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ON THE POSSIBILITIES OF HUMAN EMISSION AND RECEPTION OF HIGH-FREQUENCY ULTRASOUND

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Abstract. This article suggests the possibility of the existence of an ultrasonic channel of information exchange in humans, similar to bats, dolphins, whales, etc. The possible frequency band of such a channel is estimated, resulting in frequencies from several hundred kilohertz to several hundred megahertz. In order to verify the assumption made and to minimize the efforts to find the frequency band of the supposed communication channel in such a wide frequency range, the corresponding experiment is considered and the results of previously performed scientific researches are discussed. The consequences of the presence of such a possibility in humans are considered and, on their basis, an attempt is made to explain some unusual phenomena inherent in humans.

Keywords: frequency band, human unusual phenomena, information exchange channel, ultrasound, emission

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О ВОЗМОЖНОСТЯХ ИЗЛУЧЕНИЯ И ПРИЕМА ЧЕЛОВЕКОМ УЛЬТРАЗВУКА ВЫСОКИХ ЧАСТОТ*

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Аннотация. В данной статье предполагается возможность существования у человека ультразвукового канала обмена информацией, подобно летучим мышам, дельфинам, китам и т.д. Оценена возможная частотная область такого канала, в результате чего получены частоты от нескольких сот килоггерц до нескольких сот мегагерц. С целью проверки сделанного предположения и снижения усилий по поиску частотной полосы предполагаемого канала общения в столь широкой частотной области рассматривается соответствующий эксперимент и обсуждаются результаты ранее выполненных научных исследований. Рассмотрены также следствия наличия такой возможности у человека, и на их основе сделана попытка объяснения присущих человеку некоторых необычных явлений.

Ключевые слова: частотный диапазон, необычные способности человека, информационный канал обмена, ультразвук, излучение

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Introduction

The question of the existence of “unusual abilities” in certain representatives of humanity has divided people and the entire scientific world into two camps, whose opinions are opposite. The first camp, the camp of deniers, declared these abilities untenable, and scientists of this camp declared research in this area as pseudoscience. The second camp, relying on the practice of famous individuals, including the masters of the Chinese method of “qigong”, believes that there are such “unusual abilities” in humans. However, the scientists of the second camp still have not yet presented any convincing researches and explanations of these abilities, which has become the basis for creation of various legends and occultism.

Let us explain what is meant by the term “unusual human abilities”. The perception of information by an average person is based on the reaction of his well-known sense organs – smell, taste, touch, sight, hearing and the vestibular apparatus. The transmission of information is carried out by influencing the said corresponding organs of another person with the help of conditional gestures of body parts (limbs and head), speech and artificial systems created by man. The latter use various devices for converting propagating signals of electromagnetic waves (including light) and elastic waves. However, those human abilities, which go beyond the ordinary just in the process of exchange information without artificial systems and lie outside the sphere of occult conceptions, we will attribute as “unusual abilities”.

The author supports the opinion about the possible existence of such abilities, which was supported by numerous studies of the abilities of individual representatives of the terrestrial fauna. On this basis, the author tried to build a chain of assumptions and considerations leading to the possibility of the existence of unusual abilities in humans and their explanation with the help of ultrasonic communication channel.

The purpose of the article is an attempt, based on the supposed ultrasonic impact of a person and his reaction to it, firstly, to present ways to check the presence of such a channel of influence and to identify its frequency band; secondly, to compare the proposed facts with the available facts of modern studies of the fauna of our planet; and thirdly – on the basis of the consequences of the supposed attempt to present the physical essence of some unusual phenomena inherent in humans.

Basic assumptions, early research and discussion of results

Below are the results of works carried out by representative research teams in the field of studying unusual human abilities. Some author's considerations concerning the results of these studies are given and the ways of experimental verification of the assumptions made are shown.

