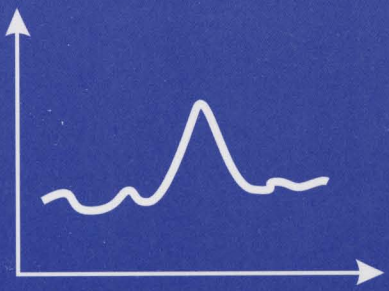
PHYSICISTS IN PARAPSYCHOLOGY



PHYSICISTS IN PARAPSYCHOLOGY

Essays

Edited
by Liudmila B. Boldyreva and Nina B. Sotina

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Translated from Russian by
Mikhail Boldyrev,
Konstantin Kouptsov,
Nadezhda Sukhorukova

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This is a collection of articles describing the results of experimental studies of some phenomena of parapsychology. Theoretical approaches based on the model of superfluid physical vacuum to explanation of the phenomena are presented.

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What Attitude Should We Take Towards Parapsychology?

The road ahead of us to conceiving all laws of nature and the various ways they manifest themselves is so long that it would be unworthy of a philosopher to reject phenomena for no other reason that they cannot be explained with the up-to-date state of knowledge.

P.S. Laplace

Parapsychology studies apparently new means of communication, or interaction, between organisms and their environment (such as psychokinesis, telepathy, dowsing...) beyond those presently understood by the scientific community.

Having encountered some observations related to parapsychology, scientists rush to find explanations. An explanation, most soothing as it may appear to some scientists, is that there is no new phenomenon, that the data was garbled or experiments were not set rigorously enough. Indeed, such an explanation always has a right to exist, because even the most meticulously designed experiment is not a hundred percent reliable. Besides, every researcher has own personal scientific bias which can be grounds for questioning his or her interpretations of the data obtained from the experiment. Therefore, it is conventional in the scientific community to consider a phenomenon as established provided it has been confirmed by several well-known independent laboratories. With this convention in mind, no one phenomenon in parapsychology may be considered established.

However, science would not move forward if it were not for those first researchers and laboratories where unclear observations became established facts. Where is the boundary

between pre-scientific knowledge based upon a multitude of observations, mixed in with prejudice and insights, and science itself? Does not the scientist creating new approaches and models cross this boundary? It is pertinent to give the following quote from Louis de Broglie (*Sur les Sentiers de la Science*): *"...human science, by its very essence rational in its basis and methods, can reach the most wonderful achievements only through dangerous and sudden mind leaps, when the abilities, usually referred to as imagination, intuition, wit, released from the heavy chains of strict reasoning, are revealed"*.

It is our opinion that ignoring parapsychology means missing a new scientific direction! Certainly, "mind leaps" in this area often lead to the opposite extreme: unconditional acceptance of all parapsychological effects, emergence of new mindbending hypotheses which are, unfortunately, too loosely connected with the conventional scientific theories. There are numerous examples of fantastic hypotheses in this area. We can recall here the fascination with concepts of multidimensional spaces used for the explanation of some phenomena of parapsychology. There are mathematical theories of multi-dimensional space, but there is a question of how they correspond to real space (connected to our perception of measure), to the framework in which matter is enclosed. This is a question about the physical modeling of nature and there are no complete models here yet. Undoubtedly, Louis de Broglie understood all too well that it was not worth relying on intuition too much and warned us against running to extremes: *"Of course, a scientist would have risked falling into delusion, had he overestimated the role of imagination and intuition in the course of his work; he would have abandoned the concept of the rationality of the Universe, which is the main principle of science, and would have returned to mythical explanations, common for the pre-scientific phase of human thought."*

One can surely question whether people are capable of rational comprehension of all the existing phenomena of

parapsychology. Indeed, the analytical abilities of the mind are limited. Theoretically, it seems that our mind cannot grasp infinite (in many respects) nature in finite time and in a finite region of space. But we hope that humanity has not yet reached the limits of rational comprehension. Even more so, many observations related to parapsychology already have rational explanations from the point of view of the existing scientific paradigms and can serve as a basis for new directions in scientific research. For example, a claim of some researchers regarding the influence of pyramids on the physiological activity of organisms becomes less exotic if we recall the influence of the shape of a cavity on the properties of an atom inside it (because of a change in the Lamb shift resulting from energy fluctuations that arise in physical vacuum under boundary conditions). Another example of the natural cause of something which seems to be a miracle concerns the almost undetectable increase in the body weight at the moment of death. It is known that the death of any living creature is accompanied by the decay of a large number of bio-molecules of the body. From the physical point of view the decay of a quantum system leads to an increase of the total mass of the constituent parts (the so-called mass defect). And we can certainly add those areas that are now being actively studied and are still traditionally believed to belong to parapsychology in spite of the fact that they are already tightly bound to the classical scientific disciplines (for instance, investigation of the electromagnetic component of the human biofield using infrared and other detectors).

However, there are phenomena (such as psychokinesis) that do not exactly fit into the modern scientific paradigm. The scientific direction we are developing, namely the superfluid physical vacuum, allows one to provide a physical meaning and interpretation to such phenomena of parapsychology.

Liudmila Boldyreva (née Sotina)
Nina Sotina

A Bit of History of Parapsychology in Russia

G.K.Gurtovoy

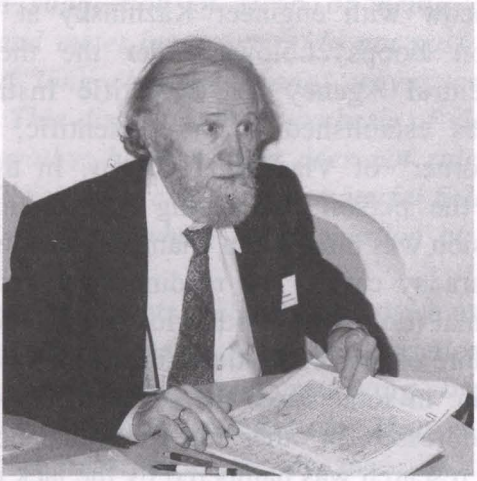
A long time ago when I was a student at the Department of Physics of Moscow State University (it was in 1933-1939), the lecturers discussed physics as an almost complete branch of science, except for some "insignificant details". Naturally, I wanted to choose a challenging theme for my undergraduate thesis. I became acquainted with several physics laboratories and chose the Biophysics Laboratory of the USSR Academy of Sciences, headed by Academician Pyotr P. Lazarev. It was agreed that my undergraduate thesis would be devoted to the biophysics of vision, and Professor Sergei Y. Turlygin, Lazarev's disciple, would be the supervisor of my studies. At the same time, Lazarev agreed to carry out supervision of my work. In February 1939, I successfully defended my undergraduate thesis and soon after that I became a post-graduate student at the Biophysics Laboratory, where Lazarev was my direct supervisor of studies. My studies, however, were interrupted by the war. Then followed service at the front, a wound, and the return to the work I liked. Soon I was conferred the degree of candidate of physical and mathematical sciences.

I benefited much from my association with Academician Lazarev and Professor Turlygin. My interest in the biological and physical aspects of psychophysiology was formed and developed owing to those people who, together with Academician Vladimir M. Bekhterev, corresponding member of the USSR Academy of Medical Sciences Leonid L. Vasiliev, candidate of physical and mathematical sciences Bernard B. Kazhinsky, were the pioneers of the psycho-biophysical phenomena research conducted in the USSR in the framework of natural science.

In 1919-1927, Academician Bekhterev, Director of the Leningrad Research Institute on Brain and Psychic Activity,

conducted a number of studies of telepathy in experiments with human beings and animals. At the same time, in 1919-1926, electrical engineer B.B. Kazhinsky (he was awarded later with a degree of candidate of physical and mathematical sciences) carried out works on theoretical and experimental grounding of the electromagnetic hypothesis of telepathy.

Generally speaking, there are the following ways of experimental justification of the electromagnetic telepathy hypothesis: the direct detection of the supposed wavelengths of brain radiation, screening radiation, and varying the distance between the transmitting and receiving brains.



Georgiy Konstantinovich Gurtovoy, Professor, Ph.D. (in physics and mathematics), Ph.D. (in biology)

The approach based on direct detection of the electromagnetic radiation of the brain was first stated by Lazarev in 1920; he supposed that it was possible "to detect thoughts in a form of electromagnetic waves in external space", and considered the task the most interesting problem of biological physics. However, at that time Professor V.K. Arkadiev came to the conclusion, based on mathematical calculations, that the

power of the electromagnetic fields created by the action currents of the "transmitting" brain was too small and did not reach the threshold value, that is, the value at which the nervous processes generated by the currents could be detected subjectively by a person. The power is much less than that of electromagnetic fields generated by electric devices and wires among which people live and work now. For this reason, Arkadiev rejected the electromagnetic hypothesis of telepathy [1].

The history of the second approach, i.e. the experimental validation of the electromagnetic telepathy hypothesis through the screening of the supposed modes of brain radiation, began in 1922 in Moscow with engineer Kazhinsky at the Practical Laboratory on Zoopsychology under the then education ministry's Central Agency for Scientific Institutions. The laboratory was established at the "scientific, cultural and educational corner" of Vladimir L. Durov. In the Kazhinsky experiments, the person performing mental influence at a telepathic session was placed in a chamber screened by metallic plates (the Faraday cage). The readings were addressed to a human or animal (dog) whose behavior was an indicator of the success or failure of the "communication". The results appeared to be uncertain: in some cases the screened person's readings reached the addressee, in other cases they did not. Kazhinsky wrote that the research was hampered by the lack of a complete set of instruments. However, in his view, "the mere possibility of implementing such a 'thought recorder' must signify a new era". Professor Turlygin adhered as well to the electromagnetic telepathy hypothesis, although he admitted that some aspects of the hypothesis cannot be explained by the properties of electromagnetic field. In 1939, I attended a seminar of the Biophysics Laboratory of the USSR Academy of Sciences where the Professor presented a report *On radiation of the nervous system*. He spoke of original experiments designed and carried out in his laboratory which allowed for a conclusion of "the

existence of radiation emanated from the human organism". Note that all the experiments were conducted within one room.

At the same time, the experiments carried out by L.L. Vasiliev at the Leningrad V.M. Bekhterev Brain Institute in 1932-1937 and later in a special laboratory for research of telepathic phenomena at the Physiology Institute under the Biological Faculty of Leningrad State University in 1960-1966 cast doubt on the electromagnetic hypothesis. This is the conclusion the researcher came to:

"There is experimental data that the screening of the transmitting person and the recipient by means of cameras made of 1-3 mm thick lead or steel plates did not obstruct or even attenuate the suggestion of sleep or being awake. Short (centimeter- and meter-long) waves do not pass through such cameras, and long (kilometer-long) waves are attenuated considerably. This discredits the hypothesis of electromagnetic nature of telepathy; however, this does not rule out that the 'transmitting' brain may create some material field or produces some energy owing to which the suggestion at a distance is performed." [2]

Vasiliev's experiments included also those associated with the third direction of research — the variation of distance between the transmitting and receiving brains. In the experiments, the distance varied from 25 m to 1700 km. It appeared that an increase in the distance did not affect the positive results in those cases where they had been definitely observed at small distances. Original experiments on mental action-at-a-distance were also carried out later (in 1956-1968) at the Automatics and Electric Measurement Institute of the Siberian Division of the USSR Academy of Sciences in the Academic Town near Novosibirsk by Doctor of Technical Sciences V.P. Petrov. Telepathic communication between rabbits was studied at a distance of 7 km. Electrodes were implanted in the brain of the "transmitting" rabbit and the brain was stimulated by electric pulses setting the rabbit on the alert, and

bringing about search and orientation reactions. Electrodes were implanted also in the brains of recipient rabbits to record the brain action currents. The results of the experiments demonstrated with statistical significance the influence of the "transmitting" rabbit on the recipient rabbit in conditions that ruled out any communication between the animals through known sense organs.

Both Turlygin's experiments in Moscow and Vasiliev's ones in Leningrad were stopped before World War II. There were no other serious experiments or research on the telepathy phenomenon in the USSR up to the end of 40's. However, the seances involving distant reading of other people's thoughts conducted by Wolf Messing (the seances were called "Psychological experiments") made the corresponding authorities address the Philosophy Institute of the USSR Academy of Sciences with a request to work out an introductory text which could serve as an explanation of the materialistic nature of the unique capabilities of Wolf Messing. At that time I worked at the Philosophy Institute, the Laboratory of Psychophysiology of Vision which was established at the Psychology Sector of the Institute. Thus, I became connected with the work, while my colleagues Mikhail M. Bongard and Mikhail S. Smirnov participated directly in it. Later Bongard and Smirnov (who became candidates of physical and mathematical sciences) successfully carried out a detailed investigation of Roza Kuleshova's "skin vision" phenomenon.

Upon defending my doctor of biological sciences thesis in 1974, I was deeply involved in conducting experiments in the field of parapsychology.

In 1975, the Bioenergetics Section was founded at the Moscow City Board of the A.S. Popov Scientific and Technical Society, with Alexander G. Spirkin, Corresponding Member of the USSR Academy of Sciences, Doctor of Biological Sciences, as Head of the Section. Some time ago Spirkin had been a postgraduate student at the Philosophy Institute where I worked, so

it was easier for me to get access to the materials of research works on parapsychology carried on in the USSR. At the end of the 1970's, I started experimenting on the mental action-at-a-distance of sensitives on electricity generating fish (Gnathonemus peterii). Essentially, those experiments were intended to reproduce the results of earlier research headed by Vladimir R. Protasov, Doctor of Biological Sciences [3]. At that time I made the acquaintance of Alexander G. Parkhomov. He came to the laboratory cellar premises where I carried on the experiments and said in a positive tone of voice: "I am just the man." Since that time we performed all the experiments together. Over a period of time we came to experiments with technical systems, such as a noise generator or microcalorimeter, because we decided that the nature of the sensitives's action-at-a-distance can be studied more effectively with devices, not primitive animals. This is because the results are more objective, and the experiments are easier to accomplish. For the same purpose, we used greater distances in the action-at-a-distance experiments. This would allow us to rule out the effects of the acoustic and thermal fields radiated, undoubtedly, by any sensitive.

In May of 1986, the Bioenergetics Section of the Moscow City Board of A.S. Popov Scientific and Technical Society was headed by Vlail Petrovich Kaznacheyev, Member of the Academy of Medical Sciences, and it was renamed the Section of Organized Matter Physical Fields. I became Deputy Chairman responsible for scientific questions. At the same time, the Committee on Energy and Information Exchange in Nature ("Bioenergoinformatika" Committee) was established under the Board of the USSR Union of Scientific and Engineering Societies. The Committee was also headed by Kaznacheyev. He directed the Novosibirsk Institute for Clinical and Experimental Medicine, where he conducted extensive studies of information exchange between living cells. He was among the first to carry out experiments on mental action-at-a-distance. A set of experiments on action-at-a-distance between

Moscow and Novosibirsk was performed by Evgeniy A. Dubitsky.

At the "Bioenergoinformatika" Committee, we spent much time and effort co-ordinating experimental works conducted by small research teams all over the country. Naturally, financial support of those works was out of question. The Committee had no funds for those purposes and most research was carried out owing only to the enthusiasm of the scientists. At the end of November 1989, the Committee organized and carried out in Moscow, at the premises of G.V. Plekhanov's Institute of National Economy, the First All-Union Conference "Energy and Information Exchange in Nature. Concepts. Applications. Prospects." More than 1200 researchers from various regions of the country and from other countries took part in the conference. The auditorium was full and a large number of people not admitted clustered near the Institute. Correspondents from all the leading newspapers and journals were present; continuous TV coverage was carried out. That was the time of parapsychology renaissance in the country. The veil of silence was lifted and numerous vetoes removed; however, the era of commercialization and the fraudulent use of parapsychology had not begun yet.

A.G. Parkhomov and I decided to make a report of our studies of sensitives's action-at-a-distance on technical systems: a noise generator and microcalorimeter. The studies had been carried on for 7 years and we obtained a number of interesting results. Among the major results were the following: the sensitive could influence a device and the effect did not depend on the distance (E.A. Dubitsky as the sensitive exerted influence on the devices located in Moscow from Novosibirsk), besides, the effect could not be described by the properties of electromagnetic fields.

About a month before opening the conference, I informed the participants of I.M. Kogan's seminar on parapsychology at Moscow State University about it and invited them to submit

applications. After the seminar, two good-looking women came to me. They appeared to be two sisters: Liudmila B. Boldyreva and Nina B. Sotina; they said that they were writing for the *Science and Religion* journal an article titled "Magic and Quantum Mechanics", so they were interested in studying the parapsychology phenomena and would like to participate in the conference. I gave them a copy of the paper I had written with A.G. Parkhomov and told them: "If you provide me with an explanation of the phenomena described here, I shall put you on the list of lecturers." In a month, they made a speech "Human action-at-a-distance and quantum mechanics". The content of the lecture and the way they delivered it were highly appreciated by the auditorium and, particularly, Academician Kaznacheyev, Chairman of the Conference. Since then, the sisters became participants of many conferences held by the Committee in Moscow and other cities.

In the course of works conducted by voluntary scientific organizations, it became more and more evident that their status and resources did not permit them to carry out research efficiently. It was necessary to take into account new conditions. In parallel with the voluntary non-profit units of the "Bioenergo-informatika" Committee, new self-supporting structures emerged. The Association of Energy and Information Exchange was the first among such organizations. Firiaz Rakhimovich Khantsiverov, Doctor of Technical Sciences, was elected Chairman of the Association. Formerly he headed the Center of Outer Space Sounding. In December 1990, the Association was renamed the Academy of Energy and Information Exchange which was transformed into the International Academy in 1992. I was elected a Member of the Academy. The Academy specified the following directions of its work: the reproduction by means of engineering and the theoretical study of such phenomena as telepathy, telekinesis, biolocation. The research conducted by the Academy is largely application-oriented.

At present I spend much time on the methodological aspects of research of parapsychological phenomena. Taking into account the impossibility of explaining the phenomena and new effects in the framework of widely-accepted physical models, I concluded that the scientific paradigm must be changed, that is, a scientific revolution was necessary. It is worth quoting R. Descartes' saying: "To find out the truth, a man must at least once in his life get rid of the accepted paradigm and build up his frame of reference anew."

