snapshot of the coexisting species and individuals in present time and the vertical changes in a common evolution. In this web of reality constructs past events become the fundament of present states. From the evolutionary point of view it is a logical necessity to assume that the construction of a given reality has to be done in such a way, that organisms may survive successfully in ontogeny and phylogeny in interdependence, and also depending on non-living factors. Reality constructs therefore cannot be described as free, arbitrary or contingent fictions.

Reality constructs of different living organisms may be expected to be more or less overlapping because of their common descent, the constructs being produced in the course of a common evolution. So reality producing cognitive faculties have evolved in interdependence with others. It could be imagined to draw an evolutionary tree of organisms on the basis of the different reality constructs, although we have no direct access to their realities. Observing animal behaviour has been a valuable method in that respect. LORENZ (1941) constructed the evolutionary tree of ducks on the basis of their courtship behaviour, just to give one early example.

3.4 Consensus reality

Humans describe large fields of their realities in a rather corresponding way. These correspondences are increasingly matching when we observe persons belonging to the same culture group, particular communities or ethnic groups.

The reasons for these correspondences and consequently for the intersubjectivity of cognitive processes may be found in the **biological foundations** of the particular person and in his **social preconditions**.

We may assume that the biological foundations of cognition in most humans are of a similar standard. But man is also a social being. Communicating with others he is extending and changing his personal reality and at the same time influencing the surrounding social field. In the course of a human life a web of interactivities and interdependencies between the individual and his surrounding field of social activities comes into being. In social communities the conformation and parallelization of actions becomes necessary. Different communities or cultures may develop their own approaches to problem solving and „understanding the world“.

Communication requires an extended and complex social consensus that can be observed for instance in the fields of language, behaviour, common values and similar strategies of action. Now on the basis of this consensus communication makes possible an extensive fusion of individual reality constructs and an intersubjective assimilation of experiencing and describing experiences is performed. By combining the different contents of their experiences the individuals that take part in this process are producing a limited, immensely dynamic, intersubjective reality, a **consensus reality**. The single person feels sheltered in it, here he meets his fellow-men, an „agreement“ has been found.

As consensus reality is emerging from individual reality constructs it assumes their **basic limitations**. A **further limiting factor** is communicability. Only the communicable parts of the personal reality can be contributed to a common reality. And there are further constraints as no absolute identity of meaning for linguistic constructs in human relations may be expected. Therefore, whatever we contribute, it is more or less fragmentary and incomplete.

Deviations of individual reality experiences from consensus reality are happening frequently. The individual person may find these dissonances or even differences to be disturbing. But quite often they are felt to be motivating and may become a permanently used friction surface.

Following these ideas consensus reality actually is a limited reality of language (in the widest sense of the word), or communication. Although it

is incomplete, problematic and full of misunderstandings, it accommodates close human relations and social units.

Certainly the concept of consensus reality may be applied to other living organism, too. And it may also be postulated for the subsystems of an organism to understand a living thing in all its harmony.

3.5 Luxury of reality

Today's scientific knowledge tells us that only once in the history of our globe living organisms developed the ability to question their own cognitive faculty and to search for their own origins. This highly developed specific cognitive faculty makes us believe to possess the comparably greatest freedom of choice and the broadest field of reality. The human specific cognitive faculty obviously is covering much more than is necessary for biological survival. We could say our reality is the most luxurious one, and we could refer to this feature as **luxury of reality**.

4. Science

One aspect of science is that it can be understood as luxury of reality based on consensus. The biological survival of the human species does not depend on it.

We understand our reality as a network of systems changing constantly in time. These systems are of a different level of order and interdependent. In addition we introduce spatial and temporal dimensions, we structure our reality hierarchically. From our observations we deduce regularities and scientific laws, causality and prognoses. Consciously or unconsciously we forget that we ourselves are the producers of these laws, that all experiences are singular events within our reality. Therefore the expectations of scientists referring to regularities and prognoses and also the expectations of man in his everyday life can be justified only with their habits of life and former experiences. The ties between observable events are always created by the observer. Nevertheless this dealing with reality, that has its origins in the habits of everyday life and was taken over and refined by scientists, is found to have been successful in the history of all organisms. Living organisms of different levels of evolution demonstrate the basically same dealing with their own constructs. They always use singular observations to deduce similarity, general validity, and reliability for their actions. Inductive acting seems to be inborn in all organisms. And they all seem to have conjectures and expectations concerning future a priori. We may assume that this type of behaviour has been accompanying the organisms during their evolution and has led to the present evolutionary situation. An interesting observation can be made: organisms demonstrate goal-directed behaviour, they act purposefully towards future, while the

evolutionary process as a whole is described to be without direction, the mainstream-evolutionists prefer non-teleological thinking. The faculty of creating constructs, inductive inferencing and appropriate acting must have developed **commonly** in a very close linkage, they were subject to a **common evolutionary** testing.

On the basis of a subjectivist view of reality a corresponding view of science becomes necessary. If we accept that reality always depends on its producer we also have to accept that there is no subject-independent knowledge and no such science. Further it is held that there is no fundamental difference between scientific and everyday life cognition, it is just a difference in detail and degree. Both have the same basic pattern. Scientific cognition may be seen as a continuation of our everyday cognition. It is especially organized, systematic and responsive to experience and using more refined, partly standardized methods and aids, and we intend to use our rational capabilities.

What can science do for us?

As any other type of cognition scientific cognition first of all creates its own reality. To pursue science means to produce a structured reality on a certain level of order. Within this reality contradictions may be removed, new connections may be realised, problems may be solved, and new problems may be created. New possibilities of action are given in an extended consensus reality and human consciousness is achieving an essential enrichment.

On this basis science brings also order into our everyday cognition and does also structure and refine it. For a single person this may lead to a relevant extension and change of his cognitive scope, he may find a new orientation in his reality with corresponding practical consequences. Existing problems of practical aspects of consensus reality like medical or technical questions could be understood and possibly solved and the solutions might effect our life circumstances considerably.

By constructing correspondences and causality with reference to different singular events science succeeds to introduce additional regularity and laws into parts of our consensus reality. Therefore science is able to make **limited predictions** in a particular consensus reality – just as everyday cognition does. If our mind is not able to construct regularities in a particular field of observation it cannot give any scientific prognoses at all. This type of scientific procedure is in contrast with the fundamental knowledge that we cannot know anything about future.

What can science not do for us?

Following this argumentation science cannot have a final goal beyond its own scope. It is characterized by a basic lack of direction. This is a consequence of a fundamental impossibility: we cannot approach intentionally a final or objective truth. The actual direction of scientific

work can be derived from past constructions corroborated in their reality, from human intuition, from human intellect, from human emotions, courage and creativity, from social circumstances, from coincidence, and other roots. Science does not explain the world in an objective way, it has no access to the world, it has no claim to objective truth.

This model of thought does not describe science to be provisional or hypothetical in the sense of hypothetical realism (POPPER 1989, LORENZ 1977). In the given context both terms would imply an ultimate knowledge that science is either approaching or is giving a hypothesis about. Scientifically gained knowledge does either fit in an already existing reality construct in the sense of a confirmation or extension, or it does not. If it does not fit the existing reality construct might be corrected or altered and even massive changes of the scientific world view might be the consequence. In other cases the gained knowledge might be rejected by the scientific community (see KUHN 1989).

So any scientific theory is a theory on reality in the contextual meaning of the word. It is tied to the dynamics of consensus reality and is valid for the time being. Its reliability becomes apparent by deriving prognoses for the scientific consensus reality and still more evidently for the reality of our everyday life. As problems can never be solved in an objective sense the validity of a scientific statement is constrained to its consensus reality on the basis of the fundamental assumptions.

This view is producing a specific concept of **scientific progress**. Science does not produce a true image of the world that is permanently becoming better and more complete. But science proceeds and moves away from the previous in the sense of „moving itself and moving something“, of „changing itself and changing something“, and of „being dynamic“. On this basis we find in the various scientific epochs permanently changing and differently detailed structures of human reality. The idea of progress in the sense of a permanent improvement of the so far attained can be maintained in the instrumentalized scientific field of application in our present time period of civilisation. For our everyday life we could hold that progress involves losses as well as gains, we cannot measure progress as standards are constantly changing.

The **boundaries of science** result from the basic limitedness of human thinking and cognition and from the circumstances of the specific consensus reality. The scientific method as the main carrier of science is subject to this limitedness with the necessary consequence that the chosen method anticipates the result at least partly. In the method the result is reflected and vice versa. Consequently it depends on the method which reality problem can be worked on and possibly be solved. The solution of a scientific problem primarily is a scientific solution determined by the method valid within the scientific consensus reality.

Each of the scientific disciplines is developing its own methods, is changing them permanently and is depending on them. By using an exact description of the methods the experiment and the result seem to become replicable and the method is subject to an intersubjective control. In fact this replicability is quite vague and the tolerated dimensions of this vagueness is result of a consensus of the particular group of scientists. The scientific experiment is a singular event and it can be repeated only in approximation.

Using different methods on the same problem may lead to different results. From the relations of these results additional and quite often essential informations on the particular reality problem can be derived. Therefore a **methodological pluralism** is one of the primary scientific demands and is of utmost relevance for a reliable and applicable description of the connections of our consensus reality.

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HAZARDOUS WASTE IN EMERGING ECONOMIES

A REVIEW OF THE PRESENT SITUATION AND FUTURE TRENDS

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INTRODUCTION

Emerging economies frequently face difficulties to implement and enforce environmental regulations that transcend the immediate perception of its public and the acceptance of the local enterprises. For this reason,

many harmful materials and hazardous waste keep slipping to improper disposal sites for lack of an adequate public awareness or business support. This is particularly true when the payment of extra fees or new taxes is required to comply with the environmental laws and regulations.

In many countries waste is a matter of growing concern to the local authorities and environmental agencies because of the ever-increasing amount of waste being generated, and also for the geographical distribution of the sites where it is produced, most of it along densely populated areas. The increase in the level of consumption of their societies, leading to additional stresses on the environment, is usually identifiable in such countries.

On the other hand, harnessing the pollution that results of the municipal garbage can be seen as an opportunity to generate employment at the community level, through the implementation of recycling-reusing businesses based on innovative technologies and creative entrepreneurship. To take good care of the local environment can bring to such societies several subsidiary benefits such as labour opportunities and the dissemination of knowledge that leads to a better quality of life.

The purpose of this text is to identify initiatives that can be taken to curb the pollution of the environment in countries in a transition phase in their economies. The experience of Brazil in this regard is taken by the author to illustrate the several hazardous waste investigated. It is believed that the examples given are applicable, in principle, to other countries also in the stage of development.

This analysis is based mostly on examples of wastes generated at the production sites, as well as the waste resulting from products discarded at the end of their life cycles. Hazardous waste generated by health services, as well as nuclear and radioactive waste, will not be evaluated at this time.

PRESENT SITUATION

The belief that environmental pollution concerns us all matured in the second half of the 20th Century, as the themes related to quality of life and public health grew in importance to the society consciousness. The concept of sustainable development first expressed in the 1980s as it is currently understood, and the UNCED – United Nations Conference on Environment and Development -, also known as Rio 92, held in Brazil, have contributed widely to a surge of achievements with regard to pollution control. In Brazil a formal National Environmental System was legally defined in 1990, giving support to a series of measures taken to protect the environment, and leading to several directives and legal documents enforcing the treatment of special wastes, with a particular focus on hazardous waste.

The local definition of waste in three classes is based on the Brazilian Standard NBR 10004 - Solid Waste - Classification, published as a national standard in 1987. This norm classifies wastes according to their potential risk to the environment and public health. In spite of its title – solid waste -, the standard covers also semi-solid waste, such as sludge, and liquids like solvents, lubricating oils and PCB's. A revision in the text of the standard is currently under way, introducing new limits for the presence of several contaminants. It has to be considered that several components of waste – asbestos, mercury, cadmium, just to mention a few – have had their harmfulness potential reevaluated in recent years.

According to this standard, to classify a waste as hazardous requires at least one of these characteristics: to be inflammable, corrosive, reactive, explosive, toxic or pathogenic. Anyone of these characteristics qualifies the waste as Class I. The same standard defines as Class III all inert waste; and as Class II the waste that, although non-hazardous, is not inert and requires special attention.

The current situation in the management of hazardous waste generated in Brazil could be summarized as follows:

- 1- The existing facilities for treating and disposing of hazardous waste are insufficient in number and, to some extent, also in quality. With few exceptions, most of approved landfills are not conceived to receive hazardous waste. In addition, the country lacks exhausted underground mines that could be used as safe disposal sites. This has been a solution adopted by countries that have had extensive underground mining activities, that led to abandoned mining areas suitable to receive, either in drums or in bulk, waste mostly solid that require a segregated destination.
- 2- Soil contamination by industries is not yet as extensive as it occurs in the old industrialized areas of most developed countries. Cleaning industrial sites, however, is an issue that will grow in importance and costs as Brazilian industries get older and follow the trend of technological replacement identified around the world. Some industrial areas are already being converted into residential or services projects and this will require soil decontamination and remedial actions at their sites.
- 3- Some local industries are resorting to stockpiling their production waste on their own premises, for lack of safe disposal sites. Others have set up their own landfills or landfarming facilities. Some of the most important chemical complexes have invested in their own industrial incinerators. After the elimination of the stockpiled waste, these incinerators are being offered for treating third parties waste, becoming a subsidiary business area to their owners.

- 4- Some large industrial complexes of recent construction have included, since their inception, central treatment and disposal facilities to service all their facilities and downstream plants. This is particularly true for the two newest petrochemical complexes installed in the northeast state of Bahia, and in the extreme south state of Rio Grande do Sul. Stricter environmental protection procedures, and increased operational efficiency resulting thereof, have confirmed the soundness of this approach.
- 5- Co-processing hazardous waste in cement kilns is becoming a common practice in some states of the federation. Permits for this kind of waste destruction are issued at the local state level. Wastes with a positive energetic content, like oil sludge, resins, paint sludge, etc, are particularly benefited by this co-processing solution. A technical requirement that cannot be neglected in this solution are the filtering facilities demanded at the exhaust end of these kilns. Such filters can require important investment costs.
- 6- Brazil is a signatory of the Basle Convention for the control of boundary transfer of hazardous waste. The National Environmental Board – CONAMA - prohibits the import of hazardous waste. However the transfer of hazardous waste from one Brazilian state to another is allowed, provided the environmental agencies of both states agree with the transfer. This is a very sensitive issue for most of the emerging economies and countries in the process of development, when we take into consideration the costs implied in controlling the movement of residues in large territorial areas, under scarce supervision by the environmental authorities.
- 7- In spite of the increasing concern with regard to the enforcement of the environmental legislation and subsidiary regulations, the control of applicable measures is still somehow loose in many areas of the country. This is true not only because of the extension of the country, but also for lack of laboratory facilities and trained personnel to cover the whole country. On the other hand the increasing interest shown by many organizations, in setting up their EMS – Environment Management Systems – in accordance with ISO 14000 standards is, to some extent, rapidly replacing the role of the state control and inducing a private control approach, aiming at the new paradigms of eco-efficiency and continual improvement championed by these international standards.

It can be inferred from the items described above that similar situations are detectable in many parts of the world where industrial facilities are being enlarged, with a corresponding growth in their consumer markets.

One inconvenience in managing hazardous waste in emerging economies still is, to a large extent, the lack of specific laws and stricter

regulations concerning the generation and destination of solid waste. As early as in the 1970s there were in Brazil laws that already enforced specifically the control of air pollution and water pollution. For solid waste, however, there was not much done to establish limits and enforce control. To some extent, this scenario is still valid for the MSW – municipal solid waste -, that constitute a problem for most of the local municipalities: they do not have satisfactory facilities where to dispose of their waste. The obstacles in solving the problem of the MSW, on the other hand, require an additional control on the destination of hazardous waste in such communities where the hazardous solid waste can otherwise be improperly dispatched, together with non-hazardous fractions, to reclaiming areas in the outskirts of many cities.

The quantity of hazardous waste generated in Brazil is largely estimated and an exact figure is not available. In 1992, CETESB, the environmental agency of the state of São Paulo, has estimated a yearly production of 200 000 metric tons of hazardous waste in the Greater São Paulo alone, that consists of an urban area with about 20 million inhabitants. This waste figure is considered, however, underestimated, because it was based mostly on self-declarations produced by the waste generators. A generation of 2,0 million metric tons per annum of industrial waste in the whole country, including both hazardous and non-hazardous waste, is considered as a minimum.

Notwithstanding the incompleteness of data and the difficulty to draw a picture that could depict the whole country, it can be said that the streams of hazardous waste from the most important generating sources already have specific solutions and are being properly treated or disposed of. Among these streams we can identify:

- A- PCB's (Polychlorinated Biphenyles) - in Brazil the production and trading of these chlorinated oils is prohibited since 1981; their stocks, including transformers and capacitors filled with these products, had to be stored in possession of their original users until an accepted technical destination was available. The solution came up when the stocked material was sent for incineration abroad or in a few accredited industrial incinerators in Brazil.
- B- Lead - automotive batteries, currently the most important end user of lead in Brazil, are generally recycled in plants specializing in recovering the lead. On the other hand, the use of leaded gasoline was suppressed in Brazil since many years, when the country adopted the addition of ethanol to the gasoline, in what it was a world precursor.
- C- Waste from tanneries - most of the leather producers and shoe manufacturers have installed industrial sewage plants to treat their effluents. The investment and operational costs of these treatment facilities are shared among manufacturers installed in a same region.

- D- Heavy metals - liquid effluents rich in heavy metals have to be treated at their source. Several surface treatment plants located in the Greater São Paulo region run a cooperative conceived to store the sludge resulting from this treatment at a common site in order to implement a collective destination to their waste.
- E- Mercury - the recovery of mercury from industrial waste, and discarded products such as discharge lamps, thermometers, etc is already practiced. Most of the mercury waste that has been accumulated for years by soda-chlorine producers has been treated by a local enterprise that recovers the mercury, bringing it back to the market. A countrywide decontamination program for lamps that contain mercury, including fluorescent tubes, is in place since 1993, processing the lamp's material that are subsequently recycled (see “A Case Study” at the end of this text).
- F- Lubricating oils - from 250 to 300 million liters of lubricating oil are replaced every year in the whole country. Of these at least 100 million liters are re-refined to recover its lubricating characteristics, and returned to the market. Part of the remaining quantity is burned as fuel in cement kilns.
- G- Tires - when improperly discarded in tropical countries, used vehicle tires become a serious menace to public health. Whether technically not classified as a hazardous waste, when filled with water tires are an ideal nursing ground for mosquitoes. A federal regulation has imposed to tire manufacturers and tire importers the responsibility to create and support a network of places for collecting and disposing of the used tires. Initiatives are being taken to transform such tires into synthetic oil in an already existing shale oil plant, or to burn them in cement kilns.

TRENDS

Notwithstanding many practical efforts already taken and the legal framework set in place in the recent years, the overall situation of the hazardous waste in Brazil still requires important steps to reach a satisfactory balance envisaging the conservation of the environment. Like many other countries in similar condition, the compliance with the new international requirements of biosecurity, food quality assurance, pest control, etc are conditions sine qua non for the insertion of these emerging economies into the new global trade practices, with all the constraints that lie ahead. A good control system for all hazardous materials and their related waste is, for that purpose mandatory.

