

*Livshits, M.S.*

USSR/Theoretical Physics

B-4

Abs Jour : Referat Zhur • Fizika, No 5, 1957, No 10860  
Author : Livshits, M.S.  
Inst : Odessa Hydrometeorological Institute  
Title : Application of Non-Self-Adjoint Operators to Scattering Theory.  
Orig Pub : Zh. eksperim. teor. fiziki, 1956, 31, No 1, 121-131  
Abstract : The elastic scattering of a particle passing through a compound nucleus is considered. The spins of the particles are not taken into account. The author constructs a scattering matrix for the particle and finds its connection with the Hamiltonian of the compound system. The value of the scattering matrix makes it possible to determine the Hamiltonian; this is shown for cases in which the compound system contains: (a) a finite number of complex levels; (b) a continuous spectrum of complex levels; (c) a degenerate real level. For all these

Card 1/2

USSR/Theoretical Physics

B-4

Abs Jour : Referat Zhur - Fizika, No 5, 1957, No 10860

cases an explicit expression is written for the Hamiltonian in terms of the parameters of the scattering matrix; the Hamiltonian is reduced to the simplest (triangular) representation. Using the formulas derived, the author considers the process of decay of the compound nucleus under the condition that it has a continuous spectrum of complex levels. In conclusion, the method developed is generalized to include the case, when the particle outside the nucleus is not free, but is in a certain potential field (for example, the Coulomb field of the nucleus). The work is distinguished for clarity of presentation, which, in spite of the mathematical complexity, makes it accessible to the non-mathematician.

Card 2/2

LIFSHITS, M.S.

SUBJECT USSR / PHYSICS CARD 1 / 2 PA - 1905  
AUTHOR LIFSIC, M.S.  
TITLE On the Scattering Matrix of an Intermediary System.  
PERIODICAL DOKl.Akad.Nauk, 111, fasc.1, 67-70 (1956)  
Issued: 1 / 1957

The present work deals with deriving the not self-adjointed operator of the energy of an intermediary system, which has been formed on the occasion of the elastic collisions of two particles. On this occasion the relativistic dependence of the mass of these particles on velocity is taken into account. A close connection is found to exist between the scattering matrix and the so-called characteristic matrix function of the corresponding not self-adjointed energy operator, so that it is in some cases possible to determine the energy operator from the assumed scattering matrix. In this connection the well-known formula by E.P.WIGNER and L.EISENBUD, Phys.Rev.72, 29 (1947) is generalized for the case of the continuous spectrum of the intermediary system. As an example of application the energy operator for HEISENBERG'S model of elementary particles is determined. In order to make the nature of this method quite clear, only the elastic collisions between two uncharged particles  $a_1 + a_2 \rightarrow C \rightarrow a_2 + a_1$  is studied in the present instance. Here C denotes the intermediary system. The moment of momentum  $l$  and the spins of the particles shall be equal to zero. The wave functions of the investigated system is best represented in form of a vector with two components. The HAMILTONIAN is accordingly written down as a matrix of the second order. In order to take account of the relativistic de-

Dokl. Akad. Nauk, 111, fasc. 1, 67-70 (1956)

CARD 2 / 2

PA - 1905

pendence of the mass of the particles on velocity, representation in the momentum space is adopted. Next, the matrix wave equation, which is separated into two wave equations, is investigated. - For the equation which determines the state  $\vec{f}$  of the intermediary state the following formula is eventually found:  $H^* \vec{f} - W \vec{f} = (a/2) \sqrt{(\hbar/2)} (V_1 + V_2 \vec{l}, \vec{l}) = \{\sqrt{2} \beta_k\}$ . For the scattering matrix we find:  $S(W) = e^{-2i(p/\hbar)} R_{S_0}(W)$ ,  $S_0(W) = 1 + i((H^* - WI)^{-1} \vec{l}, \vec{l})$ . The function  $S_0(W)$  is called "characteristic function" of the operator  $H$ . The total probability  $P$  of the intermediary system, which is referred to the time unit, is given by the following expression:  $P = (1/\hbar)(\vec{l}, \vec{l}) = (2/\hbar) \sum_{j=1}^{\infty} |\beta_j|^2$ . Finally, the following generalization of the formula by WIGNER and EISENBUD is obtained:  $S_0(W) = (1 + i \int_0^b \hbar/2 \varphi(W)) / (1 - i \int_0^b \hbar/2 \varphi(W))$ ,  $\varphi(W) = ((A - WI)^{-1} \vec{l}_0, \vec{l}_0)$ . Here it holds that  $\varphi(W) = \int_0^b d\sigma(t)/(t-W)$ , where  $\sigma(t) = (E_t \vec{l}_0, \vec{l}_0)$  is a not decreasing function. It is true that  $\vec{l}_0 = \vec{l}/(\vec{l}, \vec{l})^{1/2}$  and  $E_t$  denote the spectral family of the self-adjointed operator  $A$ . As an example the scattering function for the elastic collisions of two homogeneous particles are studied.