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Experiments and Thoughts

A.G. Parkhomov

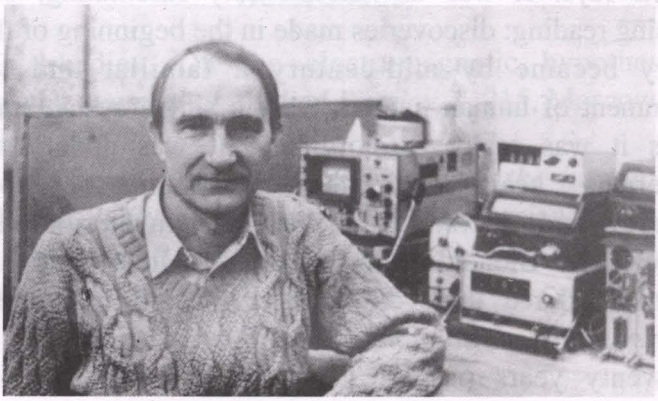
The most valuable item in our home library was considered to be a file of the *Nature and people* journal from 1911. I used to open this thick volume with great care; I turned over faded pages and looked at the pictures. I read stories, stumbling at every word ending with the hard sign[1], about distant countries, never-seen animals, early airplanes, the wireless telegraph, radium, and Röntgen rays. It was all unbelievably fascinating, but not surprising reading: discoveries made in the beginning of the 20th century became by mid-century a familiar and typical environment of human habitat. Only a single article surprised me, as it was really extraordinary. It was about thought-transferring "brain rays", the experiments of Professor Bekhterev and doctor Kotik, and the mysterious N-rays discovered by Blondlo from France. My interest in unusual phenomena flared up even stronger when I read the book *Mysterious phenomena of human mind* by L. Vasiliev.

Twenty years passed. I graduated from the Moscow Institute of Engineering Physics, worked on the properties of ionizing radiation and defended my dissertation, read many books and articles. The problem of mysterious phenomena was largely ignored in scientific literature, and only occasionally was this topic touched in popular-science journals. My interest in these mysterious phenomena, born out of an information deficit, was further inflamed by rumours about the phenomenon of Kulagina, the mysterious house on Furmanny Bystreet in Moscow, the laboratory of Academician Guliayev and Professor Godik.

[1] Old Russian orthography before language reform in 1918 — *Ed.*

The First Experiments

I got a chance to satisfy my research instinct in 1981. I met Misha Nikolayev, with whom I once worked in a scientific research group, but had later lost track of for a couple of years. I found out that Misha spent this time learning esoterics and developing psychic abilities. We decided to work together and conducted a lot of experiments in 1981-1983. The aim of these experiments was to check the reality of the phenomena and to understand their nature.



Alexander Georgievich Parkhomov, Ph.D. (in physics and mathematics)

Experiments with the photographic pictures from our family archive were also impressive. Left alone in the room, Misha picked a random photograph from the pack and expressed his feelings in writing. Further comparison of his written messages with the information we had (which sometimes had to be reconfirmed after the experiments) showed, that Misha was pretty confident in identifying already deceased people, and in pinpointing the character of somatic and psychic illnesses of the alive.

Pretty interesting also were the results with Kalanchoe[1]. Two thin electrodes were inserted into the leaf and a value of electrical resistance between them was continuously recorded. It turned out that the plant could be in the three distinct states: "sleepy" (the rate of change of the resistance is less than 10 percent per hour, low sensitivity to external influence), "awake" (the rate of resistance change can be as high as 5 percent per minute, high sensitivity to external influence), and "nervous" (resistance variations with a frequency of several hertz and an amplitude of a few percent, high sensitivity). We were not able to detect any results of psychic influence when it was in the "sleepy" state. In the "awake" state, the sensitive managed, by acting remotely and "filling the leaf with the aura of red or yellow color", to cause the resistance changes comparable to the changes caused by turning on or off a light or by piercing leaves with a needle. A "touch by the astral hand" caused it to change to the "nervous" state. In one of the experiments Misha attempted to imagine "pulling the plant out with the root". The reaction to this was unusually violent: the resistance lowered by 10 percent in less than a minute. After that, the experiments with Kalanchoe had to be terminated because every time Misha appeared in the room, the plant inter-electrode resistance started to fluctuate so wildly that experimenting would not have much sense.

What is Next?

From the very beginning I did not give any serious *scientific* meaning to the above experiments: they essentially repeated what other researchers have already done. Those experiments were practices, giving us confidence that these amazing phenomena are not figments of a sick imagination or a result of fraud, and may well be the subject of research. Countless

[1] Tropical plant also cultivated for home decoration. — *Ed.*

repetition of the experiments, only confirming the *existence* of the phenomena, would be an idle pastime. We had to go further and make such experiments that would get us closer to the understanding of what is hiding behind this shell — the amazing manifestation of the phenomena.

Paranormal phenomena are indissolubly tied to the processes of transmission and transformation of information. And the first question arising in the mind of a traditionally thinking researcher is the following: what is the *carrier* of information? Electromagnetism, lying in the foundation of our technological civilization, does not possess the qualities which might explain the series of paranormal phenomena such as weak dependence of the effect strength on distance, lack of shielding, and selective interaction with one out of a multitude of objects. The same thing may be said about sound, the flow of particles, as well as all other information carriers we can think of. One can assume that in a foundation of paranormal phenomena lies *something* conceptually different from everything mastered by science and technology.

Before embarking on studying the nature of paranormal phenomena, a proper object for psychic influences had to be chosen. It is very tempting to use living organisms for this purpose. However, the reaction of living organisms to sensitive influence is a result of a multitude of physiological and psychological transformations. Therefore it is very difficult to understand what lies at the basis of this reaction. Living organisms react to light perfectly well, but the nature of light can hardly be understood by studying this property of the organisms. One needs the appropriate photo receivers, lenses, diffraction gratings, and other "hardware". In the same way, starting the research aimed at comprehension of the essence of paranormal phenomena, one should begin with the "hardware", devices as simple and well understood as possible. Especially if we take into consideration that the psychic interaction with "hardware" is equally as successful as it is with living organisms.

Taking these considerations into account, for further studies we have chosen a calorimeter (a device for measuring thermal effects) as an object of the influence. The calorimeter responds to any influence that is accompanied by energy redistribution. It has the simplest design allowing for precise quantitative measurements. (One of our calorimeters consisted of a pressure-tight copper shell and a thermistor of MMT type of about 20 mg weight.)

The most complex problem is *thermal* shielding. The use of thermal insulators, thermoses and electronic thermostats has not given satisfactory results. A solution appeared to be simple enough: the calorimeter, in an airtight enclosure, had to be frozen into pure water. In the process of melting of the ice monolith, the change of temperature of the calorimeter enclosure did not surpass millionths of a degree Celsius, even in the close presence of a hot iron. Metallic screens were used to shield from electromagnetic perturbations. The shielding was considered satisfactory when the device did not react to the working nearby spark discharger. To prevent interference from the electrical wiring, batteries were used to power up a signal amplifier and a self-recorder. These devices were called "shielded micro-calorimeters" (SMC). Experimental results using them appeared to be quite unexpected; they will be discussed later.

Experiments with the Fish

An article by V.R. Protasov and collaborators published in the 1981 issue of the *Reports of the USSR Academy of Sciences* argued that a species of fish *Gnathonemus petersii* were extremely sensitive to various external influences, changing the frequency of electrical impulses generated by the fish. In the fall of 1982, I learned that Professor Gurtovoy decided to check the possibility of using this fish as a bio-indicator of psychic influences and he was looking for assistants. I responded to this

proposition, and this started my long cooperation and friendship with Georgy K. Gurtovoy.

A.G. Parkhomov and G.K. Gurtovoy

We conducted experiments with the *Gnathonemus petersii* in the Laboratory of Fish Orientation at Severtsov Institute of Evolutionary Morphology and Animal Ecology. Our problem turned out to be not an easy one. In order for the psychic influence to become noticeable, we had to use quite complicated complex of detecting and analyzing equipment, and take measures to isolate the aquarium from external electromagnetic, sonic, vibrational, and light interference to a maximum possible degree. Another complication was in the necessity of multi-hour recording of the "background" before every psychic influence, and the relaxation to the initial state after the influence took a very long time. Therefore, we managed to conduct no more than 2-3 experiments per day. The influence was the following: the sensitive was sitting about one meter away from the aquarium and mentally calming the fish down or mentally putting a second fish near the real one. Seventeen sensitives performed the experiment, but only eight out of them managed to reliably change the parameters of pulses generated by the fish. On the other hand these eight sensitives had 21 successful attempts out

of 25. It is important to note that under the psychic influence the pulses always became *less* frequent, whereas the "usual" influences (light, sound, and change of temperature) caused *more* frequent pulsations.

The experiments with the *Gnathonemus petersii* have shown that some people are able to confidently establish psychic contact with the fish. But using this bio-indicator for routine research is not expedient: the technique is very complicated and measurements are too long to take. The side result of the conducted experiment was the discovery of Lunar cycle periodicity with the generation of the electric pulses by *Gnathonemus petersii*: the frequency of the "background" pulses is 10-20 percent less during the new moon than during the full moon. It is curious how the fish in the aquarium in a basement managed to know about the lunar phases.

Furmanny Bystreet

The 1980s saw great interest in various unusual phenomena. I remember that a discussion of the problems of parapsychology in L.A. Druzhkin's apartment attracted about twenty people. I remember the overcrowded hall of the Institute of Physical Problems where E.E. Godik was talking about his experiments. Hundreds of people from all over the country participated in the annual All-Union seminars on the problem of biolocation. And finally, a huge All-Union conference "Energy-information Exchange in the Nature" took place in 1989.

An attempt to put some order to this fountain of amateur activity was undertaken at the Popov Society of Radio, Electronics, and Telecommunications where the Section of Bioelectronics was established. It did not conduct any research; its main role was to establish connections and to organize seminars and conferences.

Another center was the laboratory of the Problems of Bioenergetics at the All-Union Council of Scientific and

Technological Associations located in a small two-storied building on Furmanny Bystreet. It was a peculiar club, where psychics and researchers used to come for personal contacts, experiments, discussions, and to exchange information about their experiences. Seminars took place there on a regular basis.

The access to the seminars was limited. It was not possible for an outsider to get in the building because Yuriy Ivanovich and Dina Pavlovna Piatykhins, who knew everybody in person, guarded the entrance.

G.K. Gurtovoy and I gained the status of insiders of this club in early 1984. It gave us the possibility to talk with wonderful people: A.F. Okhatrin, A.V. Chernetsky, N.N. Sochevanov, A.B. Bogatyriov, K.N. Nikolayev, K.N. Perebeynos, and many others. Klim N. Perebeynos created an especially strong impression; he attracted attention even by his appearance. But the main thing was the experiments he was talking about, for example, the "spoiling" of a single photographic film out of many in the stack by the sensitive[1].

We started our systematic experimental research on Furmanny Bystreet in December of 1984. By this time, a group of about ten people interested in parapsychology gathered around G.K. Gurtovoy. We met every week, and while I was turning on the equipment, recording ground noise, and working with the sensitives, the conference room was used for reports and discussions. Objects of the influence (SMCs or flicker-noise generators) were in a small room with walls covered with metal sheets and painted black. Signals were recorded by auto-recorders in an adjacent room. Sensitives were either next to the object of influence or in other rooms. More than 20 sensitives took part in our work including such celebrities as V.V. Avdeyev, K.N. Nikolayev, and A.V. Chumak. A lot of results were obtained from the work of E.A. Dubitsky, who later on

[1] The effect similar to the exposure of the photographic film to light — *Ed.*

participated as a sensitive in "Moscow-Moscow", "Moscow-Sofia", and "Moscow-Novosibirsk" experiments.

The building where the laboratory of the Problems of Bioenergetics was located was demolished at the end of 1986, and the laboratory was transferred to a hardly suitable basement on Nikoloshchepovsky Bystreet in Moscow where it gradually withered. Our research group settled in a basement on Planetnaya Street rented by the Popov Society, where it "survived" till 1994.

Mysterious Signals

When radiation is absorbed, the heat is released. This is the principle of the application of calorimeters for precise measurements of the intensity of various types of radiation: ultrasound, radio waves, light, ionizing radiation. "Turning on" the radiation causes a very simple response in a calorimeter: a smooth increase of the signal for about a minute to a level proportional to the power of heat emission. After radiation is "turned off" the signal returns to the initial level as smoothly as it increases. Under the conditions described above, the signal corresponding to the *increase* in the temperature is always observed.

Experiments with shielded calorimeters, in which melting ice was used for thermal stabilization, started already in 1982, when Misha Nikolayev and I were "entertaining" ourselves in my apartment. By that time, while working in MEPhI (Moscow Engineering Physics Institute), I gained experience in calorimetric measuring of ionizing radiation. The first results obtained using psychic influence on SMC were striking, seemed erroneous, and contradicted everything I was accustomed to observe in calorimetric experiments. The signal change was not smooth, but abrupt. After the influence stopped it didn't return to the initial level but got "stuck" on a new level or jumped from one level to another and those levels

had very well defined values. The strangest thing, though, was that the signal sometimes corresponded to the *decrease*, not increase in the temperature relative to the initial level (Fig. 1). I replaced our registering devices with ones of a different design (they used batteries of thermal pairs instead of a thermistor), but the picture had not changed in principle. At the same time, the "regular" thermal influence — turning on the thermal heater built-in into the calorimeter — caused the appearance of quite a normal response with a slowly increasing signal. Changes of the signal under psychic influence corresponded to the thermal emission of the heater in the order of (1...10) × 10^{-6} W.

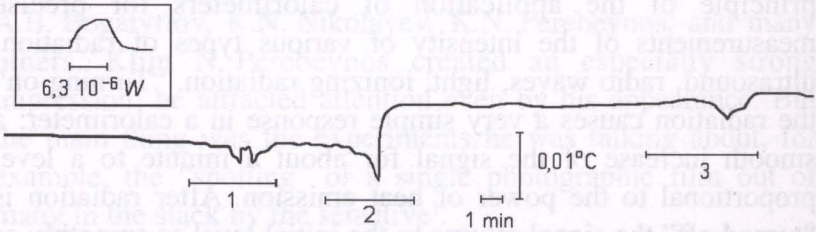


Fig. 1. Results of the influence of A.V. Chumak on a shielded micro-calorimeter. The time of the influence is marked by a horizontal line. 1 — establishing the "contact" with SMC. 2 — the sensitive mentally increases the temperature of the detector. The distance between sensitive and detector is 0.5 m. 3 — the sensitive mentally decreases the temperature of the detector being in an adjacent room 3 m away. Top left — the result of turning on and off the electric heater. March 1986.

If signals detected were related to the *thermal* processes then the abruptness of the signals meant powerful *pulse* emission of energy. The stability of the signal level meant a *constant* emission of energy, discreetness of the signal levels meant that only *some* values of the power of thermal emission were allowed. The signal corresponding to the decrease in the temperature meant that energy was taken *away* from the body of the calorimeter. It is not clear how to reconcile all these

properties into a whole using the traditional methods of the calorimetric analysis.

One can assume that sensitive influence causes a change in the physical properties of the material, in particular, the electrical conductivity of a thermistor. If this is the case, abrupt and stable changes of the signal do not look so surprising.

Experiments using SMC were continued in the laboratory on Furmanny Bystreet, and then on Planetnaya Street in Moscow. More than 200 experiments were performed with more than twenty participating sensitives.

Six sensitives in fifty experiments were able to cause noticeable reactions; in all of them signals consistent with the peculiarities described above were observed.

Flicker Noise

The thermistors used in SMC were made from semiconductors, the materials whose electrical properties change strongly upon a slight change in their physical properties. The use of thermistors for registration of psychic action is possible only under conditions of high thermo-stabilization. It was reasonable to try the other semiconductor devices whose use did not require creation of such artificial conditions. Transistors with *p-n* junctions, diodes, and photo-diodes did not exhibit the sensitivity to psychic influences. Effects of such an influence were found in measurements of the current without applying light impulses of photo-resistors and photo-electronic multipliers (PEM). The addition of a scintillator to the PEM did not affect the effectiveness of the experiments.

The effects of sensitive influence on photo-resistors and PEM became apparent only with the suppression of noise of high frequency down to 0.1 Hz. The action of the sensitive gave rise to the change in amplitude and other parameters of low-frequency fluctuations registered by a auto-recorder. Fluctuations prevailing in electronic devices at low and infra-low frequencies are called

the "flicker noise" (or *1/f*-noise) in contrast to the "white noise" prevailing at high frequencies. It is known that the strongest flicker noise appears in the devices where semiconductors are used in a semi-crystalline state (photo-resistors, thermo-resistors, photo-cathodes of PEM), and also in transistors and integrated circuits made using the "metal-oxide-semiconductor" (MOS) technology. Further studies confirmed the sensitivity of the MOS-transistors and integrated circuits to the psychic influence, and we widely used these semiconductor devices, screened from electromagnetic interference, as objects of psychic influence in addition to SMC.

The psychic influence on MOS-devices led sometimes to quite significant (tens of times!) increase or decrease in the amplitude of fluctuations; the splashes appeared not only during the time of action but also 5-10 minutes after its termination. More often, an equally remarkable effect was observed: pulses with periods from several seconds to hundreds of seconds appeared on top of the background noise (Fig. 2). With the use of several alongside placed objects of influence, there was no unique correlation of the observed effects.

In order to at least partially perceive the results described above, I familiarized myself with the available literature on flicker noise. However, I was able to find only a description of several empirical regularities and abstruse formulas giving nothing to clarify *the essence* of flicker noise. After all, fluctuations with the properties of flicker noise are inherent to very different natural and even social phenomena. Even music has a frequency spectrum close to *1/f*, i.e. has the properties of flicker noise.

We know well what *white noise* is: it is the noise of a TV set with no input signal, or of rainfall. Perception of *flicker noise*, on the other hand, is difficult in most cases due to the slow speed of the processes. In order to apprehend the flicker noise of a MOS-transistor, I have recorded it using a tape recorder at a very low tape speed, and then reproduced it at a speed 10,000 times higher. A weekly recording was "raced through" in about a

minute, thereby shifting the infra-low frequency spectrum into a frequency range perceptible by the human ear. I heard the sound of a campfire, with the wailing of a flame fanned by the wind, the cracking of snapping logs, and the hissing of evaporating drops of water.