A law passed in 1998 (Federal Law n°9605/98) addressing environmental crimes is changing very rapidly the perception of the Brazilian society with regard to the environment protection. The Environmental Crimes Law, as it became known, is extremely rigid with the

polluters and sets very costly penalties. This law is setting a new pattern of behavior to those entities that generate hazardous waste of any kind.

Another trend is related to products that contain hazardous substances, and still are discarded together with domestic refuses. Environmental agencies at the three levels of government (Federal, State and Municipal) are deeply concerned with this problem. Government initiatives are leading to new regulations that set limits to some product's contents, like the mercury content in batteries, for instance. Other regulations in course of implementation are forcing the creation of systems for product collection after their use, to avoid the contamination of other non-hazardous waste. To implement some of these legal initiatives, however, adequate treatment or disposal facilities to receive the presorted products are still missing. Most of such products considered harmful when disposed of are still requiring comprehensive and satisfactory solutions for their destination.

Certification by ISO14001 Standard and adherence to managerial systems such as the Responsible Care programme of the chemical sector are leading many organizations, particularly industries, to re-evaluate the destination of their hazardous waste. Many companies, particularly those that export their products, are rapidly adopting the new concepts of waste minimization, cleaner production and eco-efficiency. This trend will lead certainly to a reduction in hazardous waste generation at the production sites. It is also foreseeable a reduction in the volumes of end-of-life products and packaging material to be discarded.

Relationship between the environmental control agencies and the entities that generate waste is certainly improving. For instance, technical joint-committees sponsored by the environmental agency of the state of São Paulo, to which were invited representatives of producers associations in specific sectors, have been in function for several years.

Opportunities are also improving for entrepreneurs willing to invest in activities related to hazardous waste treatment and disposal. However reliable solutions for the destination of hazardous waste are in need in most parts of the country, because the existing treatment facilities, incinerators and industrial landfills are not sufficient to receive the rising quantity of hazardous waste being generated. The structuring of collection and recycling systems for products until now simply discarded with the MSW, is also a result of recent regulations envisaging the take-back approach for such products. This is the case of mobile phone batteries and will be in the future the case of other electronic waste.

Technical consulting services and experience in hazardous waste management is also much needed, particularly in organizations that are engaged in environmental certification or that entered processes of ownership merging or acquisition.

As a conclusion it can be said that notwithstanding its condition as a country with its economy in transition, and the difficulties inherent in the management of large amounts of waste, the trend in Brazil is positive in what concerns the approach taken and the implementation of technical and economically efficient solutions to the various families of hazardous waste.

A CASE STUDY

A reliable solution for treating and neutralizing certain streams of hazardous waste requires high technological skill and large investment funds, two items relatively scarce in most of emerging economies. To devise a solution at the same time technically reliable and compatible in cost with the local constraints was a challenge faced by some of the industries in Brazil that were stockpiling large amounts of waste highly contaminated by mercury.

Mercury is one of the most noxious contaminants present at wastes and refuses generated by our society. Harm caused by mercury on human beings is well known, and the danger of its presence in the food chain has been widely studied since the Minamata accident that took place in Japan.

Mercury still is used in some industrial processes such as chlorine-alkali production based on mercury cells, or PVC plastic manufacture. On the other hand mercury is also present in several everyday products like thermometers, some types of dry batteries, and in the widely used fluorescent lamps. In such cases the control of the environmental contamination is not so easy because these products are frequently discarded with the communal refuse that in most cases is landfilled or incinerated. In some countries the awareness of this problem led to regulations enforcing the consumers to discard such items separately, submitting them to special collection schemes and treatment procedures. These schemes and procedures are, of course, costly and require a personal commitment of all consumers, two conditions not easily achieved in developing countries.

In 1985 APLIQUIM, a small company installed in the state of São Paulo, in southeastern Brazil, a processing plant for hazardous wastes, with emphasis on mercury contaminated residues generated by chlorine-alkali producers. From the beginning its founders adopted the concept of recovering entirely the mercury as a secondary metal, with a remaining non-hazardous material that could be used for other purposes.

By the end of 1993 the environmental policies of several industries in Brazil were already influenced by the new concepts brought out by the Responsible Care programme, sponsored by the chemical industries, and by the framework of the future ISO 14000 standards. These industries soon realized that their environmental problems, if adequately addressed, could enhance their image of Environmental Quality, leading eventually to the broader concept of Total Quality⁴. Apliquim was then approached by the

Brazilian subsidiary of an international chemical group that was collecting and storing all its used fluorescent tubes, looking for a correct destination in line with the new environmental paradigms, although there was not any legal restriction on disposal of used lamps in common landfills. The challenge was accepted and in few weeks a special equipment, with its subsidiary installations, was conceived to treat and destroy the lamps under controlled conditions. At the beginning the programme aimed at receiving and treating fluorescent tubes discarded by just a few industries, subsidiaries of multinational groups. These firms, exhorted by their home-offices environmental and legal advisers, were storing their discarded tubes for a future and still undefined destination

This voluntary programme, that now covers the whole Brazil, is also based on an original approach in comparison with its compulsory equivalents in some developed countries: all constituents of the lamps are recovered and recycled, including the mercury, of which Brazil is an importer without local sources of mineral supply.

Besides the recovery of mercury – the primary objective -, for taking place in a developing country the programme also motivated the emergence of economical solutions for re-using other recovered materials: the glass, for instance, which is considered improper for manufacturing new lamps or any other industrial product, is successfully used to glaze low-price floor tiles employed in low-cost housing projects. A leaning towards the social responsibility of the enterprises involved in this programme could be easily identified at this stage of the project.

However one of the most interesting aspects of the programme is the marketing of its objectives, leading to the voluntary acceptance of its values by so many entities. What motivation, being it environmental, social or even commercial, drives a taxpayer to pay for an environment cleaning service that he is not obliged to? The programme rationale is based on the avoidance of the soil, air and waters contamination by mercury at the landfill areas, what would give place to future environmental liabilities. The absence of specific laws and regulations to enforce this procedure does not seem to impair the enrolment in the programme by most of the entities contacted. The fact of being a voluntary programme is put clearly to the prospective customers, at the same time that detailed explanations are given about the risks of mercury contamination to the living organisms through the food chain and the cost of the decontamination offered.

Entities that adhered to the programme still do so of their own free will. Since the programme was conceived, the consciousness that each entrepreneurial sector has with regard to its environmental liabilities can be easily assessed. A very important role is being played by the EMS - Environmental Management System - adopted by each entity. As a voluntary programme it fits right into the concept of continuous

environmental improvement encouraged by ISO 14000 standards, and strengthens an image of social correctness to the entity. On the other hand the massive participation of multinational corporations in the programme denotes an awareness with regard to their global environmental liabilities that involves their developing countries subsidiaries as well.

For its social aspects – creation of new work posts, generation of low cost building material – and its original approach for being one step ahead of the environmental regulations, this project was honoured, in the person of the author, with the Thomas Kuhn Hope for the Future for Sustainability Award 2001.

CONCLUSION

Emerging economies have a very encouraging opportunity to implement long-term solutions to their environmental problems, curbing the generation of hazardous waste from its earliest stages. While their industries are still being conceived, installed or expanded, and when their societies are already ripe to absorb the concepts of sustainable development, responsible consumption and environmental accountability, the emerging economies should not miss this historic chance.

Investment leading to new industries and production facilities should adopt, from its feasibility studies phase, a proactive attitude toward the waste these projects would generate. Prevention and minimization should take precedence over treatment and disposal. Clean technologies, cleaner production, eco-products and eco-efficiency are not only concepts but also attitudes that should follow all the steps of an organization that intends to remain competitive in the years to come.

The role of the state in what concerns the management of hazardous waste is fundamental to the enforcement of the law, but the organizations must adhere to the principles of eco-efficiency that show that waste is the result of a poor processing of raw materials or the consequence of a bad design of their products.

Technologies available for waste processing are frequently conceived by research entities with their base in highly developed countries. Although good and reliable, such technologies are not always the most convenient or the best choice for use in developing countries, with plenty of manpower and lack of maintenance facilities. Local technologies, conceived to face local constraints and envisaging the use of less specialized manpower can be a better solution in some cases.

One of the best approaches for an efficient control of the generation of hazard waste in an organization is the implementation of an environmental management system that covers all the activities of such organization, including its relationship with third parties – authorities, customers, suppliers, neighbours, media etc. The adoption of a comprehensive

certification programme, based on recognized standards and procedures like ISO 14000, OHSAS 18000 etc, can be a very important step in this regard. It should be kept in mind that Environmental Protection, Occupational Health, Safety and Social Accountability are four pillars that will support modern organizations in a world of intransigent competition, and enterprises with base in emerging economies should take advantage of this.

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ABOUT PRIORITY DIRECTIONS OF THE STRATEGY OF ECONOMICAL DEVELOPMENT OF AZERBAIJAN

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Almost 35-years period of the newest history of Azerbaijan inseparably linked with the name of national leader Heydar Aliyev. Venerable political scientist and famous politicians, exacting experts and independent observers by right consider Heydar Aliyev the prominent political figure of the world, phenomenal state leader, who can make grandiose reorganizations in the country.

More than 70 years multi-national Azerbaijan was in ISSR. For this period, our republic, in spite of certain difficulties, sometimes privation, passed considerable way of development. The stage of actual rebirth in this way, undoubtedly, was the time, when the leadership of Azerbaijan was leading by Heydar Aliyev. At the end of 60-s, in spite of the fact our national economy had colossal resources and corresponding productive potential. Moreover, there was favourable demographic situation, in the republic occurred very anxious economical situation. In some spheres negative tendencies were obviously being strengthening, the level of using of productive potential was visibly being decreased. According to rates of growth of national income per head of population, Azerbaijan was in three times behind from medium-union indicators. To overcome all the difficulties, because of which the republic rolled down into the category of exfoliating ones, to make the material base for the perspective was not simple. Azerbaijan was “soviet socialist republic” in USSR and was led as other rest republics from the center. Selected in 1969 the leader of the republic Heydar Aliyev for fully solving of many backlogs problems, considered necessary to elaborate series of programs, connected with the strategy and priority directions of rise of economy, such as improving of the structure of industry, growth of agrarian sector, developing of regions. There was began realizing of urgent measures for consolidating of industrial and labour discipline, increasing of responsibility of leader of all classes, improving of the system of training of specialists, stimulating of highly productive labour.

The results became truly unexampled: already at the end 70-s our republic, according to rates of growth of national income, industrial

and agricultural industry, other important indicators took first place in former Union. In middle and small cities, regions of the republic were open tens of enterprises of light and manufacturing industry, production sections, and subsidiaries of large industrial objects. Parameters, characterized the dynamics of development of economy of the republic of that time, hitherto amaze the imagination. None of the historical periods of XX century in development of Azerbaijan was marked with such scaled social-economical reorganizations, which were realized in 70-s.

In a word, 1970-80-s went down in history of development of the country as the most productive, fruitful and dynamical. With certainty may be said that if it were not the industrial potential, created in that epoch, then today our independent government would come across with more serious difficulties. In this connection one has to only regret, that somebody, ignoring the reality, forgetting about objectivity, considers the created in that time industrial, scientific-technical and intellectual potential as the product of soviet system, and present base – as its some remainder. Today there are no reasons for imitating to soviet system, but it should not be forgotten that in 70-80-s too, our people was living, working and creating, making cultural stocks and stocks of materials and capital equipment, Azerbaijan was being developed and going on the way of progress. Present achievements is the logic continuation of the start, acceleration, taken in 70-s of XX century and continued today, when Azerbaijan is being developed not as constituent part of totalitarian government, but as independent country, full member of world community, independently disposing of its resources and it itself determine the strategy for perspective.

We objectively consider that first years of our independence were very complicated, connected with many difficulties.

Making by, surviving their last years, the leaders of soviet government, the destroying resolves, realizing of which were by reorganization men, and then unsystematic economical reforms of latter-day “democrats”, so-called shock therapy, brought to full chaos in activity of all branches of real sector. All these negative factors and, as a consequence, loss of traditional market, practically paralyzed the economics of all, without exception, former republics. In Azerbaijan, headlong and catastrophically was destroyed the most powerful industrial potential, created with efforts of hard-working, climbing to progress of the people under leadership of wise and perspicacious leader. Seizure of 20% of territory of the republic by Armenian aggressors, aggravated unstable, explosive social and political situation.

With returning of Heydar Aliyev to leadership of Azerbaijan, there was elaborated the clear strategy of the country with account of its

peculiarities, geopolitical situation and national interests, there was thought over, comprehensively valid headed for stabilization of social and political life, reconstruction and further development of economy. By 1996 it was managed to overcome the crisis tendencies, to realize the series of measures, allowed to harmonically develop of all spheres of economy.

Today the independent Azerbaijan Republic is substantially and dynamically developing country, consecutively realizing the economical and social programs, meeting the national interests. The country is considerably moved forward in the direction of market relations, forming of new economical system, integration into the world economy. The successfully realizing strategy of development much more extended the opportunities of solving of social-economic problems, promoted the considerable increasing of rating of the country in international scene. In the society was reached the consensus on the most important of development of the republic.

Today we may establish with certainty that the strategy of development of Azerbaijan is organically linked with either advantageous position of the country, or with regularities and tendencies of world development and national priorities, and potential possibilities of the country. This strategy is so valid and clear, that without doubt, it will serve to the interests of the country for a long time.

Azerbaijan is related to the number of regions, possessed of oil and gas resources of universal importance. And this factor will prevail many tenth anniversaries. After acquiring of independent statehood, the people of Azerbaijan finally became the real of own resources, and Heydar Aliyev, as the head of the country, with his inherent foresight skillfully used this historical chance.

In 1994 in history of Azerbaijan people and Azerbaijan country took place the event of extraordinary importance and solemnity – was signed “Contract of century”, what commemorated the real appearance of Azerbaijan on world scene. To present day were signed 22 contracts with 33 leading foreign oil companies, representing 15 countries, and several agreements about Azerbaijan oil and gas resources in world markets.

Today the results of new oil strategy, the architect of which was H.Aliyev, are obvious to everybody. Only for several years, into the economy of the country was invested 6,5 milliard US dollars. One of distinctive features of the strategy is that its realizing is directly connected with growth of international authority of our country, providing with social and political stability, consolidating of economical safety and making of stable base for perspective.

Today Azerbaijan fills worthy place in world community. Practically all advanced countries, authoritative international organizations settle accounts with our country, have respective attitude toward its initiatives.

We apart mark, that foreign business circles, investors, which cooperate with us, in first place, attentively study the situation in our country, make various monitoring of political, social, economical life, make forecasts of one or another factors, indicators. It is remarkable that all of them concluded that today Azerbaijan in world community is considered the country, where is created favorable investment climate, minimum of commercial risks.

Every country, its people on one or another stage of historical development came across the serious choice: to whom to entrust the post of a head of country and will one or another candidate be able to become national leader? What will be the political policy, economical strategy of the chosen one? Everybody, to whom is important the lot of the country, the lot of its Motherland, thinks about these questions. And this is clear. The head of the country is the guarantee of its safety. It is important to know this truth by everybody.

The last several months, outlived by us on the eve of election of first President of Azerbaijan in XXI century, may be called truly important. The results of elections are known: Ilham Aliyev confidently took more than three-quarters of votes and was selected the President of Azerbaijan Republic. This means, that strategy of development of Azerbaijan, determined by Heydar Aliyev, will be continued, because it meets the interests of Azerbaijan people, and putting it into practice will provide it the happiness and prosperity.

Work in the position of Prime Minister, election meetings, and initial period of his work in the position of the head of the country, earnestly demonstrated, that Ilham Aliyev had the thought-out program of perspective development of Azerbaijan. First of all, it should be mentioned that sights, seeing of future of Azerbaijan economy, its perspective development are scientifically argued, are determined in the result of deep system analysis and correspond to the realities of a day. He objectively evaluates the scientific-technical, industrial, and working potential, which has our country. To the global processes, occurred in world economy, Ilham Aliyev approaches, first of all, with positions of national interests. This is very important factor. Because, this program is constituent part of long-term strategy of development of Azerbaijan for durable perspective, established by Heydar Aliyev. There is taken into account the complex of factors, including the real condition of society, bringing out of economical reforms in qualitative other, higher level, developing of positive tendencies in the economy, evaluation of processes, occurred either on regional, or in world levels.

The most important part of the strategy of development of Azerbaijan in many ten years forward, undoubtedly, will be the oil factor. Ilham Aliyev carried out deep researches on questions of marine hydrocarbon stocks,

which found their reflection in basic work “Caspian oil of Azerbaijan”, published in 2003 in Moscow.

Oil is the big policy, the factor of global economy. Fight for possessing and control above this strategic resource acquires more sharp character in the world. Ilham Aliyev is the prominent statesman and political figure of independent Azerbaijan. Followed exclusively national interests, he fruitfully cooperates with the most influential transnational corporations, actively promotes with improving of investment climate, increasing of inflow of investments into the economy of the republic.

It is known, that definite forces were tendentiously proclaiming that the project Baku-Tbilisi-Jeyhan with economical point of view is unprofitable and unpromising. However, Azerbaijan government does not agree with such evaluation. Was made the titanic work, in particular, with participation of famous experts and specialists on basis of account of complex of factors were exposed to the careful analysis, the technical-economical indicators, were proved the expediency and perspective of the route Baku-Tbilisi-Jeyhan. Today, as we know, wide-ranging work on construction of gigantic pipe line.

Azerbaijan takes the objective position on the questions of status of the Caspian Sea, transporting of oil and gas, commercial effectiveness, preservation of the environment. Expressing the sincere aspiration of our country, Ilham Aliyev makes deep conclusion that the oil of the Caspian Sea should be not the field of battle, but the sphere of wide cooperation between countries. “Modern Caspian diplomacy of Azerbaijan having western pragmatism, assisted by eastern flexibility and insistence in achieving of their goals, already gives positive results”.

Only in State Oil Fund of Azerbaijan from sail of oil and other channels have been already putting by 800 million of US dollars, and within the next few years the sum of receipt will achieve 4 milliard US dollars.

New oil strategy actively and wholesome influence on whole economy of the country, widens its possibilities in modernization, effective managing, promotes the solving of social problems of population, including refugees.

About it, in particular, was talking in ceremony of opening of joint venture “EUPEC-AZERBAJAN”:

- In a short space of time in Azerbaijan were created series of enterprises, world conditioned. ... Today here is being opened the plant, which is very important for economical development of Azerbaijan. The most important factor is concluded in the fact that the most part of the production, produced by all these enterprises, will be sold in Azerbaijan, i.e. it will not be necessary to seek the market abroad. And this, in its turn once more testifies, that signing the “Contract of Century” by Heydar Aliyev in 1994 was very courageous and wise step. Thanking

namely to this contract, in Azerbaijan are created the infrastructure and conditions for local producers.

We want the local companies to fill the Azerbaijan market with its production. Of course, the import is necessary, and it will be. But there, where is the opportunity, we must help to local companies to bring the produced by them production in Azerbaijan market.