INSTITUTION: Hydrometeorological Institute, Odessa.

LIFSHITS, M. S.

SUBJECT USSR / PHYSICS  
 AUTHOR LIFSHIT, M.S.  
 TITLE On the Intermediary System which is Formed on the Occasion of the Scattering of Elementary Particles.  
 PERIODICAL Dokl.Akad.Nauk 111, fasc.4, 799-802 (1956)  
 Issued: 1 / 1957

CARD 1 / 2

PA - 1936

The present work investigates the properties of an intermediary system formed on the occasion of a collision between two elementary particles on the pre-supposition that interaction between the particles is due to a quasicharge which connects the corresponding fields. In this connection the expression  $S_0(W) = (1 + (iP/2)\varphi(W)) / (1 - (iP/2)\varphi(W))$  with  $\hbar = c = 1$  is used for the scattering matrix of the collision of two particles  $a_1 + a_2 \rightarrow C \rightarrow a_2 + a_1$ . Here P denotes the total probability of the decay of the intermediary system, and for  $\varphi(W)$  the equation  $\varphi(W) = ((A - WI)^{-1} \vec{e}_0, \vec{e}_0)$  applies. Here A denotes the self-adjointed operator for the energy of the "covered box",  $\vec{e}_0$  - a certain coordinate vector, and  $W = \sqrt{m_1^2 + p^2} + \sqrt{m_2^2 + p^2}$  ( $m_1 \geq m_2$ ) the total energy of the system.

The author endeavors to find the amounts of P and  $\varphi(W)$  by the example of the scattering of a photon by an electron. On this occasion the electron "at first" absorbs a photon with the fourdimensional momentum  $k_1'$  and "afterwards" it emits a photon with the fourdimensional momentum  $k_2''$ . For this purpose the correspond-

Dokl.Akad.Nauk 111,fasc.4,799-802 (1956)

CARD 2 / 2

PA - 1936

ing elements of the scattering matrix are written down in second approximation. This scattering matrix is then transformed by transition to new variables.

For the operator  $A$  of the energy of the system described as a "covered box" we find  $\varphi(W) = -1/\sqrt{\epsilon^2(W) - m_2^2}$  with  $\epsilon = (W - \mu_1 \mu_2 / W) / 2$ ,  $\mu_1 = m_1$ ,  $\mu_2 = m_1 - m_2$ .

For the construction of the operator  $A$  and the vector  $e_0$  wave functions with two components are introduced into the investigation. If the operator  $A$  and the vector  $e_0$  are known the following equation can be found for the decay of the intermediary system  $C$ :  $i df/dt = H^* f$  with  $H^* f = M \phi f - (iP/2)(f, e_0) e_0$ .

If the masses of both particles are different from zero, the operator  $A$  has a continuous spectrum which fills the intervals:  $m_1 - m_2 \leq \lambda \leq m_1 + m_2$  and

$-m_1 - m_2 \leq \lambda \leq m_2 - m_1$ . This permits the following proof: If, at a certain moment, the incident wave is excluded, the mass of the produced particles  $C$  at

$t \rightarrow \infty$  tends towards a limit value that is different from zero and the stable particles are practically left over. An exception is formed only by the case

$m_2 = 0$  in which the spectrum of the operator  $A$  is reduced to the two points  $\pm m_1$ . Next, a formula for the scattering matrix is written down. Without

meeting with any difficulties also the equation of motion of the intermediary system in relativistically invariant form is found.

INSTITUTION:

LIFSCHITZ, M.S.

SUBJECT USSR/MATHEMATICS/Functional analysis CARD 1/1 PG - 807  
AUTHOR LIFSCHITZ M.S.  
TITLE The method of self-adjoint operators in the dispersion theory.  
PERIODICAL Uspechi mat.Nauk 12, 1, 212-218 (1957)  
reviewed 6/1957

With the notion of the intermediate kernel in the general dispersion theory the complex energy levels and the quasistationary states are combined; from the mathematical point of view it is the non-selfadjointness of the corresponding energy operator. In the present paper the author treats the close connection between the dispersion matrix of the intermediate kernel and the characteristic matrix function (see also: Lifschitz, Mat.Sbornik, n. Ser. 34, 145-198 (1954)) of its energy operator. After the dispersion matrix the energy operator is determined in certain cases.

