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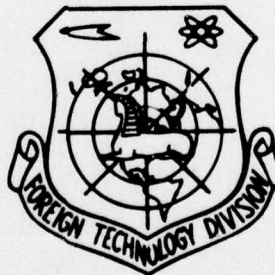
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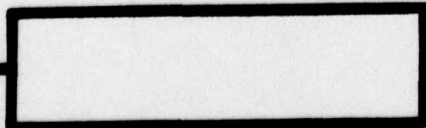


SCIENCE AND LIFE  
(SELECTED ARTICLES)



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## MACHINE TRANSLATION

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U. S. BOARD ON GEOGRAPHIC NAMES TRANSLITERATION SYSTEM

Block	Italic	Transliteration	Block	Italic	Transliteration
А а	<b>А а</b>	A, a	Р р	<b>Р р</b>	R, r
Б б	<b>Б б</b>	B, b	С с	<b>С с</b>	S, s
В в	<b>В в</b>	V, v	Т т	<b>Т т</b>	T, t
Г г	<b>Г г</b>	G, g	У у	<b>У у</b>	U, u
Д д	<b>Д д</b>	D, d	Ф ф	<b>Ф ф</b>	F, f
Е е	<b>Е е</b>	Ye, ye; E, e*	Х х	<b>Х х</b>	Kh, kh
Ж ж	<b>Ж ж</b>	Zh, zh	Ц ц	<b>Ц ц</b>	Ts, ts
З з	<b>З з</b>	Z, z	Ч ч	<b>Ч ч</b>	Ch, ch
И и	<b>И и</b>	I, i	Ш ш	<b>Ш ш</b>	Sh, sh
Й й	<b>Й й</b>	Y, y	Щ щ	<b>Щ щ</b>	Shch, shch
К к	<b>К к</b>	K, k	Ъ ъ	<b>Ъ ъ</b>	"
Л л	<b>Л л</b>	L, l	Ы ы	<b>Ы ы</b>	Y, y
М м	<b>М м</b>	M, m	Ь ь	<b>Ь ь</b>	'
Н н	<b>Н н</b>	N, n	Э э	<b>Э э</b>	E, e
О о	<b>О о</b>	O, o	Ю ю	<b>Ю ю</b>	Yu, yu
П п	<b>П п</b>	P, p	Я я	<b>Я я</b>	Ya, ya

\*ye initially, after vowels, and after ъ, ь; e elsewhere.  
 When written as ë in Russian, transliterate as yë or ë.  
 The use of diacritical marks is preferred, but such marks may be omitted when expediency dictates.

GREEK ALPHABET

Alpha	Α α	•	Nu	Ν ν
Beta	Β β		Xi	Ξ ξ
Gamma	Γ γ		Omicron	Ο ο
Delta	Δ δ		Pi	Π π
Epsilon	Ε ε	•	Rho	Ρ ρ ϱ
Zeta	Ζ ζ		Sigma	Σ σ ς
Eta	Η η		Tau	Τ τ
Theta	Θ θ	•	Upsilon	Υ υ
Iota	Ι ι		Phi	Φ φ ϕ
Kappa	Κ κ	•	Chi	Χ χ
Lambda	Λ λ		Psi	Ψ ψ
Mu	Μ μ		Omega	Ω ω

## RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English
sin	sin
cos	cos
tg	tan
ctg	cot
sec	sec
cosec	csc
sh	sinh
ch	cosh
th	tanh
cth	coth
sch	sech
csch	csch
arc sin	sin <sup>-1</sup>
arc cos	cos <sup>-1</sup>
arc tg	tan <sup>-1</sup>
arc ctg	cot <sup>-1</sup>
arc sec	sec <sup>-1</sup>
arc cosec	csc <sup>-1</sup>
arc sh	sinh <sup>-1</sup>
arc ch	cosh <sup>-1</sup>
arc th	tanh <sup>-1</sup>
arc cth	coth <sup>-1</sup>
arc sch	sech <sup>-1</sup>
arc csch	csch <sup>-1</sup>

---

rot	curl
lg	log

### GRAPHICS DISCLAIMER

All figures, graphics, tables, equations, etc. merged into this translation were extracted from the best quality copy available.

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Page 76.

Articles I-VIII.

LIFE AND MAGNETIC FIELD.

Sense organs. <sup>There are</sup> ~~them~~ many that are different. These are "windows" into world. Into world external and internal. Through them enters the information about that which occurs around us, through them <sup>proceeds</sup> ~~enters~~ the information about ~~the fact that it~~ <sup>which</sup> occurs around us, across them go the infinite commands, <sup>which control</sup> ~~work superintendent~~ of organism. Sense organs distinguish color and odors, hear sounds and maintain equilibrium, perceive pain and heat .... Man is armed by many <sup>of</sup> these "windows" into world. Without them is unthinkable the life.

Earth. Giant magnet. Everything is conceived, is developed and ~~there~~ exists in its stationary field. <sup>How</sup> ~~without doubt~~ does act it on liquid? Is there special "window" into the invisible world of magnetism? Where <sup>is</sup> ~~it~~, always ~~whether~~ is opened, and can <sup>be</sup> so it ~~is~~ only

at the early stages of the development of organism? Or generally this "windows" long <sup>ago</sup> ~~already~~ <sup>did not exist</sup> ~~no~~? And was slammed shut it in some stage of evolution, after transmitting as relay race entire necessary information to the mechanism of heredity?

The problem of the interaction of living organism with magnetostatic field is not new. Already <sup>for</sup> ~~many~~ centuries are ~~tried~~ <sup>attempted</sup> people <sup>to</sup> penetrate in this mystery of nature. Was here everything - ~~and~~ direct ~~straight~~ charlatanism and distant secret medicine of healing, were unique experiments, were fallacies and errors.

Each time it was obtained so that the touch of science to this agitating problem, yielding incidental and often even very important results, almost nothing gave for its own solution. As traces from the next impure experiments were established contradictory facts, doubtful proofs.

Gradually the problem of biomagnetism, not having lost <sup>t</sup> its scientific sharpness, <sup>required</sup> ~~shred~~ doubtful reputation. But the development of the new methods of biological studies led to reactivation, it would seem, the forever left attempts to find key ~~wrench~~ to this riddle.

But when in the facts, extracted by numerous studies, the effect

of stationary magnetic field on vital processes did obtain, <sup>it would</sup> ~~and~~ seem  
experimental confirmation, before science in entire <sup>growth</sup> ~~increase~~ did  
become even more difficult problem. How nevertheless magnetic field  
it does influence living cell, the organism?

Recently were reveal<sup>ed</sup> ~~detected~~ special magnetic properties of  
nucleic acids - the compounds, playing the exceptional role in the  
transmission of hereditary signs and in metabolism. If it is  
confirmed that the open phenomenon is not bonded with foreign matter  
of ferromagnetic substances, then will appear hope to explain the  
~~action~~ effect of magnetic field on the <sup>very</sup> ~~quite~~ <sup>to</sup> intimal vital processes.

Who it knows, <sup>perhaps</sup> ~~should be~~, <sup>after</sup> through several years the people even  
will learn with the aid of magnetic field to raise crops, to control  
heredity, to <sup>intensify</sup> ~~amplify~~ memory ! But thus far problem "life and magnetic  
field" is not solved. It will require even more considerable  
effort<sup>s</sup> ~~forces~~. And <sup>on</sup> ~~above~~ this it is worth working.

Man always lives in the magnetic field of earth. And we must to  
end ~~lead~~ study its ~~action~~ effect. This requires the progress of  
technology, <sup>connected</sup> ~~bonded~~ with the creation of powerful magnetic fields.  
This must be explained before ~~the~~ people will leave to distant  
worlds. There they can <sup>encounter</sup> ~~beget~~ the colossal magnetic fields and  
virtually ~~full~~ ~~total~~ complete absence of them.

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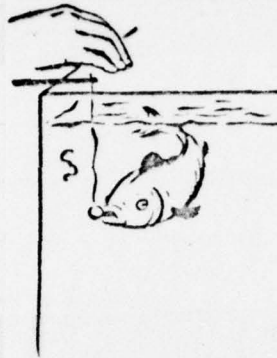
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The problem of biomagnetism awaits its solution !

CONVINCE THEMSELVES.

Of the fact that the fishes receive magnetic field, can be convinced each. For this <sup>it</sup> is sufficient to have the glass aquarium (without metallic ~~fin~~ edges), the horseshoe or any other powerful magnet and ... very much patience. Are most better conducted experiments on gold crucian, <sup>carp</sup> it is possible to take both usual our crucian and carp. During first days in the new aquarium ~~of~~ fish nothing eat. Then <sup>they</sup> begin to eat the food, when hereabout there is no one, and finally is taken feed almost from hands. Arrived time of starting of experiment.

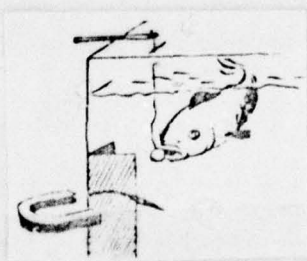
I. In one of the <sup>corners</sup> ~~angles~~ of aquarium, <sup>we</sup> ~~let us~~ lower the attached on filament bead, best of all red color.