The sphere of economy is big and complicated system. Its normal functioning depends from activity of many subsystems. Reforms, made in the republic, covered also the spheres of infrastructure. For the last years were realized the progressive improvements in development of communication, transport, power engineering, gas equipment. In considerable level was consolidated also the legislative basis, necessary for their normal functioning.

Were put into commission many modern objects – stations, communications centers, was extended the application of new informational technologies (including in settlements).

Questions of development of industrial infrastructure, normal functioning of fuel and energy complex, i.e. the spheres, connected with serving of manufacturing and population, henceforth should be in center of attraction. In prospects will be built 2 electric stations, each of which with capacity of 400 megawatt, what will promote not only the liquidation of deficit of electrical energy, but also will give the opportunities of its export.

In forthcoming period, the transporting sector also will get the further development. Already today in cities and villages of the republic are run new traverse lines, is expanded the repairs of acting roads, are built modern conditioned stations, railway stations, is improved the culture of serving of population.

Range of questions, which are determined by the leadership of government of the country, is very important. Because, it concerns the interests of not only transport sector, but of all social-economical life of the country. And that is why, it is very important to have the clear conception of development of transport complex of the republic for nearest and long-range outlook, taking into account not only internal factors of development, but also extending of commercial-economical connections of the republic, favorable conditions, which are already being created in the course of effective participation of Azerbaijan in transport corridor Europe-Caucasus-Asia.

For the last years in the republic is being observed the stable tendency of development of private sector, increasing of its role in gross social product and other indicators of social-economical life. Enterprising is turned into leading segment of new economical system, strategic resource of economical growth. In Baku and other cities and regions are opened modern

offices, are put into commission many management and residential buildings, object of serving of population.

Making a speech in the ceremony of opening of Khilli fish hatchery “Nere”. Ilham Aliyev with pleasure noted that this factory was built, mainly, by local builders, reminding, that as far back as ten years ago every construction, every small building in Azerbaijan was built by foreign specialists, because the local companies did not have the experience. “But during these years was saved the experience” I. Aliyev told, “And we see, that the local builders can build all buildings, factories in the highest level. This is very pleasant. And henceforth we must attach more importance to it, to support the local builders, producers. Generally, we should increase the manufacturing in Azerbaijan, should try to reduce the import in order to increase the internal manufacturing.”

It should be done so that the questions of development of enterprising, formation of middle class, protection of home market would be integral part of the strategy of social-economical development for long prospects. Since, the future of economy of Azerbaijan, its dynamism, qualitative development in many respects will be determined with level and quality of private enterprising.

Enterprising is the strategic course, reliable factor of growth of employment and prosperity of population, without which is impossible the solving of top-priority social problems. Today the power and financial opportunities of Azerbaijan economy were considerably increased and will being increased. Only during several nearest years into the republic will be come the income from oil at the rate of more than 5 milliard US dollars, will be increased the earnings of other financial resources too.

Now the part of external debts of Azerbaijan makes a little more than 20% of gross domestic product. This is one of low indicators among countries of CIS. I deeply make sure, that in recent prospects this number will be much less. Presence of steady financial base will allow to direct its all increasing parts foe development of real sector, for achieving of optimal level of liberalization of the participation of foreign capital in banking-financial sector, using of civilized methods of protection of small and middle business, home market, which takes place also in countries of EC, USA, China and others.

Today the Republic makes negotiations about joining in WCO. It is naturally, that eventually, we will become the members of this prestigious organization. The question is – when, on what terms and with what level of competitive ability of our economy. Here is not important the speed, but nice calculation, sober analysis of deep consequences.

In this connection the development of local manufacturing in regions, increasing of employment, replenishment of home market at the expense of own resources are very important tasks. Their solving in many respects will

be determined by the level of economical work, increasing of returning of economical science.

Very important meaning will have the elaborating of corresponding economical mechanisms taking into account our realities. Such practice exists long ago and successfully works in many countries, including developed countries. We should make the best use of this experience. This is unbiased necessity. The life itself prompts the necessity of elaborating of special program, providing for protection of native commodity producer, the corresponding law.

Market economy does not cancel all privileges, as some so-called reformers want to present to us. Agree that regulating of manufacturing in Baku or in Nakhchivan, Yardimli and Gakh or in other distant settlements are not the same.

As it is known, today among the sharpest problems of our society keeps on remaining the unemployment. To say fairly, it fell to our share in heritage from Soviet period. Many long years, rate of growth of able-bodied citizens of the republic were much higher than, on the whole, in the country. Despite of the taken measures, the intensive development of the economy, the growth of investments, the quantity of created places of works always were less than it was required. Rather serious steps for heightening of employment of people were made in 70-s. Advanced developing of progressive branches industry, improving of proportions in developing of regions, the intensive growth of agrarian-industrial sector actively promoted the increasing of employment of people. However, in first years after finding the independence, because of occurring of chaos in social-political and social-economical life, the problem of unemployment again acquired sharp character. Essentially, this process was taken its course.

In the country, for solving of this issue of the day, today appeared favorable financial-economical opportunities. And the investment climate has become quite another one. Businessmen are interested in realization of new projects, developing of profitable for them industries and services sectors.

Ilham Aliyev established the main aim in this sphere: "There is necessity in opening in every region new places of works. And the measures in this direction are being continued. I told about it repeatedly. I want to say once more, than the priority directions of the policy of future government will be connected with opening of new places of works".

Directions of I. Aliyev for creating in forthcoming period up to 600 thousand places of works were met with great approving and inspiration of all Azerbaijani people. Because the liquidation of unemployment means the improving of life conditions of the nation, protection of its genofund, promotes the consolidation of families, growth of economical power of the country.

It is clear, that the solving of so important problem as unemployment will demand the corresponding changes in activity of economical organizations. It is pleasant, that Ministry of economical development in this plan has already taken up the elaboration of concrete measures. Decreasing of unemployment will entail inserting of corresponding changes into the programs of developing of regions, modernization of the structure of industry, agrarian sector, investment policy, banking-financial system.

The priority direction of the strategy of development should also be the providing of dynamism in agrarian sector. Today, thanks to taken measures, it was succeeded to stop the recession of the manufacture, were intensified the positive tendencies in developing of the series branches. Agrarian sector is mobilized for providing of food safety and for raising of national economy.

At the same time, one cannot escape the problems, the solving of which will allow not only considerably increase the volume of agricultural production, but to improve its qualitative indicators. In the center of attention should be such questions as developing of processing industry on basis of local agricultural raw material, using of effective mechanisms for increasing of efficiency of farmer's economy, all possible improving of agricultural service, expansion of building of objects of village infrastructure.

It should be noted that after disintegration of planned, commanding-administrative system, which was distinguished by distributing character, were noticeably decreased the financial opportunities of the regions. In essence, the system of government control was brought to minimum.

Such tendency was kept in our republic too. Serious mistakes made in first years of independence and faults in managing of economy, and other negative factors brought to sharp reduction of manufacture in cities and regions of the republic. Carried out during last years the measures on reconstruction of enterprises, which have the elements of development, the making conditions for formation of enterprise bear good fruits.

Almost in all regions, was noticeably quickened the social-economical activity, the rhythm of works of enterprises is well in hand, is carried out all-round searching of reserves, are established the prospects of development.

At the same time, addressing to the participants of the ceremony on occasion of putting into service the modern brickyard in Siazan, Ilham Aliyev, in particular, marked, "It is necessary, that every region of Azerbaijan was equipped with modern amenities in order to make constructive works there. There are existed the opportunities and intentions for these purposes."

Then, developing this thought, he continued, "If in any country, enduring the period of transition, is observed the developing, (I may say, that in many

neighboring to us countries, this developing is not felt), then, first of all, is developed the central cities, capitals and large cities. Small cities, districts are not developed enough. We want to achieve the developing of each region, village, settlement of Azerbaijan so that the people live there calmly, get high salary, have the opportunity to bring up the children, so that they get necessary medical treatment in hospitals, so that they study in good schools, work in modern enterprises. This is our goal.”Today we live in conditions of globalization, and our young independent state actively takes part in world integral processes. XXI century gives to all these processes unprecedented acceleration and dynamism, what is important to be considered in determining of strategy of outlook. One of fundamental achievements of Azerbaijan people was the accelerated development of science and education. And now, in the epoch of new discoveries and high-performance technologies, Azerbaijani economy, in particular, also needs the effective support of our scientists. The matter is in not only using of cumulative scientific-technical potential with bigger return, but to actively replenish it, to improve scientific structures, to provide the strengthening of the role of scientific sector in developing of productive forces. It is necessary to reach the advance development of science intensive branches, the expanding of access to new informational technologies. It appears that National Academy of Science, many our institutes of higher education, disposing of high scientific potential, are called upon to regularly making the monitoring, correcting its place and role in solving of strategic tasks of development of Azerbaijan.

It is undoubtedly, that in forthcoming period, the international economical cooperation of Azerbaijan will obtain the further development, and will be realized the new sources of progress in reciprocal relations. It appears that with a view to promote all these positive tendencies, and for timely taking adequate measures in connection with possible evinces, wounding the national interests of the country, our scientists and specialists should carry out the large-scale researches on such directions of international relations as Azerbaijan and Europe, Azerbaijan and Caucasus, Azerbaijan and CIS, Azerbaijan and USA, Azerbaijan and East, Azerbaijan and Turkey, etc. the scales of forthcoming works impress and demand the objective appraisal of own resources, determining of priorities, providing of mutual harmony, permanent correcting of strategy and tactics.

We outlived very responsible and intensive stage. It seemed, that were left behind the insuperable problems, threatened the independence of young state with unprecedented social shocks. Today Azerbaijan is much stronger than several years ago. Every year the republic grows at pace 8-10%, what much more exceeds mean level in CIS, and even in the world. It is our largest strategic reserve. Therefore, keeping of given tendency is very important task. We need it for successful achievements of contemplated

aims. Current dynamism in economy, the consensus in society, the cumulative experience, the wish of people to live at peace and in chime – all of them are firm factors of progress of Azerbaijan State, increasing its opportunities to solve the fundamental tasks.

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SOME ASPECTS OF MAIN DIRECTIONS AND TASKS OF ECONOMICAL REFORMS IN AZERBAIJAN IN 90-S OF XX CENTURY

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Global transformation of social and political and social-economic system of socialism proposes, first of all, the decision of tasks of transition from administrative to market economy, including forming of the strategy as general plan of actions, main directions and tasks, i.e. choosing of the model and the politics of its realizing.

Complexity and contradictoriness of the process of reforming of the beginning of 90-s are caused by political instability and military aggression from Armenia, breaking of former social-economical proportions, falling of the level of production, occurrence of unemployment, and, as a consequence, falling of the standard of life of population.

In the initial form the model, recommended by specialists of International Currency Reserves and identical for all postsoviet republics, included, first of all, liberalization of trade, scale privatizing and macroeconomic stabilization. To the opinions of experts, the prices, oriented on demand, would precipitated the going out of the country from economical crises, disappearance of non-effective productions and structural reconstruction of economy. However, the realization of this idea in 1991-1993 did not bring to desirable results.

By 1994 the inflation reached 1600 % in a year, gross internal output every year was decreased on 18-20%, the volume of industrial production on 20-25%, agricultural – on 7-10%.¹

Orientation on demand could not raise on the necessary level the productions with outmoded facilities and technology. Absence of possibility to invest the most important directions in economy finally undermined the economical stability in republic. In 1993 the index of physical volume of

industry of the republic was 51% in compare with the results of 1990, and the volume of production of agricultural products was 65%.²

The actualization of searches of own way of development brought to separation of oil industry as main motive power of reforming.

For 1996-2000 in the economy of the country was invested five milliard dollars. At that, share of non-oil sector in whole volume of investments had a tendency to increase. From 33% in 1996 it reached 50% in 1999.³

Realization of oil politics allowed to Azerbaijan, taking one of leading stands in geopolitics of the region and making the economy the invested attractive, to consolidate the economical stability, to begin carrying out the privatization, agrarian and financial-tax reorganizations, to begin the decision of social problems, what connected the energetic potential of reforms on providing of interclass social world.

The political stabilization in the society, connected with coming to power in June 1993 H.Aliyev, brought to macroeconomic stabilization of 1995-1996 years and created necessary prerequisites for specifying the strategy of reforms.

Marking out as main directions giving the state property into the private property, making the agrarian reforms, creating by financial institutes the entrepreneurial space for managing subjects, there cannot be underestimated the complexity of transformational processes, absorbing also the forming of new, value notions of population, including the spheres of economic practice.

Here is very important the strategy of the government, directed to increasing of social defence of citizens, including, to suggesting of variants of self-actualization of individuals, what will allow them to adapt to changing real, and to the government – not to lose “human capital”.⁴

In developing countries, just the middle class, provides self-regulation of society. To opinions of researchers, just the absence of mass basis of small and enterprise was the falling of Russian empire.⁵

Developing of enterprise provides the filling of budget, opens new work places, reduces paces of inflation, migration, stabilizes the political climate in the country, promotes the consolidation of nation. So, “the government becomes competitive, provides its economical safety.”⁶

Governmental strategy of development of enterprise includes:

- creation of legal base, providing with timely passing the laws, Programs on developing of small and middle enterprise from 24 June 1997 till 17 August 2002.
- Carrying out of consulting and studying programs for entrepreneur;
- Creating of favourable financial-tax sphere for enterprise, particularly, in business sector of economy.

Essentially, in Azerbaijan are created the legal base for developing of enterprise, were passed the laws “About entrepreneurial activity”, “About enterprises”, “About property” and others. The real base of formation of enterprise as strategic resource of economic growth was reorganization of relations of property, bringing to “formation of wide section of private proprietors”,⁷ capable to be the part of middle class.

The process of privatization was divided into stages, which are being traced according to passed laws. They are “Governmental program of privatization of state property in Azerbaijan Republic in 1995-1998” from 29 September 1995 and “II Governmental program of privatization of state property in Azerbaijan Republic”, approved by the decree of the President from 10 August 2000.

In conditions of period of transition, is very important the support of the government, shown in the system of state priorities, in basis of which is stimulating of domestic manufacture. And if large-scale manufacture needs support of foreign investments, then the accent on small enterprise will allow finally forming and self-realizing of so-called middle class.

The process of forming of middle class in Azerbaijan is not completed. By 2001 there were registered the entrepreneurs: 86 thousand with status of juridical and 106 thousand with status of natural persons.⁸

Finding the state regulation –the unsatisfactory enterprise, there was passed series of Decrees: “Statute about National fund of help to enterprise of Azerbaijan Republic” from 27 August 2002, “About additional measures in sphere of state charge of development of enterprise in Azerbaijan Republic” from 10 September 2002 and “About suppression of interference, hampering the development of enterprise” from 28 September 2002. This will allow to enterprise, and consequently, to all economy in whole, to take qualitatively new stage.

Paces and quality of transformation are conditioned with the capability and possibility of individuals to show the entrepreneurial activity in frames of the law. Therefore, the success of reforms is directly connected with participation of wide sections of population in them. The development of enterprise became the obvious result of realization of the strategy of economical reforms. By 2000 the part of private sector in DGO was 62%⁹, by 2001 – 71%¹⁰, by 2003 – 74%¹¹.

Carrying out the economical reforms in the country, which has no reformatory traditions, has ethnic conflict, losing 20% of the territory and about 1 million refugees is very complex thing, proposing contradictions and difficulties.

But during 90-s, was elaborated the strategy, having evolutionary-organic character with relatively active social politics, what allowed to continue the taken course for modernization of Azerbaijan.

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MOHAMMED ASAD-BAY : TIME OF ACKNOWLEDGEMENT

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Among the outstanding writers of the XX century the name of "Kurban Said" – the author of the novel, titled "Ali and Nino", stands firmly, attracting a rapt attention of both readers and explorers all over the world. However his real name is Mohammed Asad-bay (1905-1942). He was born in Baku due to mixed marriage: his father was a wealthy azerbaijanian, and his mother was a Russian revolutionary, who had died very early. As he was brought up by a German governess, besides the

Russian and Azerbaijani languages, he also knew German language, and afterward it allowed him to create his books in this language. Being an exceptional person, he emigrated to Germany in the early of twenties of the XX century, and changed his name Mohammed Asad-bay to the European name “Leo Nussimbaum”, and thereby he complicated the authorship of his novels, such as “Ali and Nino”, “Girl of the Gold Horn”. In this connection he became a persona non grata in the fascist Germany and he had to emigrate from this country to Austria, Italy etc.

Mohammed Asad-bay (Essad Bey – in the Roman alphabet, the writer signed most of his books like this) also used pseudonym. It was twice. First time it looked as an attempt to change the image, to go away from the rapt and watchful attention of people, that met and associated with him, and also to hide from the curious stares and people, who did not conceal their bewilderment at the sight of his east garbs. He wanted to go away from the importunate attention from the outside, particularly attentions of official persons, police, house manager, administration of the University, where he had to go. The main task was to adapt himself to new conditions, to the German realities of the twenties – the time, not calm also for Germany, when there were revolutionary processes, rapid changes of a power, disorders, caused by mass activities, repression of the power, looking for enemies everywhere: in the midst of the left activists, factory workers, emigrants...

These years Mohammed Asad-bay accepted a new name “Leo Nussimbaum”, though he continued to sign his books under the name of “Essad Bey”. Thus, gradually the real name began to associate with the pseudonym.

Though Asad-bay (just as his father, who emigrated with him, and due to the new passport became “Nussimbaum”) could mislead the people around him, dissolve in the crowd of thousands of Berlin people, turn into the native townsman, not arousing unwholesome interest or suspicion, after some ten years this matter perplexed explorers and journalists, who tried to investigate the fact “who is who”...

And already in 1933, when Hitler came to power and began the persecution of Jews, Asad-bay felt unpleasant consequences, concerned with the acceptance of the “Jewish” surname and attempted to keep back his past as an emigrant from the Caucasus, coming from “the Bolshevistic Russia”.

The biography and personality of the writer are implicated with many interesting and important historical events, where he took part. And his works have many-sided themes and reflect great events of Russian, Caucasian, Azerbaijanian history.

Even during his life, his books gave him the glory of the wonderful publicist, explorer and journalist, who responded to the most actual and important problems of that time.

We are interested in the publications, which are connected with his name, pseudonym, that was chosen by the writer for himself, and that was a cause of the problem of authorship, and till recently Azerbaijanian and Russian explorers have tried to solve this problem. Two last foreign publications may exemplify for this: “The Man from East” – the article by Tom Raise, included in “New-Yorker”, the popular American journal (October, 1999), and “Whose are you, Ali and Nino?” – the article, included in “Foreign literature”, the Russian journal (October, 2001). These publications try to take Asad-bey with his Azerbaijanian roots to the bosom of European literature, including German literature, and in that way to fasten his creative work in the sphere, which is far from Azerbaijan.

Everything is used for it: geographical largeness of his residence and sojourn (Azerbaijan, Turkey, Germany, Austria, the USA, Libya, North Africa, Italy etc.), his large contacts with official and private persons and establishments in these countries, and also the data of publications of his works (about twenty books) in Europe, the USA and works, registered in periodicals of different counties.

All these complicated sufficiently the solution of “the problem of authorship”, different points of view and versions had arisen, but nowadays there are official documents and opinions of people, who confirm the fact that Kurban Said is a pseudonym, taken by Asad-bay.