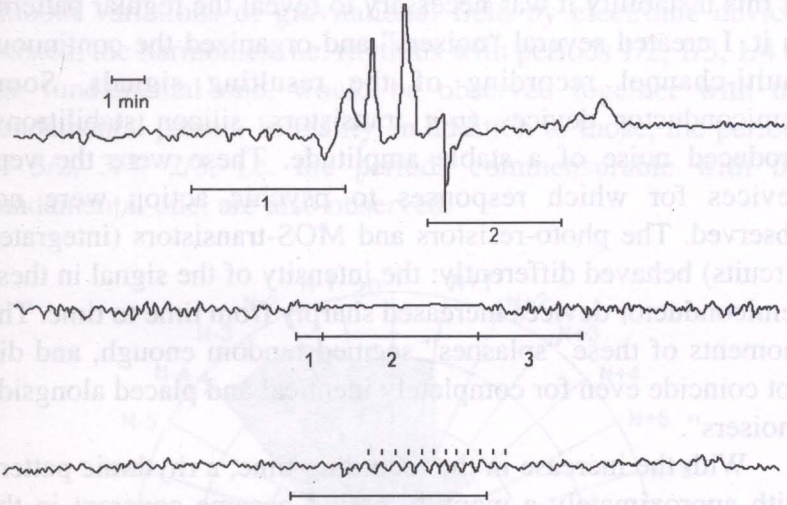


Fig. 2. Effects during the influence on the flicker noise of the chip 1LB201. ***Top:*** *Increase in the amplitudes of fluctuations. Sensitive Drozdova, December 1984. 1 — establishing the contact with the detector, feeling of "cold"; 2 — "hot" during inhalation, "cold" during exhalation.* ***Center:*** *Decrease in the noise amplitude during the experiment with sensitive Avdeyev, May 1996. 1 — establishing the contact with the detector; 2 — entering the state of "complete rest"; 3 — entering the state of "high excitation".* ***Bottom:*** *Example of the record of a signal containing a long wave train of quasi-periodic pulses. Sensitive Davydov, February 1985.*

Two processes, the mechanisms of which are completely different, manifest themselves in a similar way, differing only by their speed. Therefore, the essence of the flicker noise is not in the specific physical mechanism, but in something more general.

Let us now return to the experiments. The reliability of the results obtained was reduced by the instability of the "background noise": the intensity of fluctuations varied greatly even without the actions of sensitives. To determine the reasons of this instability it was necessary to reveal the regular patterns in it. I created several "noisers" and organized the continuous multi-channel recording of the resulting signals. Some semiconductor devices (*p-n* transistors, silicon stabilitrons) produced noise of a stable amplitude. These were the very devices for which responses to psychic action were not observed. The photo-resistors and MOS-transistors (integrated circuits) behaved differently: the intensity of the signal in these semiconductor devices increased sharply from time to time. The moments of these "splashes" seemed random enough, and did not coincide even for completely identical and placed alongside "noisers".

With the increase in the recording time, a rhythmic pattern with approximately a monthly period became apparent in the probability of the appearance of "splashes". For more precise identification of the rhythms, the recording of the signals had to be continued. After a year, it was possible to make a quite confident conclusion about the prevalence of *the synodic lunar cycle* (29.5 days) as well as the existence of the fractional periods (3/2, 3/4, 2/3, 1/3, 1/4 of it). Analysis of further records which continued for more than 10 years confirmed this conclusion (Fig. 3). Note that the same set of rhythms was found by S.E. Shnol with collaborators as a result of studies of the variations of speeds of chemical and biological reactions many years over. Comparison of the pattern of noise "splashes" with another natural monthly rhythm — the 27-days periodic solar activity — did not reveal clear correspondence.

The synodic lunar rhythm is the rhythm of changes of the Earth's gravitational field, caused by change of the relative

position of the Earth, the Moon and the Sun. However, the assumption that the "noisers" feel the changes of gravitational field directly is quite doubtful. Compared to the strength of gravitational field on the surface of the Earth, these variations are extremely small (about one ten-millionth) and occur very smoothly. Even if a mechanism of perception of such small and smooth variations of gravitational field by electronic devices existed, the harmonics, i.e. rhythms with periods 1/2, 1/3, 1/4 of the fundamental one, would be observed together with the fundamental period. In reality, in addition to those, the periods of 3/2, 3/4, 2/3, i.e. the periods commensurable with the fundamental one, are also observed.

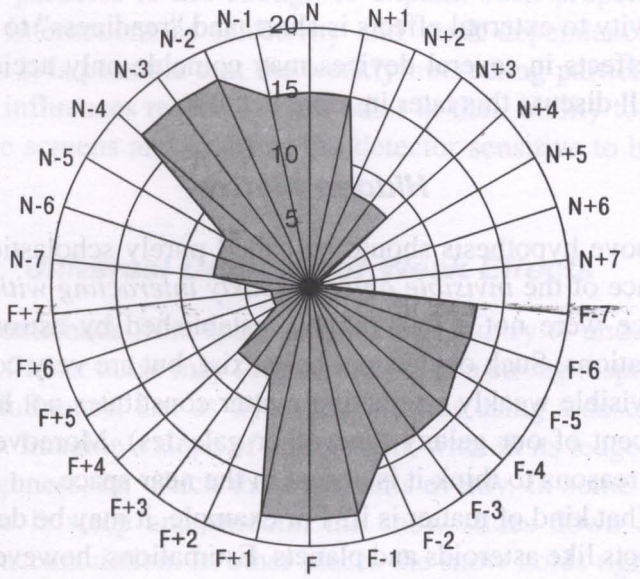


Fig. 3. Distribution of the total number of events of a sharp increase of the intensity of the infra-low frequency noise from various sources (MOS-transistors, integrated circuits, and photo-resistors) with respect to the new moon (N) and full moon (F) phases. Deviation in days from the new moon and full moon phases is shown. The results from data-recorders are summarized from October 1984 to August 1986. There were 66 events around the new moon and the full moon, and only 8 events between them, during the same interval of time.

Harmonic series are typical for mechanical or electromagnetic oscillations. Commensurability, on the other hand, is characteristic of the orbital and rotational motions in the system of gravitationally connected bodies (for example the period of rotation of Saturn around the Sun is equal to 5/2 of that of Jupiter). From this, appeared the seemingly fantastic, at first, thought that in the system of Earth-Moon-Sun there are some *invisible objects weakly interacting with matter*, performing orbital motions. Those that reach the surface of Earth in a perigee affect the processes in sensitive enough systems. The lack of similarity of response of identical devices placed alongside to this kind of cosmic influence can be explained as follows: during the processes in those devices, the time interval of high sensitivity to external effects is short, and "readiness" to react to these effects in several devices may coincide only accidentally (we will discuss this later in more detail).

Hidden Matter

The above hypothesis should be called purely scholastic, if the existence of the *invisible objects weakly interacting with matter* in space were not a fact reliably established by astronomical observations. Such objects not only exist, but are very common: this invisible weakly interacting matter constitutes not less than 90 percent of our galaxy (and other galaxies). Moreover, there are no reasons to think it is absent in the near space.

What kind of matter is it? For example, it may be dead stars or objects like asteroids and planets. Estimations, however, show that such objects can account only for a small fraction of the "hidden mass". Best grounded is the assumption that the largest portion of a hidden matter is neutrinos and other weakly interacting particles which have a non-zero rest mass. Low speed allows them to be the equivalent part of gravitationally connected systems, moving similarly to the stars, planets and satellites. It would be an unjustified exception from the general

rule, if the streams of such particles or their clusters did not perform orbital rotations around the Earth.

It must be added that the interaction of neutrino with matter at low energies corresponding to orbital motions is not as negligibly small as at the nuclear energies, and the streams of such particles (and they can be very dense) can reveal themselves quite noticeably.

The fact that detectors sensitive to psychic influence may also reveal the cosmic rhythms allows us to assume that the "carriers" of the Earth-space links (including the low-energy weakly interacting particles, like neutrino) are relevant to these effects. However, the existing knowledge about the properties of these particles is not enough to explain such properties of psychic interactions as selectivity and weak dependence on a distance. It is possible that the weakly interacting particles and psychic influences resemble each other in their ability to easily penetrate screens and to affect the detector sensitive to both of them.

Universal Detector of Weak Effects

Let us come back from space to the Earth and try to understand why the flicker noise may (or may not) give a strong response to a weak influence. Let us try to explain this using a descriptive example. Imagine a slope of a mountain, with all its ledges, pits, and roughness, on which the snow falls evenly. In some places the slope is steep and smooth; the snow slides down almost without accumulation. In other places the snow holds tighter on the slope and before sliding down a layer of snow of some critical thickness must be accumulated. In the places where the snow holds especially tight, a large amount of snow is gradually accumulated. It stays there calm and quiet for a long time until, at some moment, an avalanche of all the accumulated snow slips down sweeping everything on its way.

Imagine a man sitting near the mountain slope and listening to the sounds that reach him. He hears a weak monotonous rustle of falling snow; quite often a sound of snow sliding from steep inclines; sometimes the hits of snow lumps fallen from places where they could remain for more or less long time. In addition, if our listener remains at the mountain slope for a fairly long time, he would hear the roar of a snow avalanche.

The rustle of snow falling from the clouds is a white noise; the sound of sliding snow is a flicker noise. Weak sounds are frequently heard. Stronger ones less frequently. Very strong ones very rarely. This is the dependence of energy on a frequency like *1/f*.

Now let us subject our mountain to some influence, for example, a shot from a rifle. In the places where the thickness of snow is close to critical, the snow starts to slip down. Simultaneousness of events that would be "smeared" in time without the external disturbance leads to a louder than usual sound of sliding snow that is heard for some time after the disturbance. Afterwards, it will be quieter since the "near-critical" snow has slept down and those events which would spontaneously occur without the disturbance do not happen.

Repeated disturbance of the same strength made right after the first one will not give the same results as the first, since all the snow that could fall, was thrown down by the first disturbance. The strong reaction on the disturbance is again possible only after the near-critical layers are restored by fresh snow fallen from the clouds.

Let us now compare the effects from disturbances of different strengths, for example, a shot from the rifle and a shot from the cannon. The shot from the rifle causes the snow to slide off the steep and smooth slopes only, the places where the snow cannot remain for a long time anyway. Therefore, the recovery of near-critical conditions and high sensitivity to perturbations occurs faster after the weak disturbance. The shot from a

cannon, on the other hand, exposes the whole slope and restoration of a snow cover will take significant time. One could shoot from a rifle or cannon for quite some time and get no reaction.

Any system containing many elements able to accumulate something and to "get rid of" it after reaching some thresholds different for different elements has the above properties. There are a vast variety of such systems. For example, stresses in the bulk of the Earth, or electric charges in the clouds, or discontent in a society, or charge carriers on the defects in superconductors, can accumulate and discharge. The manifestation of the accumulation-discharge processes (in the above examples those are earthquakes, thunderstorms, revolutions, and lower-frequency electric noise) has the following properties of flicker noise:

- Dependence of the magnitude of the effect on the frequency of their repetition as *1/f*: "weak" events occur often, "strong" ones rarely;
- High sensitivity to external perturbations provided there were no such perturbations for a long enough period of time;
- Aftereffect: the duration of the response to external perturbation may exceed the duration of the perturbation itself, after which the "calm" with reduced level of fluctuations and sensitivity to perturbations occurs;
- "Inverse" dependence of the *response strength* to the repeating perturbation on the *perturbation strength*. The stronger the perturbation, the longer the "calm"; therefore, the repeating strong perturbation can cause a strong response only after a long enough pause. If the period between strong perturbations is less than necessary pause, the response to the strong perturbations is weaker than it is for the weaker perturbations with the same period;

- Dissimilarity of the response of similarly organized systems to similar perturbations. This property of flicker noise is caused by the different histories of the systems in which it occurs and the possibility of realization of different directions of processes in complex systems.

Knowing the properties of the systems generating the flicker noise, it is possible to understand the complex and ambiguous character of the response of the equipment used in the psychic influence, as well as the conditions in which this equipment gives results suitable for analysis. For that, it is necessary to shield the equipment as carefully as possible from external perturbations. Before the beginning of the influence there must be time long enough to allow the transitional processes to die out and to record the "background" noise signal. Usually it takes about 1-2 hours. The influences themselves must be short, the time interval between them must be long enough to let the aftereffect fade away (usually not less than an hour). Thus, it is possible to study only a few of the influences during one day with the most reliable results obtained when there was only one influence.

Moscow-Novosibirsk Experiment

The experiences we accumulated as well as the understanding of the outline of the processes taking place in our detectors allowed us to proceed to more complicated experiments in which a meaningful distance separated the sensitive and the object of influence. In the beginning, we did a few dozen experiments within the boundaries of Moscow (E.A. Dubitsky influenced electronic micro calorimeters located in the laboratory on Planetnaya Street or in the apartment of A.V. Moskovsky from his apartment or from the place of his work).

A member of the Russian Academy of Medical Sciences V.P. Kaznacheyev showed an interest in our research and proposed us to do an experiment in cooperation with the Institute of Clinical and Experimental Medicine (ICEM) in Novosibirsk, Russia, headed by him. Specifically for this experiment, two equal electronic micro calorimeters (EMC) were made. Researcher Yu.M. Fridman of the ICEM came to Moscow in the summer of 1988 and acquainted himself with the design of EMC mastering the use of it and then he took one of the EMC's to Novosibirsk. There were nine test records of signals made from the 13th to the 23rd of November in Novosibirsk. During this time, the sensitive E.A. Dubitsky who was in Moscow, made six attempts to influence the EMC located in Novosibirsk. Changes of the signals substantially exceeding background noise fluctuations corresponded to these attempts in five cases.

This experience allowed us to prepare thoroughly for the main series of experiments performed in March-April of 1989. Researchers I.B. Vladimirsky and Yu.M. Fridman of the ICEM made daily records of the signals coming from EMC in Novosibirsk from 7 AM to 2 PM Moscow time from March 10 to April 6 of 1989 except for weekends. We recorded the signals in Moscow at the same time of day as in Novosibirsk from February 13 to April 13.

E.A. Dubitsky made all the influences. The sensitive made a mental transfer of EMC from Novosibirsk to the desk in front of him and created a vivid image of an event that, from his point of view, would greatly change the influence properties of the object (rotation, powerful deformation, burning in a fire, change of atomic structure, etc.). There were eight records of the signals made in Novosibirsk during the days of the influences, and nine records were made during the days without the influences.

To control the "cleanliness" of the main series of the experiment a control commission headed by Professor

G.N. Petrova (Institute of Physics of the Earth of the Academy of Sciences of the USSR) was established. This commission consisted of two groups: Moscow and Novosibirsk. The sensitive informed only the Moscow group about the influences, and the Novosibirsk group was only informed about the signals. Thus, before the completion of the experiments, there was no knowledge about the influences in Novosibirsk, and in Moscow no knowledge of the signals registered in Novosibirsk. In addition, the sensitive was not informed that an EMC, identical to the one in Novosibirsk, was also installed in Moscow. The day after the experiments were finished, the protocol with the results obtained in Novosibirsk was mailed to the Moscow control group, and the protocol with information about the influences to the Novosibirsk group.

A comparison of the protocols and analysis of the obtained results showed that appearance of six signals reliably singled out from the background corresponding to the eight attempts of the influence. In the records made in the course of nine days without the influence, a similar signal appeared only once. Calculations using Poisson formula showed that the probability of this being the result of coincidence is 3×10^{-5}. Thus, the appearance of the signals on the Novosibirsk EMC and their connection with the sensitive in Moscow was statistically significant.

Analysis of the signals of the Moscow EMC has not revealed substantial differences between the days with influences and without them, as long as the sensitive did not know about the Moscow device. He was informed about it the day before the last influence, and only then was the distinct effect, close in time with the influence, registered in Moscow. This result prominently revealed the selective nature and purposefulness of the psychic influence: from two identical objects of influence only one known to the sensitive responded. Even though it was located at a much larger distance than another one which was unknown. The close object registered the

influence only after the consciousness (or sub-consciousness) of the sensitive switched to it.

Conclusions

The Caucasus Mountains seem to be beautiful, close and easily accessible if you look from the Stavropol plains. After getting closer to the mountains, we start to feel the menacing might of this giant.

Nevertheless, how difficult it is to climb this mountain slope, how many cliffs, abysses, and other dangers await you there!

Research in parapsychology is very much like climbing the mountain. At first sight, one should be amazed by vivid and unusual phenomena. Exploring them seems to be an easy task. Attempts to systematize these phenomena, to find a rational explanation of them, to connect them to the scientific knowledge that our civilization possesses, lead to the realization of the great difficulty of the problem. Experimental work in parapsychology is like ascent of the mountain slope: years of meticulous work give us very little new knowledge, and every answer to the question raised creates a multitude of new questions.

Our long-term research in the area of parapsychology gave a very limited contribution to the understanding of the essence of unusual phenomena. It confirmed once again *the already known* properties of these phenomena. However, our experiments did not give us clear guidelines to discover *the very nature* of psychic interactions. The idea of possible participation in these interactions of low energy weakly interacting particles has very feeble ground so far. The conclusion we made that the psychic interaction affects only the ongoing process, but is unable to start a new one, unable to "bring to life" a system in the equilibrium, may be important in understanding the nature of psychic interactions.

However, as the view from the top of a mountain reveals plenty of things which are invisible for an observer standing in a plane, so our experiments in the area of parapsychology and the analysis of their results allowed us to contribute something to "conventional" science. Thinking about the records of the signals obtained from the experiments of psychic influence led us to understand the nature of flicker noise — a phenomenon considered mysterious until recently. The detection of cosmic rhythms by analyzing continuous "background noise" records became the beginning of the research that showed that "hidden matter" can reveal itself not only in the universal scale phenomena, but on the Earth as well.

What is going to be next? The empirical material in the area of parapsychology accumulated so far contradicts the system of knowledge that laid the foundation of our technological civilization. How is it possible to overcome this gap, and is it necessary to do so? I will not try to answer these questions. The space for speculation is still too great.

The Phenomena of Parapsychology

E.A. Dubitsky

The facts about information transmission at a distance or influence of a human being on animate and inanimate remote objects are amazing! I have had an opportunity to conduct such experiments at a distance starting from several meters to 3-4 thousand kilometers. I, personally, influenced on cells, tissues culture, acids, alkalis, blood, magnetometers, microcalorimeters and, at last, animals and people. There was good coverage of the experiments in the Soviet and foreign press.

Evgeniy Krushelnitsky, special correspondent of *"Stroitelnaya gazeta"* newspaper (December 9, 1987), wrote in his article *"The Phenomena Without Sensations"*:

A small microcalorimeter is laying on a laboratory desk. A shell consisting of melting ice keeps up a constant temperature of 0°C in it. A kettle filled with boiling water situated near the microcalorimeter is unable to alter that zero. A sensing element installed inside, whose readings are marked on a tape of a plotter, confirms the same fact. The work is going on. Now E. Dubitsky concentrates on decreasing temperature. Soon all the people present in the room get a confirmation that the required result is achieved. There are odd jumps on the tape again. But they tend to be "minus" this time.

Now it is important to make sure that the things observed are neither fortuity nor a result of any mistake or a defect in the devices, therefore the experiments should be repeated.

Although today is Sunday, nobody is in a hurry to go home. Free time is the most convenient period for the work of one of the sections of the Popov Scientific and Technical Society of Radio Engineering, Electronics and Telecommunications conducting the research of the physical fields of animate organisms.

The experiments, as expected, have raised many new questions before scientists. The influence on remote devices from a distance of several thousand kilometers evoked special interest. The devices were situated either in Novosibirsk or in Sofia, but I was working from my Moscow apartment. It appeared that increasing the effectiveness of shielding the detector did not lead to slackening of the effects. On the contrary, it made them even more distinct.