Fish takes it for ~~bead~~, <sup>it</sup> it is tried to eat. Here we throw with a ~~series~~ <sup>number</sup> of living ~~bead~~ <sup>mosquitoes</sup>, and fish, after leaving bead, ~~it~~ swallows it. The next portion of food fish again obtains only after pulling ~~for~~ <sup>on</sup> head. And so each time. Do not forget, after finishing experiment, to extract bead from aquarium! <sup>After</sup> through several days, hardly after catching sight of bead, fish will continuously pull by it, requiring reward. It learned "to earn" <sup>for</sup> ~~to~~ itself food.

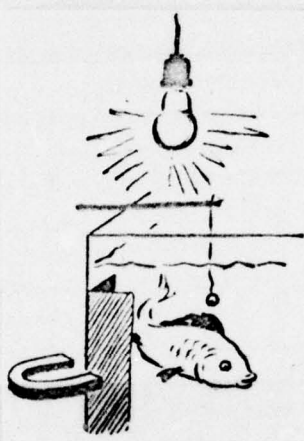
II. <sup>A corner</sup> ~~The~~ angle of aquarium we paste over <sup>with</sup> ~~by~~ opaque paper. <sup>Lowering</sup> ~~Putting~~ into water bead, is simultaneously brought magnet in the manner that ~~this~~ is shown in the figure. We <sup>place</sup> ~~substitute~~ magnet

carefully in order that the fish <sup>did</sup> ~~not~~ <sup>it</sup> ~~of its~~ see and would ~~hear~~ <sup>not</sup> ~~it~~ rustle. From this point on, the fish obtains feed only in such a case, when it pulls by head during the ~~action~~ effect of magnet. Food is eaten - magnet is removed. <sup>After</sup> ~~through~~ 2-3 minutes newly set up magnet we hold it not less than 30 seconds. If for this time fish does not focus attention on head, magnet again is removed for 2-3 minutes. During one experiment the magnet is substituted 10-20 times. Remember: to conduct the experiments is necessary regularly once during day, in the strictly established ~~installed~~ <sup>give</sup> hours. Do not ~~fall~~ <sup>up</sup> by spirit, if initially fish ~~is~~ pull <sup>both</sup> head, ~~also~~ in the presence of magnet and in ~~its~~ its absence. one-two week of "training" ~~aging~~ - and fish will begin "to ~~back~~ <sup>bite</sup>" head ~~in essence~~ <sup>mainly</sup> only under the effect of magnet. ~~Target~~ purpose is reached: is manufactured conditioned reflex to magnetic field.



*By the same method*  
 III. ~~thus~~ it is possible to ~~manufacture~~ <sup>produce in</sup> at other fishes reflex

to the ~~world~~/light: <sup>to</sup> ~~on~~ table lamp or flashlight, and to then  
"remove/~~take~~" by its, acting magnet.



1) Fish became accustomed to <sup>grab</sup> ~~suffice~~ head only with the  
~~connected~~ lamp, *turned on.*

2) We substitute magnet and after 5-10 seconds <sup>we turn on</sup> ~~lights~~  
~~world~~/light

3) After 30 seconds is extinguished the ~~world~~/light and we

remove magnet. If fish pulls bead, feed to it is not placed.

4) Let us ~~do~~<sup>do</sup> this several times and see, that the fish under the effect of ~~world~~/light and magnet ceases to not<sup>ice</sup> bead, ~~but~~<sup>and</sup> even if it ~~suffices~~<sup>grabs</sup> it, then only after long "meditations".

In this experiment the ~~action~~/effect of magnet on fishes is exhibited still brighter, than in the first.

Magnetic field, strange irritant,.

<sup>says</sup> speaks the candidate of biological sciences Yu. A. Kholodov.

With the weak rustle ~~it~~ <sup>rabbit</sup> runs away. But the cut out from body rabbit muscle, although living, will not stir even with thunderous shock. ~~to~~ <sup>is</sup> what matter? Answer, ~~response~~ <sup>is suggested</sup> ~~as~~ itself by itself: it does not hear. On muscle the sound acts not directly, but only in passing by on the ~~chain/network~~: ~~appear~~ <sup>is</sup> ~~the~~ nervous system. It is clear that to study the ~~action~~ effect of sound or any similar irritant (as ~~speak~~ <sup>say</sup> the scientists) necessary on this animal, for ~~which~~ <sup>which</sup> this ~~chain/network~~ is preserved. Entirely is placed in another way with the electric current: here it is possible to take and separate organ ~~controls~~, muscles. Indeed nervous system itself puts muscle into action with the aid of electric current.

~~such~~ <sup>there</sup> ~~that~~ <sup>much</sup> is in common of electricity with magnetic field. These are close physical phenomena. Regularly it to assume that ~~A~~ their ~~action~~ effect on organism is similar. ~~So~~ <sup>Alas!</sup> was placed experiment after experiment, but even powerful magnet did not cause an

~~abnormal~~/contraction in the isolated/~~insulated~~ muscle, although it clearly "shuddered" from weak electric current. Did come up the question: does ~~influence~~ generally magnet <sup>affect</sup> organism? ~~Can see~~ <sup>Perhaps</sup> it acts in a some other manner, rather than electric current? The explanation of this ~~they~~ <sup>was</sup> studied <sup>by</sup> the coworkers of the department of physiology of higher nervous activity MGU [~~92500~~ <sup>MGU</sup> - Moscow State University] under professor L. G. Voronin's ~~management/manual~~ <sup>leadership</sup>.

The way of investigation it indicated to us I. P. Pavlov's teaching of conditioned reflexes.

For our experiments we selected fishes. Why? We were based on the opinion of some scientists, considering that ~~the~~ fishes and birds, ~~being started~~ <sup>wing on</sup> into distant journeys, find <sup>way</sup> path on the magnetic field of earth. That means they must receive the ~~action~~/effect of magnet.

If we through the aquarium pass light current, then motionlessly the fish confronting will shudder, will swim several circles and again will be quieted. Neither ~~world~~/light nor sound nor magnet by themselves cause similar motions of fish. For the ~~consumption/production~~/generation of conditioned reflexes <sup>began</sup> we ~~became~~ to accompany each of these irritants with electric shock. For example, each time <sup>turning on</sup> ~~including~~ world/light, they transmitted

simultaneously electric current. <sup>After</sup> Through 5-10 such combinations the fish began to move, <sup>as soon as</sup> ~~it~~ <sup>turned on</sup> ~~only~~ was fired ~~with~~ light, no longer waiting until, when it <sup>shock it</sup> hits current. The same occurred with sound signals.

But with magnet nothing was obtained. 20 times simultaneously with electric shock they brought magnet to the aquarium ... <sup>30</sup> ~~40~~ ... ~~of~~ 40 times .... We already almost despaired to ~~manufacture~~ <sup>produce</sup> conditioned reflex, but finally after 50 combinations ~~of~~ fish <sup>nevertheless</sup> all the same they began to move under the effect one magnet alone. <sup>Victory</sup> ~~Conquest~~ ! Fishes receive magnetic field. . But why they <sup>so</sup> ~~that~~ late ~~to~~ react to it? Usually reflex ~~is~~ <sup>is</sup> poorly is developed, when irritant <sup>is</sup> either too powerful or too weak. Our magnetic field (equal to 100 oersteds) approximately 150 times exceeded the magnetic field of earth. <sup>Perhaps</sup> ~~It can~~ ~~be~~ it too powerful? They began ~~to~~ to decrease, <sup>it</sup> but ~~rather~~ <sup>it did not get</sup> not ~~so~~ better, but <sup>at</sup> with 10 oersteds reflex entirely disappeared. Then they <sup>tried</sup> ~~overturned~~ to increase field to 10 thousand oersted, but also this did not <sup>help</sup> ~~it~~. It remained to conclude that magnet in comparison with ~~voice~~ light or sound is weak irritant, <sup>much</sup> ~~how many~~ it, not <sup>intensify</sup> ~~condition~~. This in the same way as squeak even thousand <sup>mosquitoes</sup> ~~of~~ ~~dis~~ ~~ridges~~ remains weak in comparison with the voice of one person. Probably precisely due to the weakness of magnet so difficult to ~~reveal~~ ~~detect~~ its ~~action~~ ~~effect~~ on animals.

Usually <sup>to</sup> weak irritant not only reflexes are developed with

difficulty, but also (itself/it) has little effect on other, already ~~produced~~ <sup>produced</sup> earlier reflexes. They ~~overturned~~ <sup>tried</sup> to ~~check~~ <sup>control</sup> magnet in this plan/layout and ~~was~~ obtained strange picture.

In aquarium ~~tried~~ <sup>is fish</sup> hide with conditioned reflex to bell. We include sound, and it begins to move. Everything is normal. But ~~there~~ <sup>here</sup> together with bell is brought magnet. What ~~such?~~ <sup>is this</sup> Fish remains calm, as if ~~it does~~ <sup>it does</sup> not hear familiar sounds. We ~~test~~ <sup>try</sup> to replace magnet with world/light, but we do not obtain this ~~"choking"~~ <sup>"muffling"</sup> action/effect. ~~That~~ <sup>That</sup> a magnet proves to be here more powerful than the world/light. Generally (conducts/it) itself as the strange irritant: on one hand, weak, but on the other hand - strong.