The prominent writer did not live very long. He was well-known in the reader’s circles in Germany, Austria, the USA, Poland, and also in Italy, where he died at the age of 37.

Saving himself from the Bolshevik Power, he found himself in a strange land, different countries, and tried to conceal himself from the wild cataclysms of the epoch, which depreciate not only cultural wealth, but also the whole human life.

It was the time, when the map of the world was reshaping. Some rulers had gone, and the others came in their places. The names of these rulers and some almighty political figures and statesmen of universal importance were on everybody's lips: II Nicholas, Lenin, Trotsky, Atatürk, Reza-shah Pehlevi, Hitler, Mussolini, Stalin... People wrote, spoke, argued, said different opinions about them.

M. Asad-bay was very thoughtful for the processes taking place in the world, in the USSR – homeland, which included also Azerbaijan, abandoned by him. Especially in Germany and Italy, where fascism, coming in the place of monarchy, became a threatening power, which menaced to the peace in Europe and all over the world. And its leaders, who were raised on a pedestal, already decided many things, maybe everything. This also took place in Russia, Turkey and Iran, after the overthrow of monarchical systems in these countries.

Asad-bay wrote about II Nicholas, trying to understand the reasons of his demise, about Ataturk and Reza-shah Pehlevi, analyzed events that took place in Arabic world, Turkey, Iran and lead to the changes of governments and rulers in these countries. He worked at the books about Lenin, Mussolini, Stalin...

Among the works about Stalin special place takes a book by Asad-bay, titled "Stalin. Career of the fanatic", created in 1931, and which showed to the European readers for the first time the phenomenon of the "Caucasian revolutionary", who had already taken a leading position in the forming Bolshevistic State. It was interesting and instructively because in Germany where this book was created from the lower classes also «Fuhrers» of various scale were bursting to the power. And already in a year one of them came to the power forced to speak about himself the all world.

Asad-bay one of the firsts if no the first created the image of a new type leader come to the power on the wave on new ideology in condition of class struggle, which after the first world war took on especial scope in Europe, USA and Russia. On the example of Stalin Asad-bay created typical, objective, alive, psychological extensive portrait of leader of that model. And at the same time he opened in the face of reader «time» and «place» where his hero acted, he showed social and political prerequisites of revolutionary and rebel appearance, his life conditions, his ancestors, friends of seminary, comrades –in-arms and teachers. Conditions of his life, childhood, adolescence, youth, formation of person, world-outlook, in a word about everything that composes biography of Koba – faithful comrade-in-arms of Lenin are detailed spoken. And, certainly his interrelations with «leader of world proletariat».

Although the book brings the reader up to the beginning of 30 years, but it is modern in the exact meaning of the word. Two lines as if are planed in the narration: one retrospectively takes away to the past of Stalin, his childhood and young years. Another, talks about the life and biography of future leader, who with time dealt with his opponents would come to the power – this is a kind of perspective of hero of Asad-bay, who exactly projects the image in future tens years. And international reader (the book published in German, English and Russian languages) could make a represent about a man, who with time would be perceived in the world as the leader of superpower created by him...

Speaking about necessity of forming more or less full dossier of Asad-bay it should be noted that in archives of police services of Germany, Austria, Italy in 20-40 years of last the century, files set up on, the data about him, his contacts with other people, about his activity as a writer and publicist were noted in these files. In contrast to azerbaijani writers who exposed to repression in their homeland in the same years and their «files» have been opened already in our days discovering many curious things and

new in the characteristics of their human and creative look, Asad-bay had not luck in this meaning: you see, his archives are dispersed over the countries, which are not available for our azerbaijan researchers. How much information we could have obtained if they had been found in research asset as they say «at hand». Even if they had been ordinary «police dossier»...

While this book run into a number editions and widely reported in Europe, USA, they possible to say besides the novel «Ali and Nino», are not published in Azerbaijan and various attempts of popularization of his creation, publishing of his books in Azerbaijan or Russian languages brought only to different kind of discussions and to unfounded conclusions.

If in the countries of Europe and USA, where the writer's book became famous immediately after their publishing and definite opinion formed not always telling to the truth having a single meaning and in Azerbaijan only in the beginning of XXI century i.e. in our time, this theme is interpreted which became actual and urgent...

So the contours of new researches are drawn carefully: using a new information to clarify as it possible this question from the time of finding of Republic independence was an agenda of Azerbaijan literary criticism. You know it is a talk about writer and publicist of great talent who had a various troubles on his hard life and creative way caused by cataclysm of a rapid epoch: two world wars, revolutions (in Russia and Azerbaijan), pursuit on the side of totalitarian regimes (in Germany and Italy), every possible encroachments on creation and false rumors of writer – the author of two tens books of which besides one novel azerbaijan reader does not know about anything, only about the name of some, above mentioned during various discussions...

And today the time came to give a due to the writer who did not a little for objective reproduction of the past events according to his motherland – Azerbaijan, to recognize his contribution in the history of Azerbaijan literature which he presents in a compound and changing world, although in the status of writer – emigrant.

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MAIN DIRECTIONS OF IMPROVING THE CUSTOMS PRACTICES

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The Customs Practices plays a key role in the international trade. In any foreign trade transaction the customs-house participates twice as a

minimum: the first time during the export, the second time during the import. Therefore it is clear that the work of the customs-house has a significant impact on the foreign trade efficiency. The efficient work of the Customs bodies, lack of unjustified losses of time and material resources in the process of the customs control define the character and results of the foreign trade of the exporters and importers of any country and often are a reason of success (or failure) of the foreign trade operation.

Conditions in which operate the customs bodies swiftly change during the last decades. As a result of conduction of a series of rounds of trade talks under the aegis of GATT the level of customs taxation has decreased in majority of countries and the role of customs payments as a source of revenue to the national budgets has decreased in number of well-developed countries.

However the customs-house faced the necessity to solve the tasks which it hadn't encountered before: protection of rights to the intellectual property, fight with the trade by double technologies, protection of biological species, facing the threat of extermination, protection of the environment, toxic wastes, drugs and many others.

In different countries many of these tasks came to the fore for the customs bodies. But in general the challenge of time required modernization of the customs services, increase of efficiency of the work of the customs bodies, liquidation of procedures and formalities, which lost their importance and maximum use of the new information technologies.

One of the recommendations of the World Trade Organization directly aims at the following development of the techniques and practices of the customs bodies operation: "The Customs authorities should immediately consider the existing practices and create a program of reform of inefficient or obsolete rules and methods". The above-mentioned tasks are actively solved by the governments of many countries. Moreover, several main directions of development and improvement of the customs activity have been defined. Improvement of the legal base of the customs regulation is one of them. In majority of countries of the world during the last decade the legal protection of the customs and tariff regulation has been revised and modernized with the tendency of creation of simpler, clear and precisely working laws, and also their closeness with recommendations, conventions and other intergovernmental treaties. A peculiar international unification of legal, administrative, organizational and technical systems of the customs regulation has been observed for many years. Intensive development of the international trade during the last decades became possible largely due to the fact that the national customs systems of the overwhelming majority of countries formed on the basis of legal and organizational norms and rules having much in common. Internationally this legal compatibility has been reached owing to creation of entire system of multilateral intergovernmental

agreements and treaties. Establishment of the World Trade Organization (WTO) in 1995 and adoption of a complex package of legal documents lying at its basis play the most important role in this process.

A swift increase of the volume of the international turnover, complication of its structure, limited personnel resources of the customs bodies and requirement of all the participants of the foreign trade to reduce to the minimum the time of the goods transportation have revived the usage of the theory of risks in the customs practices with the purpose of realization of the selective customs control. A new, revised interpretation of Convention on Simplification and Harmonization of the Customs procedures (adopted in June 1999 by the countries-members of former Kiyoto Convention) defines that the countries – members of Convention have to apply a system of risk management during the customs control with the purpose of definition of the level of the customs control concerning separate persons, loads and transport means and use selectively different forms of the customs control. These provisions are included in Chapter 6 – Customs Control, recommendations 6.3, 6.4 and 6.5 of Convention .

Selectivity is the key moment in identification of load with high degree of risk, examination of which will most probably allow preventing infringement of the customs rules. This method is especially efficient during automatic execution, when a computer is used for evaluation of risks related to a concrete consignment of goods and providing a customs employee with a recommendation on the best way to act in the concrete case. Application of the system of risks management worked out in a number of countries and in the World Trade Organization is one of the main directions of the radical increase of efficiency of work of the customs bodies.

This direction has to find its place in the customs legislation of all countries. Alongside with the analysis and risk management Kiyoto Convention recommends to use the method of definition of the degree of observation of the customs rules as indication of how well the system of selective customs control works. The mentioned indicator (compliance measurement) is a statistic index, showing which part of importers, ferrymen, transport and expedition agents observes customs rules and procedures. On the one hand this index demonstrates in which directions the customs control should be reinforced, and on the other hand, it allows judging about efficiency of the existing system of analysis and risk management and to make necessary corrections in case of necessity. However, it is necessary to admit that often the customs offences are not brought out, and therefore it is impossible to calculate the index of this indicator correctly.

A new interpretation of the Kiyoto Convention gives much importance to one more direction: the customs audit-based control. The audit-based control, defined in the Convention as a system of measures, by

means of which the customs authorities satisfy themselves of the declarations' being exact and correct by the instrumentality of checking accounting records, record-keeping, commercial information of the checked persons.

In these cases the applied methods can range from self-appraisal and self-control of exporters and importers to a complicate audit check, conducted by specialized companies. One of the problems of application of this method is connected with the fact that record-keeping of the checked firms should be based on the Generally Accepted Accounting Principles (GAAP). The Customs Control System, based on the audit checks becomes more widely applied in many countries of the world. This system can be rendered automatic by means of timely including of the appropriate programs in the record-keeping of the checked firms. The customs control on the basis of the successive audit significantly speeds up the movement of the foreign trade loads and eliminates unnecessary barriers.

A growing technical equipment of the modern customs systems and services is the following peculiarity of the development of the customs regulation of overwhelming majority of countries in 1990s. Achievements of modern information technology, communication technology, methods of information processing and transmission, automatic systems of data processing, reducing to the minimum the time and distance factor lie in its basis. This question is also considered in detail in paragraph 2.2.

Separation of the processes of goods passing through the customs-house and processes of customs duties collection, record-keeping and statistical accounts is another direction of the customs services activity development and modernization. One of the recommendations of the World Customs Organization reads: "The Customs Bodies should study the possibility of separation of the processes of goods' passing trough the customs-house and processes of customs payments collection in order to reduce to the minimum possibilities of delay of goods transportation".

The thing is that a practice, according to which all the customs formalities were observed while the goods were under the customs control dominated during a long period of time in the work of the Customs Bodies. It was thought that the customs control over goods is a means of ensuring and guaranteeing the customs duties and taxes payment, the importer could be liable for. Unfortunately, the given practice continues to be applied in many countries.

However at present there are mechanisms of ensuring of the customs duties payment without physical withholding of goods. Due to this fact a system of goods passing by a simplified customs declaration is being developed in many countries, and the payment of duties and taxes is guaranteed by other methods. These methods have been well worked out in the customs practice of many well-developed countries.

In some cases the above-mentioned practice can be connected with guarantee obligations. But according to Kiyoto Convention, this concerns only some clearly defined cases. Recommendation 5.1 of the new version of Convention points out: “The national legislation should enumerate the cases, when a guarantee is required and define the forms where a guarantee is provided”.

The issue of guarantees in the Customs practices is considered one of the directions of improvement of the customs regulation. The ultimate objective of a guarantee is speeding up passing of goods through the customs with ensuring (is necessary) the payment of customs duties. A recommended form of the guarantee is a money order to a guarantee bank account, usage of liquid securities with this purpose and also a guarantee of a bank or insurance company. The interests from the sum of money, placed on a guarantee account, are not paid, as a rule. The sum of the security obligation is defined by the customs-house. However this sum should not exceed the size of the customs duties and payments, calculated for the moment of guarantee submission, or, in disputable cases, a maximum size of the customs payments, calculated by the customs-house. The national legislation of the countries – members of Convention should clearly define and enumerate cases, when a security is necessary. Recommendation 5.3 of the Convention defines that a declarant can choose any of the form of guarantees indicated in the Law. In the cases if goods regularly pass through the customs, a declarant can submit The General Security, covering successively passing consignment of goods. Recommendation 5.5 of Kiyoto Convention of 1999 defines that “in the cases if a security is necessary for ensuring of obligations, emerging in the process of customs registration, the customs authorities receive the General Security, in particular, from declarants, who regularly declare loads in different customs-houses of the given customs territory”. The security validity terminates as soon as the customs authorities make sure that the obligations covered by the security are fulfilled.

It should be stressed that in materials of the World Customs Organization (and before it – of the Council on Customs Collaboration) it has been repeatedly noted that delays of goods passing through the customs are caused by many factors, including low efficiency or insufficient professionalism in the work of ferrymen, transport and expedition firms and customs brokers. In the cases when these persons provide incomplete or unauthentic information, the customs declarations are declined or the documents processing is significantly delayed. Due to this fact the World Customs Organization recommends to the governments of all countries to work out the minimum standards for such professions and to strictly control their observation. The important problem, largely defining the efficient operation of the entire system of customs control is information which

should be provided by customs services to all the interested physical and juridical persons. Along with this in the foreign legislation defining the customs services operation it is stressed that imparting of extensive information about laws, standard acts, decisions and orders of general character to all the interested persons is the obligation of the customs bodies, which should impart this information to all the interested persons.

Publicity and openness, clearness and timeliness of information provided by the customs authorities to all the interested persons, is regarded as one of the most important conditions of acceleration of the process of customs processing of goods and one of the important directions of increase of the speed of commodity movement in the foreign trade.

The following group of problems is connected with unification of customs documents and harmonization of requirements to the number and diversity of the documents required by the customs authorities. One of the first questions is the form of the customs declaration. In June 1999 the Council on Customs Collaboration (now the World Customs Organization) adopted a recommendation addressed to all the participants of the Council on Customs Collaboration (CCC) and also to all the UNO members and the customs authorities of the European Union to use a common load declaration worked out by CCC in the capacity of customs declaration. The Kiyoto Convention of 1999 repeats this recommendation in general form.

As for the technology of preparation and transmission of documents in the electronic form, the World Customs Organization recommended all countries to use the standards for electronic transfer of data, worked out in accordance with EDIFACT UNO.

The World Customs Organization recommends the customs authorities to reduce the volume of information embraced by customs declaration to data necessary for charging and collection of customs payments, statistic data collection and legal application of the customs legislation (Recommendation 3.12, Kiyoto Convention, 1999). As for the number of documents, necessary for supporting the load customs declaration and for other purposes of customs registration, here in all the foreign countries the customs authorities actively realize the WTO requirement, saying that countries-members of WTO acknowledge the necessity of reduction and simplification of the import and export documentation (GATT-1994, Article VIII 1, (c)). It is necessary to take into account that complicated requirements to the documentation, too large list of additional documents and proliferation of their number and quantity of copies is regarded by WTO as an additional tariff barrier.

Thus, there are a number of key directions of the modern customs practices development. They are: decrease of the customs tariffs, simplification and optimization of non-tariff measures of regulation, unification of the customs legislation, switching from the total customs

control to application of risks management in the customs activity, etc.

The World Customs organization plays a key role in increasing the efficiency of the Customs activity. The system of conventional regulation of the foreign trade activity and assistance in modernization of the national customs services significantly promote the development of the world trade.

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NEWS OF SCIENCE

A 1.3- (TRANS) YEAR IN THE OXYGEN PRODUCTION OF A EUKARYOTIC UNICELL

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In time series consisting of separate data sets obtained in light and darkness alternating at 12-h intervals, we document a spectral component with point-and-interval estimates both longer than 1 and shorter than 2 years, called "transyears". *Background.* *Acetabularia acetabulum* is extensively used for the study of biological clocks (1). It also has a very prominent circaseptan rhythm (2) that, in the electrical potential of algae released into continuous light after prior standardization in light and darkness alternating at 12-h intervals, exceeded the amplitude of a circadian rhythm (3). A circadecadal (about 10-year) rhythm was detected in this alga. Adding to this spectrum, which includes prominent non-photoc cycles, is the transyear, tested herein after the discovery by John D. Richardson of a 1.3-year cycle in the solar wind (the particles ejected from the sun's surface into and through interplanetary space) (4) and the follow-up report on alternations between 1.3 and 1.6 years (5).

Materials and methods. The time series collected on the direction of Hans-Georg Schweiger were first organized by Sigrid Berger and Lübbo von Lindern (6) and made into a computer-manageable data base by the senior author. They are here analyzed by cosinor to obtain circadian parameters that were analyzed by linear-nonlinear least-squares rhythmometry as a pool of each parameter separately.

Results. Table 1 documents the findings with transyears given in **bold**. The transyearly amplitude is substantially larger than the amplitude found at a period of precisely one year.

*In 14 years of experiments on oxygen evolution by *Acetabularia*. 297 algae kept in LD12:12 each contributed up to a week's around-the-clock data on oxygen production. 24-h relative amplitude expressed as % of the corresponding MESOR. The latter analysis provided the point-and-interval estimates for period and amplitude and underlies the amplitude ratios (in **bold**). The linear estimates at a trial period of precisely 1.3 years (in *italics*)

are also shown, but the transyear is defined as one or several spectral peaks, each showing a 95% confidence interval lying between (and not overlapping) 1 and 2 years. Before using the 24-h acrophase as input for the succeeding least-squares analysis, it was noticed that the 24-h acrophases concentrated on one side of the circle. The circle was then opened opposite their circular mean and the 24-h acrophase taken effectively as deviations (in fractions of a cycle, i.e., degrees/360) from this mean. The consistently greater transyearly amplitude applies for 3 of 4 parameters tested when the A at the predicted precise 1.3-year time period is considered, yet the consistently dominant (amplitude ratio > 1.0) is emphasized, in keeping with the result of a linear-nonlinear analysis.

Table 1

Unseen solar wind competes with and sometimes dominates over the season

Greater prominence of the largely invisible signature of the solar wind's transyear(s) than the impact of the seasons*

Parameter	Transyear Period (y) [95% CI]	Transyear Amplitude (A) [95%CI]	1-y A	Transyear/year A ratios	
				A (1.3 y) NL/A(1.0 y)	A (1.3 y) F/A (1.0 y)
MESOR	1.298 (1.188, 1.408)	0.051 (-0.02, 0.12)	0.024	2.125	2.125
24-h A	1.681 (1.587, 1.774)	0.063 (0.02, 0.11)	0.012	5.250	1.154
24-h relative A	1.116 (1.066, 1.166)	0.084 (0.02, 0.15)	0.040	2.100	0.375
24-h acrophase	1.311 (1.260, 1.363)	0.013 (0.00, 0.02)	0.011	1.182	1.182

Discussion. As in the human body's circulation, a unicell that has been tracked to have been on earth around 500 million years ago shows an aspect of its physiology, which corresponds to the invisible (to the human eye) solar wind rather than to the alternation of seasons.