Evgeniy Anatolyevich Dubitsky, sensitive

But how did I influence the thermistor — an isolated piece of a semiconductor inside a microcalorimeter? The method looks rather nonsensical, you can analyze it yourselves. At the beginning, I mentally placed the semiconductor in liquid oxygen or helium, then placed it in molten magma for the sake of contrast. The device showed a decrease in the temperature in the first case and an increase in the second one. But soon I got bored of that and started to do it differently: I began to imagine the atoms of the object being influenced (the thermistor) on an increased scale and mentally manipulate them (for example, compress the atoms or speed them up). And, just think, this intellectual adventure has led to positive results!

At that time I participated also in the experiments conducted by Vlail P. Kaznacheyev, a member of the Soviet Academy of Medical Sciences, at Novosibirsk Institute of Clinical and Experimental Medicine. Alexander I. Autenshlus, head of the Institute's laboratory of "Immune Diagnostics and Pathological Conditions" measured the influence of a sensitive on the speed of ribonucleic acid synthesis. The experimental setup consisted of three supports and three test tubes with blood attached to each of them. The test tubes of each support were colored differently: blue, red, and green. The experimenters did not know the time of my influence on the test tubes. The influence was conducted from Moscow and I sent by mail the time of the influence, the number of the support and the color of the test tube I had acted upon. The experiments were successful, the speed of the ribonucleic acid synthesis changed by 30 percent.

A series of Bulgaria-USSR international experiments on the action-at-a-distance of a sensitive were conducted in 1987-88.

The Moscow-Sofia experiments on the influence of the sensitive on people with cancer were conducted from July 13 to 24, 1987. The sensitive was in Moscow, the sick people were in Sofia. The following people took part in the experiments on the Bulgarian side: Vera I. Tocheva, Ph.D. (in medicine), senior scientist; engineers Dmitr Dimitrov and Todor Tabakov. The experiments were carried on in the period from 20:00 PM to 23:00 PM Sofia time (during 6-16 minutes) in a massive, monolithic building at the center of Sofia. The air temperature during the experiment varied between 30 and 32°C, the relative humidity was 35-50 percent. Unexpectedly, a single-channel telemetric equipment recording cardio-vascular functioning rate was connected up to the tested people in July 23, but I had not been notified about that. The equipment consisted of a microtransmitter with the carrying frequency of 67 MHz and a *Riga-103* radio. The result of the experiments was unexpected: the signals of the cardio-vascular functioning rate were not

detected during the session, however, the signals became detected again after the end of my influence (the mental influence occured for approximately 10 minutes, air temperature 30°C).

The absence of the signal of the cardio-vascular functioning rate during the influence of the sensitive may be explained by the sensitive's influence on the operating mode of the equipment. (The results of influencing the oncological patients are not discussed here.)

In April 1988, the Moscow-Sofia experiments on influence of sensitives on instruments were carried out. Let me quote here the contents of a certificate passed to me from Sofia after the end of that series of experiments.

Moscow-Sofia International Experiment.

From the USSR: sensitive E.A. Dubitsky, Scientific Secretary of the Section "The Research of Physical Fields of the Animate" of the Popov Scientific and Technical Society of Radio Engineering, Electronics, and Telecommunications.

From the People's Republic of Bulgaria: a working group headed by Prof. Stefan Kinev, Ph.D., Director of the Central Laboratory of Solar Energy and New Sources of Energy, Bulgarian Academy of Sciences.

The object of the influence is an equipment "Mettler", system TA-3000, for thermoanalitical measurements. Any substance can be used as a working substance, 0.5 cm^3 of water was used in the experiment. The equipment consists of a computer, a plotter, and a calorimeter. A constant temperature is kept up in the system with an accuracy of 10^{-5} °C.

The first experiment. *April 15, 1988. The influence was conducted by a sensitive from Moscow.*

The plotter registered three peaks:

1. 4:35 PM — plus 3×10^{-3} °C;

2. 4:37 PM — minus 3×10^{-3} °C;

3. 4:57 PM — minus 3×10^{-3} °C.

The sensitive used two methods of the influence on the working substance: once he used a method aimed at increasing the water temperature (plus), twice he used a method aimed at decreasing the water temperature (minus).

The second experiment. *April 21, 1988. Six peaks were registered that was in accordance with the program of the sensitive. The maximum change in the temperature fluctuated within* $\pm 10^{-2}$ *°C.*

Note. *The equipment was put out of operation after the experiments. According to an assumption of Prof. S. Kinev, the semiconductor sensor at which the influence was aimed failed.*

How can all this be explained? The experimenters do not know (so far). Miracles?

Experiments on distant psychokinesis

Registration of Bio-field Influence on a Gas-discharge Detector

K.G. Korotkov

1. Introduction

The development and approbation of detectors which register directed psycho-energetic influences of people are of great importance for the study of energy-information exchange, and bio-field influence. We advanced a hypothesis that such detectors may be based on physical and biological processes having multiple stable phase states and capable of switching between the phases under the influence of weak actions. As seen from Fig. 1, a weak action will result in a slight change dR_A of the output characteristic, whose change will be undetectable against the noise background in the case of a smoothly changing process A; and the same weak action in the case of a jump-changing process B will result in a substantial change dR_B of the characteristic.

This principle was implemented in a special gas-discharge detector (K.G. Korotkov, USSR Invention Certificate No. 1322900 of 08.03.1987) which was used in a number of experiments on establishing a possibility to register mental bio-field influence of a sensitive on a physical system.

A special type of pulse avalanche discharge is used in the detector; the development of discharge is determined by redistribution of an electronic-ionic charge on the dielectric surface. Depending on the power supply voltage the discharge has several quasi-stationary phases; each phase is characterized by a definite number of discharge pulses in a unit time. Registration of discharge phases is performed using both the oscilloscope screen and the pulse counting circuit with a signal recorder (see Fig. 2).

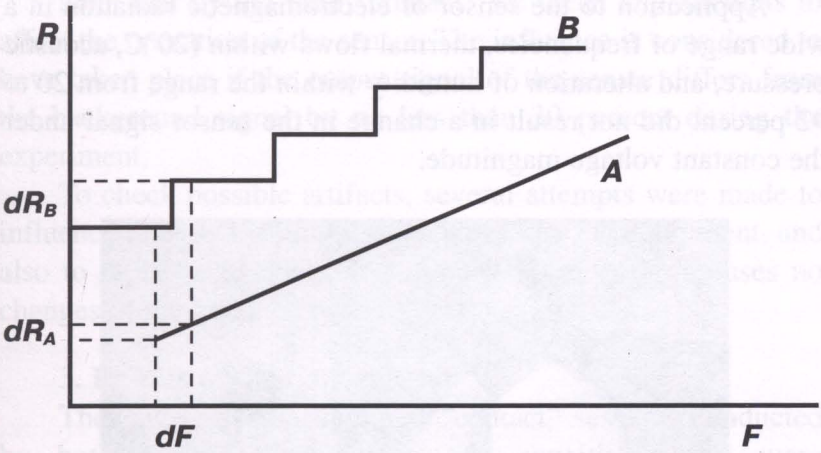


Fig. 1. The physical process output characteristic behavior versus the influencing factor magnitude. A is a smoothly changing function, B is a jump-changing function.

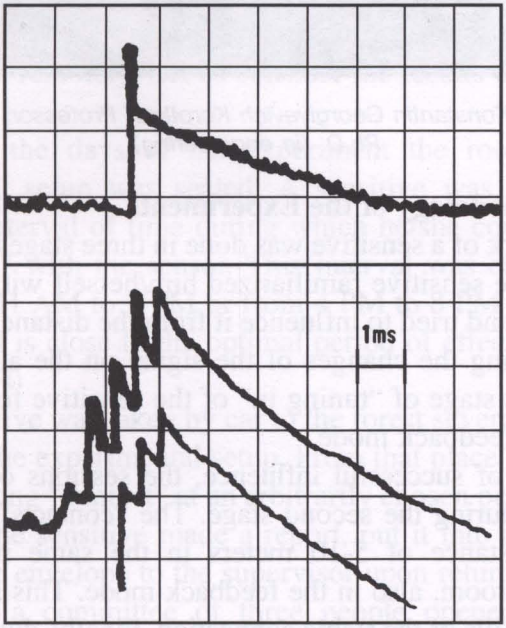


Fig. 2. Oscillograms of the detector discharge glow pulses for two different discharge phases.

Application to the sensor of electromagnetic radiation in a wide range of frequencies, thermal flows within (20°C, acoustic pressure, and alteration of humidity within the range from 20 to 92 percent did not result in a change in the sensor signal under the constant voltage magnitude.

Konstantin Georgiyevich Korotkov, Professor, Ph.D. (in engineering)

2. Methodology of the Experiments

The work of a sensitive was done in three stages. During the first stage the sensitive familiarized him/herself with the design of the setup and tried to influence it from the distance of 0.5-1 m while watching the changes of the signal on the auto-recorder. This was the stage of "tuning in" of the sensitive for successful work in the feedback mode.

In case of successful influence, the sessions of "contacts" were made during the second stage. The "contacts" were made from the distance of 5-10 meters in the same room or the neighboring room, also in the feedback mode. This stage helped to develop skills of the stable connection. Finally, during the third stage, a "contact" was made at a distance of 200-3000 meters.

Note that by the term "contact" we mean any attempts to affect the operation of the sensor. The influence is considered to have taken place if the output signal of the sensor differs from the background signal by no less than 30 percent during the experiment.

To check possible artifacts, several attempts were made to influence directly the amplifying and measuring equipment, and also to replace the sensor by a photo-diode. In both cases no changes of the parameters were observed.

3. Results of the Experiments

There were several hundred "contact" sessions conducted by both reference sensitives and sensitives who were professionals in healing and dowsing. In the reference group of 50 people no one caused noticeable influence on the operation of the device. 25 sensitives out of 45 "professionals" caused some (somewhat noticeable) influence, 10 of them steadily reproduced this influence during the second stage, 4 worked during the third stage, that is, remotely. Let us consider the results of the remote influence.

During the days of the experiment the room with the experimental setup was sealed. A sensitive was assigned an individual interval of time during which he/she could establish the "contact" with the sensor. This interval was chosen in the range from 11 AM to 3 PM or from 4 PM to 8 PM hours. (This time interval is close to the optimal period of effective work of the sensitives).

A sensitive was taken by car to the forest several kilometers away from the experimental setup. From that place he/she made a one hour long "contact" at an arbitrarily chosen period of time. After that, the sensitive made a report, put it into an envelope, and gave the envelope to the supervisor upon return. At the end of the day, a committee of three people opened the room, processed the curves from the auto-recorder, and created a report. The report and tapes of the auto-recorder were placed into

an envelope, sealed and handed over to the supervisor. Another committee of 5 people opened the envelopes and compared the data.

In seven experiments of that kind the existence of significant changes in the sensor signal was established. The beginning of these changes coincided with the time of the "contact" in two cases, and was delayed by 2-12 minutes in five cases. In three experiments, the signal returned to the background level right after termination of the "contact"; in two cases during 30 minutes after termination; in two other experiments the signal remained unchanged for one hour after which time it changed to a level distinct from the background level.

The conclusion about statistically reliable distant action of the sensitive on the sensor signal was made on the basis of the results of the experiments.

Registration of Phenomena of Psychokinesis by Means of Magnetic Devices

G.N. Dulnev

Two micro-teslameters G-79 (the device measures magnetic induction in millionths of a tesla) were used in the experiments. The first, the regular one, was subject to sensitive's action, the second, the reference one, was set aside to measure background values of magnetic induction.

A micro-teslameter G-79 is intended for measurement of a component of magnetic induction of varying magnetic field directed along the axis of the inductive magnetic transducer. A micro-teslameter measures the root-mean-square value of magnetic induction for varying magnetic fields with frequencies from 20 Hz to 20 kHz in the range of 0.02 to 1000 microtesla. The circuit was composed of two probes and a measuring unit.

During the measurement, in order to reduce the level of electromagnetic interference, one of the probes was shielded by a metal tube with a 1 cm thick wall.

The influence of the sensitive on the sensor could be done in two ways. In some cases, the sensitive imagined that "rays stretched from his or her hands to the sensor". In other cases, the sensitive imagined that the sensor was placed in front of him or her and then attempted to exert influence on the device. Note that "influencing an image" is the technique which is commonly used by sensitives and this technique was employed by the sensitive in the action-at-a-distance experiments.

In one of the experiments carried out in our laboratory in 1994, the sensitive Soloviov influenced the sensor from the distance of about 15 km. The conditions of the experiment were agreed over the telephone. The influence session lasted 3.5 minutes.

Gennadiy Nikolayevich Dulnev, Professor, Ph.D. (in engineering)

The results are shown in Fig. 1, where curves 1 and 2 correspond to the background and the target signal, respectively. The beginning of the influence corresponds to the origin of the

coordinates. The gradual growth of magnetic induction even after the termination of the influence deserves special attention. In 15 minutes after the termination of the influence, the signal returned to its original background value. The reference device with the arbitrarily oriented sensor of the micro-teslameter placed in a different room in the same building for the time of the experiment did not show any changes beyond the background limits.

Apparently, the difference in the readings of the reference and the regular devices would be difficult to explain if the influence of the sensitive were of electromagnetic nature.

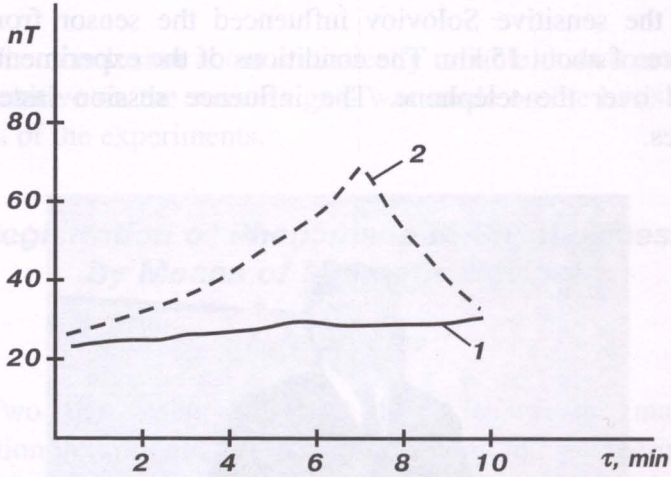


Fig. 1. Magnetic induction variation (in nanotesla) as a result of the sensitive's long-range action. The period τ of observation is given in minutes. Curve 1 corresponds to the background value, curve 2 to the action of the sensitive.

Note that the action of the sensitive on the sensing element of the device at a long distance was preceded by a short-range (3 m) action of the same sensitive. In the latter experiment, the reading of the device returned to its initial background value in 30 minutes.

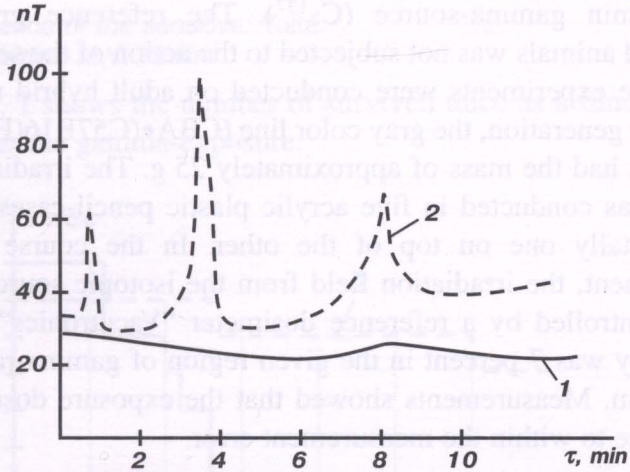


Fig. 2. Magnetic induction variation as a result of the sensitive's short-range action. The period τ of observation is given in minutes. Curve 1 corresponds to the background value; curve 2 — to the action of the sensitive.

Lethal Dose Gamma-Exposure and Bio-Energy Therapy

V.I. Kartsev

The present research was conducted with the aim of detecting a possible phenomenon of physical influence of sensitives on vital functions of mammals subjected to a lethal dose of gamma-radiation.

Methodology

To conduct the research, a test on survivability of laboratory animals which is widely used in radio-biology was chosen. The test is a standard strong uniform irradiation within the lethal range (900, 915 rad).

All groups of animals of the same experimental series were exposed uniformly and simultaneously to radiation from a

30 rad/min gamma-source (Cs^{137}). The reference group of exposed animals was not subjected to the action of the sensitive.

The experiments were conducted on adult hybrid mice of the first generation, the gray color line (CBA•(C57B16(F1)); the females had the mass of approximately 25 g. The irradiation of mice was conducted in five acrylic plastic pencil-cases placed horizontally one on top of the other. In the course of the experiment, the irradiation field from the isotopic source Cs^{137} was controlled by a reference dosimeter "Vacutronics" whose accuracy was 7 percent in the given region of gamma-radiation spectrum. Measurements showed that the exposure doses were the same to within the measurement error.

Vladimir Ilyich Kartsev, Ph.D. (in medicine)

The Results

The First Experiment.

Date of the experiment: July 1991.
Exposure rate: 900 rad.
Number of exposed animals: 9 in the main group subjected to the influence of the sensitive; 10 in the reference group which the sensitive did not act upon.
Time of the sensitive's influence: 15-20 min. before the exposure.
Location of the animals: Moscow.

Location of the sensitive: Yalta.
Sensitive: M.V. Fatkin.

Fig. 1 shows the number of survived mice as a function of time after the gamma-exposure.

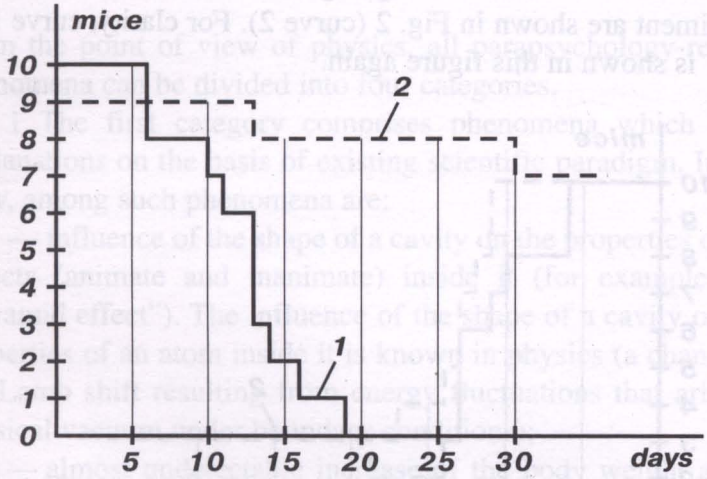


Fig. 1. Number of mice which perished after gamma-exposure (900 rad). Curve 1 corresponds to the reference group; curve 2 to the group (test group) subjected to the preventive influence of the sensitive.

Six mice from the test group have lived for no less than 1.5 years. The hair of all mice turned gray. The overall appearance and behavior of the animals were quite satisfactory.