It is known that the human skin and internal organs are dotted with nerve endings, with the help of which a person senses acoustic waves starting from zero frequencies, in contrast to the human hearing organs. They perceive only sound oscillations in the maximum range of $\Delta F_a = 16 \text{ Hz} \dots 20 \text{ kHz}$ frequencies, according to the wavelengths in the interval of $\Lambda_a \approx 20.6 \text{ m} \dots 16.5 \text{ mm}$, taking into account the speed of $v_a \approx 330 \text{ m/s}$ of propagation of acoustic waves in the air. Below these frequencies lies infrasound, and above – ultrasound [1, 2].

The essence of the author's basic assumption lies in the fact that humans have such areas of the body, which, with their corresponding nerve endings, can be likened to a kind of acoustic transducer of ultrasonic frequencies. The latter converts the ultrasound affecting it into a certain signal, which is perceived by the human nervous system, delivering certain information to the brain. Moreover, it is assumed that this acoustic transducer is reciprocal, i.e. the human brain, through its nervous system, is able to influence this acoustic transducer in such a way that it generates ultrasound. The set of these acoustic transducers, i.e. the human nervous system and the brain, capable of receiving and processing the influencing ultrasound, as well as to produce it in accordance with the causal activity of a person, we will conventionally call the transceiving center.

Thus, the human body is similar to a system consisting of a set of reciprocal acoustic transducers – ultrasonic antennas, the input signals of which are received by the transceiving center, which controls and directs the work of these antennas. Then such a modeled system, according to the theories of antennas and general communication, is capable of the following [3, 4]:

- to emit ultrasound coherently and, therefore, directionally;
- the parameters of the emitted ultrasonic wave can be modulated by the brain (in other words, the ultrasonic emission can be informative);
 - when receiving ultrasonic energy, the system is able to determine the direction of its inflow;
 - to exchange information with a similar system.

In other words, a person is capable to exert an ultrasonic influence on someone or something at a distance and in a certain direction, and to determine the direction of arrival of such an influence acting on oneself. Moreover, he is capable to establish communication, contact with another person at a distance without the participation of the usual organs of sight, hearing and speech.

Why is an ultrasonic, and not an infrasonic channel of communication assumed? The answer to this question implies the effectiveness of the channel with which a person may be gifted. There are three significant circumstances, when comparing these channels. The minimum wavelength of infrasound is $\Lambda_{a \min}^{infr} \approx 20.6 \text{ m}$ (corresponding to $f_{a \max}^{infr} = 16 \text{ Hz}$) about 10 times greater than the natural size of a person and three orders of magnitude greater than the maximum wavelength of ultrasound $\Lambda_{a \max}^{ultr} \approx 16.5 \text{ mm}$ ($f_{a \min}^{ultr} = 20 \text{ kHz}$). Then, according to the antenna theory [3], the human body is practically unable to provide either directional transmission of influence or directional transmission of information in the assumed way via the infrasonic channel, in contrast to such a possibility via the ultrasonic channel. This is the first circumstance.

The second circumstance is the obvious smallness of the level of natural interference of the ultrasonic channel compared to the infrasound one.

The third circumstance is that from the point of view of the information capacity of the communication channel, it is much larger for a higher-frequency ultrasonic channel compared to a low-frequency infrasonic channel [4].

In the 1970–80s, the intensive scientific research has been carried out in the USSR on people with unusual abilities. The research was conducted at the Leningrad Institute of Fine Mechanics and Optics (LIFMO; now ITMO University) under the leadership of academician G.N. Dulnev and at the Moscow Institute of Radio-Engineering and Electronics by the USSR Academy of Sciences (now IRE RAS) under the leadership of academician Yu.V. Gulyaev. People with unusual abilities were called “operators” by scientific teams, and we will stick to this terminology later in the article.