Livshits M.S.

AUTHOR: BRODSKIY, M.S., LIVSHITS, M.S.

42-1-1/13

TITLE: Spectral Analysis of Non-Selfadjoint Operators and Intermediate Systems (Spektral'nyy analiz nesamosopryazhennykh operatorov i promezhutochnyye sistemy)

PERIODICAL: Uspekhi Matematicheskikh Nauk, 1958, Vol 13, Nr 1, pp 3-85 (USSR)

ABSTRACT: While the decomposition of a selfadjoint linear operator  $A$  into simplest operators can be carried out always with the aid of the so-called "decomposition of the unity", the decomposition of non-selfadjoint operators is very difficult even in finite-dimensional spaces. Only during the last years (also by numerous publications of the authors of the present paper) these difficulties partially could be put aside and a theory of non-selfadjoint operators could be obtained. In the present survey the results of this theory scattered over the whole literature are combined and ordered, where of course only the direction looked after by the authors is considered. This direction bases on the consideration of the so-called characteristic matrix function  $\omega(\lambda)$  of the operator  $A$ . This unique analytic function of the parameter  $\lambda$  is an invariant of the unitary transformations of the considered Hilbert space  $H$  and its decomposition into factors is connected closely with the determination of the

Card 1/2



Spectral Analysis of Non-Selfadjoint Operators and Intermediate Systems 42-1-1/13

invariant subspaces of the operator. In the last chapter of the present paper the developed theory is applied to the investigation of the intermediate systems which appear at collisions of elementary particles or of atomic nuclei. If the transition of a system from the initial state  $X$  to the final state  $Y = SX$  happens according to the scheme  $X \rightarrow C \rightarrow Y$ , then for the energy of the instable system  $C$  a non-selfadjoint operator  $A$  can be constructed, where it is stated that the  $S$ -matrix is identical with the characteristic matrix function of  $A$ . 28 Soviet and 9 foreign references are quoted.

AVAILABLE: Library of Congress  
Card 2/2 1. Mathematics 2. Spectral analysis

24(5)

SOV/20-126-3-25/69

AUTHOR:

Livshits, M. S.

TITLE:

Intermediate Systems in Quantum-electrodynamics (Promezhut-  
ochnyye sistemy v kvantovoy elektrodinamike)

PERIODICAL:

Doklady Akademii nauk SSSR, 1959, Vol 126, Nr 3,  
pp 550 - 553 (USSR)

ABSTRACT:

Basing upon the conception of the intermediate system, ex-  
pressions are developed in the present paper for the matrix  
elements of various processes of quantum-electrodynamics. The  
scattering of two free particles is investigated, and it is  
assumed that it develops in the following form: During the  
first stage, the two particles vanish with the simultaneous  
occurrence of the intermediate system. In the second stage,  
the intermediate system vanishes, and two new particles in  
new states are formed. In earlier papers by the author (Refs  
1,2,3) it was shown that the behavior of the intermediate  
system is described by the operator given by formula (1). In  
formula (2) the scattering matrix is given and it is further  
mentioned that both formulas are correct both in the case of  
weak and strong interaction. It is shown that matrix (2) can  
be approximated by matrix (3) in the case of weak interaction.

Card 1/2

Intermediate Systems in Quantum-electrodynamics

SC7/20-126-3-25/69

The further contents of the present paper is an investigation of concrete problems of quantum-electrodynamics. The scattering of a photon by a free electron is investigated. First, the two possible ways of transition from one state of a particle into another is given and for the first (weak interaction) the elements of matrix (2) are deduced for various directions of the relative motion of the colliding particles by means of the operator (1). Likewise, the elements of the approximation matrix (3) are calculated, and the latter are specialized for the mass center of the system. In a similar manner the elements of the matrix for the second way (strong interaction) are developed. In the last part of the paper the scattering of a positron by an electron is investigated. Further, the two possible ways are given, and the calculation of the elements of the approximation matrix and of the exact matrix is carried out in an analogous manner. There are 5 Soviet references.