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BLOOD PRESSURE AND HEART RATE READINGS FOR SOLAR SCIENCE AND HEALTH CARE

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Blood pressure (BP) and heart rate (HR) abnormality, accumulating into excess, can be picked up by rhythmometry as overswinging, i.e., circadian hyper-amplitude-tension (CHAT), can occur on some days but not on others, e.g., in relation to emotions, exercise or magnetic storms. Fewer than 7 days of monitoring mean a greater chance of a false diagnosis. It was of interest nonetheless to compute, based on only 48 hours of monitoring, the percentage of morbid outcomes (such as a stroke) among subjects testing positive (i.e., for CHAT or for MESOR-hypertension), is known as the sensitivity of the test. CHAT has a sensitivity of 28.2%, as compared to 92.3% for the case of MESOR-hypertension. The specificity of a given test is the percentage of subjects with no adverse outcome among those testing negative. CHAT has a specificity of 94.6%, as compared to 45.7% for the case of MESOR-hypertension. The efficiency coefficient is the percentage of correct diagnoses in the light of outcomes. For CHAT, it is 85.9%, as compared to 51.9% for MESOR-hypertension. These values strongly

suggest the merit of assessing the blood pressure variability, notably the circadian amplitude of blood pressure, since the diagnosis of CHAT is not meant to be used as a substitute, but rather as a complement to the diagnosis of MESOR-hypertension. The same comment applies to the assessment of heart rate variability, gauged by the standard deviation (sensitivity = 25.6%; specificity = 95.7%; coefficient of efficiency = 86.5%), and to that of the pulse pressure (sensitivity = 56.4%; specificity = 94.6%; coefficient of efficiency = 84.5%).

Two features of the chronobiologic approach render the monitoring highly effective. First, blood pressure and heart rate can be automatically monitored without interrupting everyday life. Nothing special needs to be done and the procedure is hardly noticeable. This type of monitoring greatly reduces the likelihood of false readings and helps reaching an informed decision regarding treatment. Second, the data analyzed for rhythms are interpreted in the light of reference standards from gender- and age-matched peers in clinical health. Longer than 7-day profiles become indispensable when some circadian abnormality is detected, some about-half-weekly or about-weekly abnormality is sought, and/or the response to a change in treatment needs to be assessed.

Benefits are:

- a. The diagnosis of MESOR-hypertension is improved.
- b. Abnormalities of blood pressure variability provide warning signs of a heightened vascular disease risk prompting prophylactic action.
- c. The decision to treat is facilitated in terms of choosing between non-pharmacologic or pharmacologic treatment and, in the latter case, in terms of selecting the kind of medication, its dosage, and the timing of its administration in an individualized way, rather than treating an inhomogeneous collective, as in large clinical trials.

The response to treatment can again be rigorously assessed for each individual patient. If all these data are saved and aligned with data from the physicosphere, science can use the approach relying on spontaneous changes in the environmental variables to examine their consequences in the human circulation, as a transverse approach, complementing longitudinal monitoring.

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ABOUT LOGICAL ERROR DURING DESIGNING OF DETECTORS OF GRAVITATIONAL WAVES AND METHOD OF ITS REMOVAL

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A. Einstein was the first person, who predicted existence of gravitational waves in general relativity theory /1/.

The peculiarity of gravitational wave is that during passage via space and bodies, it does not only deform them, but also exerts alternate influence on distance between remote masses in space. Thus, gravitational wave changes amplitude of disturbance of space metrics η , which, correspondingly, ought to lead to alternate moving away and approaching of masses, located in the field of passing gravitational wave, by this:

$$\eta \approx \frac{1}{2} \Delta L / L \quad (1)$$

where η - is amplitude of disturbance of space metrics; ΔL -is relative displacement of two spatial points in the field of gravitational wave; L -is distance from one spatial point to another one.

Namely, this effect of quadruple influence of gravitational wave on separated masses is applied at modern laser, interferometer, and gravitational-wave detectors, representing slightly modified interferometer of Michaelson. Hertzenshtein M.E. and Pustovoit V.I. /2/ first proposed application of this principle for detection of gravitational waves. Problem of development of detectors of gravitational waves and gravitational-wave researches by J. Weber was sufficiently comprehensively enlightened in works /3-6/.

Though more than 30 years have passed since invention of the first J. Weber's detector of gravitational waves, however, hitherto, the main cause of failure of attempts to register gravitational waves is not known /7/.

In 1970 Weber made a sensational statement- gravitational waves are discovered, and their source is in direction to the center of Galactic. Consequently, other researchers from some foreign countries constructed Weber's detector, however, it was not possible to register gravitational waves in any case. What did J. Weber register in reality? This question remained unsolved.

Consequently, other researchers from some countries of the world constructed detectors of similar type, and majority of them was more

sensitive, than first samples. However, none of them managed registering gravitational waves using them. This fact put under doubt results of registration of gravitational waves, obtained by J.Weber.

Weber's detector was purposed to register gravitational waves with frequency $10^{-3} - 10^5$ hertz, and correspondingly, with wavelength of $3 \cdot 10^{-11} - 3000$ m.

After J. Weber's first experiments, gravitational-wave researches acquired unexampled scale. According to level of applied technologies unique detectors were created in different countries, and laser interferometers were more labor-intensive devices comparing with others. List of different types of detectors, developed and operating in different countries, is presented as follows:

A. Laser interferometers

LIGO (USA)

VIRGO (France/Italy)

TAMA 300 (Japan)

GEO-600 (Germany)

AIGO (Australia)

Dulkyun (Russia)

B. Cosmic laser interferometers

LISA (USA)

C. Spherical detectors

MiniGRAL (Netherlands)

ELSA (Italy)

GRAVITON (Brasil)

D. Resonance-mass detectors

NAUTILUS (Italy)

EXPLORER (Switzerland)

AURIGA (Italy)

NIOBE (Australia)

ALLEGRO (USA)

E. Torsion detector

ATROPATENA (Azerbaijan)

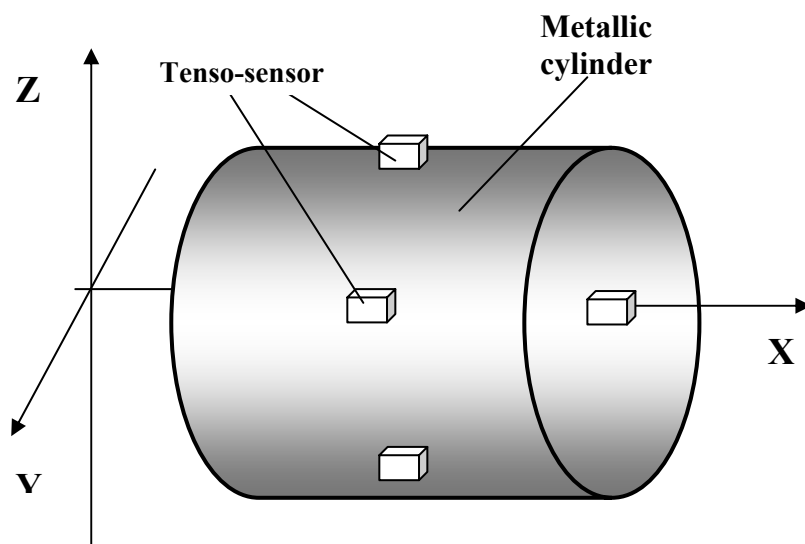
However, in spite of tremendous finances allocated for solution of problems of registering of gravitational waves, the purpose was not meantime achieved. Natural question arises, what is the main reason? The only answer of the authors of presently functioning detectors is: lack of sensitivity of available gravitational-wave antennas. Is it the case in reality?

In our opinion, this problem is not so much connected with low sensitivity of detectors, as with logical error, crept during their designing.

Let us examine this error and start from resonance types of detectors, for example, from J. Weber's detector.

Weber's detector is the device for registration of gravitational waves, containing solid metallic cylinder and special tenso-sensor, registering deformation of cylinder, during passage of gravitational waves at resonance frequency of cylinder.

The essence of this device is, that dimensions of solid metallic cylinder are compared with length of registered gravitational wave ($\leq \lambda / 2$), and by this end during passage of the first half period of gravitational wave it stretches cylinder in direction of its propagation and compresses crosswise. During passage of the second half-period, cylinder compresses in direction of propagation of wave and expands in perpendicular to it.



Pic.1. Schematic sketch of principle of operation of Weber's detector

As a result of passage of gravitational waves deformations of cylinder, by idea of developers, must be registered by means of special tenso-sensor (for example, piezo-sensors), and one may judge on passage of gravitational wave according to results of these measurements. Fundamental scheme of construction of Weber's detector is indicated in pic.1.

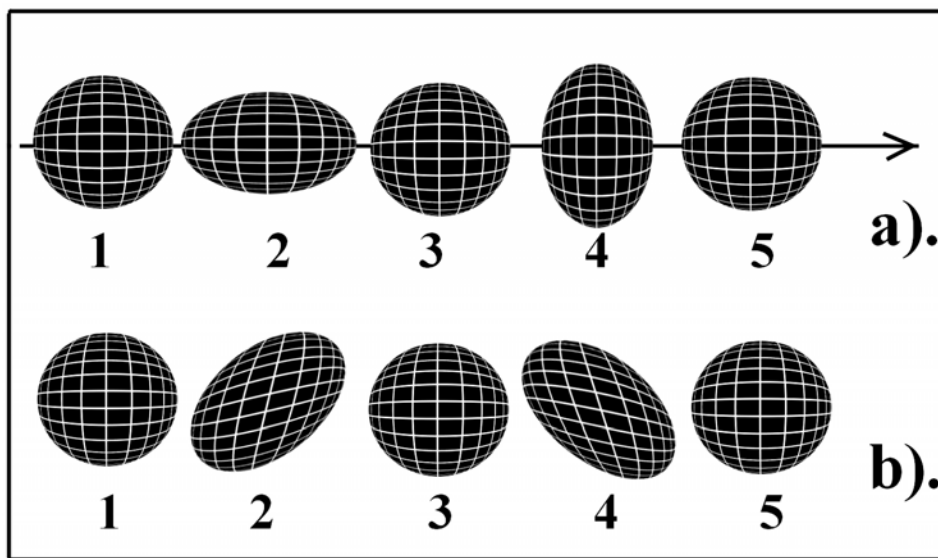
The drawback of this device is: its physical basis conflicts with relativity principle of special theory of relativity, due to this point it can not be applied for registration of gravitational waves.

According to general relativity theory, gravity is interpreted as curvature of spatial-temporary continuum by means of masses i.e. each mass

curves the space around itself. Namely, this curvature in space and in time is the main reason of gravitational interaction of masses.

Gravitational wave is represented as variable gravitational field freely propagating with light velocity, and displaying in formation of relative accelerations of bodies. While propagating in space, gravitational wave quadrupolly curves space and all bodies located in it, according to indicated in pic.2.

Thus, deformation of spherical body in the field of passing gravitational wave is schematically indicated in pic.2, and pointer indicates direction of its propagation. Position 1 -before passage of wave, position 2 - at the point of passage of the first half-wave, position 3 - corresponds to point of change of first half-wave into second half-wave, position 4 reflects passage of second half-wave, and position 5 – point of change of half-waves. Same positions are reflected in pic. 2b, however, in this case wave is directed in perpendicular to plane of sketch.



Pic. 2 Image of deformation of spherical body during passage of gravitational wave via it.

Taking into account, that during passage of gravitational waves, the length of which λ , exceeds, at least, twice linear dimensions of cylinder, deformation of cylinder and environment, surrounding it takes place, and change of curvature of space covers not only cylinder, but indicators, just as well, which must calculate these deformations. Thus, according to main positions of special theory of relativity, registration of gravitational waves by means of Weber’s tensor is basically, impossible.

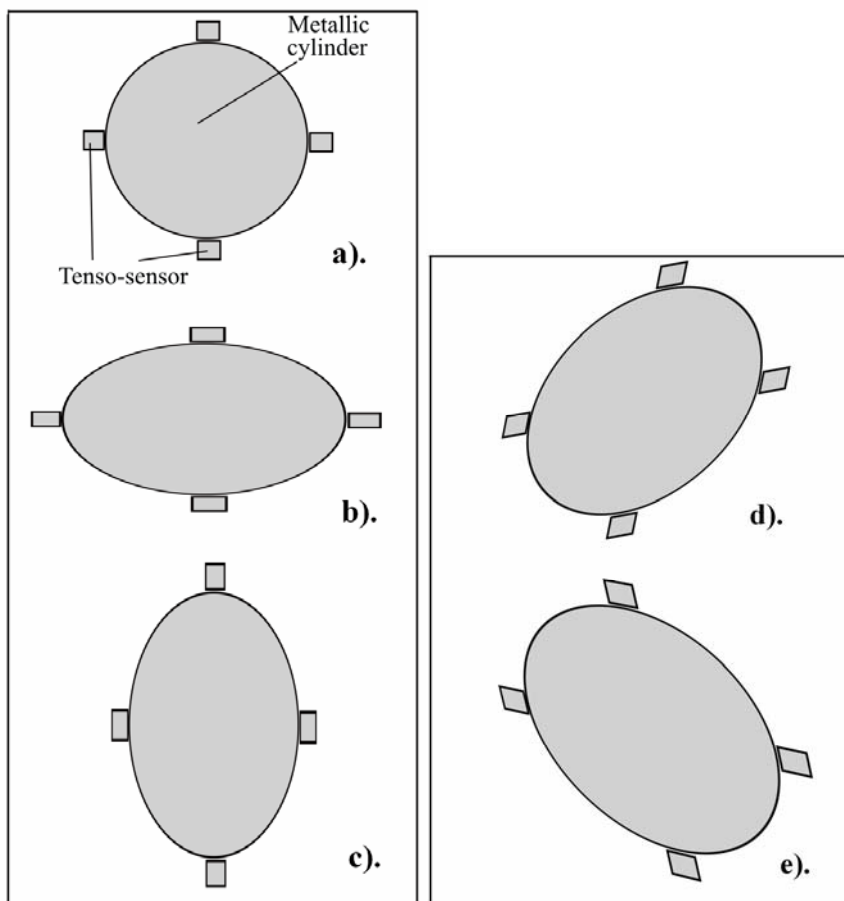
Principle of relativity states, that all laws are invariant in relation to transition from one inertial system of frame to another one. It means that if system of coordinates changes somehow, then all processes and nature laws in this coordinate system change invariantly in relation to each other.

During consideration of problem of registration of gravitational waves it is necessary to determine criterion, which defines parameters of system of coordinates. The only criterion in this case is length of gravitational wave, which we want register. Thus, length of coordinates of system X,Y,Z, where sensitive element must change its linear dimensions ought to be $< \lambda/2$, where λ -is length of gravitational wave. Proceeding from relativity principle of Einstein during change of this system of coordinates, it is impossible, by any means, to measure any physical variations of processes or dimensions of bodies and distances between them by means of devices or physical principles, operating in this system of coordinates. However, the principle of operation of Weber's tensor conflicts with principle of relativity of Einstein. Let us demonstrate this by means of specific example.

Influence of gravitational wave on metallic cylinder (resonator) and registering tenso-sensor in Weber's detector is indicated in pic. 3. Deformations of cylinder at direction of gravitational wave perpendicularly to its axis (parallel to its end) are indicated in pic.3 a, b, c, and deformations at direction of wave in parallel to its axis (perpendicularly to end), are indicated in pic. 3 d) and e).

It means that along with measured value (linear dimensions of cylinder) dimensions and shape of measurement sensors change (proportionally) invariantly, as result of this, indicators can not register deformation of cylinder, connected with passage of gravitational wave. At the same time, these tensors register any vibrations and noises, not relating to gravitational waves, for example, microseisms, vibrations from operating mechanisms etc.

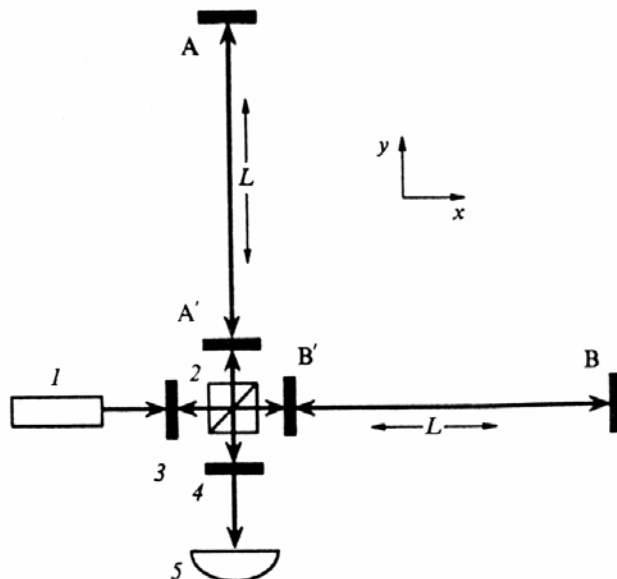
Device for registration of gravitational waves based on principle of laser interferometer is considered as more sophisticated and effective one. As an example, one may consider the principle of operation of gravitational-wave antenna LIGO (USA).



Pic. 3 Chart of influence of passage of gravitational wave on metallic cylinder in Weber’s detector

Scheme of principle of operation of LIGO detector /3/ is given in pic.4. LIGO represents laser interferometer, consisting of two L-shaped joined vacuum tunnels, inside which laser rays propagate.

Main elements of detector are two optical resonators: Fabri-Pierro, consisting of two pairs of mirrors AA' and BB'. Distance between mirrors in each pair is $L = 4 \cdot 10^5$ cm. Laser ray, initiating from radiator 1, passes via optical divider 2, which jointly with additional mirrors 3 and 4 provides connection between resonators. Coefficient of reflection of mirrors A and B is 1, whereas mirrors A' and B' possess definite transparency.



Pic. 4 Scheme of principle of operation of detector LIGO /3/

Laser rays, reflecting from these A and B mirrors, return back and while falling onto second pair of mirrors A' and B', reflect from them returning to mirrors in the end of tunnels. After multiple reflections from both pairs of mirrors, laser rays return into the zone of cross-section of tunnels, where they overlap on each other, creating interferential picture, fixed by register of interference. At very small displacements of mirrors, compared with length of laser wave, interferential picture must be changed and this change is registered by means of special registrar.

In our opinion, the main drawback of this device, as in case with Weber's tensor, is impossibility of registering gravitational waves by means of this device, due to violation of main principle of special theory of relativity - principle of relativity.

Like in the case with Weber's detector, gravitational wave, length of which λ is proportioned with dimensions of registering system, (in this case with length of L - shaped system of tunnels, where laser rays propagate), changes geometrical parameters of this system and space, as a whole, in such manner, as it is indicated in pic.2.

Meantime, system of L - shaped tunnels represents ideal coordinates system XY, as part of three-dimensional space XYZ, changing its curvature under influence of variable gravitational field, generated by passage of gravitational wave. Naturally, during passage of gravitational wave, linear dimensions of the whole system change periodically, and massive mirrors,

suspended on thin strings in the beginning and in the end of tunnel will either approach, or move away in relation to each other. It seems that, it is rather logical possibility to register these movements remotely by means of laser ray, which has to fix these transitions of mirrors by changing interference picture in the area of their imposition. Such technical decision is erroneous due to violation of principle of relativity of SRT. Laser ray passing inside tunnel also represents the part of registering system, parameters of which are characterized by coordinates system X, Y, Z.