During the study, the research groups identified the following conclusions [5–8]. Firstly, in the “working mode”, the operator experiences great stress, and each session is hard work for him, which was confirmed by the operators themselves. Secondly, during the session, the operator generates pulses of magnetic and electric fields and there is a characteristic increase in the intensity of infrared and optical emission around his hands. At these moments, acoustic pulses with duration of hundredths and tenths fractions of a second are also recorded. Thirdly, the operator is able to move objects by acting on them with his hands at a distance. If a glass wall opaque to infrared emission is placed between the operator's hand and the object, the effect of the action is not disrupted. Fourthly, in the same mode, the charged microdroplets of sweat from the sweat glands of the operator's hands were sprayed at a distance of several centimeters. It should be noted that this phenomenon in subsequent studies by Moscow scientists was presented as the basis for the “triboelectric” model of charge separation around the operator. Its essence is that the operator is charged with a charge of a sign opposite to the charges of the microdroplets of sweat that are sprayed out. They “wet” with their charge the surrounding objects. As a result, a Coulomb attraction of the nearby object by the operator occurs [8].

The author assumes that the above-described changes registered in the operator are an external manifestation of physiological restructuring of the operator's body and its work in the mode of generation of marked fields (including registered acoustic pulses, for which the glass barrier is practically transparent). It is physically clear that the operator's body must spend a significant part of its energy from its resources to generate the described processes, which leads to great physical exertion.

The author's next assumption concerns the operators themselves.

Let us think about how people communicated with each other at the dawn of the formation of man as a thinking person. If a person was gifted with the above-mentioned abilities, then, probably, the transmission of some desires, primitive thoughts was realized by means of ultrasonic channel of communication. The similarity of this is clearly expressed, for example, in killer whales and dolphins in mating season or when organizing a hunt, which is repeatedly proved by scientific researches. However, with the evolution of man, his vocal cords, language and speech developed. A person had to use the communication channel with another person less and less often, when significant expenses of his own physical resources were required. Naturally, with the evolution of man, his ability to communicate, to make contact with another person in this way was lost. Nowadays, there are people who, due to hereditary characteristics, have retained this ability to a greater extent than others, and we now call them people with unusual abilities. The masters of “qigong” practice call such people as “gifted” and even developed a method for improving their abilities for the practice of healing people.

How to check whether the supposed ultrasonic channel exists? For this purpose, the author proposes an experiment schematically depicted in Fig. 1.

The operator acts on a object and moves it. The fact that the lightweight object (a scale pan, a matchbox, a cigarette) moves due to the operator's directed impact on the object is undeniable and is cited in the studies of both Moscow and Leningrad scientists [5–8]. Then we place the cigarette at the bottom of

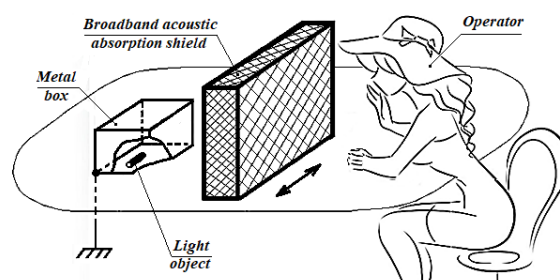


Fig. 1. Scheme of the experiment

hermetically sealed grounded metal box. Clearly, it is transparent to ultrasonic waves, which, according to wave theory [1, 9], create acoustic pressure that repels the object from the operator. However, the box excludes any electromagnetic influences from the operator, as well as the effects of convective air flows and any possible particles. In the case of particles, this also includes the above-mentioned charged microdroplets of sweat sprayed by the operator. In such isolated state, the operator repeats the session of impact on the cigarette. If after the session, when the box is opened, the fact of the cigarette moving in it away from the operator is still recorded, then we can talk about the presence of ultrasonic influence. Then, in the space between the box and the operator, a broadband sound-absorbing screen is introduced, after which the operator again repeats a session of influence. If the fact of the cigarette moving is not recorded, it confirms the ultrasonic nature of the impact of the operator.