ASSOCIATION: Khar'kovskiy gornyy institut (Khar'kov Mining Institute)

PRESENTED: January 15, 1959, by N. N. Bogolyubov, Academician

SUBMITTED: August 8, 1958

Card 2/2

86031

S/020/60/135/003/009/039  
B019/B077

9,3230 (include 3403)

AUTHORS: Livshits, M. S. and Flekser, M. Sh.

TITLE: Reduction of a Reactive Four-pole Into a Series of Simple Four-poles

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 135, No. 3, pp. 542 - 544

TEXT: The authors start their investigation with the following relations between the four-pole terminal voltage and the current  $E = U \exp(-i\omega t)$  and  $i = I \exp(-i\omega t)$  and define the vectors  $\vec{x}_1$

$$\vec{x}_1 = \begin{pmatrix} U_1 \\ I_1 \end{pmatrix} \text{ and } \vec{x}_2 = \begin{pmatrix} U_2 \\ I_2 \end{pmatrix}$$

and their components are the input and output voltage and current amplitudes. A linear relation exists between  $\vec{x}_1$  and  $\vec{x}_2$  which is written as a matrix  $S(\omega)$  whose elements are a function of  $\omega$ : ✓

Card 1/4

86031

Reduction of a Reactive Four-pole Into a Series of Simple Four-poles

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B019/B077

$\vec{x}_2 = S(\omega)\vec{x}_1$ , where  $S(\omega) = \begin{pmatrix} s_{11}(\omega) & s_{12}(\omega) \\ s_{21}(\omega) & s_{22}(\omega) \end{pmatrix}$

S(ω) is called a four-pole transmission matrix; a chain type connection of four-poles corresponds to an expansion of the matrix S(ω) in factors: S(ω) = S<sub>n</sub>(ω)S<sub>n-1</sub>(ω)...S<sub>1</sub>(ω), where the S<sub>i</sub>(ω) are the transmission matrices

of each term. In the following, the authors limit their work to passive four-poles with reactive elements only. In this case the elements of S(ω)

have the following forms: s<sub>11</sub>(ω) = f<sub>11</sub>(ω<sup>2</sup>), s<sub>12</sub>(ω) = iωf<sub>12</sub>(ω<sup>2</sup>), s<sub>21</sub>(ω)

= iωf<sub>21</sub>(ω<sup>2</sup>), s<sub>22</sub>(ω) = f<sub>22</sub>(ω<sup>2</sup>), where f<sub>ik</sub> are the rational functions with real coefficients. The matrix S(ω) is called a reactive matrix when the assumption is satisfied that there is no negative output at the terminals of a four-pole; this leads to a transformation from a reactive four-pole to chain type connections of simple four-poles which can be represented by reactive factors of the S-matrix. In the following, the authors base their work on that of V. P. Potapov and Yu. P. Ginzburg and prove the theorem

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Card 2/4

860E

Reduction of a Reactive Four-pole Into a  
Series of Simple Four-poles

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B019/B077

that any reactive four-pole can be replaced by an equivalent chain of simple non-reducible four-poles shown in Fig. 2 where the last element has to be an ideal transformer. There are 2 figures and 5 references: 4 Soviet and 1 German.

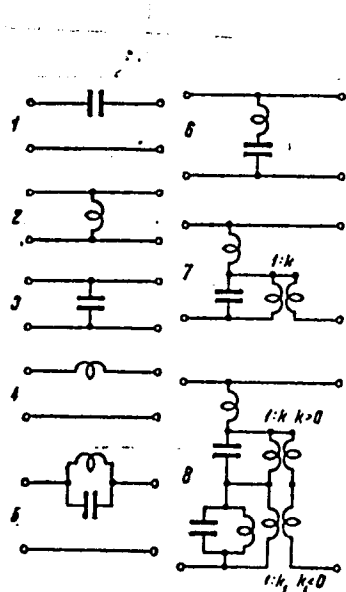
ASSOCIATION: Khar'kovskiy gornyy institut (Khar'kov Mining Institute)

PRESENTED: June 6, 1960, by N. N. Bogolyubov, Academician

SUBMITTED: April 20, 1960

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Card 3/4



PHC. 2 (Fig. 2)

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B019/B077

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Card: 4/4

S/109/62/007/002/012/024  
D201/D303

9.1300

AUTHOR: Livshits, M.S.