The Second Experiment.

Date: February 1992.
Exposure rate: 915 rad.
Number of exposed animals: 10.
Time of the sensitive's influence: 15-20 min. before the exposure.
Location of the animals: Moscow.
Location of the sensitive: Cheliabinsk.
Sensitive: V.V. Paivin.

By agreement with the sensitive V.V. Paivin, he exerted a preventive therapeutic influence on a single, presumably a

"marked up" mouse from the group of irradiated mice. Experimenter-manager in Moscow was not notified of that. The mouse, however, was not marked up intentionally, and V.V. Paivin did not know about this. Presumably, that was the reason that three mice in this group survived. The results of the experiment are shown in Fig. 2 (curve 2). For clarity, curve 1 of Fig. 1 is shown in this figure again.

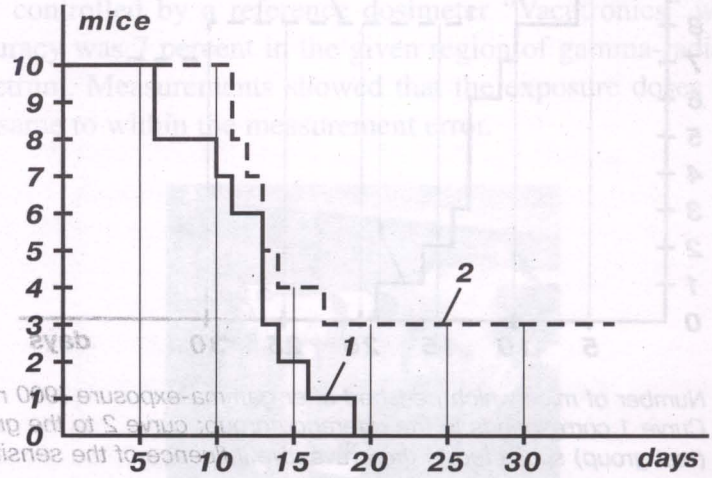


Fig. 2. Number of mice which perished after the gamma-exposure. Curve 1 corresponds to the reference group exposed to 900 rad. Curve 2 to the group of mice (test group) on which the sensitive exerted selective preventive influence (after the gamma-exposure to 915 rad).

The hair cover of the mice was dim and disheveled all the time after the gamma-exposure.

Note that deaths of mice in the test group, on which the influence was exerted, occured later than in the reference group in the first experiment, even though the radiation dose in the second experiment was higher.

Thus, the data obtained suggests that the remote influence of the sensitive has resulted in increasing of resistance to radiation in laboratory animals (mice) which were exposed to lethal doses of gamma-radiation.

Into the Deep of Matter

L.B. Boldyreva, N.B. Sotina

1. Introduction

From the point of view of physics, all parapsychology-related phenomena can be divided into four categories.

1. The first category comprises phenomena which have explanations on the basis of existing scientific paradigm. In our view, among such phenomena are:

— influence of the shape of a cavity on the properties of the objects (animate and inanimate) inside it (for example, the "pyramid effect"). The influence of the shape of a cavity on the properties of an atom inside it is known in physics (a change in the Lamb shift resulting from energy fluctuations that arise in physical vacuum under boundary conditions);

— almost undetectable increase of the body weight at the moment of death. We explain the phenomenon in the following way. Death of any living creature is accompanied by a decay of a large number of bio-molecules of the body; from the physical point of view the decay of a quantum system leads to the increase of the total mass of the constituent parts (the so-called mass defect);

— some phenomena of psychokinesis where influence of a sensitive on a distant object can be explained by acoustic, diffusive or electromagnetic processes.

And we can certainly add to this category those areas that are now being actively studied and, by tradition, are still believed to belong to parapsychology in spite of the fact that they are already tightly bound to the classical scientific disciplines (for instance, investigation of the electromagnetic component of the human biofield using infrared and other detectors).

2. The second category includes those phenomena of parapsychology which admit physical interpretation provided

the model of superfluid physical vacuum, being developed by us is adopted.

According to our model any material body (animate and inanimate) is a structure in the physical vacuum. Some phenomena of psychokinesis could be explained by interactions between such structures.

3. The third category includes the phenomena which do not directly contradict the contemporary scientific knowledge but no explanation of which is seen at present. In our view, the phenomena of this kind are as follows: telepathy, remote dowsing (using geographical maps), determination of the location or conditions of a person by the photo (for details see the essays by I.M. Kogan and E.G. Bondarenko).

Liudmila Borisovna Boldyreva (left), Ph.D. (in engineering) and Nina Borisovna Sotina, Ph.D. (in physics and mathematics)

Note that a few researchers propose to explain some of these phenomena by quantum nonlocality. However, the concept of quantum nonlocality which emerged from the theory of composite states and the experiments with quantum-correlated

elementary particles has been considered arguable so far. There are several ways of "explanation" of quantum correlations.

— Copenhagen interpretation according to which nothing can be said about some properties of elementary particles before the measurement (please note the existence of a paradox: although the properties themselves, such as the orientation of spin, do not exist a priory (before the measurement), the correlation between those properties for two quantum-correlated particles is maintained all the time).

— Existence of "hidden parameters" and interactions which propagate at superluminal rates.

— Rejection of "arrow of time" (a possibility to make time reversible).

However, how can any of the above ideas serve as a basis for explanation of the following phenomenon: a sensitive telling by a photo of a person whether the person is alive or dead?

4. The fourth category comprises phenomena which contradict the modern physical knowledge obtained both theoretically and experimentally.

Precognition (perception of some future situation in details) is an example of such phenomena. Rapid development of nonlinear physics and thermodynamics of nonequilibrium processes which took place during the past decades has revealed the necessity of introducing the "arrow of time" (irreversibility) for fundamental description of nature. It became clear that even in classical mechanics, while solving a specific task one can face an impredictable chaotic behavior of some dynamic system. (For an extended discussion, see section "The Arrow of Time").

2. The Arrow of Time

In the fundamental physical laws underlying classical Newtonian mechanics, relativity, and quantum mechanics based on Schrödinger equation, time enters implicitly, as a parameter, making no distinction between the future and the past. In other

words, classical laws remain invariant with time t replaced by $-t$ (time-reversibility)[1] as well as t replaced by $t+a$, where a is an arbitrary number. These laws seem to justify the Laplacian determinism: once all the interactions between individual objects are determined, future can be predicted on the basis of initial conditions.

If one assumes that time-reversible laws are the only laws of nature, then irreversible processes, such as diffusion, could be considered a consequence of the approximate description of complex reversible processes. Seemingly, if the infinitely powerful intellect existed, it would be able to calculate and predict everything using only the fundamental laws.

This kind of reasoning about fundamental physical laws is in agreement with a number of paradoxical ideas concerning time: 1) possibility to travel in time, 2) recurrence in development of nature, 3) fatality. In parapsychology, these considerations became the ground of the explanation of precognition (perception of some future situation in details).

Many researches believe determination of laws invariant with respect to both time and space coordinates to be the summit of scientific thought. Some "exact" sciences made their ultimate goal to find the most general laws *lying beyond* specific phenomena. This tendency has led to the great interest to the symmetries in modern theoretical physics. As an extreme, it resulted in a requirement that *all* fundamental laws, even not yet discovered, must be invariant under Lorentz group of transformations, that follows from the first postulate of the special relativity.[2]

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[1] In Schrödinger equation, when changing t to $-t$, the wave function must be replaced by complex conjugation function.

[2] No one objects the use of the group theory. It is necessary to remember, however, that in the group theory the "active" and the "passive" transformations of coordinates do not differ. In the physical system, these are the different transformations in principle. Therefore, giving too much weight to the invariance of the mathematical formulation of the natural law with respect to some group, it is easy to loose touch to the real conditions in which this law was obtained.

Rapid development of nonlinear physics and non-equilibrium thermodynamics in the last decade made, however, the first breach in the massive obsession by symmetries by showing the necessity of introducing time-irreversibility ("arrow of time" — a notion introduced by Eddington in 1928) in the fundamental description of nature. It became clear that even in certain problems of classical mechanics one can encounter the unpredictable or chaotic behavior of coordinates and momenta characterizing the state of a dynamical system (called chaotic system). Probabilistic description of evolution of chaotic systems gives rise to the "arrow of time".

As an example of chaos one can mention the turbulent regime in a liquid. In the case of turbulence, two arbitrary close points of the liquid can diverge to a finite distance in finite time.

A simple example of dynamical chaos[1] is demonstrated by a weakly dissipating spherical pendulum in the case when its suspension point is forced to oscillate periodically. Motion of the pendulum becomes chaotic if the period of oscillations of the suspension point approaches the period of free oscillations of the pendulum.

In order for the description of motion by means of trajectory to be adequate to reality, the trajectory must stay "almost the same" upon the slight change of the initial conditions. In chaotic systems this does not happen: trajectories, initially close, diverge with time (it is said that chaotic systems are sensitive to the initial conditions). Therefore the description of chaotic systems in terms of deterministic causality is impossible. Indeed, the cause-and-effect connection is understood as "the same cause under similar conditions produces the same result". For chaotic systems it is impossible to determine the class of "similar situations" in which the

[1] In Dynamical chaos is irregular motion obtained as a solution of deterministic equations in the absence of random parameters or forces. In general, chaos is thought of as absolute disorder, is philosophical sense, a primordial disorder.

"similar causes" (i.e. "similar initial conditions") produce "similar results" [1].

Let us assume that describing a specific mechanical problem we specify a set of numbers as an initial condition for equations (the initial state of the system). However, some of these numbers may appear irrational. If the system is chaotic, we obtain different solutions depending on the number of digits in the representation of the irrational numbers. One can say that for these systems there exist a region in the state space (defined by precision of our measurements) for which all the points correspond to "similar" systems, but these systems move along the trajectories diverging exponentially with time. For chaotic system one can introduce the internal time scale (Lyapunov time) — the time interval during which two systems corresponding to "similar" initial conditions can still be considered as "similar" (i.e. prediction of motion is possible to some extent). However to increase the time interval during which the trajectory can be predicted, say by 10 times, one has to increase the precision of the initial conditions by exp(10) times. Moreover, regardless of the precision of our measurements, after long enough time compared to the Lyapunov time, the memory of the initial state of the system is completely lost.

Thus, the existence of chaotic systems shows that in general, using Newton's equations and starting from the initial conditions, it is impossible to predict the behavior of single trajectories. (Note that it would be possible to calculate a real trajectory up to some moment in the future if we could control the motion or the position of the trajectory in the phase space was known in the future). It is proven that the behavior of chaotic systems admits irreducible probabilistic description giving rise to the "arrow of time". One can say that the existence of chaos makes it necessary to include the "arrow of time" into the fundamental description of nature.

For parapsychology the said above means that the idea of travel in time, as well as precognition, does not agree with the latest achievements of science. (We must note that precognition should not be confused with ordinary prediction, or some approximation into the future based both on the personal experience, knowledge of the expected course of events, and deeper sources of information, feeding our intuition, such as telepathy). We expect objections such as: 1. "What about well known predictions of Nostradamus?" 2. "How can one interpret the statistically reliable experiments on guessing of random numbers?"... The first question can be opposed by a contra-argument: "Is it possible to say with absolute certainty based on the Nostradamus notes, what is going happen in, say, 20 years from now?" Unfortunately, it is impossible since the records left by Nostradamus admit several interpretations, and only afterwards (when the event already happened) it is easy to choose the right one. There are several arguments to answer the second question. We give only one of them: there is no ideal generator of random numbers; every real one always has some regularity.

Having admitted that irreversibility of physical phenomena is a fundamental law of nature, physics reached an agreement with various theories of evolution. However, one has to give up something in exchange. Although physicists do not like to admit the fact, the introduction of the "arrow of time" into the fundamental principles of Nature is the large price to pay. It has to be admitted that the special relativity can no longer be a global world-view, but only a physical model successfully describing a number of physical experiments. Indeed, due to the "arrow of time", there is no equivalence between space and time, as asserted in the special relativity.

In any real physical system, accidental external disturbances which may cause an unexpected behavior of the system are always present, even if the system is non-chaotic (in the

mathematical sense). A question arises: is it possible to rule out (theoretically) any accidental disturbances if we take into account an increasing number of facts (by considering larger domain under study)?

From the modern cosmology viewpoint, the Einstein — de Sitter spatially-plane model (in which the spatial metric is Euclidean) is believed to be adequate the reality [2]. If the Universe is open[1] (i.e. the curvature of the space is negative or zero), no physical system can be completely isolated from accidental external actions. But if the closed Universe model (the curvature of the space is positive) is assumed to be valid, then, as I. Prigogine noted [1], due to the particle birth from the physical vacuum, from the thermodynamic viewpoint the Universe (treated as a system of particles with positive energy) may be still regarded as an open system. In this case, however, an objection can be made, that if the nature of physical vacuum were known, then processes of creation of particles could be predicted.

In our view, the physical vacuum being a medium which fills the space between elementary particles is a hierarchical system of media (namely, in a mathematical sense there exists a series of scales of averaging in any volume of the physical vacuum). Whatever "fine" medium is taken as a reference frame in the hierarchy there is a "finer" medium which governs to a certain extent the laws of the first medium. In this sense, no physical system can be completely isolated from accidental actions from "deep of matter".

References

1. Prigogine I. *The End of Certainty: Time, Chaos and the New Laws of Nature*, N.Y., 1997.
2. Taylor A., Peacock *Phys. World* **14** (3) 37 (2001).

[1] A physical system that can exchange both heat and matter with an external world is called open.

3. Self-organization in the animate and inanimate nature

According to the second law of thermodynamics, an isolated system (that can exchange neither energy nor matter with the outside) slowly evolves from an ordered initial state with low entropy to a disordered equilibrium state corresponding to higher entropy (order means the localization of particles or energy in some space region). The discovery of this law in the 19th century discouraged many people because it meant that our Universe moved inevitably to a completely disordered state (chaos), or its "heat death". Fortunately, however, if such a process exists it is not monotonous. The reverse process, *the self-organization* of highly ordered structures[1] from simpler ones or even from chaos, can also be observed in nature. There is no violation of the second law because, thermodynamically, self-organization takes place only in nonisolated systems.

The term "self-organization" appeared for the first time in the scientific language in the beginning of the 1970s as a collective term for numerous natural phenomena. Self-organization, as implied by its name, occurs without directed influence from outside.

Examples of self-organization

1. Fluid convection

A typical example of regular structures formed spontaneously from a chaos is the fluid convection in a gravity field. In the convection developed due to the heating of a fluid from below, one can observe the onset of dissipative structures, i. e. the structures existing only while the system dissipates (the so-called Bénard cells). If the external energy or mass influxes do

[1] By the structure of a system composed of separate elements of arbitrary nature is meant the type of organization of the elements and the character of interaction between them. We distinguish between spatial, temporal and functional structures.

not allow the system to evolve to the equilibrium, the structures formed spontaneously may be fairly stable. Note that what we speak here about is *the self-organization*, since it is impossible to control this process by the variation of the external conditions. Different dissipative structures proved to be consistent with the identical boundary conditions. This variety is the result of the instability developed in strongly non-equilibrium situations where even the slight disturbances in boundary conditions can lead to wide-scale effects.

Mathematically, here we again deal with the chaotic systems discussed in the preceding section or, to be more specific, with the most interesting case of dissipative chaos. For *dissipative chaos*, the motion no longer has the character of full mixing in the phase space. In the presence of dissipation and, simultaneously, external mass or energy influxes, the chaotic system may evolve to a complex stochastic motion, called a *strange attractor*. A dissipative system with many degrees of freedom may have many attraction zones in the phase space, i.e. attractors. In such complex physical systems with multiple attractors, *the self-organization* process may develop (in the self-organization, a coherent interaction between distant particles arises; accordingly, the number of the degrees of freedom decreases).

2. A model of spontaneous emerging life

In a non-linear chemical reaction, ordered structures can be formed in chemical systems. Chemical reactions occur through collisions of molecules. In order for a reaction between molecules to occur, they must overcome a certain energy barrier, the so-called activation energy, therefore, not all collisions result in a reaction. Any collision leading to a chemical reaction causes a local change in the concentration of reagents which, in its turn, can cause a local change in the reaction rate. Therefore, depending on the chemical bonds imposed on the system, complex structures can be formed in such systems. For example, under certain conditions appear periodic chemical reactions, the so-called

"chemical clocks". Unlike mechanical clocks without friction, "chemical clocks" appear due to nonequilibrium processes, and their operation is oriented with regard to the "arrow of time".

The molecules created in chemical reactions are conserved even after the external bonds imposed on the system have been removed. Such molecules can serve, in their turn, as a starting point for further creating more and more complex molecules, and, possibly, biomolecules at some stage. That is why, as many researchers think, the long-time way of nature's evolution, which resulted in life being born, is indeed the way of progressive chemical evolution. It is the way of random variations and initial selection on the molecular level.

However, the part of history, which preceded appearance of the simplest organisms, remains a mystery. Unfortunately, it is still unclear how the mechanism of controlled and reproduced biosynthesis appeared.

Moreover, modern molecular biology appears to be incapable to overcome the logical conflict between the necessity to have a ferment, controlling synthesis of an information molecule (DNK or RNK) and simultaneously to have these molecules coding the synthesis of the ferment, controlling their synthesis [1].

From the point of view of physics the pre-biological evolution can be considered as evolution of quantum objects. The more complex the molecules became the more complex quantum systems they represented. Eventually emergence of bio-molecules indicated a new qualitative leap in evolution of quantum systems: the quantum systems appeared which were able to self-organize. In case of bio-molecules the process of ordering can be localized on a single molecule!

In our view, the significant cause of genesis of biomolecules (in this scenario of emerging life) was *the stability of molecules*: after removing dis-equilibrating bonds appeared new molecules remained! Thus nature was able to accumulate information. Note that from the point of view of

thermodynamics the nature of stability of the molecular structure has nothing in common with the stability of coherent dissipative structures in a fluid. Unlike the latter case, there is no need in supplying energy or matter from outside to conserve the molecule. The molecule is a quantum system and its stability is described in terms of quantum physics. Note that biomolecules are similar to aperiodic crystals, and it is owing to the crystals that the solid objects which surround us are stable (time-invariant).

The gene is an example of a giant biomolecule. While discussing the stability of the gene which transfers hereditary information from one generation to another, the founder of quantum physics E. Schrödinger wrote [2]:

"... to reconcile the high curability of the hereditary substance with its minute size we had to evade the tendency to disorder by 'inventing the molecule', in fact, an unusually large molecule which has to be a masterpiece of highly differentiated order, safeguarded by the conjuring rod of quantum theory".

The genes of a living organism are combined into greater biomolecules, chromosomes.