The even more unexpected results gave experiments on guppies. In them in no way it was impossible to ~~manufacture~~ <sup>produce</sup> conditioned reflex to magnet. At the same time the conditioned reflexes, which were ~~produced~~ <sup>produced</sup> with the aid of other irritants, magnetic fields ~~stuffed~~ <sup>was muffled</sup> ~~just as~~ <sup>just as</sup> distinctly ~~and~~ <sup>as</sup> in fishes. This was more than strange. Until now, the researchers were confident that if the irritant is ~~received~~ <sup>per</sup> by animal, then to it compulsory it is possible to obtain conditioned reflex. But here ~~action~~ <sup>action</sup>/effect is present, but there is no reflex.

In order to explain all these strangenesses, it was necessary to explain, ~~without doubt~~ <sup>how</sup> magnet is received by animal.

Initially to us it seemed that to find answer/response to this question is easy. Completely accidentally it <sup>was</sup> reveal~~ed~~ detected that if we in fishes <sup>produce</sup> ~~manufacture~~ magnetic reflex, then already to the ~~world~~/light of reflex to develop not necessary: it appears itself. And, on the other hand, if we <sup>produce</sup> ~~manufacture~~ the conditional photic reflex, magnetic <sup>reflex</sup> appears as by itself. Sonic reflex did not detect this close relationship with magnetic. <sup>suggested was</sup> ~~Assigned~~ itself the conclusion that the magnetic field is received just as ~~world~~/light, network eyes.

On this they wrote ~~and~~ in scientific publication. With the ~~action~~/effect of magnet some people ~~they~~ perceived weak glow. Magnet "did not sound", "did not issue odor", but "glowed" ! Everything spoke for the fact that if there is not the eye, the perception of magnetic field must be destroyed. How was our surprise and the disappointment, when eyeless fishes began to react to magnet not worse than <sup>the</sup> sighted <sup>ones</sup> ! That means retina here <sup>has nothing to do</sup> ~~not~~ with what. Mechanically continuing to give the usual set of conditional irritants, we suddenly saw, that our blind fishes react to ~~world~~/light ! True, ~~world~~/light they <sup>per</sup> received more badly than sighted, but <sup>it is</sup> completely ~~it is~~ distinct. And, most importantly, in them still brighter was reveal <sup>detect</sup> ~~exposed~~ resemblance in <sup>effect</sup> ~~action~~

of ~~world~~ light and magnet. But now it is already difficult to say, ~~whether~~ magnet "glows" or ~~world~~ light "is magnetized".

Thus, our strange irritant is "it <sup>was selected as</sup> absorbed to itself in the comrades" <sup>of</sup> world light. If they ~~the really/actually~~ <sup>are</sup> "non-<sup>separable</sup> differentiation of friends" <sup>and</sup> ~~even~~ one always accompanies another, then this facilitates search.

Let us compare conditioned reflexes with small filaments, then the brain, where are closed reflexes, ~~it~~ will be the assembly, which binds all filaments. Thus we began to <sup>remove</sup> ~~drive out~~ different sections of the brain of fish and each time <sup>see if</sup> ~~to look~~, were preserved our small filaments - magnetic reflexes. the removal <sup>forebrain</sup> ~~distance of prosencephalon~~ did not destroy them. When was cut the <sup>mid</sup> ~~average~~ brain, a little changed the only photic reflex: it became the same as in <sup>a blinded</sup> ~~the dazzled~~ fish. They <sup>removed</sup> ~~moved away~~ the cerebellum disappeared sonic reflex, injured <sup>diencephalon</sup> ~~intermediate~~ brain - disappeared photic and magnetic reflexes.

To the physiologists it is known that the frog, if we place ~~the~~ crystalline particle of salt on its <sup>diencephalon</sup> ~~intermediate~~ brain, <sup>holds</sup> ~~travels~~ leg from the dilute solution of sulfuric acid not ~~then~~ <sup>so</sup> rapidly, as it <sup>does</sup> ~~does~~ without salt. The same <sup>delay</sup> ~~inhibition~~ of reaction we observed, when they acted on the <sup>diencephalon</sup> ~~intermediate~~ brain of frog by magnet or

world/light. That means magnetic field ~~really~~/actually is received by intermediate brain. Its removal/~~distance~~ in fishes led to the disappearance of reflex to magnet, in the same way as the destruction of hearing ~~the~~ <sup>apparatus</sup> ceases the perception of sound.

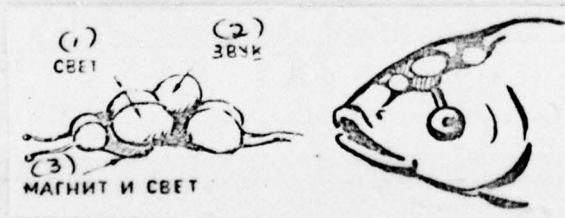
Our irritant not only strangely acts, but also strangely ~~is~~ is received. For it, it proves to be, ~~not~~ not necessary special sense organ. It without difficulty penetrates everywhere, but it acts only on the <sup>a definite</sup> ~~determined~~ section of brain. If we accept this point of view, then it is possible to explain some strangenesses in the action of magnet.

Thus, with whatever irritant we dealt, excitation from it compulsorily traverses the intermediate brain. Magnetic field seemingly occupied here path at junction, ~~with~~ railway station and it detains the motion of other train-excitations. This is why magnet exerts strong braking ~~action~~ effect !

As weak irritant magnetic field cannot ~~auto~~ <sup>slip</sup> ~~is~~ sent into other divisions of the nerve system and therefore ~~it~~ does not cause reactions. But if we ~~do not~~ <sup>help it</sup>, if we ~~apply~~ <sup>use</sup> it together with the powerful irritant, which ~~is~~ <sup>lays out the</sup> way, then to magnet it is possible to <sup>produce</sup> ~~manufacture~~ conditioned reflex.

Let us return to our experiments. In fishes the reflexes are closed in intermediate brain. That means to the excitation, caused by magnet, it is here necessary to only a little <sup>be d</sup> ~~move~~ <sup>there</sup> and will occur the formation of conditioned reflex. In birds the conditioned reflexes are closed ~~by~~ <sup>before</sup> brain. ~~to~~ magnet there it is difficult to select, and therefore <sup>on</sup> ~~to~~ it it is not possible to ~~manufacture~~ <sup>produce</sup> conditioned reflex in birds. It is possible that <sup>for</sup> ~~on~~ man the magnet acts entirely differently.

Finally, resemblance to ~~world~~/light also can be explained by the direct ~~action~~/effect of magnet on intermediate brain. Specifically, this division of brain closely related ~~with vision~~ <sup>to vision</sup>.



Key: (1). ~~World~~/light. (2). Sound. (3). Magnet and ~~world~~/light.

The eyes, actually, are the <sup>growths</sup> ~~apophyses~~ of intermediate brain. So that the excitation, caused by stationary magnetic field, most <sup>likely</sup> ~~is~~ can be guided along the widest path - visual tract.

We finish conversation about strange irritant with a feeling of dissatisfaction, as if ~~they~~<sup>we</sup> read only several leaflets of the middle of the most interesting narrative. Indeed remains still much unknown. How magnetic field in intermediate brain is converted into the nerve excitation? ~~How~~<sup>How</sup> magnet does act on people? As to in practice utilize already known properties of magnet? Answer~~s~~<sup>responses</sup> to these and many other questions can be obtained only as a result of the work of the researchers of the different specialties, which ~~supplied by~~<sup>had as</sup> their ~~target purpose of~~ explaining ~~communication~~<sup>connections</sup> between the magnetostatic field and ~~the~~ life.



# Experiments in Psychomagnetism

Professor of Leningrad university.

L. L. Vasiliev.

The ~~action~~ effect of magnet, <sup>by</sup> is more precise, magnetic field <sup>on</sup> to different organisms (biomagnetism), on the brain and the psychic phenomena (psychomagnetism) <sup>belongs</sup> leads to the questions, which <sup>for</sup> during centuries first are <sup>occupied</sup> manifested by the attention of the scientists, <sup>and then</sup> first they are discarded into the refuse box of pseudo-scientific searching, then again <sup>d</sup> they surface, concentrated by new observations, and again they <sup>were forgotten for</sup> ~~are~~ many years .... Is noted at present the new lift of the interest in bio- and psychomagnetism, caused by fresh experimental data in works (A. Blyumenfel'd) on the magnetic properties of the dipole molecules of nucleic acids, which play this large role in the life of cells, including cerebriic.