TITLE: The method of non-self-conjugate operators in the waveguide theory

PERIODICAL: Radiotekhnika i elektronika, v. 7, no. 2, 1962,  
281 - 297

TEXT: The author applies the spectral analysis of non-self-conjugate operators to determine the field inside a resonator (or any other inhomogeneity) at the end of a waveguide or a coaxial line. If the dependence of the dispersion matrix on frequency  $\omega$  is known, the solution is sought in the form of series of orthonormal fields which may be found by triangulation of the Maxwell operator at non-self-conjugate boundary condition, without solving the Maxwell's equations. If required, the model field may be evaluated to any degree of accuracy from the solution of a certain non-self-conjugate boundary problem in Maxwell's equations, for which the Maxwell operator becomes a non-self-conjugate operator. An equation is derived

Card 1/2

✓  
B



LIVSHITS, M.S.; NIKOL'SKIY, V.V.; SUKHOV, V.G.

Self-adjoint operator method in the theory of waveguides. Radiotekh.  
i elektron. 8 no.10:1798 0 '63. (MIRA 16:10)

LIVSHITS, M.S.

Linear physical systems linked with the outer world by  
communication channels. Izv. AN SSSR. Ser. mat. 27 no.5:  
993-1030 S-0 '63. (MIRA 16:11)

LIVSHITS, M.S.

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Open systems as linear automata. Izv. AN SSSR. Ser. mat. 27  
no.6:1215-1228 N-D '63. (MIRA 17:1)

ACC NR: AM6031227

Monograph

UR/

Livshits, Mikhail Samuilovich

Operators, oscillations, and waves; open systems (Operator, kolebaniya, volny; otkrytyye sistemy) Moscow, Izd-vo "Nauka", 1966. 298 p. illus., biblio. Errata slip inserted. 12,000 copies printed.

TOPIC TAGS: functional analysis, open system, operator theory, non self adjoint operator, *mathematic operator*

PURPOSE AND COVERAGE: This book is an attempt to establish a physical interpretation of the theory of non-self adjoint operators. The theory of open systems (physical systems, such as waveguides, antennas, and others connected with the outside world by communication channels through which waves of various types can propagate) developed in this book, which extensively utilizes the theory of non-self adjoint operators, is an important step in this direction. Some characteristic features of such theories for systems with a finite number of linear, independent, communication channels are presented. The application of the theory of open systems to various problems of the theory of oscillations and wave theory is analyzed and some illustrative examples are presented. The book is intended for mathematicians working with functional analysis and its applications, and also for physicists and engineers working with the quantum theory of scattering, radio physics, electric circuit theory, and acoustics.

Card 1/2

UDC: 517.5

ACC NR: AM6031227

TABLE OF CONTENTS (Abridged):

Foreword - 5

Introduction - 7

Ch. I. Basic concepts and equations - 10

Ch. II. The decomposition of open systems - 48

Ch. III. Models of open systems - 84

Ch. IV. Electric circuits - 125

Ch. V. Transformation of open systems - 152

Ch. VI. Systems with a finite number of degrees of freedom - 179

Ch. VII. Waveguides. The quantum-mechanical theory of scattering - 223

Ch. VIII. Transient motions of an open system - 263

Bibliography - 294

SUB CODE: 12/

SUBM DATE: 18Apr66/

ORIG REF: 062/

OTH REFL 010/

Card 2/2

LIVSHITS, M.Ya. [deceased].

~~Use of fine and shell sands in ordinary and lightweight concrete.~~  
Izv. AN Azerb. SSR no.6:29-42 Je '55. (MLRA 9:6)  
(Concrete)

AZRILENKO, B.S. [Asvylenko, B.S.]; LIVSHITS, M.Ya. [Livshyts', M.A.]

Use of ultrasonic waves for the manufacture of emulsions.  
Leh.prom. no.1:22-23 Ja-Mr '62. (MIRA 15:9)

1. Odesskaya dzhutovaya fabrika.  
(Emulsions) (Ultrasonic waves--Industrial applications)

LIVSHITS, M.Ya.

Use of reserpine for a patient with thyrotoxicosis and chronic nephritis with a nephrotic component. Trudy MONIKI no.5:231-232 '62. (MIRA 16:4)

1. Iz II terapevticheskoy kliniki Moskovskogo oblastnogo nauchno-issledovatel'skogo klinicheskogo instituta imeni Vladimirovskogo (zav. - doktor med.nauk L.P.Pressman). (THYROID GLAND--DISEASES) (KIDNEYS--DISEASES)  
(RESERPINE)



LIVSHITS, M. Z.