Another experiment was described in the studies of Leningrad scientists. The operator N.S. Kulagina acted on the cup of balanced sensitive analytical scales, again placed under a shielding metal cap. Then a forevacuum (about 10^{-3} Torr) was created in the cap, and the operator's action on the cup was not recorded during her numerous attempts. This led the researchers to the idea of a possible acoustic nature of the operator's action on the cup [5, 6]. However, the same works note that after the description of the performed experiments, the editorial board of the journal "Parapsychology and Psychophysics" in 1992 stated the following. As part of a research program for the study of the ability of an operator to move (in a working mode) nearby objects, the L.L. Vasiliev Parapsychology Foundation was able to record the movement of suspended objects in a vacuum of up to 10^{-2} Torr. The Foundation did not have such outstanding operators as Kulagina, who were able to move heavy objects over long distances. They studied the actions of operators on torsion balance, a much more sensitive device that requires less skill and effort from the operator to move the device. Their conclusion was that the observed movement of the torsion balance in a vacuum casts doubt on the explanation of the phenomenon by any acoustic fields.

The author does not agree with the conclusion of the Foundation, because the performed experiment with such sensitive torsion balance can be interpreted as follows. After the formation of a forevacuum, the possible ultrasonic impact of the operator on the balance ceases, which agrees with the experiment involving Kulagina. However, due to the very high sensitivity of the torsion balance, its movement is caused by an unaccounted phenomenon of a different nature, which is not acoustic.

Given the fact of the existence of ultrasonic channel in humans, the question of the frequency band of this channel remains open. One thing is clear: humans must have such a channel at frequencies higher than the ultrasonic frequencies emitted by dolphins and bats, because humans are insensitive to the ultrasound of these animals.

To localize the frequency band of the human ultrasonic channel, we resort to the phenomenon of the presence of an aura (halo), which an ordinary person can see in special cases and in a special environment around an outstanding person. It should be noted that images of a halo are found in ancient religious pictures and icons around the faces of saints, and the existence of the halo is not denied by anyone for sure.

The author supposes that this pronounced manifestation of an aura around a person with outstanding unusual abilities is the result of the effect of his ultrasonic emission on the surrounding air. Its density is modulated in accordance with the standing ultrasonic wave that somehow arose, forming a kind of diffraction grating in the air. Then the solar white light will diffract on such a formed grating [10]. We consider that the wavelengths of the incident white light are approximately $\lambda \approx 1 \mu\text{m}$. To observe the diffraction of light on such a spatial grating, it is necessary that its period d lies in the interval from lengths comparable to the wavelength of light incident on it, i.e. $d_1 \approx \lambda$ (case of a good diffraction grating), to lengths of the order of several hundred wavelengths of light, i.e. $d_2 < 1000\lambda$ (case of a rough diffraction grating). In these cases, for the period of the grating we approximately obtain $10^{-6} \text{ m} \approx d_1 \leq d < d_2 \approx 10^{-3} \text{ m}$. On the other hand, the period d of the diffraction grating formed under the influence of ultrasound will be of the order of the acoustic wavelength Λ_a , i.e. $d \sim \Lambda_a$. Then we obtain that the frequency interval $\Delta F_a \approx F_{a1} - F_{a2}$ of acoustic waves emitted by a person is limited by the frequencies:

$$F_{a1} = v_a / \Lambda_{a1} \approx v_a / d_1 \leq \frac{3,3 \cdot 10^2}{10^{-6}} = 330 \text{ MHz}; \quad (1)$$

$$F_{a2} = v_a / \Lambda_{a2} \approx v_a / d_2 \leq \frac{3,3 \cdot 10^2}{10^{-3}} = 330 \text{ kHz}. \quad (2)$$

This is a large range for finding the frequency band of such a communication channel. In order to reduce the effort in attempts to find it, we propose to analyze the experiment on the scattering of laser radiation passing between the operator's palms. This unique effect was discovered by prof. G.B. Altshuller in experiments when the operator Kulagina affected a long glass cuvette with her palms [5]. Its length was 40 cm and the cuvette contained a solution of PGG dye in alcohol, through which a helium-neon laser beam passed. The palms were placed at a distance of 3–50 cm from the cuvette. As noted in this work, the effect of operator's influence was manifested in visually observed "flashes" the beam scattering on emerging inhomogeneities in the cuvette in the impact zone, as well as in a strong flickering of the laser spot on the screen behind the cuvette. These inhomogeneities in the cuvette had the form of thin thread-like particles or formations. Moreover, it was observed that other operators were failed to achieve similar effects.