Serious observations on psychomagnetism were for the first time made by famous French neuropathologist Charcot and ~~Binet's~~ his successors <sup>Binet and 1880's</sup> Pere in the ~~eightieth years of past century~~. In essence they consisted in the following: in the hypnotized hysterical patient

with verbal suggestion was caused any visual, auditory or olfactory hallucination. Patient told to physician, that ~~it~~<sup>she</sup> sees on ~~the~~<sup>her</sup> hand butterfly, ~~she~~ hears, for example, music or perceives ~~it~~<sup>of</sup> smelled roses. If at this moment to ~~its~~<sup>her head</sup> ~~glove~~ they brought at a distance of several centimeters powerful horseshoe magnet, then the suggested hallucination weakened, disappeared entirely. The magnet ~~moved away~~<sup>was removed</sup> - hallucination was renewed. This remarkable phenomenon was observed by no means in all patients and <sup>by</sup> the majority of subsequent researchers it was not confirmed. At the beginning of our century it was forgotten.

In 1919 I undertook the check of the experience<sup>ments</sup> of ~~the~~ Binets and Pere and, to ~~my~~<sup>my</sup> surprise, on ~~hyp~~<sup>just</sup> hypnotic performance with one ~~sound~~/healthy tested ~~with full/total/complete certainty it~~ observed ~~by her~~<sup>this</sup> picture. Soon it was possible to find an additional five persons, who experience<sup>d</sup> tested in hypnotic state the same effect.

I had the very powerful wavelike magnet, which held ~~the~~<sup>a</sup> load <sup>of</sup> in one and one-half kilogram. Applying it, I it could complement~~at~~ the data of the French authors by one additional unexpected observation. The place of the presentation of magnet to the head of tested ~~value~~<sup>able</sup> did not have, i.e., this could be occiput, ~~sinciput~~<sup>vertex</sup>, front; but substantially in order that the plane of the symmetry of head would

pass between poles of magnet. In five <sup>persons</sup> tested magnet ~~it~~ would disturb the suggested hallucinations, when its North Pole was located <sup>opposite</sup> ~~against~~ the left side of head, <sup>and</sup> ~~but~~ south pole - against right, and only in one - in the reverse position of poles.

During July 1920 took place the first Petrograd physiological conversation - <sup>a</sup> ~~the~~ university small circle, from which subsequently was formed the All-Union society of ~~the~~ physiologists. During this <sup>meeting</sup> ~~collection~~ I offered to come forward with the report ~~communication~~ "about the effect of magnet on somnambulistic hallucinations" (theses of report are printed in III volume of the "Russian physiological journal" for the year 1921). Report caused the lively exchange ~~metabolism~~ of opinions. some would deny any ~~action~~ effect of magnet, indicating that the hypnotizer can by careless questions direct <sup>the one</sup> ~~tested~~ to that, what it itself from it expects (reasonable objection, which was made even in times of Charcot's experience). Others advanced the reflector hypothesis of the ~~action~~ effect of magnet, <sup>was</sup> which ~~adhered~~ to in <sup>his</sup> ~~its~~ time Fere: directly on brain magnetic field does not act, at best it can be the weak irritant of skin receptors and receptors of the hair, which send the ~~momentum~~ ~~impulse~~ pulses of excitation ~~into~~ cerebrum. To this professor A. A. Likhachev added the following concept. Perhaps, the electrostatically charged hairs of skin and head are attracted by one magnet pole and repulsed by others, but this is considered by

hypnotist because of the frequently observed in hypnosis increase in the sensitivity.

Only two been present (one of them was professor G. P. Zelenyy) recognized possible the direct effect of magnetic field on cerebriic neurons and the elapsing in them neuro-mental processes, after recalling in this case, which magnetic field penetrates through bones and soft tissues inside skull.

~~Against~~ <sup>Stat</sup> the hypothesis of the aiming ~~action~~ effect of the verbal suggestions of hypnotizer I could advance a <sup>number</sup> series of objections. <sup>from</sup> ~~on~~ those which were hypnotized the experiments <sup>with</sup> magnet produced sometimes those <sup>persons</sup> who did not know, <sup>what kind of</sup> which one should expect results. Magnet could be covered <sup>with material</sup> ~~into matter~~ so that experimenter would not know the arrangement of poles, and all the same magnet ~~it~~ would act in one position of poles and ~~it~~ would not act with other. Finally, approach/~~approximation~~ to the head of any metallic or woofen object ~~subjects~~, which do not possess magnetic properties, to the suggested halucination of effect did not exert. / True, after the multiple repetitions of these control experiments alternately <sup>with</sup> ~~on~~ "magnetic" nonmagnetic object <sup>P</sup> ~~subjects~~ gradually acquired the ability to influence halucination. Apparently, this occurred as a result of the formation of conditional reflexes on the basis of the unconditional ~~action~~ effect of magnetic field on the cerebral cortex

of brain.

Subsequently for me it was possible to demonstrate these phenomena to academician V. M. Bekhterev and the specially assigned <sup>him</sup> by ~~it~~ board. In young years academician Bekhterev worked in Parisian clinical aspects of Charcot and for life preserved interest in the action/effect of magnet on the hysterical patients. Board confirmed the results of several experiments. one of them attests to the fact that with shallow hypnosis and weak because of this manifestation of the suggested hallucinations the magnetic field does not ~~attenuate/weaken~~, but, on the contrary, ~~it~~ amplifies the suggested hallucinations.

All these observations led to assumption about the fact that magnetic field <sup>is</sup> capable of amplifying the carotid inhibition of crust neurons. It, of course, needed reinforcement by experiments on animals. At first selection <sup>was in</sup> fell to frogs. By the means of simple attachment animals <sup>were</sup> pulled up ~~themselves~~ <sup>by</sup> for rear extremities, and they hang downward by head. This put them for some time (sufficiently constant for each of them) <sup>into</sup> to motionless hypnotic state. <sup>By</sup> ~~From~~ stopwatch was determined its duration, and from <sup>a number</sup> ~~series~~ of experiments was derived <sup>concluded</sup> average value. To frog was brought the same magnet, which served <sup>for</sup> us in tests on those <sup>people</sup> which were hypnotized. ~~people~~. With the indefinite arrangement of magnet poles only a little

~~It~~ increased the average duration ~~and from series of experiments she~~  
~~was derive/concluded average value.~~ To frog was brought the same  
 magnet, which served us in tests on the hypnotized people. With the  
 indefinite arrangement of magnet poles only a little increased the  
 average duration of hypnotic state (2.733 minutes against 2.045  
 minutes, i. e., by approximately 33 percent). The difference was more  
 expressed (3.136 minutes against 2.045 minutes - 53 percent) in 11  
 experiments ~~on the determined~~ <sup>with definite</sup> position of poles - themes very, in  
 which in experiments on people-hypnotists we observed the state of  
 the depression of carotid braking.

Later <sup>at</sup> the institute ~~of~~ brain <sup>I</sup> placed experiments together  
 with practicing students on the effect of the same horseshoe magnet  
 on generated in them motor conditional reflexes of hand; as  
 unconditional irritant served the electric current, started into the  
 fingers of the same hand. In 12 experiments, carried out <sup>on</sup> ~~to~~ four  
<sup>persons</sup> tested, furthermore predominated the <sup>attenuating</sup> ~~braking~~ effect of magnet. In  
 sharper form this braking effect of magnetic field on the conditional  
 reflexes of fishes and pigeons was establish <sup>at</sup> ~~installed~~ by Yu. A.  
 Kholodov in 1958. In the first place, the braking ~~action~~ effect of  
 magnetostatic field reminds the suppressing effect of the positive  
 pole of direct ~~of~~ electric current - the anode. The sharply  
 stimulating action of electric field, on the other hand, is similar  
 to the ~~action~~ effect of classical irritant - cathode. <sup>Q</sup> ~~This~~ <sup>does</sup> not that

means however that the magnet cannot exert the stimulating ~~action~~ effect. Was expressed the opinion that the <sup>moving</sup> driving magnet, and variable magnetic field, <sup>guides</sup> aims in the nerve tissue the electric currents of supertreshold force. For example, long already it is known that the alternating magnetic field of <sup>great</sup> large force ~~the~~ caused <sup>flickering in eyes of man, so-called</sup> phosphenes. ~~In~~ In collaboration with Ye. T. Gal'vas, Ya. I. Perikhan'yantsem and <sup>and myself</sup> P. V. Terent'yev (transactions of the institute of the brain of the name Bekhterev, <sup>Vol.</sup> ~~that~~ XVIII, 1941-1946) by powerful horseshoe magnet it was possible to cause <sup>light</sup> phot~~ic~~ phosphenes in woman, who preliminarily accepted the dose of "payote" (mexican cactus, containing mescaline and other alkaloids). This preparation causes unusually the powerful and prolonged excitation of visual region of cerebri cortex. When are screwed up eyes, in the field of view <sup>there spontaneously</sup> volitionally appear and kaleidoscopically change each other extremely bright and coloring visual <sup>images</sup> ~~nodes~~. Of our tested, <sup>who</sup> ~~that~~ <sup>were</sup> being located in dark room, the rapid adjustment of magnet downward at a distance several centimeters from postcranial region each time caused the appearance of the <sup>moving</sup> driving phosphene in the form of "trace from <sup>falling</sup> shooting star" (according to its expression).

Little understandable, but very is significantly another phenomenon, which was being observed by us in the same experiments: when the magnet, approximated to the occiput of tested, <sup>person was</sup> ~~they~~ turned ~~to~~ 180 degrees, then this many times it caused in a row the same

rotation of spontaneous visual mode.