"Epidemiological Effect of Using Preparations of the DDT Type in the Control of Malaria in the Peat-Cutting Regions of Orekhovo-Zuyevo Rayon", Med. Paraz. i Paraz. Bolez., Vol. 17, No. 1, pp 26-30, 1948.

SHLENOVA, M.F.; NIKOPOROVA, A.V.; SERGIYEV, P.G., professor, direktor instituta;  
BEKLEMISHEV, V.N., professor, zaveduyushchiy otdelom: LIVSHITS, M.Z., za-  
veduyushchiy.

Development of a method for protecting a worker's settlement from pests in  
the peat fields. Med.paraz.i paraz.bol. no.4:322-331 J1-Ag '53.  
(MLRA 6:9)

1. Entomologicheskiy otdel Instituta malyarii, meditsinskoy parazitologii i  
gel'mintologii Ministerstva zdravookhraneniya SSSR (for Sergiyev and Bekle-  
mishev). 2. Orekhovo-Zuyevskaya protivomalyariynaya stantsiya (for Livshits).  
(Insects, Injuries and beneficial)

GRIGOR'YEVA, V.I.; LIVSHITS, N.A.

Blood proteins in pulmonary tuberculosis patients. Lab.delo 6  
no.1:8-11 Ja-Fe '60. (MIRA 13:4)

1. Iz kafedry tuberkuleza (zaveduyushchiy - prof. A.Ya. TSigel'nik)  
I Leningradskogo meditsinskogo instituta imeni I.P. Pavlova.  
(BLOOD PROTEINS) (TUBERCULOSIS)

LIVSHITS, N.A.

Subjgribbtte I schëtno-reshayushchiye ustroystva. L., Izv. Voenno-Elektrotekhn. Adad. (1940)

SO: Mathematics in the USSR, 1917-1947  
edited by Kurosh, A.G.  
Markushevich, A.I.  
Rashevskiy, P.K.  
Moscow-Leningrad, 1948

LIVSHITS, N. A.

*Properties of Circuits*

1171 THE FUNDAMENTAL CIRCUITS OF CONTACTS-  
CONTROLLING AND SELECTING SYSTEMS - N. A.  
LIVSHITS, N. N. KLYUEV, & A. P. MASOVSKIY  
(*Elektronika & Telemechanika* (in Russian), No. 1  
1971, pp. 25-30)

The disadvantages of electro-mechanical devices used in controlling and selecting systems are pointed out and a number of suitable valve circuits free from relays or moving parts are proposed. The circuits discussed are designed to perform the following functions: self-latching at the beginning of the signal impulse, self-latching at the end of the signal impulse, selection of signals lasting a predetermined time interval, self-releasing after a predetermined time interval, maintaining the voltage level of signal impulses, and selecting current impulses of different directions.

LIVSHITS, H. A.

Mr., Chair Theoretical Foundations. -1945-.

"Basic Calculations of Alternating Current Magnetic Chains with Cylinder and Plane Iron Cores," Zhur. Tekh. iz., 15, No. 11, 1945

FA 26T90

LIVSHITS, N. A.

USSR/Physics

Dec 1946

Coils - Magnetic Fields  
Magnetic Fields

"Magnetic Fields and Constants of DC Coils with a  
Magnetic Circuit of Two Infinite Coaxial Cylinders," N. A. Livshits, 10 pp

"Zhur Tekh Fiz" Vol XVI, No 10  
Theory for coils with magnetic circuits in the form  
of two infinite ferromagnetic coaxial cylinders.  
Determines the poles and distribution of magnetic  
flow in finite and infinite large outside radius  
of the surface slanting cylindrical layer. Complete  
analysis for equal and different magnetic perme-  
ability of cylinders. Determines the inductivity  
of coils and the mutual induction of two coaxial  
coils with the examined magnetic circuit.  
ID 26T90







AM4006612

BOOK EXPLOITATION

S/

Livshits, N. A.; Pugachev, V. N.

Probability analysis of automatic control systems. V. 1: Probability and statistical characteristics of effects and processes. Linear stationary and nonstationary systems (Veroyatnostny\*y analiz sistem avtomaticheskogo upravleniya. [t.] 1: Veroyatnostny\*ye i statisticheskiye kharakteristiki vozdeystviy i protsessov. Liney\*ye statsionarny\*ye i nestatsionarny\*ye sistemy\*). Moscow, "Sovetskoye radio," 1963. 895 p. illus., biblio., index. 12,000 copies printed.