3. The growth of a living organism from an embryo

Complex organisms are also an example of self-organizing structures developing from embryos. In the process of growth, the organism "consumes" energy and matter supplied from outside, owing to which it is not only conserved but is developed into a higher level of organization. From this point of view, the organism is like a self-organizing structure of inanimate matter that develops in an open system. However, this is the only similarity between the structures. The development of an organism follows strictly determined laws remaining valid through generations and is unlike the spontaneous development of structures of the inanimate. Schrödinger was possibly the first who drew attention to that. He wrote [2]:

"The living organism seems to be a macroscopic system which in part of its behaviour approaches to that purely mechanical (as contrasted with thermodynamical) conduct to which all systems tend, as the temperature approaches the absolute zero and the molecular disorder is removed."

For a deeper insight into Schrödinger's idea we shall briefly discuss the very essence of the animate: the capacity for reduplication and inherited variation. To this end we shall consider in a sketchy way the behavior of the chromosome in meiosis (reductive division) occuring under quasi-equilibratory external conditions. In meiosis the double chromosome set of the parent cell simply separates into two single sets, one of which goes to each of the daughter cells, the gametes. However, before being separated, any two "homologous" chromosomes come into closer contact with each other, during which they sometimes exchange their genes. The process is called "crossing-over". There is a noteworthy feature of the process: in crossing-over neither energy nor matter are consumed from outside, but, on the contrary, part of the molecules are released and transferred to the cell. Such release of energy and matter is characteristic of the quantum process where two molecules combine into one molecule. (It is worthy to note as well, that in crossing-over the number of degrees of freedom for the 2-chromosome system is decreased, but the quasi-equilibratory ordering originates from order, not from chaos).

The major property observed in the described above process is the absolute order: the whole process is adjusted with accuracy to the motion of one simple molecule, as if we are dealing with an ideally tuned in mechanism. Among various structures being studied in physics at present this is possible for quantum systems only. One may say that one is dealing with a macroscopic quantum system here.

The birth, life and death of systems are studied by synergetics, an interdisciplinary branch of knowledge. In

synergetics, various phenomena of both nature and social life are studied using the same methodological principles. Thus self-organization in physical and chemical processes originates, as a rule, in open non-linear systems. When observing self-organization, a quantitative measure, called the correlation distance, can be introduced to determine the interaction between objects. The emergence of structures is accompanied by an increase in the correlation distance.

However, the nature of correlation is different for different phenomena of self-organization. Ordering may occur with energy consumption or release. The definition of synergetics (given by H. Haken, its founder) as a interdisciplinary branch of knowledge that studies the joint action of a large number of objects (molecules, cells, etc.) resulting in the creation of a structure on the macroscopic level does not cover all situations of forming the structures. For example, in crossing-over in meiosis before the beginning of conjugation there are already two structures — two chromosomes (not "large number"). Besides, there are different interpretations of the very concept of self-organization. (Some authors use the term "organization" for the process of quasi-equilibratory ordering occurring from the disorder with energy release to differentiate the term from the non-equilibratory ordering with energy consumption, the latter ordering being called "self-organization".) Taking into account the above considerations and some other facts, it should be stated that synergetics is not defined well at present, there is no unified constructive formalism; the range of phenomena studied is not clearly defined.

So we accept the simple classification given by Shrödinger [2] for defining the process of ordering in the animate and inanimate nature. E. Schrödinger specified two principles.

1. Creation of "order from disorder".

This way of ordering is observed in an open system if the system is in a strongly non-equilibratory state.

2. Creation of "order from order". This refers to ordering which is constantly supported.

Life selected the latter principle. The development of an organism follows certain strictly defined laws under quasi-equilibratory (from the point of view of thermodynamics) external conditions. At a considerable deviation from the state of equilibrium, the self-organizing structure of animate substances can become unstable. That is, organisms can perish due to considerable changes in temperature or other parameters.

No doubt that the organism uses the first principle of self-organization as well. For example Babloyantz [3], having analyzed the brain's electric currents (electroencephalograms) researchers found out that during sleep the brain showed chaos with a 5-dimensional attractor (5 independent variables); and while awake the brain showed random behavior (due to random interactions with the environment).

However, the major feature which distinguishes the animate from the inanimate is that cell fission is carried out according to "order from order" principle.

The classification of the self-organization principles given by E. Schrödinger reveals an important feature of the behavior of living matter, but does not answer the question put by Schrödinger himself: how does the hereditary substance function? However, there are two important conclusions to which Schrödinger came.

1. The organism's activity cannot be reduced to the manifestation of known laws of physics. In fact, any law of physics manifests itself only for a large number of occurrences, i.e. as a statistical or probabilistic law. It is different with biology, so Schrödinger wrote [2]:

"A single group of atoms existing only in one copy produces orderly events, marvellously tuned in with each other and with the environment according to most subtle laws... we are here obviously faced with events whose

regular and lawful unfolding is guided by a 'mechanism' entirely different from the 'probability mechanism' of physics."

Moreover, referring to the question: how does the hereditary substance function?, Schrödinger noticed: *"We must therefore not be discouraged by the difficulty of interpreting life by the ordinary laws of physics. For that is just what is to be expected from the knowledge we have gained of the structure of living matter. We must be prepared to find a new type of physical law prevailing in it."*

Note that since the time when Schrödinger wrote those lines it became especially clear that quantum mechanics in its modern form rule out replication.

2. The laws that underlie the development of an organism resemble most closely the deterministic laws of classical mechanics at the absolute zero where any disorder and friction disappear. (Having in mind further discussion we shall notice that there are liquids which enter the superfluid state at temperatures close to absolute zero. In the superfluid state, the friction of liquid at the vessel walls disappears, and the motion of liquid is determined by the order parameter. One can say that the liquid in the superfluid state represents a macroscopic quantum system).

Based on the above, we shall try to make another step toward understanding of the main question put by Schrödinger: "What is life?" We shall look at a live chromosome through the eyes of a physicist. Being a very large molecule it consists of simpler atoms and molecules which are the same as the respective atoms and molecules in inanimate matter. The chromosome demonstrates not only its own stability as a quantum system, but also the stability of the biological laws which determine its structure and control its activity. It is as if inside the chromosome there was a mechanism which makes it switch from one stable quantum state to another according to strict deterministic laws. It appears as if somebody controls the quantum states of this

giant molecule, the chromosome. But where does the mechanism which controls the quantum jumps reside? It would be logical to assume that it is located "outside" the chromosome which is controlled by it. We suppose that the mechanism can be found in *the physical vacuum* where all the elementary particles constituting the chromosome "float". Developing this idea we put forward a hypothesis that ***any living organism has its "continuation" in physical vacuum, which is both a spatial and "controlling" structure there*** (we name it "live-structure").

Thus, in our view, to explain the self-organization in the animate nature, it is necessary to go beyond the molecular level in the investigations, into the deep of matter.

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4. The Superfluid Physical Vacuum

Physical vacuum is a material continuum filling the space between elementary particles. Before the special theory of relativity was introduced, space was assumed to be filled with a medium (ether) with the properties similar to a common "mechanical" medium. Since such a model of ether could not explain a number of experimental facts, the theory of special relativity discarded the ether, as a physical medium. In theory, the concept of vacuum turned out to be equivalent to the concept of space entirely devoid of matter. In general theory of relativity the situation has changed. The vacuum became associated with a gravitational field present even in the absence of electromagnetic field.

The concept of vacuum has been considerably expanded with the development of quantum theory. In this theory, zero oscillations of electromagnetic field are present in vacuum even in the absence of photons and, consequently, at zero average energy of the electromagnetic field. In modern quantum theory of field, the concept of vacuum has been further enhanced: the phase transitions in vacuum similar to the phase transitions in condensed media (for example, in superfluid ^{3}He-*B*) came to be treated [1, 2].

Prior to publication of studies on quantum transitions in the physical vacuum, some researchers [3-5] proposed a model of vacuum as a superfluid state of pairs of oppositely charged particles, the fermions, with zero total spin of the pair. (A superfluid consisting of pairs of fermions with zero projection of the total spin of the pair on the specified direction is known at present. It is ^{3}He-*B*.) The model is substantiated well enough. The superfluid properties of vacuum (zero viscosity while in motion) explain the observed nondissipative motion of celestial bodies in space. The presence of electrically unlike micro-particles describes the dielectric properties of the vacuum and the generation of electrically charged elementary particles out of the vacuum.

The postulate of zero total spin of a pair corresponds to the fact that for the description of spin-spin interaction between the elementary particles accounting of the spins of only those particles is sufficient.

The four-dimensional relativistic formalism was preserved in all of the proposed models, and the propagation of light was not considered in them. In some papers, the photon was introduced as a collective excitation of a fermion field [5, 6]. However, the nature of the excitation was not specified.

In our works [7-9] we also presented a model of vacuum as a superfluid consisting of pairs of fermions with zero total spin of the pair. We extended the analogy between the properties of superfluid ^{3}He-*B* and those of the physical vacuum.

Such properties of the superfluid ^{3}He-*B* vortices as quantization of the angular momentum, nonzero inertial mass, electric polarization [10] allowed us to suggest that the photon was a vortex structure in the superfluid physical vacuum.

The transfer of the angular momentum of a vortex of superfluid ^{3}He-*B* to the spins of atoms composed it can be interpreted as the existence of rotational viscosity in the medium. We have shown that there is a possibility for the vortex-wave process described by the equations of the Maxwell type to propagate in the superfluid medium with rotational viscosity, that is, the Cosser medium. In essence, according to our concepts, the superfluid physical vacuum is the luminiferous medium. In our works we show, that those concepts are in agreement with the major experimental data, and we derived a formula for transformation of the energy of photon from one inertial (in the sense of Galileo) frame to another.

Because of lack of viscous friction any superfluid medium is able to sustain for a long time the structures (e.g. vortices) created in it. But owing to the fact that superfluid ^{3}He-*B* consists of fermions it has unique properties in this respect: stable spin structures may be created in it. The topological structures created in the fluid were studied in a number of fundamental works. In our view, one of such structures, the uniformly precessing domain (UPD), is of special interest. An UPD is created by particles whose spins precess with the same frequency. The energy of such a structure is determined as $S\nu$, where S is the total spin of precessing particles, ν is the precession frequency. If we assume that $S = h$, we shall get the classical expression for the particle energy in the Schrödinger wave function. We suggest that such an identity of the expressions for energy is not occasional and that a bound particle, described by the Schrödinger equation, (e.g. an electron in an atom) creates a structure of the UPD type in the superfluid physical vacuum. As a justification for our

suggestion can serve the fact that we were able to begin to explain some effects of quantum non-locality and to derive a Schrödinger-type equation on the basis of this suggestion and remaining in the framework of the physical vacuum model. (Note that superfluids are described by the wave function of condensate which is not the same as the Schrödinger wave function.)

One of the remarkable properties of superfluids is the existence of processes leading to the equalization of order parameter. In superfluid ^{3}He-*B* the order parameter gradient can be caused, for example, by a difference in orientation of spins of the fluid particles or a difference in the spin precession phases. As an example, we describe an experiment carried out at the Institute of Physical Problems in Moscow by a group of researchers headed by the Academician Borovic-Romanov (1987) [11].

There were two vessels with superfluid ^{3}He-*B* linked by a narrow channel; uniform precession of spins of ^{3}He atoms was generated, that is, two UPD's were created. The difference in the frequencies of precession of atomic spins in the vessels was about 0.1Hz (~ 10^{-5} percent of the precession frequency). The difference in the precession frequencies resulted in the creation of a nonzero precession phase gradient, that is, a difference in the order parameter phases and, correspondingly, in the creation of a superfluid spin current. At a certain magnitude of the spin current, a precession phase slip of $2\pi n$ took place along the channel.

The following features of the process are worthy of notice:

1. Quantization of the phase slip magnitude at which the phase slip takes place.

2. Selectivity of the effect: the phase slip takes place only at a specific magnitude of spin current (or phase gradient, which is the same).

3. Independence of the length of the channel linking the UPD's, that is of the distance between the interacting structures.

Thus, if the physical vacuum has the described above properties, quantum objects create within it certain structures which can interact between each other (for example, by means of spin current). This interaction has the property of "selectivity" and does not depend on the distance between the interacting structures.

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Let us consider some examples of influence which sensitives can exert on instruments and primitive organisms.

Influence on microorganisms

Before the experiments discussed here, in modern genetics there were no facts demonstrating the variation of microorganisms combined with transformation of certain forms into others within the same enterobacteria family (the interspecific and generic transitions, according to current taxonomy) under artificial influences. From May 1988 to December 1989, the Tomsk Medical Institute team of researchers headed by K.A. Chernoshchiokov conducted experiments on sensitive's influence on microorganisms [1].

The technique used was as follows. One-day cultures of colon bacilli (No. 1257), typhoid bacilli (No. 335), Flexner bacilli 2a (No. 795), Sonne (No. 987) and B-43 (the culture obtained experimentally from the typhoid bacilli, which had no analogues in the intestinal family) were dissolved in a physiological saline. A sensitive exerted influence on a closed saline-contained phial by surrounding it with the palms of the hands at a distance of 5 to 10 cm for 2-10 min. Fourteen sensitives took part in 91 series of experiments and 24 positive outcomes resulting in the variation of the microorganisms were obtained. The following ecological transitions were placed on record.

The colon bacilli could transform into various bio- and serovars differing from the original strain by 5 or greater number of characters. Various biovars of nonpathogenic colon bacilli, enteropathogenic colon bacilli, and microorganisms (designated by the researchers as B-43) which do not have analogues in the family of enterobacteria were obtained from Eberth's bacilli. Various biovars of colon bacilli and fecal alkali former were obtained from the dysentery bacteria; from B-43 were obtained

typhoid fever bacteria, various biovars of colon bacilli, and bacteria of the enterobacterium type.

The acquired characters were inherited in the successive generations, which allowed the researchers to state the fact of structural changes in the cell genome.

Thus the results of the described above unique experiments show that the sensitive is able to cause genetic changes which are inherited. It should be mentioned that genes are biomolecules, i.e. quantum objects.

Additional information. It was established in experiments conducted in 1983-1989 [2] according to Chernoshchiokov's technique that such ecological transitions of microorganisms from one form into another can be caused by geomagnetic disturbances and magnetic storms (of natural origin) of various intensity and temporal frequency range.

Influence on unicellular algae

The experiments were carried out in 1977-1978 at the Institute Medical and Biological Problems by V.I. Kartsev [3]. V. Zhuravliov, the sensitive, exerted influence on a one-cell mobile alga Euglenia viridis at a distance of 3 to 4. The sensitive was given a task to affect the mobility of the alga. The most significant result of the trials was complete immobilization of the alga, the original fusiform being lost. All mass of the alga became a set of separable aggregations.

It is remarkable that as soon as the cell ceased to be a living organism it lost its form, that is, the "distant" correlations disappeared. It should be mentioned that the "distant" correlation is a feature of the quantum system.

Influence on magnetometers

The experiments were carried out jointly by the St. Petersburg State Institute of Precise Mechanics and Optics (now the Technical University) under the supervision of G.N. Dulnev and the Institute of Terrestrial Magnetism (IZMIRAN) (1978)

[4]. The action of N.S. Kulagina, the widely known sensitive with outstanding extrasensory capabilities, on magnetometers of various type was studied.

The degree of influence of the sensitive on the readings of the instrument appeared to be dependent on the design of the instrument and its principle of operation. For example, the astatic magnetometer (an optical-mechanical device) used as a reference instrument indicated from 7 to 13 nT, which is within the normal range, while measuring the initial magnetic intensity of Kulagina (before the trials). At the same time, while influencing the induction copper-wire coil connected to an oscillograph and influencing the sensing element of a portable proton magnetometer (based on the induction coil as well), no effect was observed. It followed from the experiments that N.S. Kulagina did not generate either pulse or stationary magnetic field beyond the normal range.

However, another series of experiments led to striking results. In such experiments the magnitude of magnetic induction was measured using a germanium Hall probe which was influenced by the sensitive either with passes of the hands at a distance or by enclosing the sensor in the palms. The magnetic field was recorded and the magnitude of magnetic induction was equal to 10^6-10^7 nT which exceeded the norm by approximately 0.5×10^6. The signal was maintained by the sensitive for 3-4 sec. Fig. 1 shows the two typical results of Kulagina's influence (dash line and continuous line).

Conclusions were made from the experiments that, firstly, the sensitive's effect on the instruments was not of a magnetic character, and, secondly, it occurred on the quantum level. Indeed, the Hall probe is a device in which detection of magnetic field is done by electrons, that is the quantum objects. The external magnetic field creates the Lorentz force that acts on the electrons. Since it was established that Kulagina did not generate any magnetic field, the effect produced by her on the Hall probe could be explained by direct action on electrons, the quantum objects.

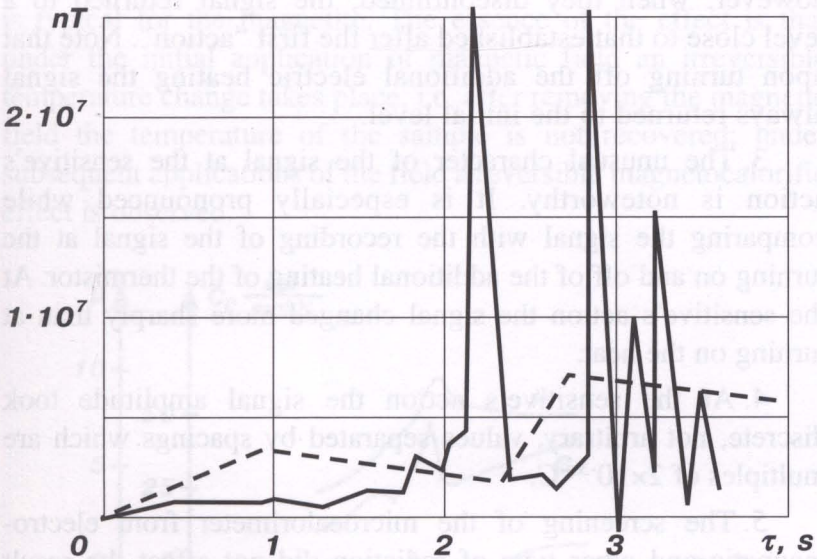

Fig. 1. Output signal of the Holl probe influenced by N.S. Kulagina at a distance as a function of time.

Influence on microcalorimeters

Let us consider the experiments of G.K. Gurtovoy and A.G. Parkhomov on sensitive's action-at-a-distance [5]. The microcalorimeter is an instrument intended to measure weak thermal effects. It can measure the temperature difference (through measuring the thermistor's electrical resistance) of the order of 10^{-5} °C.

An analysis of the results of a great number of trials reveals the following characteristics of the sensitive's action-at-a-distance.

1. The sensitive could produce not only an increase but also a decrease in temperature. Note that the absorption of "conventional" types of radiation such as electromagnetic or acoustic by the thermistor could lead to increase only in the temperature.