It is necessary to assume that further research on psychomagnetism promises the solution of many mysteries of the work of brain.



"Especially ~~it~~ <sup>ing her</sup> struck in ~~its~~ exterior fine thin metallic band, as if diadem <sup>which</sup> ~~is~~ <sup>her forehead</sup> covered front.

- this is <sup>mama</sup> ~~she~~, he said Lemansel. - <sup>she</sup> ~~he~~ has migraine.

<sup>Mrs.</sup> ~~The~~ ~~Mr.~~ Lemansel' were greeted <sup>with</sup> with me by sorrowful voice and probably after noting, <sup>how</sup> ~~so~~ astonished I looked <sup>at her forehead</sup> ~~at it~~ ~~at first~~, she

said with the smile:

- do not think, young person that these are <sup>*crowns*</sup> ~~the corona~~: this  
simply magnetic band from headache".

(Anatole France, ~~is~~ "Red Egg").

~~Permian period.~~ the medical institute.

DEPARTMENT OF NORMAL PHYSIOLOGY.

Here under professor M. R. Mogendovich's <sup>leadership</sup> ~~management~~ the group of the researchers conducted extensive work on research on the ~~action~~ effect of magnetic field on vital processes.

On the results achieved by them, about conclusions and <sup>proposals</sup> ~~assumptions~~ speaks the scientific worker of laboratory the candidate of the medical sciences R. G. Skachedub.

<sup>Proposals,</sup> ~~assumptions,~~ conclusions ....

Magnetic field is one of the real factors of environment, and its effect on living organisms <sup>are</sup> undoubtedly necessary to consider in biology and medicine.

Permanent magnet influences the properties of the blood.

In magnetic field the blood is coagulated more slowly.

It was for the first time shown, that the leukocytes - the white blood ~~ball/spheres~~ <sup>globules</sup>, protecting organism from microbes, in magnetic field become more active. Thus, are ~~raised~~ <sup>increased</sup> the ~~shielding~~ <sup>protecting</sup> properties of organism.

Is ~~opened~~ <sup>revealed</sup> the "phenomenon of Mogendovich" - the retarding/~~deceleration/delay~~ of the precipitation of erythrocytes (red brown ~~ball/spheres~~ <sup>globules</sup>) in magnetic field. The professor Mogendovich considers that this is the result of the action of external magnetic field on the electric and magnetic properties of erythrocytes. Erythrocytes begin to move in a circle, and is possible, ~~and to~~ <sup>to</sup> rotate around ~~its~~ <sup>their</sup> axes.

Permanent magnet changes the permeability of animal cells and tissues. Investigations ~~they~~ <sup>were</sup> conducted on the isolated/~~insulated~~ living muscles of frog. It turned out that the weight of muscle,

which was ~~being~~ located in special physiological solution, is increased more, if it ~~is~~ <sup>is</sup> exposed to ~~of~~ <sup>effect</sup> magnet. The same results were reached by another method - the lifetime staining of skeletal muscles. Muscle, which is located in magnetic field, absorbed more color ~~paint~~, than others.

The action of magnet decreases the necessity of organism for oxygen, lowering the ~~common/general~~ total level of gas exchange. This was established ~~installed~~ in the series of tests on white mice, which in the special glass chamber (glass permeated for a magnetic field) placed between the poles of constant electromagnet.

It is obvious <sup>that</sup> magnetic field suppresses the nervous system. ~~By~~ this it ~~is~~ <sup>can</sup> possible to explain that the ~~action~~ effect of magnet decreased the pain of wounded. (This treatment was applied in ~~the~~ <sup>2 during</sup> ~~permeated period~~ during Great patriotic war).

Of the existence of the phenomena of biomagnetism it is possible to convince any. It suffices to place the head of man between the poles of the electromagnet even of the small force: the switching on and ~~the~~ <sup>off</sup> ~~disconnection~~ of electromagnet is accompanied by the perception of flashing ("magnetic phosphene"). Some in

~~Full total~~/complete darkness see the brightness of the electromagnet itself, which disappears with the disconnection of current.

*There*  
Are such data, that characterize in essence the problem of biomagnetism at present. Is made not so much, but also not so ~~it is~~ *little* ~~small~~, if we consider that ~~mist~~/fog, which surrounded until recently these questions.

WILL BE REQUIRED BY THE FUTURE ASTRONAUTS MAGNETIC COMPASS?

Although the astronaut, notes the American scholar McCracken [Massachusetts <sup>Inst</sup> Technological Institute], ~~it~~ will not need the information about magnetic fields for space navigation, they can be used for the purpose of the protection of man from the intense, lethal ~~emission~~ radiation, which from time to time is <sup>ejected</sup> discarded by the Sun.

Magnetic lines of force have <sup>great importance</sup> ~~large value~~ for the propagation of the radiated by the Sun cosmic rays. Electrically charged particles can freely move along magnetic lines of force, rotating around them on spirals. But to intersect them <sup>by</sup> ~~to~~ them is very difficult.

Thus, magnetic lines of force served as if <sup>channel</sup> ~~canal~~ for particle motion, emitted by the Sun. Therefore they have <sup>great</sup> ~~large~~ value for the understanding of the nature of cosmic rays and bonded with them phenomena, observed in the Earth, and also for the flight safety of the future astronauts.

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If astronaut is have the contemporary ~~map~~/chart of the magnetic fields of interplanetary space, then he will be able to avoid the incidence ~~impingement~~ into magnetic field, maneuvering <sup>by</sup> with ship and passing the zones, where lines of force are connected with the Sun. Then, even if <sup>there</sup> ~~it~~ will occur sudden outbreak on the sun with the ejection of lethal particles, spacecraft will be shielded from their action.

250 Thousand Gauss.

In the special laboratory of the higher technical school of Massachusetts (USA) <sup>there</sup> will be constructed the magnet with the strength of field in 250 thousand Gauss~~es~~. Along with purely physical investigations on giant magnet it is <sup>proposed</sup> ~~assumed~~ to study the effect of magnetic field on human organism.

(Atompraxis, 10/11 1960).

## MAGNETIC PILLS.

The ancient physicians used magnet not only for an extrinsic ~~action~~ <sup>effect</sup>, but also they gave ~~to~~ <sup>to</sup> its patients inside. The Egyptians, for example, looked at magnet as at the ~~substance~~ <sup>means</sup>, with the aid of which it is possible to achieve immortality. But were such, who asserted that the magnet is a poison, and antipoison from it - garlic juice.



The theoretician of antique medicine Galenus considered magnetically stable substance. Wise Avitsenna <sup>#</sup> treated by the magnet ~~of~~ hypochondriacs. Paratsel's prepared from it magnetic manna, and Agricola - salt, oil and essence.

Thus one of the methods of the "treatment" of Paratsel's: "⊗"

"Take the magnet, died ocher, and ~~it is~~ buried in the earth/ground; on it are poured the seeds, inoculated with ~~that~~ *the same* ~~illness/sickness/disease,~~ *as that of* ~~which~~ ~~in~~ patient. For the acceleration of increase it is necessary to pour on them by that water, by which the patient washes herself. As soon as these seeds ~~will~~ grow patient ~~of~~ gets better".



~~XXXXXXXXXX~~

2). And in this case the bactericidal ~~action~~/effect of the aeros  
Page 84.

Rostov-on-Don.

Institute of roentgenology, radiology and oncology.

M. A. Ukolova and G. G. Khimich:

#### PERMANENT MAGNET AFFECTS INCREASE IN SARCOMA

in the experimental division of our institute are carried out two series of observations of the ~~action~~/effect of permanent magnets on the sarcoma of white rats. Magnets are applied <sup>as</sup> assorted composition and different force. In the first ~~set~~ <sup>series</sup> of experiments we take the magnetized rings of steel wire, which are fastened around neoplasm. To control rats fasten the same annuli, but not magnetized. In 60% of animals with neoplasms from 1 to 1.5 cm. in diameter, subjected to the effect of magnet, will occur resorption of sarcoma.

The neoplasms of larger size/~~dimension~~ are not decreased. Not in one of the control rats <sup>was</sup> ~~of~~ resorption ~~it is~~ observed.

In the second series of experiments are applied the magnets from the alloy ~~of~~ ANKO-4 with induction <sup>of</sup> 1100 gauss. In a number of cases occurs the resorption of the much larger neoplasms: to 6 x 3 cm.

It is possible to assume that the physical effects of this type <sup>connected</sup> are ~~related~~ with those discovered in 1958 by professor L. A. Blumenfeld by the properties of the magnetic polarization of the nucleoproteins of living cells.

## PROTECTION FROM LETHAL RADIATION DOSES.

The American researchers M. P. Barnotti and D. M. Barnotti ~~communicate~~ <sup>report</sup> that if we hold mice for several weeks in the field of powerful permanent magnet, then in them it is observed leukocytosis - ~~it grows/rises~~ <sup>increases</sup> a quantity of white blood cells in the blood. A maximum increase in the quantity of leukocytes (to 30-60%) is noted during of the first two weeks after removal of animals from magnetic field.