Therefore, change of curvature of space, leading to linear changes not only of registering system, but of the whole space just as well, will lead to corresponding linear change of all elements of system, including parameters of ray itself, which proceeds from principle of relativity of SRT. In reality, according to principle of relativity of SRT, parameters of laser ray do not change in relation to coordinates system changed concurrently with it, because linear parameters of ray will vary invariantly to linear variations of the whole system. And this ray will not change interference picture during approaching or moving away of mirrors, as the length of its wave will decrease or increase proportionally to these variations. It means that invariance of all processes inside system of coordinates, changed by gravitational wave, will be preserved. However, in relation to other coordinates system, which was not subjected to influence of gravitational wave, length of wave of laser ray, will vary by value, corresponding to linear variations of space, curved by gravitational wave.

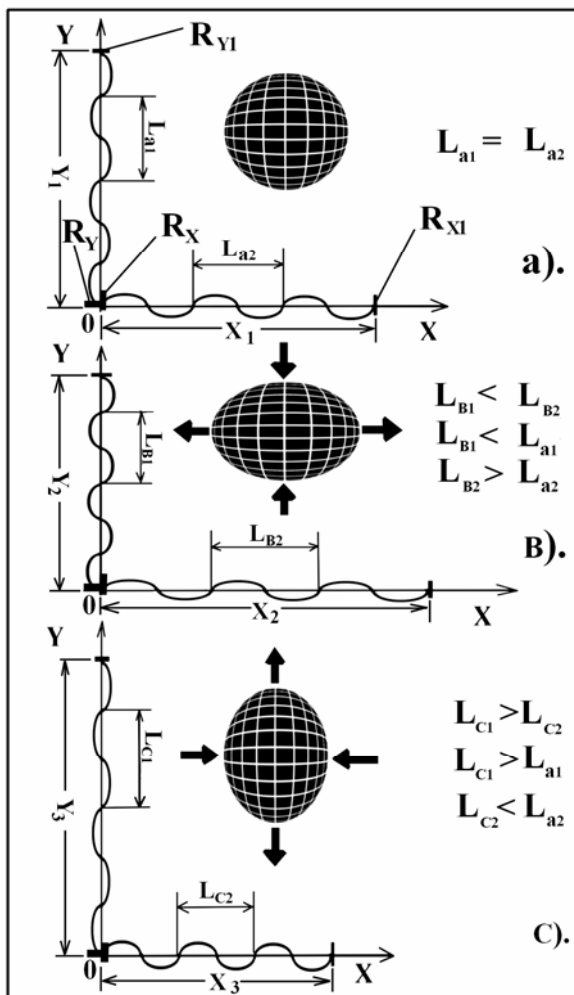
For presentation, an example of variation of parameters of ray during change of curvature of space under influence of gravitational wave and, as a result, of all parameters of registering system along with coordinates system is schematically indicated in pic.5.

Propagation of laser ray inside tunnels, parallel to axes X and Y before passage of gravitational wave, is indicated schematically in pic.5 a).

R_{y1} and R_{x1} are mirrors, installed on thin strings in the end of tunnels located along the axes X and Y. At the same time, X_1 and Y_1 are distances from mirrors R_y and R_x , located at the point of cross-section of 0 tunnels up to mirrors R_{y1} and R_{x1} .

As it is evident, mirrors do not change their position relatively to axes, and lengths of waves of laser rays remain unchangeable just as well.

Variation of linear dimensions of the whole system during passage of the first gravitational half wave, whose length of half wave exceeds length of registering system (length of tunnels), is indicated in pic.5 b). As it is seen, distance X_2 to mirror R_{x1} by axis X increased, and distance Y_2 by axis Y decreased. Correspondingly, length of wave L_{B2} of laser by axis X increased, and length of wave L_{B1} by axis Y decreased correspondingly.



Pic. 5. Schematic sketch of variations of wavelength of laser during passage of gravitational wave via laser interferometer.

Variation of linear dimensions of coordinates system during passage of the second gravitational half-wave is indicated in pic 5 c). As it is seen distance X_3 to mirror R_{X1} by axis X decreased, and distance Y_3 by axis Y increased. Correspondingly, wavelength L_{C2} of laser by axis X decreased and wavelength L_{C1} of laser by axis Y increased.

Wavelength of laser ray L in changed coordinates system, pic.5 b)., deformed by the first gravitational half wave, will change to value $\Delta L_{B,X,Y}$ differently along axes X and Y in relation to non-changed system of coordinates:

$$\begin{aligned} \Delta L_{BX} &= (X_1 - X_2) \cdot L \cdot X_1^{-1} \\ \Delta L_{BY} &= (Y_1 - Y_2) \cdot L \cdot Y_1^{-1} \end{aligned} \quad (2)$$

where L-is wavelength of laser in non-changed coordinates system (before passage of gravitational wave); $X_1 - X_3$ is distance from laser radiator to mirror R_{X1} correspondingly before passage of gravitational wave and during passage of the first gravitational half-wave; Y_1 and Y_3 is distance from laser radiator to mirror R_{Y1} , correspondingly, before passage of gravitational wave and during passage of the first gravitational half-wave;

Meantime during passage of the second gravitational half-wave, wavelength of laser ray along axes X and Y will also change by value $\Delta L_{cx,y}$

$$\begin{aligned} \Delta L_{cx} &= (X_1 - X_3) \cdot L \cdot X_1^{-1} \\ \Delta L_{cy} &= (Y_1 - Y_3) \cdot L \cdot Y_1^{-1} \end{aligned} \quad (3)$$

where L-is wavelength of laser in non-changed coordinates system (before passage of gravitational wave); $X_1 - X_3$ is distance from laser radiator to mirror R_{X1} , correspondingly, before passage of gravitational wave and during passage of the second gravitational half-wave; Y_1 and Y_3 is distance from laser radiator to mirror R_{Y1} , correspondingly, before passage of gravitational wave and during passage of the second gravitational half-wave;

Thus, as it is seen from expressions (1) and (2), wavelength of laser L in both tunnels of gravitational- wave and laser-interferometer detector will increase and decrease invariantly to linear changes of the whole system of registration (coordinates system).

The only way out from the formed situation is division of coordinates system, where sensitive element (tensor), with varying linear dimensions during passage of gravitational wave and system of registration, is located, by means of which measurements of deformation of tensor are made.

This effect is not gravitational Doppler effect, which is displayed near big masses, possessing enormous gravitational field, for example, quasars, causing red displacement and, it is consequence of principle of Einstein relativity.

However, observer, being outside changed coordinates system, would be able to fix changes of these parameters.

Meantime, construction and metric parameters of registering system itself must be such, that results of its measurements would not subject to influence of gravitational wave, which curves space and temporary continuum. And, we consider such construction below.

For removal of above described drawback of resonance-mass detectors and laser interferometer, gravitational-wave antennas, we proposed new construction of detector of gravitational waves with separate systems of coordinates for sensitive element and for registering system. By this, sophisticated detector is a set of two different types of detectors-laser interferometer and resonance-mass detector. It means that resonating mass is applied as sensitive element and laser interferometer - as a registering system - /8/.

The essence of proposed construction is that resonator and registering system are two independent upon each other systems of coordinates, parameters of one of them (resonator) are directly connected with length of registered wave, i.e. its linear dimensions must be less than half period of length of gravitational wave ($< \lambda/2$). Registered gravitational wave exerts deforming influence on coordinate system of resonator and these deformations of resonator are fixed by registering system. At the same time, whole registering system (laser interferometer) is another coordinate system on which registered gravitational wave, passing via system, does not exert influence, because length of gravitational wave is significantly less than linear dimensions of registering system.

Thus, by means of registering system independent on resonator-laser interferometer, not subjected to influence of gravitational wave, insignificant variations of linear dimensions of resonator during passage of gravitational wave are registered.

Principal scheme of construction of proposed detector of gravitational waves is indicated in pic.6.

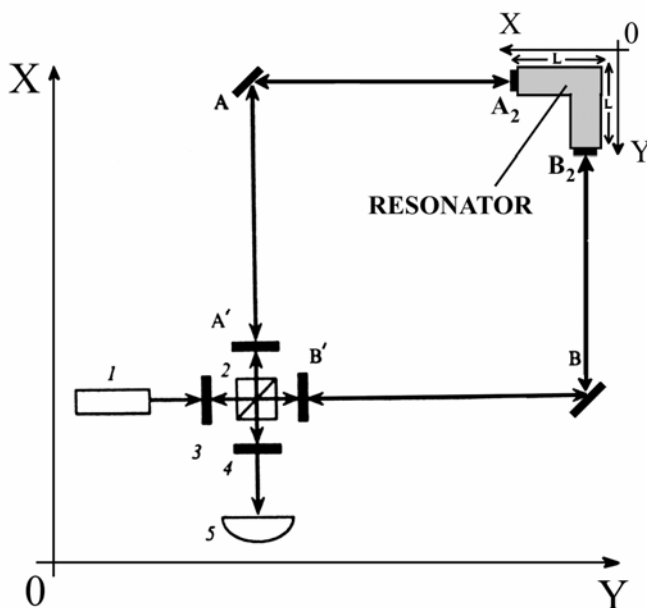
Device operates as follows: Coherent laser rays initiate from radiator 1 and passing via optic divider 2 fall on mirrors A and B, passing via additional half transparent mirrors 3 and 4 and also A' and B'.

As it is seen from scheme (pic.6), the first part of gravitational interferometer reiterates exactly construction of mentioned antenna LIGO. However, construction of proposed by us second part of detector, is distinguished fundamentally from LIGO antenna. Mirrors A and B are turned by 45°, due to this point laser rays are reflected at right angle and fall on mirrors A₂ and B₂, located at ends of L-shaped resonator, made from the solid material, for example, metal, length of shoulders of which is $< \lambda/2$ of gravitational wave.

Thus, during passage of gravitational wave, length of which exceeds twice linear dimensions of resonator, it quadrupolly deforms resonator, made from the solid material. By this, taking into account, that length of

gravitational wave is significantly less than linear dimensions of system of registration of laser interferometer, gravitational wave does not exert deforming influence on registering system.

Laser ray, reflected from surface of mirrors A_2 and B_2 , will register their small displacements in relation to mirrors A and B .



Pic.6 Scheme of construction of laser-interferometer, resonance-mass detector of gravitational waves.

As it follows from above indicated, if the principle of relativity is not considered in presently known constructions of detectors of gravitational wave, then this drawback in this construction is removed.

If parameters of one of coordinate systems are given by length of gravitational wave, then measurement system is to be beyond field of influence of gravitational wave. This is possible only in such case, when metric parameters of registering system significantly exceed linear parameters of sensitive element, but in no case, vice versa. In this and namely in this case measurement system (laser interferometer) will not be subjected to influence of registered gravitational wave.

For confirmation of above mentioned we would like to cite wonderfully formulated by Braginskiy main physical principles, on which detectors of gravitational wave are to be based: “In accordance with principle of equivalence, two free masses in uniform gravitational field will move with equal acceleration. Thus, as appears from principle of

equivalence, any device, which we supposed to “enter” between two free masses in uniform gravitational field, will not register this field.

Construction of proposed by us gravitational-wave antenna completely corresponds to scientific and technical requirements, indicated by V.B.Braginskiy.

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AGE AND THE TRANSYEAR OF HUMAN BLOOD PRESSURE

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Aim. To examine, as a function of age with serially independent sampling, i.e., as to individuals, the transyear (TY), defined as a spectral component of about 1.3 years, with point and 95% confidence interval estimates between (and not overlapping) precisely 1 and 2 years. *Background.* It was shown for circaseptan-circadian amplitude ratios of human blood pressure (BP) and heart rate (HR) that while during maturity the circadian amplitude is most prominent, very early and very late in life, the circaseptan component may predominate over the circadian and that an early prominence of the non-photically evolved circaseptan is also found in other species, e.g., pigs, rats, crayfish and *Acetabularia acetabulum*. *Methods.* Human BP and HR series were subjected to linear-nonlinear rhythmometry (1) and \log_{10} -transformed ~ 1.3 to 1.0-year amplitude ratios were computed and fitted with a second-order polynomial as a function of age. *Results.* The model is statistically significant for systolic BP, as shown in Figure 1. Amplitude ratios, assigned to midpoints of monitoring spans, are shown for both BP and HR in Figure 2, where the horizontal lines represent the individual monitoring spans. Ratios above unity are invariably found in different series from premature and at-term babies. By contrast, most ratios are below unity during the ages from 40 to 70 years. Later in life, there is a tendency in the elderly to have a larger transyearly than yearly amplitude.

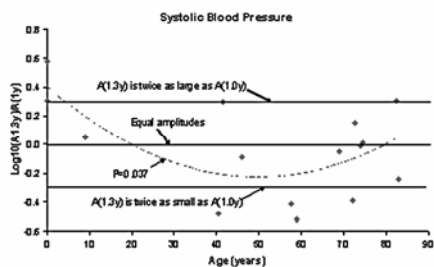


Figure 1.

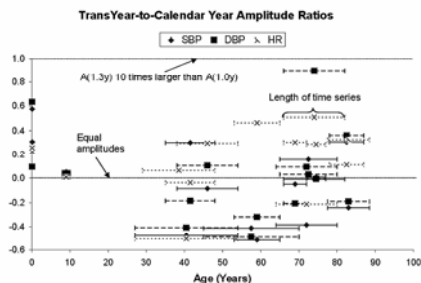


Figure 2.

Discussion. When two components with periods that are close in length characterize a time series, as in the case of the year and the transyear, beating can be demonstrated by simulation (2) and may contribute to the initiation and/or exacerbation of risk elevation or disease, as suggested earlier for the case of the circaseptan vs. circadian prominence.

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A TRANSYEAR IN AIR BACTERIA AND STAPHYLOCOCCI

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In bacterial sectoring studied yearly for nearly two decades (1), we document transyears, defined as spectral components with point-and-95% confidence interval estimates between trial periods of precisely 1 and 2 years. *Materials and methods.* Time series each covering several years had been earlier used to demonstrate an about-decadal cycle (1). Linear-nonlinear rhythmometry was applied to these data (2-4).

Results. Table 1 demonstrates, in **bold**, the transyear found for the bacterial and for environmental variables during the span corresponding to the biological data.

Discussion. No causal relations are implied, but the evidence is accumulating for trans-years in a broad phylogenetic perspective, including humans at one extreme and bacteria at the other. It is noteworthy that early in human life, in the neonatal circulation, the weekly change has a greater amplitude than the photic daily change and the transyear. The same is found in eukaryotic unicells. This is not the case for presumably genetic changes such as sectoring in prokaryotes, the air bacteria and staphylococci here anticipated.

Table 1

Peaklets in periodograms found by nonlinear least squares at initial trial periods of 1, 1.3 and 1.6 years in bacteria and in helio- and geophysical variables*

*Environmental series covering only the span of the bacterial series. Original data of Piero Faraone, Milan (piefarao@tin.it). **Cis-year shorter than 1 year and longer than 0.5 year (not overlapping 1 year).

	Trial $\square = 1.0$ y		Trial $\square = 1.3$ y	
	\square (y)	A	\square (y)	A
	[95% CI]		[95% CI]	
<i>Air bacteria</i>				
Bacteria (interpolated)	1.021 [1.014, 1.028]	2.85 [2.45, 3.25]	1.237 [1.195, 1.280]	0.67 [0.25, 1.09]
Geomagnetics (K_p)	1.007 [0.986, 1.027]	0.17 [0.09, 0.24]	1.275 [1.229, 1.321]	0.12 [0.04, 0.19]
Geomagnetics (Dst)	0.997 [0.979, 1.193]	3.14 [1.87; 4.41]	1.407 [1.343, 1.470]	1.75 [0.47, 3.02]
Wolf N	0.958 [0.929, 0.988]	0.52 [0.13, 0.91]	1.186 [1.135, 1.236]	0.47 [0.08, 0.86]
Bacteria	0.960 [0.945, 0.976]	2.45[1.94,2.97]	1.310 [1.227, 1.392]	0.85 [0.31, 1.39]
Geomagnetics (K_p)	1.103 [1.070, 1.137]	0.27 [0.17,0.36]	1.372 [1.306, 1.436]	0.21 [0.11, 0.30]
Geomagnetics (Dst)	1.064 [1.040, 1.088]	7.02 [5.16,8.87]	1.327 [1.272, 1.382]	4.63 [2.72, 6.55]
Wolf N	0.982 [0.880, 1.085]	0.44 [—]	1.381 [1.271, 1.492]	0.80 [0.19, 1.40]
<i>S. aureus</i>				
K_1 bacterial series	0.975 [0.951, 1.000]	2.18 [1.66,2.71]	1.318 [1.259, 1.376]	1.63 [1.08, 2.18]
K_2	0.988 [0.964, 1.012]	2.00 [1.55,2.44]	1.296 [1.224, 1.368]	1.12 [0.65, 1.59]
K_3	0.952 [0.930,0.975]**	3.18 [2.53,3.82]	1.584 [1.445, 1.722]	1.54 [0.87, 2.22]
Geomagnetics (K_p)	1.145 [1.091, 1.198]	0.28 [0.17,0.39]	—	—
Geomagnetics (Dst)	1.090 [1.053, 1.127]	7.86 [5.55,10.17]	—	—
Wolf N	1.049 [0.955, 1.144]	0.86 [0.19,1.53]	1.335 [1.211, 1.460]	1.02 [0.34, 1.70]
Trial $\square = 1.6$ y			$\frac{A \sim 1.6}{A1}$	
\square (y)	A			
[95% CI]				
<i>Air bacteria</i>				
Bacteria (interpolated)	1.591 [1.533, 1.650]	0.80 [0.38, 1.23]	<	
Geomagnetics (K_p)	1.573 [1.515, 1.631]	0.14 [0.06, 0.21]	<	
Geomagnetics (Dst)	1.736 [1.673, 1.799]	2.80 [1.54, 4.06]	>	
Wolf N	1.616[1.557,1.675]	0.72[0.33,.12]	>	

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SOME ASPECTS OF POSSIBILITY OF PREDICTION OF EARTHQUAKES ON BASE OF MONITORING OF NON-TIDAL VARIATIONS OF GRAVITY

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(Produced by the Academician of IAS E.N.Khalilov)

Short-term prediction of earthquakes is one of the most important problems arisen in front of humanity. Impossibility to define the main cause of earthquakes aggravates the problem. Undoubtedly, scores of indications of earthquakes, displayed before or after earthquakes, exist, however, these indications change every time in different ways. Displayed indications originate absolutely from different areas of nature, for example, biological, biophysical, unknown natural phenomena, uncommon behavior of animals, geophysical etc.

Mankind has not yet discovered true decision by means of classification of these indications, which will enable to find any regulations or definitions for prediction of earthquakes.

However, geophysical phenomena are subjected to definite order among indications of earthquakes: by time of origin, periodicity, location, position of epi- and hypo centers, by change of natural gravi - and magnetic fields, by localization of natural thermal field, by change of meteorological conditions, activation of mud volcanoes and many other factors. Among these factors violation of gravitational stability at definite mutual location of the Moon and the Earth represents interest.

For detection of any dependence of earthquakes upon position of the Moon, monitoring observations with two gravimeters were conducted at special polygon of the Scientific-Research Institute on Prediction and study of Earthquakes. Gravimeters were selected in such way, that they were similar in indications i.e. point of division and the shift of “zero point” at absolute values were characterized between each other by insignificant difference.