2. When the very first sensitive's "action" stopped, the signal did not return to the initial level for a long time. The subsequent sensitive's "actions" resulted in a signal change;

however, when they discontinued, the signal returned to a level close to that established after the first "action". Note that upon turning off the additional electric heating the signal always returned to the initial level.

3. The unusual character of the signal at the sensitive's action is noteworthy. It is especially pronounced while comparing the signal with the recording of the signal at the turning on and off of the additional heating of the thermistor. At the sensitive's action the signal changed more sharply than at turning on the heat.

4. At the sensitive's action the signal amplitude took discrete, not arbitrary, values separated by spacings which are multiples of 2×10^{-3} °C.

5. The screening of the microcalorimeter from electromagnetic and other type of radiation did not affect the result achieved by the sensitive, and in some cases made it even more "distinct".

6. The effect of the sensitive's action did not depend practically on the distance between the sensitive and microcalorimeter. It varied from 0.5 to 2000 km.

Consider now the behavior of magnetite (a Fe_3O_4 composition manufactured using a special technology) during the spin directional transition [6]. Within the temperature range of 122-128K the magnetite is in a labile (unstable with respect to both strong and week interactions) state, and when a disturbance in the form of magnetic field is exerted on it a phase transition takes place in the magnetite; this is accompanied by substantial changes in the characteristics (see Fig. 2). Also, during the spin directional transition a magnetocalorific effect is observed, namely, the fall in temperature (ΔT) of the sample during the transition period. The magnitude ΔT can reach 0.2K. It is revealed that an irreversible magnetocalorific effect of the first measurement (the so-called ΔT-effect of the first measurement)

is typical for the magnetite. The essence of the effect is that under the initial application of magnetic field an irreversible temperature change takes place, i.e. after removing the magnetic field the temperature of the sample is not recovered; under subsequent applications of the field a reversible magnetocalorific effect is observed.

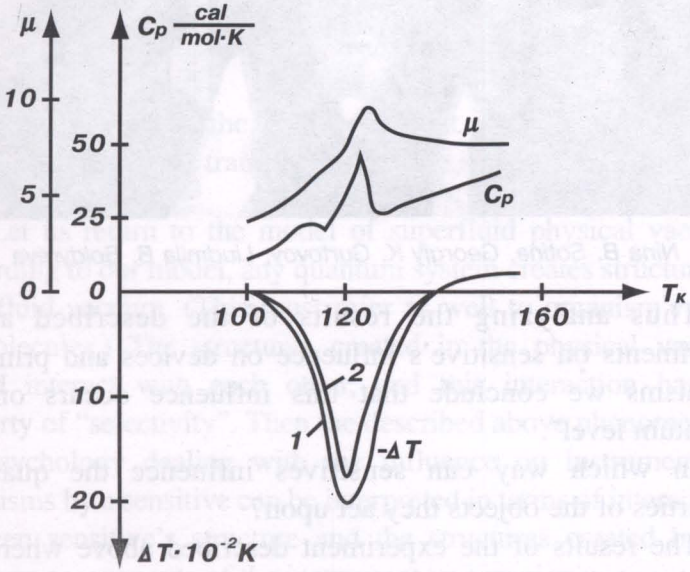

Fig. 2. The magnetite's characteristics in the area of spin directional transition. C_p is the specific heat; T_K is the temperature of the thermostat with the sample contained in it; ΔT is a change in temperature T; μ is the magnetic susceptibility; 1 is the first measurement (the measurement conducted for the first application of magnetic field); 2 is the second measurement.

Thus the magnetite properties, such as the fall in temperature, the high rate of variation of the magnetite characteristics, and the first measurement thermal effect are similar to the mentioned above features of the sensitive's effect on instruments.

The above analogy allows us to insight into the nature of sensitive's influence namely it may be supposed that it is the spins of the particles the object consists of that are affected.

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Thus analyzing the results of the described above experiments on sensitive's influence on devices and primitive organisms we conclude that this influence occurs on the "quantum level".

In which way can sensitives influence the quantum properties of the objects they act upon?

The results of the experiment described above where the sensitive influenced successfully the readings of a micro-calorimeter equipped with an electromagnetic screen at a distance of up to 2000 km seem to be the most mysterious from the physicist's point of view. In such conditions the acoustic or electromagnetic waves or diffusion cannot account for the effect of the sensitive's influence.

The "selectivity" of the sensitive's influence also cannot be explained by action of any known field. A.G. Parkhomov described an interesting episode of his research work concerning Dubitsky's influence on the microcalorimeter. Dubitsky and the device were in different rooms. A reference device of the same type was placed in the Dubitsky room and while the sensitive was unaware of its existence, the device

did not respond to his influence. Similar phenomena take place in other experiments described above. For example, G.N. Dulnev who described the successful influence of sensitive Soloviov on a magnetic transducer at-a-distance of 15 km pointed out that a similar device placed in an adjacent room did not respond to the influence throughout the experiment. K.G. Korotkov wrote about the same phenomenon: *"...the 'tuning in' of the sensitive is performed with respect to a specific sensor with definite design features"*.

Thus, to explain the above effects it is necessary to search for a new type of the transmission of the sensitive's influence.

Let us return to the model of superfluid physical vacuum. According to our model, any quantum system creates structures in superfluid vacuum. (This must refer as well to organism's large biomolecules.) The structures created in the physical vacuum would interact with each other, and this interaction has the property of "selectivity". Then the described above phenomena of parapsychology dealing with the influence on instruments or organisms by a sensitive can be interpreted in terms of interactions between sensitive's structure and the structures created by the quantum components of the instrument or organism.

No doubt that the structures created in vacuum by such quantum systems as organisms ("live-structure") must differ from those created by non-living quantum objects. If the latter structures can be considered as "attendant" with respect to the quantum object, the first ones are "controlling": they control the functions of biomolecules, e.g. the process of crossing-over at meiosis.

The above outlined approach to the explanation of some phenomena of parapsychology allows us to determine ways of experimental study of the phenomena of parapsychology, e.g. using spin-polarized substances or photon beams for screening the sensitive's action on an instrument or an organism.

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Typical Phenomena in Parapsychology

I.M. Kogan

The history of parapsychology can be divided into three large periods. First, from the 1880s to 1930s, was the period of accumulation and systematization of facts and observations. The second period, 1930s-1960s, was the phase of comprehension or thinking about the phenomena, and, more importantly, organization and conduction of focused and systematic laboratory studies. Important contributions to the study of the parapsychology phenomena were made by the Rain family in the USA and by L.L. Vasilyev in the USSR. We now live in the third period, which can be called the "modern history" of parapsychology. The beginning of the "modern history" in the USSR can be dated precisely. It was the result of the social and political life of that time. This time is called "the first thaw", the beginning of which can be determined within several days (!) — about the date of the famous speech of N.S. Khrushchov at the 20th CPSU[1] Congress in the fall of 1956.

Already in 1962-63, during the liberal "wave", the books by B.B. Kazhinsky ("Biological radio-communication?", Kiev, Ukrainian Academy of Sciences, 1962), L.L. Vasiliev (Mysterious phenomena of human mind, Moscow-Leningrad, 1963) and others were published.

The result of this period was the Section of Bio-information at Moscow branch of All-Union Science and Technology Society of Radio, Electronics, and Telecommunications created by the initiative of E.K. Naumov, A.S. Pressman, I.M. Kogan and other enthusiasts and headed by me during 1965-1975. During the following years, other groups conducted similar research worked under that Society. At the present time I head a group "Problems

[1] Communist Party of Soviet Union — *Ed.*

of bio-field". Below I will describe types of parapsychology phenomena, which was discussed in our group.

Telepathy

Telepathy is the transfer of thoughts and feelings of one person to another at a distance. The reader may certainly recall an "event" from own life suggesting thoughts about telepathy.

I will recall the honoring the famous actor and psychic W.G. Messing on his 65th anniversary. This was on January 19, 1966 in Moscow.

Ippolit Moiseyevich Kogan, Professor, Ph.D.(in engineering)

It is about the speech of P.K. Ponomarenko who had been dealing with Polish refugees being the first secretary of the Central Committee of Bellorussian Communist party in the fall 1939, during the entrance of the Soviet Army in Poland. He told his audience of 400-500 people that once he was informed about arrival in Belorussia of "somebody named Messing", who claimed to possess "supernatural" abilities. "Could he be a spy?" — thought Ponomarenko and asked to arrange a meeting with him. When Messing arrived, a group of people in Ponomarenko's office decided to test his abilities by mentally

giving him a task: "to go up to the second floor, come to a specific bookshelf, take a specific book on a specific shelf, open it on a specific page and underline a specific word". According to the setup of the experiment, after Messing left the room and went to carry out the task, everybody in the room must be thinking about the sequence of actions Messing should perform. In a while, Messing came back to the room carrying the book with the underlined word.

Everybody was stunned. Then, as Ponomarenko told in his talk, he asked Messing: "Can you walk into Stalin's office in the Kremlin without a pass?" Messing confirmed that he could. According to Ponomarenko, a few days later Messing indeed came to the room in the Kremlin where Ponomarenko with some othere people were waiting for him (Stalin was not there). Then Ponomarenko asked: "Well, can you now walk out of the Kremlin, if we warn all the guard posts?" Messing again confirmed that he could and, indeed, walked out.

The Experiments with Zener's symbols

The series of experiments with Zener's symbols (thousands of tests) were conducted in 1972-74 by the Section of Bio-information with participation of the outstanding sensitive L.A. Korabelnikova. During the first year the method was polished, favorable psychological preconditions were found, and so on. Yu.G. Korabelnikov took active part in the development of the method and in conduct of the experiments. He also performed extremely careful statistical analysis of the data.

The significance of the experiments discussed below is great for two reasons.

The first reason is due to the extreme care about the conduct of the experiments, large amount of accumulated statistical material, and a carefully thought out method.

The second reason is no less important, namely, that similar experiments (but in considerably less volume) were repeated 6

years later by Yu.B. Kobzarev with the participation of Korabelnikova, that yielded similar results. Thereby the objection of critics of parapsychology about the non-repeatability of its phenomena is challenged. Note that despite the experiments being conducted by a prominent scientist, a Member of USSR Academy of Sciences, they could not be published in *Doklady Akademii Nauk*[1] — a situation typical to the "official" science of that time. The results were published as a short note in a good and popular, but not classical, scientific journal *Technica Molodezhi*[2].

Let us turn to a more detailed description of the experiments. Their essence was that the sensitive (Korabelnikova, artist by profession) was to recognize the card with Zener's symbol (cross, circle, wavy lines, star, square) put into a non-transparent envelope of thick cardboard. In some experiments instead of Zener's cards she was offered cards with decimal digits (0 to 9).

Research methodology. Zener's symbols were drawn in black India ink on a white Whatman[3] 70×70 mm^2 paper. The size of the symbols was approximately 50×50 mm^2, thickness of lines 10 mm. Digits were printed typographically with black paint on rectangular cards of thin cardboard, their size was approximately 2 times greater than Zener's symbols. Cards were gathered in decks, 100 pieces each, in such a way that there were either 20 Zener's cards of each type or 10 cards with each digit. Selection of objects was performed from decks shuffled in a dark room in black bags.

The chosen card, still in the black bag, was put into one of the similar envelopes made from dense white 0.5 mm thick cardboard with the size of 100×140 mm^2. Three sides of each

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[1] "*Reports of the Academy of Sciences USSR*" — the official publication of Academy of Science of Soviet Union, one of the most respectable journals — *Ed.*

[2] "*Technology to Youth*", popular science journal — *Ed.*

[3] Paper type used for engineering graphics — *Ed.*

envelope were sealed with PVC[1] tape, the open fourth side was where the cards were inserted. In some of the experiments the cards were put into cardboard envelopes with one or two 30 micron thick foil plates preliminary glued in. The foil plates were put either in front, or behind, or on both sides of the symbol.

The procedure of the experiment. One of the participants of the experiment put cards into envelopes in a separate room. The standard number of envelopes in a series ("run") was 25. Then the envelopes with cards were shuffled and given to the experimenter. He passed the envelopes to the sensitive (Korabelnikova) in such a way that the images were facing her. L.A. Korabelnikova, blindfolded with a cloth band, put the envelope against her forehead, and after a while named the contents of the envelope. The answer of the sensitive was recorded in the protocol. After that the card was taken out of the envelope, and the actual symbol was also recorded in the protocol. In a series of specially set-up experiments the content of the envelope was determined by the sensitive from a distance of 0.5-0.8 m.

It is important to note that, after the method and procedure was polished during 1972, not a single result was excluded from the data analysis regardless of whether it was successful or not. It is also worth noting that during all experimental studies a friendly psychological atmosphere was deliberately created.

Results. The persuasiveness of the results obtained is obvious: the average number of correct identifications in a single run (from 109 total runs) was approximately 2.9 times the mathematical expectation of random correct guesses. It is indicative that the "intensity" of correct identifications, i.e. the ratio of the number of correctly named symbols to the time spent on the complete run was in good correlation with their resultativity: the more successful the recognition, the faster it goes.

[1] Plastic (polyvynilchloride) electric insulator tape — *Ed.*

Of course, the analysis of data was done by standard methods of mathematical statistics, discussion of which in this article is irrelevant.

Thus, there are no grounds to doubt that correct answers are the result of purposeful "sensitivistic" recognition (near-vision). This statement is supported by the following observations. In a number of cases, Korabelnikova correctly pointed out to the accidental twist (misplacement) of Zener's symbol in the envelope (the cross was perceived as X, square as rhombus, and so on), and to the accidental placement of two symbols in the same envelope (which was possible the because insertion was done in complete darkness). And once (there was a single case) she correctly identified the absence of a symbol in the envelope, when the author of this article, putting symbols in the envelopes, seeking to provoke, left one of the envelopes empty (without telling anyone, of course).

Experiments on recognition of Zener's symbols in cardboard envelopes at a distance of 50-80 cm from the sensitive were done in a way was similar to that described above. As a result of 16 such runs, the average number of correct identifications was 1.7 times above the mathematical expectation of the correct accidental coincidences. The process of recognition required significantly more stress from the sensitive, and the intensity of recognition was thus less than in the contact recognition.

10 runs were made with aluminum foil placed inside the envelope between the sensitive and the symbol. In order that neither sensitive nor experimenters knew about the foil in the passed envelope, the foil was put inside 4 out of 25 cardboard envelopes, as usual in a dark room in a bag. Then all the envelopes with the inserted Zener's cards were shuffled. Visually, they were completely indistinguishable. Analysis of the results was done separately for envelopes with and without the foil. As a result, the average number of correct identifications in

the first case (with the foil) was 0.83 of the average number of correct identifications in the second case.

In the same way 10 runs were done with the foil placed inside the envelope in the back of the card. The results appeared similar: the average number of correct recognitions for the envelopes with the foil was 0.89 of the average number of correct identifications without the foil. Practically, the same results were obtained with two sheets of foil placed in front of or behind the symbol.

An essentially different result was obtained with two sheets of foil glued both in front and in the back of the symbol, such that the symbol was surrounded with the foil. In 16 runs, in which 4 envelopes contained the foil and the other 21 did not, as in all experiments with the foil, the ratio between averages of correct identifications of the symbols in cardboard envelopes with and without the foil was 0.52. Analogous results were obtained with Zener's card put inside a completely closed foil envelope which in turn was put into the cardboard envelope. Therefore, complete shielding of symbols by the foil, even though deteriorating the result, leaves some possibility for correct identification of the symbols.

The Distant Clairvoyance

This type of parapsychology phenomena includes obtaining information about remote objects (kilometers and larger distance away) by a sensitive.

One particularly striking example of this phenomena happened in the end of 1980s. During field exercises, a soldier disappeared from a military base. A search of the soldier was done in two stages. During the first stage, the sensitives L.A. Korabelnikova and K.N. Nikolayev, while in Moscow, independently pointed out a region, about 50 square kilometers, where the lost soldier (dead, in their opinion) was located. They used a photograph of him and a geographic map covering a 400

square kilometer area 1000 km away from Moscow. During the second stage, Korabelnikova went to the site of the exercises and marked a region about 1 square km area where the search for the corpse should be done. She used the topographic map covering slightly more than a 100 square km area. A few months later, due to road conditions, a dead body was found in that region and identified as the lost soldier. The surrounding area had distinctive details pointed out by the sensitive.

We have a number of other documented observations of this sort. Below are given two of them: Search for disappeared man and search for a lost officer.

Search for a disappeared man

To: Scientific Adviser of Parapsychology Laboratory at A.S. Popov's Sciencific and Technical Society for Radio, Electronics and Telecommunications, Professor I. Kogan.

In the February 25 issue of "Stroitelnaja Gazeta" from this year we learned about wonderful experiments conducted by staff of the laboratory with the participation of Korabelnikova. Help us to find the traces of missing mechanic-technician from kolchoz "Avangard" (Piryatin county, Poltava region) Gritsenko Pavel Efimovich, born 1937, living in the town of Piryatin, Poltava region. On February 17, 1989, after work, he returned to the town from the village of Kalinovyi Most after 5 PM, but did not reach his home. A search did not give any results. He was dressed in a jersey, black hat, boots size 41; height below average.

Included is a photograph of P.E. Gritsenko and regional maps.

28/II-1989 [signature] M. Melnichenko.

Dear M. Melnichenko,

According to my perception, P.E. Gritsenko is dead, search for a corpse in a river, for a more precise result I need his photograph which is not signed by another person on the back.

30/III-1989 [signature] Korabelnikova.

Telegram. Piryatin Poltava region ... for Korabelnikova Liudmila Andreyevna.

Yesterday found body Gritsenko Paver Efimovich Udai river sorry for trouble relatives.

Search for a lost officer

Ministry of Defence. Military camp 81616.
March 27, 1989. No 261400,
Berdichev Zhitomir region. "TT"
To: Korabelnikova L.A.

Dear Liudmila Andreyevna!

Our colleague, army officer Lieutenant Fiodor Kapynis, was lost on March 7, 1989 in Berdichev. Officer Kapynis performed his duty in Afghanistan from 1986 to 1988, received an award. Daily search did not yield any results. We ask to provide assistance in the search of our colleague. The messenger has the necessary official documents for the search.

Commander of the camp 81616 Lieutenant Colonel [signature] Buchtoyarov.

Protocol of search, Moscow 11/IV-1989.

Kapynis Fiodor, according to Korabelnikova: killed, body in water in square 22x27 sq.m., search swamp north of Bystria village and right bank of Gnilopiad river up to alienated territories.

M. 1:25000. 11/IV-1989 [signature of Korabelnikova]
Major [signature]

Ministry of Defense. Military camp 81616.
May 24, 1989. No 261400,
Berdichev Zhitomir region. "TT"

Dear Liudmila Andreyevna.

I would like to inform you about the results of search for Lieutenant Kapynis F. The body of Kapynis was found in the area indicated by you, in water. The cause of death is being investigated. Thank you very much for your information. Best regards,

Commander of camp 81616
Lieutenant Colonel [signature] Buchtoyarov.