TOPIC TAGS: automatic control, control system probability analysis, random disturbance function, linear steady state control system, control system transient process

PURPOSE AND COVERAGE: This book is intended for a wide circle of scientific personnel, aspirants, engineers, and students in schools of higher education specializing in various branches of the theory and techniques of automatic control and industrial automation. It could also be useful to technical personnel specializing in tele-

Card 1/4

AM4006612

mechanics, radio engineering, or radar or concerned with statistical problems. The book contains a systematic exposition of probability methods for the analysis of automatic control systems. This first volume deals with the probability and statistical characteristics of random processes and with methods for their determination and evaluation. The characteristics and probability analysis of linear stationary and nonstationary systems and methods to determine the accuracy of their operation are discussed. The characteristics of random processes occurring in these systems are being determined by the application to their arbitrary inputs of any number of both stationary and nonstationary random effects. The authors thank B. C. Dostupov and Ya. Z. Tsy\*pkina for their advice.

TABLE OF CONTENTS:

Foreword -- 3

Card 2/4

IVANOV, V.P.; LIVSHITS, N.D.; LIPOVOY, A.I.

Efficient design of rod bolting for the Mirgalinsay Mine.  
Gor. zhur. no.10:50-53 O '61. (MIRA 15:2)

1. Mirgalimsayskiy rudnik, g. Kentau.  
(Kantau region--Mine roof bolting)

LIVSHITS, N.D.; LIPOVOY, A.I., starshiy inzh. po rationalizatsii; LUNEV, I.N.

Practice of and prospects for using self-propelled equipment. Gor.  
zhur. no.3:20-23 Mr '62. (MIRA 15:7)  
(Mirgalimsay region—Mining machinery)

LIVSHITS, N.D.; NIVIN, A.F.

Rapid drifting. Gor. zhur. no.3:24-27 Mr '62.

(MIRA 15:7)

1. Zaveduyushchiy gornymi rabotami na Mirgalimsayskom rudnike (for Livshits).
  2. Gornyy master/gruppy po vnedreniyu novoy tekhniki na Mirgalimsayskom rudnike (for Nivin).
- (Mirgalimsay region--Mining engineering)

**"APPROVED FOR RELEASE: 06/20/2000**

**CIA-RDP86-00513R000930310009-6**

**APPROVED FOR RELEASE: 06/20/2000**

**CIA-RDP86-00513R000930310009-6"**

LIVSHITS, N. N.

"On the Laws of Binocular Color Mixture," Dok. AN,  
28, No. 5, 1940. Gorki All-Union Inst. Experimental  
Medicine, 1940-.



LIVSHITS, N.N.

Effect of X-ray irradiations of the cerebellar region on conditioned  
redlex activity in dogs. Trudy Inst.biol.fiz. no.1:50-62 '55.  
(X RAYS--PHYSIOLOGICAL EFFECT) (MLRA 9:9)  
(CEREBELLUM)  
(CONDITIONED RESPONSE)

LIVSHITS, N.N.

Effect of repeated total X-ray irradiation on conditioned food  
reflexes in dogs. Trudy inst.biol.fiz. no.1:63-78 '55. (MIRA 9:9)  
(X RAYS--PHYSIOLOGICAL EFFECT)  
(CONDITIONED RESPONSE)

LIVSHITS, N.N.

Voprosy Radiobiologii (Problems of Radiobiology), under the editorship of M. N. Pobedinskiy and P. N. Kiselev, Medgiz, 1956, 427 pp (from Meditsinskiy Rabotnik, 23 Oct 56)

This collection is devoted to a study of the action of ionizing radiations on the live organism on the basis of studies of the laboratory of the Central Scientific Research Roentgeno-Radiological Institute. (U)

Ocherki po Radiobiologii (Essays on Radiobiology); Prof A. M. Kuzin, editor in chief; Moscow, Publishing House of the Academy of Sciences USSR, 1956, 312 pp

This collection of essays includes the following: "The Biochemical Basis of the Biological Action of Ionizing Radiation," by A. M. Kuzin, pp 5-96; "Experimental Study of the Action of Ionizing Radiation of Mammals," by N. I. Shapiro, pp 97-150; "The Nervous System and Ionizing Radiation," by N. N. Livshits, pp 151-232; and "Morphological Changes of the Nucleus and Chromosomes Under the Action of Various Types of Radiation," by L. P. Breslavets, pp 233-311. (U)

Sum. 1322

LIVSHITS, N. N.