The team of Moscow researchers under the leadership of academician Yu.V. Gulyaev explained the effect of laser beam scattering by the influence of the above-mentioned microdroplets of sweat sprayed by the operator's palms on the laser beam. This version is presented in [8] by prof. E.E. Godik, the leading scientist of this team, and it is quite acceptable for the case of the beam passing through the air directly between the operator's palms. However, the proposed version does not explain the laser beam scattering effect in the case of prof. G.B. Altshuller's experiments. In these experiments, the effect of microdroplets of sweat sprayed by the operator's palms on the laser beam in the air in front of or behind the cuvette is excluded. The reason for this is the distance of 3–50 cm of the operator's palms from the cuvette, due to which the sweat microdroplets (which are sprayed at a distance of several centimeters) practically do not reach the ends of the long 40-cm cuvette. On the other hand, the same charges of microdroplets on the cuvette are not capable to cause thread-like inhomogeneities in the cuvette solution, which were observed in the experiment.

Another interesting effect described in [8] should also be noted. It consisted in the registered health-improving effect on sick patients during classes with a master of the Chinese practice of "qi-gong". During the health session, the patient was in a compartment, which was located at a distance of 2–3 m from the master. The compartment was not soundproofed, and during the session, the master sat quietly on a chair, unlike the previously studied operators. He did not show any activity, expressed in the form of his sound commands or movement of his body parts. Prof. Godik, trying to explain this healing effect, suggested hypothesis about the possibility of infra- or ultrasonic influence on the patient.

The author suggests the possible nature of the operator's exposure to high-frequency ultrasound. This ultrasonic channel provides the above-mentioned circumstances regarding the pronounced directional properties of communication, its noise immunity and informativity. Then, in the experiment with the laser beam scattering between the operator's palms, the medium (whether it is a solution of PGG dye in alcohol in a cuvette or in the air – in the absence of a cuvette) is subjected to such possible ultrasonic influence. The resulting standing ultrasonic wave between the operator's palms, and hence in the cuvette or in the air, will produce thread-like scattering inhomogeneities in the medium, through which the laser beam will pass. These inhomogeneities in density will be the greater, the higher the intensity of the ultrasound. If the operator is also able to vary the frequency of the ultrasound, the result will be oscillations in the displacements of inhomogeneities, which will cause the laser spot to flicker on the screen. It is clear that the intensity of the scattering effect of the laser beam will depend on the density of the medium and the intensity of the standing ultrasonic wave in it, as well as on the degree of the operator's ability to vary the frequency of the emitted ultrasound. Then it becomes clear that only Kulagina, who had the most pronounced unusual abilities in comparison with other operators, was able to cause the observed effect of laser beam scattering in Altshuller's experiments.

However, in the case of a possible standing ultrasonic wave in the medium, when the laser beam passes, Raman scattering of laser light caused by this standing ultrasonic wave should also take place [10]. It is known that the results of this phenomenon is the appearance of frequency satellites in the spectrum of scattered laser light, which are removed from the primary light frequency f by an offset value Δf , equal to the frequency F_a of the ultrasonic wave, i.e. $\Delta f \approx F_a$. By performing a spectral analysis of the scattered light with a spectral device, it is possible to determine the frequency of the ultrasound used.