Monitoring observations were conducted from 16.10.2003 to 30.12.2003. The curve of changes of values of gravity in time was made. 3-4 readings were taken from gravimeters. The Moon positions i.e. new moon and full moon were ployed on the curve. Naturally, Moon position refers to the Eastern semi-sphere of the Earth, where Azerbaijan is located. Asian earthquakes with magnitude ≥ 5 , occurring during indicated period of time, were also ployed on the catalogue of earthquakes.

From comparison of the Moon position and change of gravitational field, it is well illustrated, gravitational field is not correlated with full moon and new moon, and semi phases of the Moon- between full moon and new moon, correspond to minimal values of gravity. Besides, from comparison of gravitational field with period of formation of strong earthquakes, it is mentioned that strong earthquakes correspond to semi-phases of the Moon and minimal values of gravitational field.

Analyzing obtained data, we imagine that during the semi-phase of the Moon, gravitational field is more perturbed (decreased), than during full- and new moon and this leads to active movements of macro-blocks of the Earth, as a result of which, seismic activity increases.

It is necessary to mention, for more reliable proof of such similarity long term measurements and detailed analysis are required.

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INFLUENCE OF ZEOLITE-CONTAINING BIOADDITIVES ON PHYSIOLOGICAL STATE OF THE ORGANISM

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As it is known, the analysis of the Earth is enriched with different elements and their compounds, which are necessary to human organism.

One of unique compounds is Zeolite. Azerbaijan is rich with this gift of Nature and there is no problem in using of it. The necessity of using of

zeolite for improving the physiological state of human organism is confirmed by its valuable qualities. As it is known, zeolite is the adsorbent.

The retained water in its mixture is very easily exchanged in the human organism with slags, containing in it. Thereby, it helps the human organism to get rid of slags, to recover, to normalize the functional indicators. Accordingly, the purified from slags organism works more coordinated. The importance of this factor for human organism is very high. As it is known, all processes, occurring in human organism, his own actions, and his life are regulated by the function of the brain. The brain works without apparent loads and with less energy consumption. Correspondingly, the time, allotted by the organism for resting of brain, i.e. slumber, is considerably decreased. The most important meaning in normalizing the functions of human organism has the analysis of zeolite, which consists of more than 80 micro and macro elements. The lack of micro and macro elements brings to different kinds of diseases: sciatica, infarct, trombophlebitis, diabetes, neurosis, cholecystitis, nephrite, goitre endemic, gastritis, ulcer of gastrointestinal tract, arthrosis, podagra of respiratory tract diseases and lungs, intestinal disorder, shedding of hair and nails, skin diseases, etc.

We can list very many diseases, connected with namely the deficiency of micro and macro elements. The medical treatment from them can be found in zeolite. Besides, zeolite has fine catalytic property, its capability to catalysis plays the role of ferments in organism. And as it is known, namely the ferment system supports living indicators of human organism. The colloidal solutions of some micro and macro elements have the same qualities, such as: colloidal copper (Cu^{+2}), colloidal silver (Ag^{+1}), colloidal cobalt (Co^{+3}) and so on, which may be used in combination with zeolite not only for extermination of prerequisites, leading to different diseases, but for treating these diseases. Capability of zeolite-containing bioadditives to influence on organism in the level of biochemical, ion-exchange, oxidation-reduction processes is irreplaceable with nothing. What is more important, the using of zeolite bioadditives is characterized with the fact that they selectively influence on organism, give from themselves only what is lack in the organism, taking, at the same time, the excesses of elements, their compounds and other substances, unnecessary for organism.

Using of zeolite bioadditives in combination with vitamins of groups: A, B, C (separately or in complex) shows very good results in recovery human organism and his immune system. The immune system has principal meaning for human organism. Zeolite additives, having cleared the organism, introduce in it the lacking macro and micro elements, mainly, saturating it with silicon, which is so important for building of skeleton and muscular systems, coverlet, regenerating it in cellular level, thereby, renew, rejuvenate and strengthen it.

Carried out experiments showed that in the persons who took zeolite-containing bioadditives, was improved the slumber, was increased the resistibility to infectious diseases; they are seldom sick with acute respiratory diseases; was improved the quality of scalp, in separate cases was observed the darkening of colour, was stopped the shedding of hair.

Was occurred the evident improving of coverlet: were disappeared the spots, blackheads, heat-spots, neoplasm as a wart. The capability to regeneration of tissues was increased very much, the green wounds, the cuts from sharp and cutter objects became to heal. Dry and wet skin soon became normal. Strengthening of functions of endocrine glands promotes the quick self-cure of organism, increasing of resistibility, efficiency, capacity to withstand the stresses, nervous derangement, clear understanding of true reality, taking immediate and right decisions.

Clearing the organism and blood, the zeolite-containing bioadditives, normalize the water-salt balance, pH of the organism, correspondingly, strengthens the exchange processes in it, and promotes normal processing and assimilation of proteins, fats, carbohydrates, vitamins and other substances.

This is not the whole list of advantages of zeolite bioadditives. Even hence, it is seen, that zeolite bioadditives have great future, and it is difficult to revalue its importance for normal functioning of human organism. Tomorrow is with zeolite bioadditives and their derivatives.

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APPLICATION OF THE REMOTE CONTROLLED MANIPULATORS AT EXTREME SITUATION

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The decision on technical supply of rescuers was formed naturally, due to increasing necessity to render the first medical aid to victims of natural and technogenic calamities and at the same time not to subject people from first aid team to additional risk. The application of remote manipulators is one of considered aspects in this article.

It is necessary to mention, humanity started applying the manipulator since ancient times. The first manipulator was the stick which served as extension of the human hand.

As it is, purpose of manipulators has not changed hitherto, just qualitative change, improvement of “extension sticks” took place.

The scientists of the whole world participate at development of new and sophistication of old principles. The main point of qualitative transition is separation, directly, of controls from operator, which resulted in following:

- It is not necessary to be in epicenter of place of calamity. Though operations are very frequently performed within limits of direct vision, nevertheless, risk from possible inflicting of harm to health of operator is minimized. At times, even working at distance of several meters, operator is able to accomplish work not endangering his life.
- In some cases manipulator has dimensions and weight less than human weight and height, which allows it entering those territories and objects, where human access is impossible.
- If in contrary significant efforts are required, then again, to apply manipulator with the “steel muscles” is more preferable than human force
- Analysis of levels of risk to human health directly at the place is again is in favor of manipulators.

Let us consider typical situation, the building was destroyed during the earthquake. However, situation is aggravated that during some time after destruction of the building water, power supply, gas (if it is chemical enterprise gas may consist of different compounds and concentrations). For primary analysis of air contamination, it is necessary to send expert with triers and to give for analysis, when he returns. It is not worth while reminding about peril which may catch him at that period, it may be spontaneously arisen fire and high possibility of explosion. Additionally, all these movements are time consuming, and this is not in favor of the people, who are under ruins.

Hence, let us consider situation, where remote manipulators are applied. Operator controls manipulator from safe distance and receives information from it in on-line regime. At that, information is not only of visual character, all possible analyzers for defining of concentration of explosives, poison-gases, sensors of vibration and super sensitive microphones are applied. Such set of sensors allows without much time

consumption analyzing situation and conducting work on cleaning of the way for other rescuers, who follow him, leading risk to minimum.

The devise of more minimized size may be driven into narrow manhole, where human can not penetrate. At that, water, minimal foodstuff, medicaments, portable radio and torch may be supplied to victim. If human does not give signs of life then by switching on microphone, it is possible to make analysis for checking of his breath and palpitation.

Nuclear industry with periodical necessity to repair and to undertake preventive measures without stopping of reactor, was one of spheres, where application of remote manipulators started. It is out of question to speak, that dose of radiation received by human during his work are far from normal background and it negatively reflected on human health. It is out of question to speak about direct participation of human during extreme situations. You may recall Chernobyl, so many people suffered and so many people died.

The problem of terrorism, which became global for the last period, gave new push for development of remote manipulators We may notice, namely, manipulators and not robots, because final decision must be taken by human. It would be unjustified to replace intuition by algorithm of behavior, as situation, practically, every time has unique character. Israeli Special Forces were among the pioneers. Presently, many structures of different countries apply developments in this area.

At the same time, tendency of building up of manipulators by intellectual capacities is of special attention. For example, each manipulator is supplied with clutches, which is not simply mechanics, they are provided with tactile sensors. They are sensitive not only to force of compression, but to such parameters as temperature, vibrations including wide specter, such as frequencies and levels. For example, different gas sensors of highly explosive substances are available.

Tracing the tendency of development, one may imagine direction of undertaking of further steps on the way of development of manipulators.

First of all, this is increase of period of independent work, two successfully developing lines are available in this direction.

The first line is decrease of power consumption, for the last years electronics made swift dash in this sense and applied different technologies.

The second line is power supply. These are the newest batteries, allowing reserving power per unit weight by dozens of times more than it was previously.

The parallel solution of these problems allows sparing time, and, at the same time, increasing functionality.

Second- is increase of range and application of new developments are, expected, to be solved positively. Application of satellite navigation allows identifying its location with great exactness and its means to make

connection to location. By adding to this factor the possibility of obtaining of television signal allows operator orienting at location far from the plains of accident

Third is increase of “armament”. The speech in this case is about different sensors. This is sense of smell, temperature measurements, acoustic analyzers, analyzers of micro seismic fluctuations, pressure and this enumeration may be very long. Surely, without miniaturization of all these sensors, one may not speak about location of such laboratory aboard of manipulator, which is small in size and weight.

Movers- is one direction, where big work is proceeding. Besides customary wheels and caterpillars, such methods of movement, like step, crawling, flying and skipping are in the study. Certainly, classical methods were numerously tested and, that is why, they are mainly applied in practice, but there are achievements, development of latest algorithms allows relying on practical application of above mentioned methods of movement.

The main purpose of starting of all this business is executive devices.

Many developers, especially developers of industrial robots participated at development of instruments and made important contribution. Developed by them theoretical and practical base, with great simplicity moved from walls of enterprises to remotely controlled manipulators.

In conclusion, it is necessary to indicate highly developed states of the world actively develop manipulators with aim to apply them in many spheres, which are not considered in this short resume.

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APPLICATION OF GIS TECHNOLOGIES IN THREE-DIMENSIONAL MODELING

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The development of high technologies makes drastic changes in the methods of geological-geophysical researches, in particular, during studying the depth structure and during evaluation of perspectives of oil-and-gas content of big depths. One of the most important achievements of development of computer technologies are GIS technologies (geographical informational systems). Application of GIS to oil industry and geology

appreciably widens the opportunities of forming and effective using of database.

So, applying of GIS technologies allows, in absolutely new principles, to draw up the maps of different destinations on basis of specially formed database. Such approach makes the opportunity to form the multifunctional digital maps, reflecting any “attached” to maps information, which is in database. So, for example, GIS – maps of seismic zoning may contain the information about tectonic faults of the Earth’s crust, of hypocenters of the earthquakes, axes of the stresses of seismic centers, etc.

Besides the mentioned tasks, GIS technologies allow to model three-dimensional images of different geological objects and their elements – pay thickness of oil deposits, bedding of layers, blocks and faults of the Earth’s crust, structure of different heterogeneities and anomalies in geophysical fields, speeds of spreading of seismic waves, etc.

So, we created three-dimensional model of zone of subduction and seismofocal plane of Benyof in the Caspian Sea. The model allows to observe the spatial location of zone of subduction of South-Caspian microplate, submerging under Scythian-Turanian plate, with spatial binding to it the seismic centers and depth faults of the Earth’s crust. GIS technologies allow to model the different complicated processes in dynamics, for example, the process of subduction within Caucasus-Caspian region during last 10 million years, or the process of forming, migration and further accumulation of hydrocarbon deposits. Using space images, the GIS technologies allow to carry out the monitoring of different processes, for example, to trace the dynamics of ecological pollution of territory, or to observe the activity of mud volcanoes in the degree of flow of mud-volcanic breccias in time /1/.

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SUPER-LONG GRAVITATIONAL WAVES INFLUENCE ON MEASUREMENTS OF GRAVITATIONAL CONSTANT

The search for gravitational waves is one of the most interesting and urgent problems of present time, as since prediction of its existence by A. Einstein in his works on relativity theory, published in 1916-1918, humanity unsuccessfully attempts to discover them by means of the latest methods and detectors. The other problem connected with theory of gravitation is impossibility (to present day) of determining the exact meaning of G, accurate to higher third after the comma.

The results of researches, produced in the works /2,5-9/ testifies to big deviations in measured values of gravitational constant G, received during last years by different scientists in different countries in different time. The deviations are observed, beginning with third sign after comma, in spite of the fact that accuracy of measuring instruments allows to register G with accuracy to 5th sign. These deviations in values of G do not allow to increase its accuracy higher than 3rd sign after comma, what is reflected in values, given from CODATA. In the given situation, the most important problem is to ascertain the reasons of these deviations of G and answer the question “Are these deviations random or they have regular character? If the deviations of G have regular character, then it is important to know:

- Which physical factor influences on indicators of Cavendish balance, and what nature he has – geophysical or astrophysical?

The only opportunity to answer this question is carrying out the international experiment on simultaneous monitoring of G in different regions of the Earth. If such factors are super-long gravitational waves, as the author of the project supposes, then for single-valued answer to the question it is necessary to measure G in two mutually perpendicular directions.

Analysis of variations of measured G (gravitational constant) values from 1985 to 2000 led us to conclusion, that they reflect wave variations of G, which are the result of imposition of super long gravitational waves of two orders with periods of 7,7 years and 2-2,5 years.

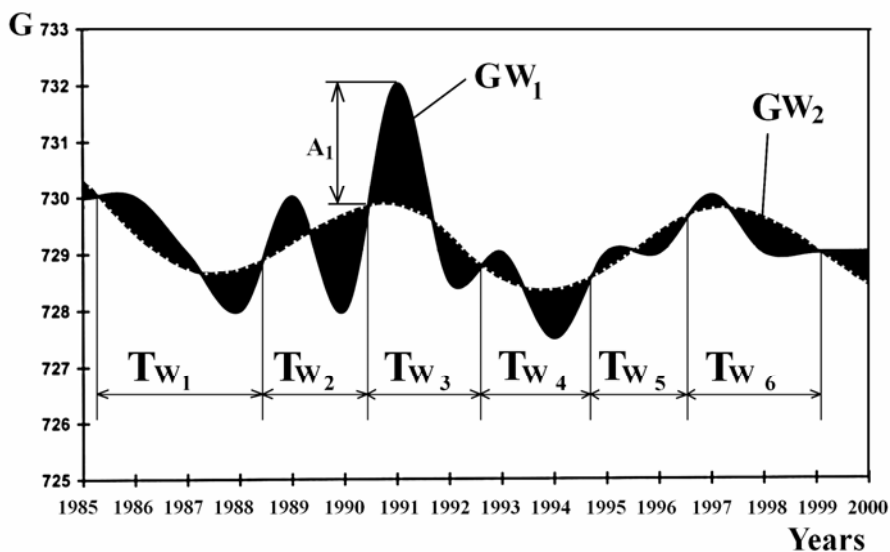


Fig. 1. Chart of actual values of variations of gravitational constant G from 1985 to 2000, averaged by years (by data /9/).
Axis G - G values starting from second number after coma;
 GW_1 - is a chart of actual values of variations of gravitational constant, averaged for a year (gravitational wave of first order);
 GW_2 - trend, approximated by sinusoid (gravitational wave of second order)
 TW_1 - TW_n - are periods of gravitational waves of first order;
 A_1 -maximal amplitude of gravitational wave of first order;

Passage of SGW causes quadruple deformation of the Earth, which was confirmed by recent discovery made by Christopher Cox from research company Raytheon and Benjamin Chao from NASA center in Maryland, made on the basis of study of long term variations in zonal coefficient of spherical harmonics of the Earth of the second degree, of the so-called coefficient J_2 . By means of artificial satellites of the Earth and laser measurements, they discovered quadruple change of the shape and size of the Earth, decrease of its radius in poles and its increase by equator. Namely, such reaction of the shape and size of the Earth is possible during passage of gravitational waves via it.

Basic results of this work are formulated by the author in the form of following postulates:

- Measured values of variations of gravitational constant have statistically reliable character and exceed the errors of measurement devices by order;
- Variations of measured values of gravitational constant have wave character;
- Gravitational constant is invariable constant, and observed variations of measured values of gravitational constant are sequence of influence of super

long gravitational waves passing via the Earth, on interaction of masses in Cavendish balance;

- Basically, it is impossible to measure accurate value of gravitational constant (higher than the third sign) by means of applied modern methods to day, due to the permanent presence in the Universe of gravitational waves, influencing on indications of Cavendish balance. However, it is possible to do it by means of method, developed by the author and device for registration of super long gravitational waves;

This allows registering disturbances of space metrics in mutually perpendicular directions and registering gravitational waves.

Taking into account the quadruple character of influence of gravitational waves on space, via which they pass, an attempt to explain, observed by different researchers, variations of measured values of gravitational constant G is made, by means of influence of gravitational waves, passing via the Earth on indications of Cavendish balance. Thus, from one side, by increasing of accuracy of measurements, logical explanation of increasing of scattering of measured G values appears, and, from another side, terrestrial conditions show that it is practically impossible to measure the true G value. This is connected with permanent influence of gravitational waves on interaction of Cavendish torsion balance, applied for G measurement.

NEW PRINCIPLE OF REGISTRATION OF SUPER-LONG GRAVITATIONAL WAVES: TORSION DETECTOR ATROPATENA

Results conducted of researches allowed the author to develop basically new method of registration of super long gravitational waves and device for its realization.

These method and device are based on registration of influence of disturbance of metrics of space during passage of SGW on interaction of loads in Cavendish balance. The device is based on the point, that in Cavendish balance the additional shoulder with loads, located perpendicularly to the first one, is installed.

Detector of super-long gravitational waves “Atropatena” allows to register the changes in time of gravitational interaction of masses in three directions of Cartesian system of coordinates – X, Y, Z (Fig.2).

Such principle allows to determine the quadruple character of changing of space-time metric. The registration is carried out with the help of digital gravitational-wave station.

The principle of operation of Detector Atropatena is as following (Fig.2). In upper part of detector body 1 are hanged up in two thin threads the two beams 2, oriented mutually perpendicular to each other. Inside of the body is created the deep vacuum. In absence of gravitational wave, the small masses, located on the ends of mutually perpendicular beams 2 and big

masses 3 change the space curvature in definite sphere, and are in definite distance from each other. In passing of first half-period of gravitational wave, the bobs of one of the beams will be approaching to big bobs, and of second beams – will be moving away. In passing of second half-period of gravitational wave, the direction of moving of beams will be changed on the reverse one.