These data will allow the scientists to construct the following working hypothesis. If we treat by the magnet of mice in which under the ~~action~~ effect of the ionizing radiation are disturbed the hemopoietic functions of bone marrow, then little it is developed white blood ~~cells/spheres~~ <sup>globules</sup>. Was made a series of the experiments, which to a determined degree will justify the prognosis of the scientists. Mice ~~are~~ subjected to preliminary action fields of permanent magnet more easily <sup>carried</sup> ~~transfer~~ the radiation doses, lethal for animals under normal conditions.

## IS FEASIBLE NEW METHOD OF DIAGNOSIS OF CANCER.

In the English scientific journal "Nature" ~~will~~<sup>there</sup> appear <sup>ed</sup> the report/~~communication~~, that the American scientists F. Senftl and A. Thorpe, possibly, ~~will find~~<sup>have found</sup> the new method of the diagnosis of cancer. They ~~run~~<sup>ran</sup> experiments with the cancerous tissue of the liver of rats and ~~they will~~<sup>ed</sup> establish that the magnetic properties of sick tissue and tissue ~~sound~~<sup>ed</sup> healthy were not identical.

If, they note, that further experiments will show that the same difference is characteristic for other form/~~species~~ of cancerous diseases, then "the measurement of magnetic properties ~~is~~ will be possible to apply for the purpose of diagnosis".

But plants? Are subjected they to the ~~action~~ effect of magnetic field?

#### MAGNETOTROPISM.

Who ~~has~~ not play <sup>ed</sup> the childhood <sup>with</sup> magnet, forcing "to dance" nails and metallic pearl! But for sure you <sup>did</sup> are not trying to attract <sup>with</sup> ~~lighted~~ by the magnet ... plant. But this almost is possible. Recently coming from family of roots is completely clearly drawn to the side of south plus. . This surprising phenomenon will <sup>was</sup> ~~open~~ discover <sup>ed</sup> ~~by~~ candidate of biological sciences A. V. Krylov. He ~~will~~ <sup>called</sup> name it magnetotropism.

For the last ~~last~~ several years under his management <sup>at</sup> in the institute of the physiology of ~~the~~ plants <sup>in</sup> K. A. Timiryazeva's ~~name~~ the Academy <sup>of</sup> of Sciences of USSR conduct curious works on research on the effect of magnetostatic field on the vital activity of plants. Untimely death <sup>interrupted</sup> ~~breaks~~ the experiments of scientist. Many ideas ~~will~~ remain <sup>ed</sup> those which were not accomplished, the most interesting hypotheses - not proofed. Now investigations <sup>are</sup> continue <sup>d. by his</sup> ~~in~~ coworkers and the comrades, expecting to find to this means much new and valuable.

What is magnetotropism? Before us the basic theoretical conclusions to which ~~we~~<sup>arrived</sup> on the basis of the hundreds of experiments ~~of~~<sup>his</sup> A. V. Krylov and G. A. Tarakanov's collaborator.

Does not occur this case in order that plant would be mistaken - would grow upward by roots, downward by leaves. In a strict order is constructed each cell in living organism; its sides are nonhomogeneous. In exactly the same manner, for example, usual cabbage ~~sheet~~<sup>leaf</sup> has the right and left halves ....

Why precisely thus? Why not otherwise? They say that the cell is polar: its ends ~~leads~~<sup>is</sup> are not identical. Is polar the plant: sharply are distinguished roots and the upper sprouts. But ~~that~~<sup>what</sup> such is polarity? In what <sup>is</sup> the essence of this phenomenon? In the word itself "polarity" is laid the concept of field. The most universal form of the manifestation of field, i. e., motion of matter, ~~its~~<sup>its</sup> electromagnetic ~~is~~ state. All substances have to some degree magnetic properties; this is the physical basis of those complex processes, which occur ~~flow~~<sup>flow</sup> in living organisms and determine their increase, development. We frequently say that any ~~sheet~~<sup>leaf</sup> is the whole chemical plant. Each proceeding there, reaction, in turn, leads to a change

magnetic properties, appear electric potentials - biocurrents. Biocurrent already itself changes the ~~character~~/nature of the magnetic properties of substance. Thus, is created the closed circle, the indissoluble unity of electromagnetic field with living system. Each time depending on conditions, <sup>there</sup> originate one or the other electromagnetic state, and it determines the polarity of entire organism.

<sup>Here is</sup> ~~thus~~ ~~and~~ the answer/response: polarity is the property of living matter, which determines the metabolism of organism. But at the basis of polarity lie ~~first~~ the magnetic properties of substances.

"It is ~~possible~~ <sup>consider</sup> possible to ~~count~~, writes A. V. Krylov, that physical basis, which determines the continuity of the conversions of substances in organism, is uncompensation (asymmetry) of electromagnetic forces, in other words, asymmetry of polarity. In this case, apparently, by no means it is indifferent as shifted electromagnetic field: to the side of positive or negative sign".

Thus, polarity is a basis of bases; depending on its state are amplified or are inhibited vital processes, can occur (their even) ~~full/total/complete~~ disorganization, which <sup>leads</sup> ~~leads~~ to the death of separate cells and organ/~~controls~~, <sup>and then</sup> ~~but~~ that also entire organism.

Thus far this is hypothesis. . Far going, opening captivating prospects. It makes it possible to approach in a new way the study of the most important problems of biology, such, for example, as heredity. <sup>Perhaps</sup> ~~It can be,~~ precisely, this path will lead to the development of the efficient and reliable methods of control of increase, development, the life of plants and animals.

As the basis of hypothesis are placed the real facts, checked by experiment. Here are they.

From the report of the laboratory:

I. The magnetic field of earth must have a direct/~~straight~~ effect on the vital activity of plants. This will confirm experiments.

II. The seeds of grain, maize, cotton plant are placed in the humid glass chamber. On special support/~~socket~~ was stuck filter paper whose end/~~leads~~ are <sup>lowered</sup> ~~aditted~~ into vessel with the tap or distilled water in order evenly to wet paper. Part of the seeds was oriented by rootlets of <sup>germ</sup> ~~nucleus~~ to the northern magnetic band of earth, another - <sup>was</sup> to south. Germination <sup>was</sup> produces in darkness, at temperature plus

18-25°.

It is necessary to especially maintain completely essential for such experiments the part: necessary to take the only dry seeds: if they are preliminarily wetted or turning up, then the effect of magnetic field sharply weakens or completely is lost.

Under such conditions we germinated the seeds of maize of type "Voronezh-76" and ~~will~~ <sup>ad</sup> establish ~~install~~ (see photo 1) that those seeds, which were directed by rootlets of nucleus <sup>toward</sup> to the south magnetic pole of earth (2), germinated <sup>a</sup> to day <sup>earlier</sup> earlier than the seeds, turned by rootlets of nucleus to north magnetic pole (1). Furthermore, in <sup>first</sup> ~~by~~ ~~pen~~ the case an increase in the roots and ~~haulies~~ <sup>stems</sup> will be more intense. and sprouts from the seeds, turned by rootlets of nucleus to the north magnetic pole of earth, <sup>were</sup> bent and <sup>grew</sup> ~~they~~ ~~increase~~ in the direction of south magnetic pole. The same law ~~will~~ show <sup>ed</sup> the seeds of the wheat of type "red-grain" (3 and 4).

<sup>was called</sup> This phenomenon ~~was~~ magnetitropism.

III. <sup>Was</sup> studied the ~~action~~ effect of magnetic field, created by artificial permanent magnets. For these experiments was designed special instrument.

On photo 2 is evident the intergrowth of the seeds of grain placed into artificial magnetic field. Earlier ~~will~~ <sup>began</sup> to germinate those of them, rootlets of ~~nucleus~~ <sup>germ</sup> of which was directed to south magnet pole. Are confirmed the same laws, which were noted earlier.

IV. Trace <sup>d</sup> we the simultaneous effect of magnetic field and chemical substances - stimulators.

We consider that the ~~action~~ effect of such substances on rate and ~~character~~ <sup>Growth</sup> nature of ~~increase~~ and the development of plants must be examined first of all from the viewpoint of the possibility of change ~~birth~~ <sup>under</sup> by their effect of the state of polarity. For our experiments we select giberellin. With its solution/opening are filled the tiny opening ~~apertures~~ <sup>apertures</sup>, made in the dry ~~hullies~~ <sup>seeds</sup> of wheat "red-grain."

As is evident in photography 3, gibberellin exhibits its ~~action~~ effect on an increase in the sprouts differently.

In such a case, when seeds were oriented by rootlets of ~~nucleus~~ <sup>germ</sup> to the positive pole, gibberellin more powerfully ~~is~~ stimulates <sup>its</sup> ~~increase~~ <sup>Growth</sup>. This testifies that one and the same substance under conditions of the different state of polarity exhibits its

~~action~~/effect dissimilarly.

Experiment shows and another very important side: polarity can change with the aid of chemical substances, in particular with the aid of gibberellin. If usually sprouts more actively <sup>grow</sup> ~~increase~~ to south pole, then with interference of gibberellin we see opposite picture. Comprehensive research on the polar (magnetic) properties of stimulators and inhibitors of increase will render great aid in the understanding of the mechanism of their ~~action~~/effect.