Let us estimate the resolution A of the spectral device. Taking into account the frequency $f \approx 3 \cdot 10^{14}$ Hz ($\lambda \approx 1 \mu\text{m} = 10^{-6}$ m – in the visible light region) of the incident primary laser radiation and the frequency of the proposed generated ultrasound, according to (1) and (2), we obtain that the resolution A of the spectrum analyzer should lie in the interval of values:

$$A \approx f/\Delta f \approx \frac{f}{F_{a1}} \dots \frac{f}{F_{a2}} \approx \frac{3 \cdot 10^{14}}{3,3 \cdot 10^8} \dots \frac{3 \cdot 10^{14}}{3,3 \cdot 10^5} \approx 10^6 \dots 10^9. \quad (3)$$

It follows from (3) that to measure the ultrasound frequency F_a , a spectral device of high class will be required.

However, in the absence of such a device, the narrow frequency range of the assumed ultrasonic emission of the operator can also be determined in the experiment proposed by us (see Fig. 1) to verify the existence of such emission. For this purpose, in this experiment, instead of a broadband acoustic absorbing screen, it is necessary to use a set of sequential narrowband absorbing ultrasonic filters.

By measuring the frequency band of ultrasound generated by the operator and constructing a corresponding acoustic receiver, it is possible to directly measure many parameters of human-generated ultrasonic emission, including the degree of informativity of the ultrasonic channel.

Some modern studies on the generation of ultrasound by living organisms and effects of ultrasound on them

As follows from the above, the physical interpretation of human unusual abilities is based on the assumption that ultrasound is generated by humans with frequencies above several hundred kilohertz. Here we note that there was an attempt to explain such abilities using the “theory of torsion or microlepton fields”, which, however, were not recognized by the scientific community [11]. The paper [2] presents extensive studies on the search of ultrasonic emission by mice, rats, hamsters, guinea pigs, rabbits, monkeys and humans, as well as on the effects of this emission on them. The studies were carried out in the frequency range up to 100 kHz. In [1], the studies on the effects of ultrasound on human organs

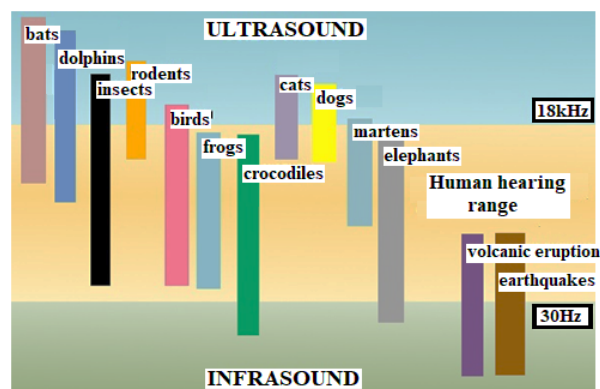


Fig. 2. Frequency ranges heard by different animals from the MoDiVa study, Walloon region, Belgium¹

and cells are presented, but these studies are limited to a number of discrete frequencies up to 10 MHz. The author is not aware of any open publications of studies directly aimed at searching for and determining the frequencies of ultrasonic emission by humans at frequencies above several hundreds of kilohertz.

To find out how probable the author's assumption about generation of ultrasound of high frequencies by humans and mutual acoustic conversion in their bodies to ensure information exchange, we will give similar examples in nature. From the point of view of the presence of ultrasonic channel of communication, dolphins and bats have been studied well² [1, 2, 12–16]. Based on modern studies of fauna representatives, whales, rodents, insects, dogs and cats can also be classified as such “ultrasonic” creatures. The classification of some animals by the frequencies of the sound they produce, is shown in Fig. 2 [18].

Whales use ultrasound to navigate and catch fish in turbid water, and as a weapon to stun the fish. Ultrasonic signals from the whales cause the air-filled swim bladders of fish to resonate so intensely that the vibrations transmitted to body tissues disorient the fish and sometimes even kill them³.

The bats use ultrasonic waves to detect obstacles, navigate spatially and communicate⁴ [1, 9, 12, 16]. Their ability to echolocate is due to the generation of ultrasonic waves in the frequency range of 40–100 kHz. With the help of reflected waves, they navigate in space, determining directions and distances to surrounding objects. The higher the frequency of the sound, the finer the details the bats can distinguish and the more accurately they plot their flight path. In flight, bats use ultrasonic communication to manage flight safety to avoid collisions. Common bats adjust their flight paths and make way for the socially superior bat.