Note that observations of unique ability of Korabelnikova were conducted for many years.

Biolocation (Dowsing)

E.G. Bondarenko

In the unknown we live — for a while,
Unaware of what we are able to do.
(Alexander Block)

I became interested in dowsing (or biolocation which seems to be a term coined in Russia) in 1974 when I got acquainted with A.A. Malakhov, Doctor of Geological Sciences. Since that time I spent several years working out techniques of training intended to develop biolocation ability and training myself and other people. My professional biolocation practice began in 1981 in the area of archaeology, and during 7 years (up to 1988) I took part, as a biolocation operator, in 35 archaeological expeditions. In 1988, I was invited to participate in rescuing the people who had been buried (dead or alive), as a result of an earthquake, under the ruins of the town of Spitak (Armenia). Using biolocation techniques, I found the bodies of 39 victims. Some of them had not been detected by specially trained dogs of the Polish rescue team.

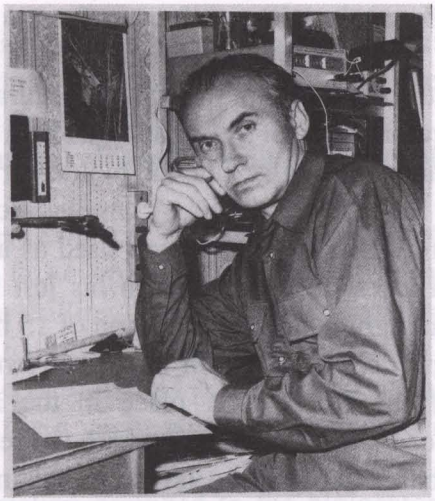
From 1989 to 1992 I worked as an engineer-biolocator at the Production and Prospecting Geological Association "Sevzapgeo" and as head of the biolocation division at the "Nizhnevartovskneftegas" association. In the period from 1989 to 1994, I carried out biolocation prospecting work in 29 geological expeditions undertaken by various geological organizations.

Being a biolocator-trainer, I headed the biolocation training courses for "Sevzapgeo" employees in 1991, and in 1993 I delivered a course of lectures for the fourth-year students of the Psychology Department of St. Petersburg State University.

Out of all kinds of psychophysical information relations between the consciousness and the environment, biolocation,

which is an ability of a human being to acquire information of the locality of an object, is a matter of keen interest for a lot of people. From time immemorial, biolocation (dowsing) was used to search for underground springs or ores. Formerly, a dowsing-rod was used as an indicator by the dowser who held the branches in his hands. At present the pendulum or "frame" are the most frequently used types of indicator. The L-shaped "frame", constructed as a rule out of thick steel wire, has a vertical axis of rotation. In the vicinity of or above the object being searched for, the "frame" starts oscillating or rotating which is caused by spontaneous ponderomotive motions of the hand.

In geology, biolocation is most efficient in those cases where it is necessary to detect a deposit and determine to a certain accuracy its boundaries irrespective of the deposit depth. The biolocation method makes it possible to directly obtain information of the position of the deposit boundaries.



Evgeniy Georgiyevich Bondarenko, engineer-biolocator

As an engineer-biolocator, I participated in determining oil-bearing layers from on board an AN-2 airplane in the north of the

Timano-Pechorskaya province. The exploration was concerned with local structures (with a burial depth from 3.500 to 4.000 m) identified with seismic prospecting techniques.

The routes of the search covered four geological sites: Vangureyskiy, Oleniy, Siurkharatmanskiy, and West-Khosedaiuskiy. In order to tune in to the biolocation effect some reference commercially viable wells were used within each site and the airplane course was plotted so as to pass over such well. Then the exploration was concentrated on prospective objects (geological structures) such as individual elevations, wells with unknown productivity, and the boundaries of a sediment wedging out zone on the Oleniy site.

On all the sites, 40 structures were explored and 13 among them were checked by means of probe drilling. Out of those 13 objects, a coincidence with the biolocation data was achieved for 10 objects, i.e. 77 percent.

(Note that for the precise location of the boundaries of the deposit, the biolocation exploration from the airplane was supplemented by exploration on foot or from a motor vehicle, which allowed us to specify the boundaries of the oil deposit underlaying at the depth of 400 m with an accuracy of ±100 m.)

The biolocator obtained information using a "resonator" (an object or substance serving to tune the biolocator in to the object being searched for) and a "frame". A sample of crude oil from a well in the Horeiverkskaya cavity was used as a resonator. The biolocator held a test tube with oil in his left hand while the frame was in his right hand. Investigation of 15 holes which had been drilled earlier showed that for the barren structures or wells the rotation of the frame took place in the absence of the resonator and for the paying wells — with the resonator.

The map-based biolocation is of special importance. It is known that some biolocators can indicate the position of the object to be located by means of exploration of topographical maps, aerial photographs or even simple graphical sketches only; the biolocator does not visit the site before the analysis.

Official papers of Evgeniy G. Bondarenko as an engineer-biolocator

The efficiency of the technique is illustrated by the following examples (note that the author was the principal, and, sometimes, the only biolocator):

1. Locating oil deposits with the use of cartographic material only

There were 12 objects, and the customer (not the biolocator) knew whether those objects were paying or barren from the results of probe drilling. The biolocator explored topographical maps provided to him. The correct diagnosis was obtained for 10 objects, which constituted 83 percent of all the objects.

2. Search for a yacht which disappeared in the Pechora Sea

The information provided to the biolocator consisted of a radiogram where the yacht size, name, color, number of yachtsmen, and the date of the last radio session were indicated. As a result of biolocation analysis of a 1 cm to 10 km flight map

the suggested location of the rescued yachtsmen was specified. A rescue helicopter that arrived in the point indicated by the biolocator found and picked up the crew of the yacht at the first flight. The place of the accident was situated at about 450 km from the biolocator, on the coast of Cape Kanin Nos.

3. Search for MI-8 helicopter No. 22605 which transported a team of drillmen and disappeared in the region of Khanty-Mansiysk in 1991

After many months of unsuccessful searching a group of biolocators headed by me carried out, from St. Petersburg (located at a distance of greater than 2000 km from the search area), a distant search with the use of 5 sheets of a 1 cm to 5 km topographical map provided by the Tiumen Central Agency of Civil Aviation. Each biolocator explored, independently of others, all 5 sheets of the maps displaying the region where the helicopter route passed. All the biolocators specified the same region with a discrepancy of no greater than 10 cm (that is, within 50 km). The coordinates of the suggested place of the helicopter crash specified by each biolocator were passed to the Tiumen Central Agency of Civil Aviation.

When the helicopter was discovered, it became clear that the suggested and true coordinates differed by the value of only 10 to 30 km.

4. Search for the 13th century church foundation (Zelenetsky monastery)

The church foundation made of boulders was buried under another boulder foundation constructed later. As a result of biolocation analysis of a 1 cm to 5 m draft, the exact locality of the foundation was specified. The foundation was opened up in several hours in the place indicated on the draft by the biolocator. It consisted of boulders of about 50 cm diameter. It is important to note that modern instrument-based search techniques would not be able to identify a stone structure underlaying a similar structure made of the same material.

5. Identification of deposits of gold (scattered and in nuggets)

Three biolocators received three identical sets of topographical map photocopies. No coordinates or geographical positions of the areas to be identified were provided. The comparison of the biolocation results with the customer information showed that the biolocators had specified correctly practically all known commercially viable deposits of gold, both scattered and in nuggets.

6. Diagnosis of technical state of oil wells

A biolocator was given a task to detect oil wells which had a specific defect. The work was ordered by the Nizhnevartovsk-neftegas Association. For the purposes of biolocation analysis, the biolocator was provided with schematic drawings showing the well location patterns. Only encircled numbers of wells were shown on the drawings. During 2 days of work, several hundred wells were explored by the biolocator. Among them 14 wells were specified by the biolocator as defective. A check carried out during the next year revealed that the accuracy of the technique was greater than 80 percent.

7. Locating specific ships at a large distance from the biolocator

The objects of the experimental search were hydro-geographic ships of the same type, namely "M. Krupsky", "Ivan Kruzenstern" and "Academician Krylov". The ships were in the Atlantic Ocean and they visited the ports of Canada and Europe. A 1 cm to 200 km map of the Atlantic Ocean was used by the biolocators: the author and one of his colleagues (from the Division of Biolocation). The photos and technical data of the ships were presented to the biolocators as initial data.

Twelve series of the experiment were conducted in 1990. On the basis of the results of the experiment, the following conclusions can be made:

a) At least in 80 percent of all the attempts the location of a specific ship was determined correctly. In the rest 20 percent the

deviation from the true location of the ship was no greater than 3 cm on the map. If a ship was anchored in a port, the port was always determined correctly.

b) In a search for more than one ship at one time the locations of the ships were specified correctly while the names of the ships could be determined incorrectly. For example, if the locations of "M. Krupsky" and "Academician Krylov" had to be specified, the biolocator could place "M. Krupsky" in the location of "Academician Krylov" and vice versa.

c) The biolocators always specified as a result of the search an area of about 1 cm^2 on the map, irrespective of the map scale. From this follows that the accuracy of determining the coordinates of the ship depends on the scale of the map. (Note that this characteristic is shared by the archeological and geological biolocation work done with the use of maps.)

From the above examples it can be seen that a trained biolocator is able to successfully locate objects of various type at any distance.

It is the author's opinion that the biolocation phenomenon does not fit in with the modern scientific paradigm.

From Parapsychology Towards Magic

L.B. Boldyreva, N.B. Sotina

What is the best?
— Having evaluated the past
to make it meet with the present.

Kozma Prutkov

The famous ethnologist James George Frazer wrote in his book *The Golden Bough*:

"If we analyze the principles of thought on which magic is based, they will probably be found to resolve themselves into two: first, that like produces like, or that an effect resembles its cause; and second, that things which have once been in contact with each other continue to act on each other at a distance after the physical contact has been severed. The former principle may be called the Law of Similarity, the latter the Law of Contact or Contagion. ...Charms based on the Law of Similarity may be called Homoeopathic or Imitative Magic. Charms based on the Law of Contact or Contagion may be called Contagious Magic."

Here is an example of imitative magic. If an Indian of the Ojibwa people (North America) wished to bring harm on his enemy, he made a wooden figure of the enemy and pierced its "heart" with a needle or shot an arrow from a bow, knowing positively that this caused a pang in the very heart of the enemy.

There is a lot of descriptions of rites associated with contagious magic. For example, a custom could be found all over the world (and can be still found somewhere) to carefully hide baby-teeth that had fallen out, or severed hair and nails so that they could not be found and nobody could work their ill will upon the child. The Law of Contact can be illustrated as well by a Scythian custom of fraternization: drinking wine from a bowl with drops of blood of the participants in it. It was

supposed that after that the new "brothers" would be connected with each other so that any injury done to a "brother" in one of new battles would inevitably bring harm upon all others.

Many magic techniques assumed possibility of establishing "contacts" between alive and dead human beings. To attract the soul of someone who was deceased a strand of hair could be used. Homer left us a description of a rite where Greek warriors at the walls of Troy covered slain Patroclus with hair cut off from their heads (see also [Boldyreva L.B. & Sotina N.B., Magic and Quantum Mechanics, *Science and Religion,* **5** and **7**, (1990) (in Russian)]).

Liudmila Boldyreva, Nina Sotina, shaman Valeriy Topoyev, in Hakassia

Thus magic rites provide a lot of evidence that far back in the past people believed:

— that one person can affect another from a large distance;

— that even cut off hair, nails, extracted teeth, etc. continue to constitute a whole with their former owners and that "contacts" can be established with them via those objects;

— that one can establish a "contact" with another person by forming the person's image in mind; wooden figures might serve a means of mental concentration;

— that "contacts" between alive and dead people are possible.

Perhaps, our readers living in the 21st century will believe in the same as soon as they become familiar with the results of the experiments on influencing the devices and organisms by a sensitive.

Here are the types of "contact" demonstrated by modern "magicians".

1. Establishing a "contact" via a handwritten text

Such a kind of "contact" was demonstrated by L.A. Korabelnikova in the experiments conducted by I.M. Kogan. In Korabelnikova's speeches at parapsychology seminars she stated that a specimen of handwriting was the most "informative" for her. Wolf Messing, widely known owing to his experiments on telepathy (some of them were carried out with the participation of G.K. Gurtovoy), wrote of such a "contact" in his book *I Am a Telepathist*: "I took a sheet of paper with a text... I see that the hand which wrote the text is dead." W. Messing wrote further that it is easiest for him to establish a "contact" with a person when he (Messing) holds an object belonging to the person and there is a relative or a cater-cousin nearby who is thinking of the person.

2. Establishing a "contact" by similarity

This kind of "contact" was demonstrated by sensitive E.G. Bondarenko who hold in his hand a vial with oil while contouring oil-fields from an aircraft or with a geografical map.

3. Establishing a "contact" by image.

That is, by means of mental creation of a visual image of the object seen earlier de visu or on a photo.

Here is a citation of a sensitive's work description made by G.N. Dulnev: "The sensors were placed in a massive steel tube. The sensitive made first an attempt to 'break through the wall of the tube', then he formed an image of the sensor in his thought."

In the described above experiments "Moscow-Novosibirsk" and "Moscow-Sofia" sensitive Dubitsky worked using a created image.

L.A. Korabelnikova and E.G. Bondarenko worked with photographs. In our presence Bondarenko gave details of a person (job, locality, etc.) having only the photo of the person. Note, that there was a man nearby who knew those details.

In the mentioned above Wolf Messing's book there is an impressive case of establishing a "contact" by photo. Messing describes how he got information about a young man whose photo was given to him by the young man's sister. "I am looking at the photo of the poor woman's brother... And all of a sudden I see him as if he got off the photograph. He looks younger; in a smart suit. I say: 'There is nothing to worry about, miss. Your brother is alive. He had hard times, but now he is doing well. You will receive a letter from him in thirteen days, today inclusive.' It became the talk of the town. The information reached the journalists. When the thirteenth day forecasted by myself came, it appeared that the journalists of almost all Polish newspapers had gathered at that small town. The letter from far off Philadelphia was delivered with the evening train. The fact received full coverage in the Polish newspapers."

As for the sensitives' action-at-a-distance, it is noteworthy that all sensitives started the process in a similar way as the ancient magicians: they attempted to imagine mentally that the device was exposed to a physical process which would result in the desired effect.

For example, Dulnev describes the following technique of sensitive's action: "The sensitive could form in his mind an image of a burning match while acting on a temperature sensor or an image of a magnet while acting on a magnetic transducer".

In the described above experiments with the microcalorimeter, sensitive Dubitsky thought of the device being immersed into molten metal to produce a signal corresponding to increasing the temperature or into liquid nitrogen to produce a signal corresponding to decreasing the temperature.

The above analogies argue that the same physical processes may underlie both some magic rites and some parapsychological phenomena.

In the section "Into the deep of matter" we have shown that ascribing the properties of a superfluid to the physical vacuum can provide a clue to the explanation of some phenomena of parapsychology. It is noteworthy that the model of superfluid physical vacuum being developed by us provides an approach to explanation of one of the most widely spread rites: "purification by means of fire".

Fire festivals can be found among all peoples from the times immemorial. Some elements of such festivals survived up to present day: the Easter Fires, the Midsummer Fires, etc. During the festivals people jump over fire or danced around fire. Having analyzed fire festivals the etnographists came to a conclusion that the original function of the festivals was purificatory one: those who participated in the rites believed that fire destroys "magic" relationships. In the model being developed by the authors, the photon is a structure in the physical vacuum, therefore, it can affect interaction between other structures. From this point of view, fire consisting of a vast member of photons can destroy relationships between people through destroying relationships between their live-structure in the superfluid physical vacuum.

A question emerges as to why the phenomena of psychokinesis, telepathy, etc., which were known for thousands of years, have not yet become the subject of experimental study in the framework of a special fundamental branch of science and, moreover, why some scientists still reject the necessity of such a

study? No doubt that the main reason for that is the scarcity of people with paranormal ability. Moreover, the studies performed so far have shown that the effect of the person's action on a device takes place after a certain training. In the process of training, the sensitive learns to tune in the organism to a definite action.

For example, Dulnev's team carried out an experiment where the efficiency of influence of a sensitive upon a magnetic transducer as a function of the image formed mentally by the sensitive was studied. The sensitive mentally formed in consequence various images of such figures as a sphere, cube etc., totalling 7 images. It appeared that the result depended on the image formed by the sensitive.

While analyzing the work of sensitives, K.G. Korotkov states that during the training the sensitive invoked mentally images of various animals and associated them with the device being acted upon.

V.I. Kartsev told us that in the experiments where a sensitive influenced on mice at a distance of about 30 km the maximum effect was achieved when the sensitive was playing "garmoshka", a kind of button accordeon.

Dubitsky found in the course of long training that the efficiency of his action increased if he "controlled" mentally "the speed of the electrons and the size of their orbits in the atoms", that is, he simulated the change of characteristics of the atoms in the process of heating or cooling the substance.

The training of a sensitive cannot be accomplished without feedback from the reading of the device to the sensitive. Felix V. Shirokov, Ph.D. (in physics and mathematics), the translator into Russian of Hausel's book "Parapsychology", conducted in 1967, together with Karl N. Nikolayev, the well known sensitive, the experiments on telepathic transmission of the information between Moscow and Kerch (about 1200 km). He told us that one of the most important results of the experiment was the conclusion of the necessity of training the sensitive with the use

of feedback. Namely, after each telepathic session, the sensitive-recipient had to be informed whether he received correctly the information "sent" to him. Only after such careful training could the main research work may be conducted.

A short-term course of sensitives' training cannot give good results. This refers especially to the courses of heeling where the feedback can be provided only on the basis of multi-year health monitoring of a large number of patients.

Kartsev told us that he faced great difficulties in his search for sensitives for his experiments. In most "folk medicine" centers, even the largest ones, not one sensitive agreed to participle in the experiments. In his paper "What is a sensitive able to do?" (VITA, 3, 1995), Kartsev wrote: "The results of work of the healers differed drastically: 9 of 18 healers could not exert any influence on the cell culture, the rest produced the results which were not only different, but opposite in effect between each other."

Korotkov stated that out of 95 sensitives working as healers or dowsers on a professional basis only 4 people could work at a distance of 2000 to 3000 m. Dulnev confirms this: "...only from 2 to 3 percent of the sensitives give the results which exceed noticeable the statistically average results. As usual, these are the prominent sensitives: N. Kulagina, A. Chumak, A. Ignatenko..."

Thus research in the area of parapsychology should include the development of techniques to search for people with paranormal abilities and methods of training such people.

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Authors: Liudmila B. Boldyreva & Nina B. Sotina

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Annotation

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There is no complicated mathematics, and the book are accessible to all those having interest to physics.

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