V. Polarity plays the role also in the immunity of plants - their ability to resist diseases. The sprouts of the seeds, oriented by rootlets of nucleus to north magnetic pole, densely occlude by parasites - mold fungi (photo 4, to the left). the resistivity of these sprouts will be clearly ~~lowered~~/reduced. Entirely appear in another way the sprouts of the seeds, oriented to south magnetic pole (photo 4, ~~to~~ the right), although the conditions will be equivalent.

All these facts indicate that the electromagnetic state (polarity) is the most important factor of the vital activity of plants.

*Captions*  
~~signatures:~~ ~~the~~ candidate of biological sciences A. V. Krylov, G. A. Tarakanova.

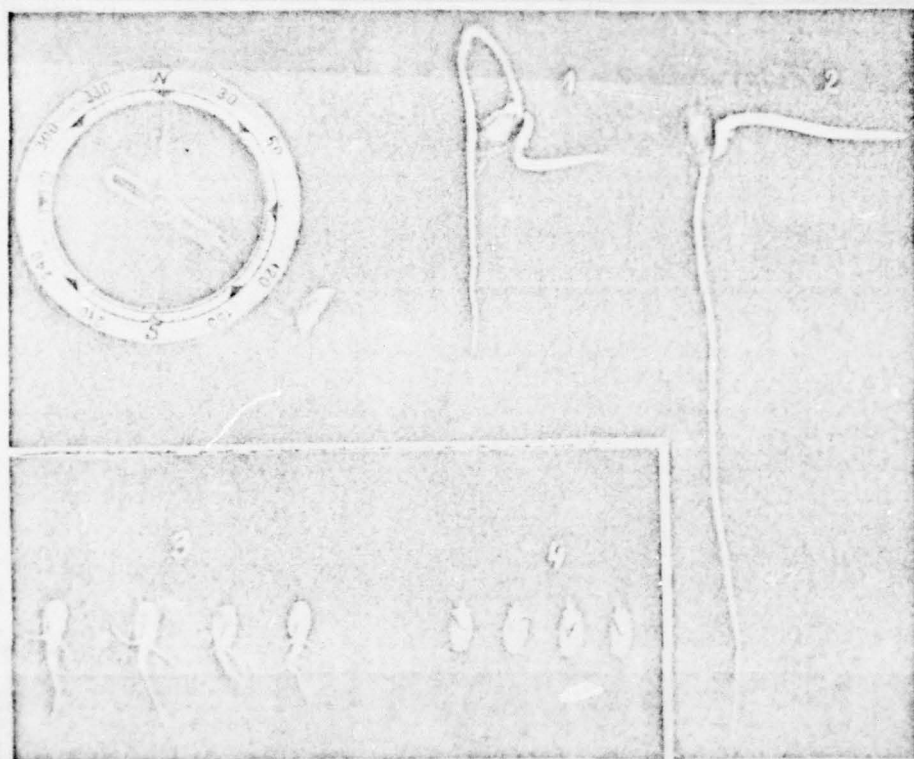


Photo 1.



Photo 2.



Photo 3.

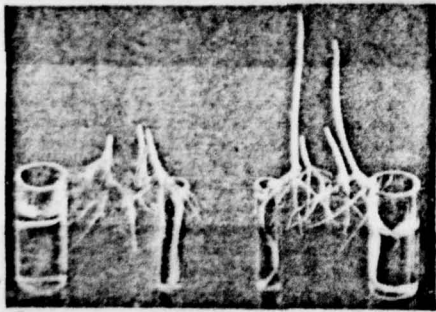


Photo 4.

DESERVES ATTENTION.

[p. 85 of original]

The effect of magnetic field on living organisms <sup>has</sup> ~~will~~ become the ~~object~~/subject of real studies only in the <sup>most recent</sup> ~~quite last/latter~~ years, although the searches in this direction are undertaken from old times.

Only recently this phenomenon will be strictly scientifically proved on plants. The merit of this discovery/~~opening~~ belongs to Soviet <sup>scientist</sup> ~~scholar~~ Aleksandr Vasilyevich Krylov.

Already the first experiments showed that with the germination of seeds in magnetostatic field an increase in the sprouts sharply is accelerated during the orientation of rootlets to south magnetic pole. <sup>These were</sup> ~~this will be~~ the first scientifically established facts, which lie as the basis of experiments.

It is difficult at present to foresee all the scientific and practical consequences, which ~~it~~ <sup>be</sup> can <sup>by</sup> give the investigation of magnetotropism of living beings. However, already now there is no

doubt that we deal with the new, previously unknown property of living matter whose research ~~on~~ deserves the most careful attention.

Life on the Earth ~~store~~<sup>was added</sup> up in the determined magnetic field, characteristic to our planet, and this, of course, ~~it~~ had to be reflected in the evolution of life and to peculiarities of the organization of metabolism. Therefore the abrupt changes in the magnetic fields, which the organisms can be subjected ~~to~~<sup>both</sup> on the Earth, ~~so~~<sup>and in</sup> particular on ~~leaving~~<sup>going</sup> into space, are capable, probably have essential effect on the different sides of their vital activity.

We hope that the ~~(ships~~<sup>space</sup> - the researchers of outer space will bring ~~any~~<sup>much</sup> new data on the effect of magnetic fields on living beings.

Academician A. L. Kursanov.

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English professor's experiments L. D. Odas (Belford college).

1960

Was investigated the effect of magnetic field on <sup>growth</sup> ~~an increase~~ in the plants. For this purpose was used large permanent magnet. the maximum strength of field reaches 4 thousand gauss. Experiment is conducted as follows. In sterile conditions in the small glass chamber on nutrient agar ~~grew~~ <sup>grew</sup> the sprouts. The chamber, ~~establish~~ installed between magnet poles, rotates in horizontal plane (~~this~~ <sup>was</sup> necessary for ~~relieving~~ <sup>removing</sup> the ~~action~~ effect of the earth's gravity). Observations ~~they~~ <sup>were</sup> conduct <sup>ed</sup> ~~after~~ <sup>on</sup> roots of plants. Head of root and the section of closest pole was photographed after each of 10-15 minutes. Made the vast number of experiments and in all cases - with very rare exception ~~/elimination~~ - ~~roots they detect distinct by~~ ~~exception/elimination~~ - roots <sup>revealed</sup> they detect distinct bendings, rootlets ~~it is~~ <sup>were</sup> deflect ~~/diverted~~ to the side of ~~the~~ <sup>less</sup> smaller strength of the field of magnet, seemingly ~~it~~ <sup>ing</sup> departed from its ~~action~~ effect.

The determined changes are observed in the internal structure of

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cells. Special attention was directed to grains of starch; them formed drops more on that half of the cell, which ~~is arranged~~<sup>was</sup> located nearer to the concave side of root, i. e., further from magnet. It is possible to assume that in cell there is some mobile/~~rotile~~ material, which is distributed (and carrying off after itself starch grains) by action of magnetic field in the same manner as ~~for~~ under the ~~action~~/effect of the force of the earth's gravity.

ARE NECESSARY ~~THE~~ MORE PRECISION METHODS OF STUDY.

considers the candidate of biological sciences, head <sup>of</sup> biophysical  
laboratory of central institute of health resort science and  
physiotherapy A. S. Presman

the magnetic phenomena we ~~occur naturally ourselves~~ <sup>encounter in nature</sup>  
everywhere - from the magnetic properties of electron and atom to the  
grandiose magnetic fields of space.

On the Earth in the process of evolution everything living had  
to be adapted to the stationary field of terrestrial magnetism. It is  
known, however, that this field in the course of time undergoes  
change beginning from daily variations to extremely slow changes -  
the so-called secular variations. Especially abrupt changes (magnetic  
storms) occur in the periods of the maximum solar activity. There is  
no doubt, that all these changes one way or another manifest  
themselves the functioning of living organisms. It is possible that  
the noted during the greatest solar activity deterioration in the  
state of people with cardiovascular and nerve diseases to some degree

~~is loaded~~ <sup>connected</sup> with magnetic storms.

On the processes of vital activity it can, to pronounce and the stay in the ranges of magnetic anomalies, where the magnetic intensity ten times is higher than usual. This must ~~manifest~~ <sup>affect</sup> itself plants and animals. ~~It~~ even more probably <sup>is</sup> the biological effect of the artificially created magnetostatic fields in laboratories and in the industrial enterprises, where the intensity ~~strength~~ <sup>is</sup> already ~~into~~ tens <sup>of</sup> thousand <sup>of</sup> times ~~are~~ <sup>than</sup> more the natural fields of earth.

In numerous experiments the scientists observe the ~~action~~ effect of powerful magnetic fields. But no one still not it will be impossible to ~~reveal~~ detect the action of weak natural magnetic fields on living organisms. Does indicate this that such effects are absent? Probably ~~no~~ <sup>t</sup> Are necessary the more precision methods of studies, and there can be, another approach to the very evaluation of biological effect.