The little brown bat (lat. *Myotis lucifugus*) is an insectivorous bat found throughout North America that can use ultrasound to detect and avoid objects as thin as a human hair during the flight. Other fish-eating bats capture small fish swimming near the surface of the water, navigating only by the ripples in the water created by their movement. The leatherback bat, searching for prey, emits ultrasonic squeaks about five times per second, each squeak lasting 10–15 milliseconds. When the bat detects potential prey, it continuously increases the number of these squeaks and decreases their duration, similar to the emission of radar pulses when a target approaches to radar. The duration of the squeaks decreases to one millisecond when the number of squeaks exceeds 200 per second.

¹ Fedorov A. Kto i kak slyshit ul'trazvuk [Who and how hears ultrasound], Available: <https://blog.pribormaster.ru/kto-i-kak-slyshit-ultrazvuk> (Accessed 13.01.2025) (In Russian)

² Ter-Grigorian I. Letuchie myshi peregovorili vsexh [The bats talked everyone out], Available: http://www.gazeta.ru/science/2007/10/22_a_2257226.shtml (Accessed 13.01.2025) (In Russian)

³ Kak zhiivotnye ispol'zuiut ul'trazvuk [How Animals Use Ultrasound], Available: <https://mir-znaniy.com/kak-zhiivotnyie-ispolzuyut-ultrazvuk> (Accessed 13.01.2025) (In Russian)

⁴ Ter-Grigorian I. Letuchie myshi peregovorili vsexh [The bats talked everyone out], Available: http://www.gazeta.ru/science/2007/10/22_a_2257226.shtml (Accessed 13.01.2025) (In Russian)

Other insectivorous bats change the frequency of their squeaks and use overtones when hunting. Leaf-eating bats that hunt in the jungle use echolocation without changing the frequency of their squeaks. To detect prey, they use the Doppler Effect – the difference between the frequency of the ultrasound generated by the source and the frequency of ultrasound reflected from an object moving forward or backward relative to the ultrasound source.

Many species of moths are sensitive to the ultrasonic echolocation signals of bats. To avoid being caught by a bat, which is about 6 m away, these moths suddenly fold their wings and drop down, disappearing from the predator's flight path, or land on something. Some moths perceive the ultrasonic cry of bats with the help of paired organs on the abdomen that resemble the eardrums. Each such organ consists of a thin cuticular membrane, behind which is an air sac, that enables the membrane to vibrate when struck by an acoustic wave. Connected by nerves to the brain, these organs are sensitive to the frequency range of ultrasonic cries produced by insectivorous bats.

A special place is occupied by small long-necked primates (lat. *Tarsius*)⁵. Scientists from Humboldt University (California, USA) found that tarsiers “communicate” using pure ultrasound. For example, Philippine tarsiers hear ultrasound with frequency up to 90 kHz and emit cries at frequency of about 70 kHz. So far, these are the highest frequencies ever recorded in the “speech” of terrestrial mammals.

From the above, it follows that there are numerous examples of the existence of an ultraacoustic channel of communication between the animals of our planet. Humans, according to modern views on biology, are the highest thinking representatives of nature. Then, the author's assumptions about the possibility of humans having their own ultraacoustic communication channel with a higher frequency and greater informativeness do not seem so incredible.

Assessment of the concentration of possibility human ultrasonic emission and its implications

Let us discuss the degree of concentration of emitted ultrasonic energy by the operator and the consequences of this concentration. For this purpose, let us give some estimates for ultrasonic frequencies of several hundred kilohertz, for example $F_a \approx 400$ kHz. The wavelength of such an ultrasound in air will be $\Lambda_a = v_a / F_a \approx 330 / 4 \cdot 10^5 = 8,25 \cdot 10^{-4} \text{ m} = 0,825 \text{ mm}$. Let us assume that the circular emitting ultrasound surface, comparable to the human palm, has a diameter of $D \approx 8 \text{ cm}$. Then the plane angle $\Delta\theta$ of the solid angle of the emission pattern of the main lobe of such a emitting site, according to the antenna theory [3], will have the following value:

$$\Delta\theta \approx \frac{\Lambda_a}{D} \approx 0,01 \text{ rad} \approx 0,6^\circ. \quad (4)$$