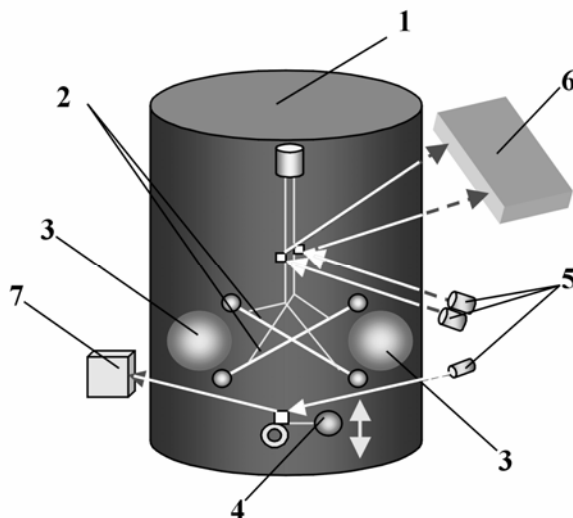


Fig.2. Scheme of principle of operation of torsion detector of super-long gravitational waves ATROPATENA.

- 1 – detector body, where is created deep vacuum;
- 2 – mutually perpendicular located horizontal beams with small bobs;
- 3 – big bobs;
- 4 - the bob, moving in vertical direction;
- 5 – laser oscillators,
- 6 – the register of laser beams, reflected from the mirrors of sensitive systems of horizontal beams;
- 7- the register of laser beam, reflected from the mirror of vertically moving bob.

At that, the bob 4 is fixed in elastic suspender and can move in vertical position. Moving of bob 4 actually measures the changes of gravity of the Earth. In passing of gravitational wave, the bob 4 will be making the undulating vertical displacements. Three special laser oscillators 5 direct the laser beams to mirrors, located in beams 2 and in lever of bob 4. Being reflected from mirrors, the laser beams are directed on registers 6 and 7. Any micro-displacements of mirrors are fixed by registers 6 and 7, and the information about displacements of laser beams is given in digital form to computer.

For exclusion of influence of seismic and geodynamic factors on indicators of detector, on the station are simultaneously uninterruptedly registered the seismic fluctuations and slow inclines of the Earth on the axes X, T, Z.

The physical principle of operation of detector Atropatena is that, in absence of gravitational wave (Fig. 3A), big 1 and small 2 bobs change around themselves the space curvature 3 and interacts with power $F = G \cdot m_1 \cdot m_2 / r^2$, where G is gravitational constant, m_1 and m_2 – masses 1 and 2, r – the distance between masses.

In passing of first half-period of gravitational wave, the length of which reasonably increases the distance r between masses 1 and 2 (Fig.3B), the field of gravitational wave not only in quadruple way changes the space metric, but also influence in quadruple way on changing of space curvature 3, aroused by the bob themselves 1 and 2.

As a result of it, the interaction between bobs is changed noticeably quicker, than the changing of space metric, aroused by passing of gravitational wave. The space curvature around the bobs are changed in quadruple way, and they move away from each other. In passing of second half of gravitational wave, the space curvature 3 around the bobs 1 and 2 is changed on the reverse in quadruple way, and the bobs approach to each other (Fig.3C).

During passing the super-long gravitational wave through the Earth, when the length of gravitational half-wave considerably exceeds the diameter of the Earth, the Cavendish balance in different zones of our planet will show different values of gravitational constant G. In Fig. 4 (1) is shown the situation, when the gravitational wave is absent. In this case, in all spots of the Earth, the Cavendish balance will show the equal value. In Fig.4 (2) is shown the situation, when the first gravitational half-wave passes through the Earth. In this case, if Cavendish balance have orientation in the relation to direction of the wave, as it is shown in the scheme, then in the sphere of poles the device will show the decreasing of G value, but in equator – the increasing of it. During passing of second half-wave (Fig.4 (3)) in the sphere of poles the Cavendish balance will show the increasing of G value, and in equator – the decreasing of it. Meanwhile, if to change the orientation of Cavendish balance in the relation to direction of gravitational wave on 90° , then the changes of G will have the contrary character. The torsion detector of super-long gravitational waves Atropatena works with this principle.

The torsion detector of super-long gravitational waves Atropatena is considered to register the gravitational wave in wide frequency band with period of wave from several minutes to many years.

The detector Atropatena is the first in the world detector of gravitational waves, where is used absolutely new principle of registration of gravitational waves, which has not been never used for this purpose before.

The author of inventing of torsion detector of gravitational waves is Khalilov Elchin Nusrat, Doctor of science, Professor, geophysicist.

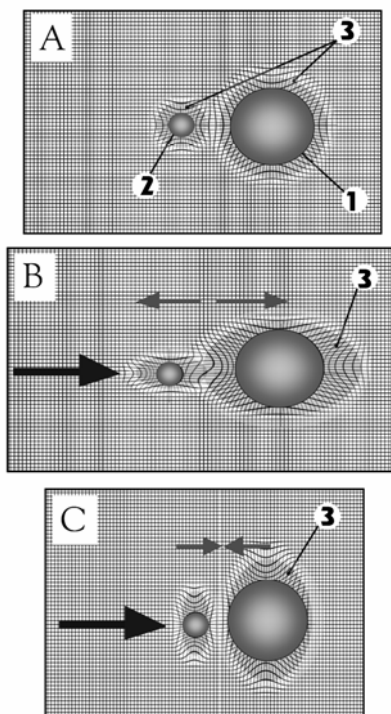


Fig. 3. Influence of super-long gravitational wave on changing of crookedness of space around the bobs in Cavendish balance.

→ - direction of spreading of gravitational wave;

↔ - direction of moving of masses;

1 – big mass; 2 – small mass; 3 – the sphere of the largest changing of crookedness of space, arouse by big and small masses;
 A – Absence of wave; B – Passing of first half-wave; C – Passing of second half-wave;

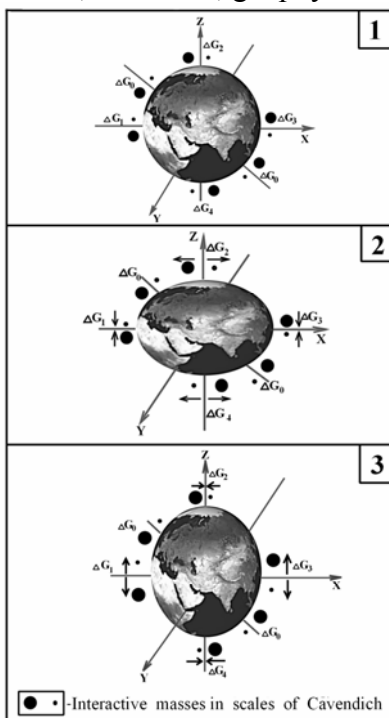


Fig. 4. Influence of super-long gravitational wave, passing through the Earth, on interaction of bobs in Cavendish balance in different parts of planets.

- 1 – absence of wave;
- 2 – passing of first half-wave;
- 3 – passing of second half-wave;

FIRST EXPERIMENT OF DETECTOR ATROPATENA



Photo 1. Torsion detector of super-long gravitational waves Atropatena and its author - Doctor of science, Prof. Khalilov Elchin Nusrat (geophysicist), director general of Scientific Center of Fundamental and Applied Researches (Baku, Azerbaijan).

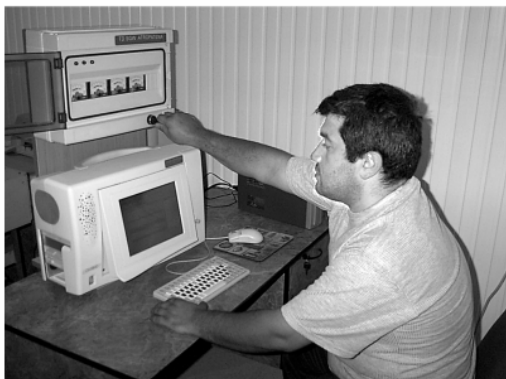


Photo 2. The digital registering station of super-long gravitational waves. The station simultaneously registers the deflections of masses in three directions -X, Y, Z.



Photo 3-4. Vacuum pumps.
 1 vacuum pump for creation of primary vacuum;
 2 vacuum pump for creation of deep vacuum.



Photo 5. A first model detector of Super-long gravitational waves (ATROPATENA-1)

PROPOSAL ABOUT COOPERATION

**INTERNATIONAL COUNCIL FOR SCIENTIFIC
DEVELOPMENT**

**INTERNATIONAL ACADEMY OF SCIENCE
EAST-EUROPEAN SECTION**

(Berlin, Germany)

**SCIENTIFIC CENTER OF FUNDAMENTAL AND
APPLIED RESEARCHES**

(Baku, Azerbaijan)

**SCIENTIFIC-RESEARCH INSTITUTE ON PROGNOSIS
AND STUDYING OF THE EARTHQUAKES OF
ICSD/IAS**

(Baku, Azerbaijan Republic)

SHAMAKHA ASTROPHYSICAL OBSERVATORY

(Shemaha, Azerbaijan)

ABASTUMANI ASTROPHYSICAL OBSERVATORY

(Tbilisi, Georgia)

**INTERDISCIPLINARY PARTNERSHIP
PROJECT GEOCOS ON THE THEME:**

**“STUDYING OF POSSIBILITY OF REGISTRATION
OF SUPER-LONG GRAVITATIONAL WAVES (SGW)
BY MEANS OF TORSION DETECTOR OF SGW AND
INFLUENCE OF SGW ON GEOPHYSICAL
PROCESSES”**

1. ACTUALITY OF THE PROBLEM AND SCIENTIFIC NOVELTY

Name of the project “GEOCOS” reflects the connection of processes, occurring in the Earth and in the cosmos, in particular, the influence of super-long gravitational waves, which have cosmic origin, on the processes, occurring in the Earth.

Researches, carried out in the whole world with purpose of registration of gravitational waves (GW) have not yet had success. Meanwhile, it is undoubted, that the discovering of GW will answer many questions of astrophysics, fundamental physics and geophysics, and will be the next incitement to development of modern natural science.

In the world there are several types of detectors of GW, which use different physical principles:

A. Laser interferometers:

LIGO (USA)

VIRGO (France/Italy)

TAMA 300 (Japan)

GEO-600 (Germany)

AIGO (Australia)

Dulkyun (Russia)

B. Cosmic laser interferometers

LISA (USA)

C. Spherical detectors

MiniGRAL (Netherlands)

ELSA (Italy)

GRAVITON (Brazil)

D. Resonance-mass detectors

NAUTILUS (Italy)

EXPLORER (Switzerland)

AURIGA (Italy)

NIOBE (Australia)

ALLEGRO (USA)

Our Institute suggests to use the fundamentally new physical principle to register the super-long gravitational waves, described above and realized in the acing detector Atropatena (Baku, Azerbaijan). More detailed description of physical principles, laid in the basis of detector of SGW is given in the work/2/ or in the part “scientific works” in the site www.intacademy.com

The researches carried out by us, allowed to come to the conclusion that the observed by many scientists of the world the variations of values of

gravitational constant G are connected with influence of super-long gravitational waves, passing through the Earth, on Cavendish balance /2-4/, www.intacademy.com

Meanwhile, for single-valued answer this question about reasons of variations of G , it is necessary to carry out the simultaneous monitoring of G values in different parts of the world /7-9/. Decision of this problem has great actuality about necessity to find the answer to one of the most important questions of fundamental physics – Why variations of G are observed, and about large-scale developing of cosmic space, which requires the exact G value.

Super-long gravitational waves (with period from several minutes to many years), in contrast to high-frequency gravitational waves, have opportunity to influence on different geophysical processes, which occur in ionosphere, atmosphere, hydrosphere and in the bowels of the Earth. We do not bring the influence of SGW to only geometrical change of space metric, but also consider it as greatly more complicated process, changing the direction of energetic flows in the Earth and near-earth space. In the works /2-4,10/ are given the results of researches in this sphere, which show the possibility of influence of SGW on geodynamic and geophysical processes. For the first time it is suggested to view the problem of registration and studying of gravitational waves in interdisciplinary aspect – on the border of fundamental physics, astrophysics and geophysics. In geophysics to the problem of GW was not enough attended, in spite of the fact that the Earth is one of elements of cosmos, and any cosmic factor, including gravitational waves, influence on it. However, taking into account the shapes of our planet, for making essential changes in redistribution of energy flows is necessary sufficiently long time of influencing on the Earth, which is peculiar to super-long gravitational waves. As it is known, the introduced energy is characterized not only with value of amplitude but also with duration of period of influence.

2. AIM AND TASKS OF RESEARCHES

The aim of researches is registering of super-long gravitational waves and studying of the possibility of their influence on geophysical processes.

The main tasks of researches are:

- studying of possibility of influence of SGW on indications of Cavendish balance during measuring of G value;
- studying of possibility of influence of SGW on atmospheric processes;
- studying of possibility of influence of SGW on processes in ionosphere and on solar activity;

- studying of possibility of influence of SGW on geophysical processes (variations of geophysical fields, changing of spectrum of seismic noises, etc.);
- studying of possibility of influence of SGW on geodynamical processes (activity of the earthquakes, volcano eruptions, slow movements of Earth's crust, movements of lithospheric plates, etc.).

3. METHODS

In the project is suggested to divide the participants of the project into two categories:

1. The participants of the project, who directly carry out the uninterrupted registration of SGW in different parts of the Earth by means of identical torsion detectors of SGW.
2. The participants of the project, who carry out the monitoring of physical processes in atmosphere, in solar system, in the ocean, on the surface and in the bowels of the Earth, and in the cosmos – by means of artificial satellites.

4. MAIN NECESSARY CRITERIA

1. One of the most fundamental criteria of the given project is providing of simultaneous uninterrupted monitoring of measurements of gravitational constant G in two inter-perpendicular directions (X , Y) and variations of the gravity (Z) in different, maximum distant from each other parts of the Earth, what is provided by means of torsion detector of SGW.
2. It is necessary the absolutely identity (standardization) of all technical parameters of torsion detectors of SGW, which are used in different parts of the Earth.
3. It is necessary to exclude the influence of seismic and geodynamic factors on indications of torsion detector of SGW, what is achieved by means of simultaneous digital recording of seismic noises and slow inclinations of surface of the Earth in three directions (X , Y , Z).
4. It is necessary the uninterrupted recording of all parameters with exact single time reference by means of signals of time, coming from JPS.
5. Those participants of the project who will take part in registering of SGW should be provided with absolutely identical torsion detectors of SGW. Our Institute may solve this problem.

6. The essence of the methods of realization of this project is as following:

- Simultaneously in different, maximum distant from each other, parts of the Earth will be registered SGW with the help of identical torsion detectors of SGW, with single time reference;
- Registering of SGW is accompanied by digital registration of seismic noises of the Earth in three directions (X, Y, Z) and slow inclinations of surface (is recorded the amplitude and azimuth). This system is included into the complete of torsion detectors of SGW;
- Simultaneously is carried out the monitoring of following parameters: variations of geomagnetic field, tideless variations of gravity, natural vibrations of the Earth, level of world ocean in different parts of the Earth, solar activity, space-time distribution of cyclones and anti-cyclones, space-time distribution of covering the Earth with clouds, seismic and volcanic activity, long-term variations in zonal coefficient of spherical harmony of the Earth of second degree J_2 , changes of spectral characteristics of seismic noises, different parameters of ionosphere, changes of angular velocity of Earth rotation, etc.

5. POTENTIAL PARTICIPANTS CAN SUGGEST THE REGISTERING OF ADDITIONAL PARAMETERS, WHICH MAY BE OF INTEREST FOR THIS PROJECT

At the end of every determined period (for example, yearly) the participants make comparison and correlation of signals, registered by torsion detectors of SGW, with account of influence of seismic noises and slow inclinations of surface. If there exist similar signals in most of detectors of SGW, we may make the conclusion about registration of super-long gravitational waves and determine the direction on their resource in the cosmos.

After it there will be made the correlation analysis of received signals of SGW with other geophysical, meteorological and cosmic factors, and will be valued the degree of influence of SGW on geophysical, geodynamical and cosmic processes.

Revealing of such connection will allow to answer many questions about natural science, in particular, about the reasons of impossibility of exact determining of G, and about cause-effect relation in variations of many geophysical and astrophysical parameters and rhythm of natural processes.

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In the project it is proposed taking part of geophysics, astrophysics, physics, meteorologists, oceanologists and the specialists of other specialties.

The potential sponsors (grantgivers) of the project may be National Scientific Fund of the USA, NASA, CRDF, INTAS, national scientific funds of different countries and other big state, private and social organizations, interested in the given project.

On the first stage, the coordination for realizing the project takes upon himself Scientific and Research Institute on prognosis and studying of the earthquakes and the author of this project – director general of the Institute, President of “INTERGEO-TETHYS” HOLDING, doctor of science, Professor, Academician of International Academy of Science/ICSD Elchin N. Khalilov (geophysicist).

The partial financing of the project on the first stage takes upon itself the Holding - International Scientific Technical Complex “INTERGEO-TETHYS”

Is planned the confirming several scientific coordinators of the project from different countries, which will be elected in the meetings of Coordinating Council

The author of the project suggests to give the functions of leader of the project on the leading scientist in this sphere, whom will propose the main sponsors (grantgivers) of the project.

**THE PROJECT AND ITS NAME ARE REGISTERED IN
WORLDWIDE ORGANIZATION OF INTELLECTUAL PROPERTY
(WOIP)**

For torsion detector of SGW is written the application to get the patent PCT/AZ2003/000001.

The organizations and potential sponsors (grantgivers) and participants of the project, which are interested in the project, please, fulfil the attached form and send it with your proposals and wishes to the following contact numbers and e-mail:

Fax: (994 12) 493 66 65; (994 12) 438 80 65

e-mail: sgwgeo@yahoo.com

**REGISTRATION FORM
OF SPONSOR/PARTICIPANT OF THE PROJECT GEOCOS**

1. Full title of the organization or surname and name of individual participant _____

2. Please, register our organization as a SPONSOR/PARTICIPANT (underline) of GEOCOS project.

3. Contact person:

Surname _____

Name _____

Country _____ **Position** _____

Academic degree/status _____

E_mail _____ **Fax** _____ **Tel.** _____

4. FOR SPONSORS:

Our organization is interested in realizing the GEOCOS project and would like to finance its realizing with amount of _____ \$US/Euro

5. FOR PARTICIPANTS:

We would like to carry out the following works in the frames of the GEOCOS project

6. PROPOSALS:

Signature _____

Date _____

INFORMATION ABOUT INSTITUTE

Scientific-research Institute on Prognosis and Studying of the Earthquakes has the status of non-commercial non-governmental organization. The Institute is a part of International Council for Scientific Development/International Academy of Science – Health and Ecology and is a part of Holding - International Scientific-Technical Complex “INTERGEO-TETHYS”.

The Institute is established in 2001 and registered in the Ministry of Justice of Azerbaijan Republic (Number of State Registration 1349).

The Institute has State Licence of Azerbaijan Republic for carrying out scientific-research works: in the sphere of prognosis of the earthquakes, aerospace researches, cartography, geophysical, geological, ecological and other kinds of scientific researches (Number of State Licence 004451).

In the Institute there are the following scientific subdivisions:

- Laboratory of applied geophysical researches;
- Laboratory of elaboration of electronic and electron-mechanical equipment;
- Laboratory of gravitational-wave researches and monitoring of geophysical fields;
- Laboratory of space researches;
- GIS Center;
- Computer Center;
- Seismic Station;
- Scientific-research ground (outside Baku);
- Scientific-research geophysical vessel;
- Sector of earthquake-proof construction.

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