The role of magnetism in biological phenomena, apparently, is not limited only <sup>by</sup> effect of external magnetic fields <sup>on</sup> living beings. ~~It is~~ Very probably <sup>a</sup> that the magnetic reactions are one of the important sides of vital activity, one of the main participants of the intimal <sup>the</sup> processes, which take place in living cells, one of the <sup>means</sup> operators of <sup>control of</sup> these processes. Such we ~~as~~ <sup>ideas</sup> <sup>expressed</sup> can be ~~said~~ in connection with the

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works of L. A. Bluzumfeld, who investigated magnetic properties of the molecules, which form part of the principal part of the living cell - its nucleus.

~~It~~ would want to note that, studying the mechanism of the biological effect of magnetic fields, one should remember about <sup>the fact</sup> that ~~which~~ the processes, which occur in living cell, <sup>do</sup> not always succeed in squeezing into in the strict basis of the physical laws, valid for an inanimate nature. Repeatedly were presented the hypotheses that for the understanding of biological phenomena it is necessary, perhaps, to construct the building of new physics, in the same way as this happened in its time during the investigation of microcosm. It is possible that research on magnetic phenomena in living cell will be the first <sup>stone</sup> ~~calculation~~ in the construction of foundation for such a physics.

*Remarks*  
PHYSICIST'S OBSERVATIONS.

Any investigation of the physical action on vital processes must be accompanied by the careful analysis not only of the biological, but also physical side of experiment. Unfortunately, in works on the biomagnetism ~~of~~ this not it is evident. That which was ~~opened~~ <sup>discovered</sup> already by Faraday the fundamental law of electromagnetic induction says, that any change of the magnetic field stimulates (~~is~~ induces) in conductive bodies the electric current whose force depends not on the ~~quite~~ <sup>very</sup> magnetic field, but on the rate of its change.

~~For~~ <sup>For</sup> any organism, which has the nervous system, the transmission of excitation <sup>is</sup> ~~conducted~~ <sup>ad</sup> by electric current. And completely it is natural that the excitation in nerves or the brain of electric currents acts on organism. But indeed as a result of the inclusion and ~~the~~ inclusion of the magnetic field into all internal tissues, in particular in nerves and brain, is stimulated current in accordance with their conductivity. It is extremely desirable in greater detail to investigate the ~~action~~ effect of the induced currents on the nervous system. But only one ought not to call this "biomagnetism"

and ~~shows~~ <sup>all the</sup> more by the "action/effect of residual magnetic field".  
 Biological effect in all experiments <sup>with the</sup> on connection, inclusion and <sup>exclusion</sup> disconnection of magnetic field produces electric current.

Well, and <sup>how</sup> without doubt <sup>it</sup> is better, if in experiments is used the permanent magnet, which include ~~(connected and)~~ <sup>and</sup> cannot be disconnected? And in this case <sup>with</sup> during approach, approximation or <sup>with</sup> during removal, ~~distance~~ of magnet are stimulated electrical currents, only weaker (<sup>since</sup> ~~that~~ as motion of magnet ~~it~~ occurs more slowly than connection or disconnection). The excitation of currents occurs ~~and~~ <sup>and</sup> then, when with respect to magnet moves the object, for example, the fish swims in the field of permanent magnet. From this viewpoint not one of the experiments, which claim to research on biomagnetism, is not pure/clean: indeed are not excluded the completely induced currents. Worse than that, ~~on~~ the results of experiment had to <sup>affected by</sup> ~~manifest itself~~ such uncontrollable factors as the speed of the <sup>movement</sup> ~~locomotion~~ of magnet.

Possibility of the electric effect on the nervous system is obvious. Hardly (it is) possible to doubt also the fact that the magnetic fields here act only through the induced currents. That means in application to the nervous system, one should speak not about biomagnetism, but about bioelectricity.

Is incomparably less clear the question concerning the ~~action~~/effect of magnetostatic field on lowest organism or isolated tissues, which the nervous system do not have. Here is not excluded direct/~~straight~~ effect on the motion of charged particles (as ~~this~~, for example, ~~it~~ is observed in experiments on the coagulation of colloids). But ~~is~~ which biological effect from this ~~action~~/effect, to judge thus far <sup>is</sup> difficult, since the published experimental data are contradictory. In Rome already more than 30 years there <sup>has existed</sup> a special institute of electrogenetics. The director of this institute, Alberto Pirovano ~~is known breeder~~ published from fifty works, in which <sup>he</sup> ~~it~~ asserts that by the ~~action~~/effect of low-frequency or even magnetostatic field it is possible to cause hereditary changes of plants. But confirmation <sup>is on the part of</sup> from other researchers these results will not obtain.

The question concerning direct/~~straight~~ (besides the nervous system) electromagnetic control on living substance is very <sup>urgent</sup> ~~actual~~ and requires careful testing. But it seems to me that all the possible effects must much <sup>more</sup> ~~brighter~~ <sup>ly</sup> be exhibited under the effect of high-frequency variable fields, i. e. radio waves. Magnetostatic field most more interestingly <sup>would be</sup> ~~will to test~~ in combination with variable fields. This method widely is used in the works of L. A. Blumentfeld and other researchers for research on living substance. <sup>but should</sup> ~~but~~ one ~~ought~~ not to have checked <sup>is</sup> other somewhat experimental

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conditions) action on it? It is possible to expect that will be reveal<sup>ed</sup>~~detected~~ the interesting phenomena, well familiar to the physicists, but for biological ~~target~~ purposes still in no way used.

Doctor~~g~~ of Physics and Mathematics, professor D. A. Frank<sup>7a</sup>menetskiy.

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"For astronautics I consider very important the question concerning the possible protective action of magnetic field in the relation to the ill effect of the ionizing radiation on organism. But question requires special development, and thus far <sup>about</sup> ~~against~~ this nothing that which was determined cannot be said still".

Professor M. R. Mogendovich, chairman of department of the normal physiology of ~~Permian~~ <sup>Permian</sup> medical institute.

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HYPOTHESIS OF Candidate of Biological Sciences.

G. M. Erdmann

the findings ~~derive~~ <sup>prove</sup> that the magnetic field directly acts on the nervous system. This, probably causes physicochemical changes in metabolism, which can be ~~connected~~ <sup>connected</sup> with the formation of conditional reflexes, on which depends the behavior of animal.

Thus, almost all ~~case forward~~ <sup>appearing</sup> scientists consider that the research of the doctor of chemical sciences, managing ~~the~~ <sup>the</sup> laboratory institute of the chemical physics of the Academy of Sciences of the USSR L. A. Blyumenfel'd will ~~bring~~ <sup>carry</sup> to the problem of biomagnetism the so ~~such~~ long-awaited proof.

This is what ~~says~~ <sup>says</sup> L. A. Blyumenfel'dy ~~page~~

THE PROBLEM OF BIOMAGNETISM.

Perhaps not on one scientific question appeared in world literature as ~~many~~ <sup>much as</sup> the mutually contradictory confirmations, as ~~concerning that~~ <sup>the question</sup>, does ~~exert~~ permanent magnetic field <sup>exert</sup> any effect on biological processes and living beings.

For the ~~latter~~ <sup>last</sup> of one hundred years (up to our days) from time to time are printed the scientific works whose authors ~~communicate~~ <sup>report</sup> that they observed this effect of magnetic field. Then, as a rule, other scientists publish the works, which deny previously the obtained positive results.

I do not know up to now ~~not~~ of one experimental fact, which unambiguously testifies to the existence of such effects. All results either are statistically uncertain or they can be explained by the electric effects, which appear with ~~connection~~ <sup>exclusion</sup> /inclusion and ~~disconnection~~ of magnetic field or during the motion in it of the objects of measurement.

Thus, to the question concerning ~~that~~ <sup>whether</sup>, acts or does not act magnetostatic field on living beings, at present there is no ~~answer~~ <sup>response</sup>.

Some authors refer to the discovered in our laboratory new magnetic properties (the so-called "pseudo-ferromagnetism") of nucleic acids and nucleoprote<sup>ins</sup>~~ins~~, and also to a change of these magnetic properties in the process of an increase in the unicellular cultures as to the proof of the existence of biomagnetism.

This is based on misunderstanding. We study not the effect of magnetic fields on any biological subjects or processes, but the magnetic characteristics<sup>d</sup> most important biological structures. The observed by us magnetic properties are such, that the available in laboratories magnetic fields cannot to any noticeable degree influence the chemical and other characteristics of biopolymers (energy of magnetic reactions<sup>me</sup> considerably less than thermal energy).

Of course, it is not possible to completely exclude the possibilities of the governing effect of weak magnetic reactions and their changes in the process of development to the course of biological process, for example, at the level of cell. In complex macrosystems energetically very weak interactions can lead to <sup>great</sup> ~~large~~ effects, approximately so, as pushing of knob can cause powerful explosion. However, there are no proofs of the presence similar effects as yet. We in our work examine magnetic properties only as indicator of the important special ~~feature~~ peculiarities of the electron structure of the objects being investigated.

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I is not completely confident in the fact that research on the effect of magnetostatic fields on biological systems is of considerable interest. Scarcely whether it is possible to expect *great* large effects, at least because *they* already they *could be* ~~will~~ reveal ~~detect~~. But in science ~~ever~~ it is *never* ~~not~~ possible to previously consider these or other investigations hopeless. In any case, at present most of all are necessary the reliable facts, as yet, unfortunately which are *not present.*

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