Thus, from the author's assumption about the coherent emission of high-frequency ultrasound by the operator, from (4) follows a significant directionality of human palm emission. In other words, in the main share of emission it is possible to create a noticeable density of ultrasonic energy at distances of 10 m or more, similar to “ultrasonic” representatives of the fauna. At the same time, according to another author's assumption, there is a physiological restructuring of the operator's organism associated with this process. It is expressed in the intensive work of his sweat glands, revealed in the course of early studies. As a result, the operator's ability to attract (due to triboelectric effect) and repel (due to acoustic pressure) closely located objects is physically explained. Moreover, it is possible to explain the experiments with the scattering of a laser beam (due to the formation of inhomogeneity of the medium) by the operator in the air and in the cuvette at Altshuller's experiments.

The experiment, demonstrated by Kulagina with a ping-pong ball hovering in the air between her palms, may also be clearly explained physically. Due to the triboelectric effect, the charged ball is repelled from

⁵ Dolgopyaty govoriat “na chistom ul'trazvuke” [Tarsiers speak “pure ultrasound”], Available: https://zoom.cnews.ru/rnd/news/line/dolgopyaty_govoryat_na_chistom_ultrazvuke (Accessed 13.01.2025) (In Russian)

the similarly charged surface of the table (also “wetted” with sweat droplets) upwards for some distance until the distance-dependent Coulomb repulsion force is balanced by the opposite attractive force of the ball. At the same time, the Coulomb force of attraction between the oppositely charged ball and the operator’s body is compensated by the opposite force of acoustic pressure on the ball, created by the ultrasonic wave emitted by the operator.

The human sensitivity to ultrasound of high frequencies, which, according to the author's assumption, has been preserved in humans during the evolution, and the possibility of directed emission of such concentrated ultrasonic energy by a person explain the following unusual phenomenon. Sometimes a person at a distance feels the attention of another person without seeing or hearing him or her. Turning round, the person quickly finds among many other people the one whose attention is concentrated on him. This is, in fact, a consequence of the acoustic location produced by humans, similar to dolphins, bats, etc. Such detection is known in radio engineering as “direction-finding”, which is used in “passive radar” [17].

A physical basis for interpreting other unusual phenomena appears, which manifest themselves when the operator concentrates his influence on a person nearby and establishes an information connection with him or her. Through such a connection, it is possible to transmit and receive thoughts, images, feelings and unconscious states from one person's brain to another person's brain or body at a distance, without using any known means of communication or manipulation.

In light of the above, it becomes clear that the effectiveness of the above-described phenomena, related to information exchange, will be determined by both the information capacity of ultrasonic communication channel and the process of detecting the ultrasonic signal by a person.

Conclusion

The article attempts to explain the unusual abilities of a person using specific physical and biological concepts and a probable model of information exchange via a channel with ultrasonic waves. Of course, the proposed assumption requires experimental confirmation. This is where one important question arises. Is it worth continuing research in the direction of clarifying the nature of such abilities or denying them immediately? The author is convinced of the need for such research, because if his assumptions are correct, the purpose of further research should be the answers to the following tempting, but difficult questions:

- How is the ultrasound emitted by humans modulated by their brains?
- What parameters of the ultrasound are modulated and by how much?
- How are ultrasound signals detected?
- What is the degree of perception of information embedded in the carrier of ultrasound of such frequencies?

Clarification of these questions, firstly, it will allow to eliminate some legends and occult ideas about unusual human abilities. Secondly, it will allow to take measures towards the urgent problem of protecting a person from the effects of intense ultrasound, which can cause great harm to the physical and mental state of a person.

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