"Conditioned Reflex Activity of Dogs Due to Chronic Effects of Ionizing Radiation on the Brain," by N. N. Livshits, Institute of Biological Physics, Academy of Sciences USSR, Biofizika, Vol 1, No 3, 1956, pp 221-231

The present research is concerned with the chronic local effect of ionizing radiation on conditioned reflex activity of the cerebral cortex. Cobalt<sup>60</sup> with an activity of 5.04 millicuries was used as the source of ionizing radiation. Average dose was 1.61 r for 6-7 hours per day for 6 days per week over a period of several months.

In addition to the action of ionizing radiation on cortical activity a detailed blood study was conducted.

Sum 1239

The author concludes that chronic local effects of gamma radiation from cobalt<sup>60</sup> on brain of dogs subjected to average daily doses of about 10 r for 6-7 hours of exposure with a total dose of 500 r in 3 months caused acute, long-lasting changes in conditioned reflex activity. The reaction of the cerebral cortex to the action of ionizing radiation depends on the typological characteristics and on the original conditioned reflex background of the animal. Dogs with a weak type of higher nervous activity but with comparatively stable conditioned reflex background showed decreased conditioned reflexes and abrupt circular disturbances of higher nervous activity. Dogs of a weak type with irregular conditioned reflex background exhibited a temporary normalization of conditioned reflex activity.

*Sum 1239*

USSR/human and Animal Physiology - The Nervous System.  
Abs Jour : Ref Zhur - Biol., No 2, 1958, 9052

V-10

Author : N.N. Livshits  
Inst :  
Title :

: The Problem of the Role of the Central Nervous System in  
the Reactions of the Blood to the Effect of Ionizing  
Radiation.

Orig Pub : Biofizika, 1956, 1, No 5, 452-462

Abstract : After a number of combinations of conditioned stimuli  
with irradiation with a dose of 40-100 r, it was possible  
to obtain among rats, rabbits and dogs conditioned reflex  
changes in one or several hematological indices. However,  
the full picture of the radiation reaction of the blood  
has not been reproduced. The difficulty in producing a  
similar conditioned reflex lies in the facts that these  
reactions are not protective in nature, but rather harmful  
to the organism. Apart from the humoral mechanism of the

@  
USSR

Name: LIVSHITS, Nataliya Naumovna

Dissertation: The Influence of the Electric Field  
of Ultrahigh Frequency and Ionized  
Radiations upon the Central Nervous  
System

Degree: Doc Biol Sci

Affiliation: Inst of Biol Physics, Acad Sci USSR

Defense Date, Place: 28 Nov 55, Council of Military-  
Medical Order of Lenin Acad imeni  
Kirov

Certification Date: 12 Jan 57

Source: BMVO 7/57

000930310

LIVSHITS, N.N.

Effect of ionizing radiations on the functions of the nervous system.  
Itogi nauki.Biol. nauki no.1:262-283 '57. (MIRA 11:3)  
(RADIATION--PHYSIOLOGICAL EFFECT) (NERVOUS SYSTEM)



USSR/Human and Animal Physiology -(Normal and Pathological). T-12  
Nervous System. Higher Nervous Activity. Behavior.

Abs Jour : Ref Zhur - Biol., No 11, 1958, 51309

Author : Livshits, N.N.

Inst : -

Title : Conditioned Reflex Activity in Dogs in the Presence of  
Locally Applied UHF [Ultra-High Frequency] Fields to  
Certain Zones of the Cortexes of the Large Hemispheres.

Orig Pub : Biofizika, 1957, 2, No 2, 197-208

Abstract : Locally applied bilateral excitations of hearing zones of  
husky dogs by a 7-55 volt strong UHF [ultra-high frequen-  
cy] field, conducted through a ring electrode (24 mm in  
diameter) which was attached to the skin, proved to effect  
almost exclusively conditioned reflexes (CR) only, which  
were connected with acoustic analyzers. In less husky  
dogs, such induction impeded the function of all the inves-  
tigated analyzers. Induction of the UHF field into

Card 1/2

- 117 -

~~LIPSHITS, N.N.~~

Role of the nervous system in the reactions of the organism to  
ultrahigh-frequency electromagnetic fields. Biofizika 2 no.3:  
378-389 '57. (MIRA 10:8)  
(MICROWAVES--PHYSIOLOGICAL EFFECT)  
(NERVOUS SYSTEM)

USSR/Human and Animal Physiology (Normal and Pathological)  
Nervous System. Higher Nervous Activity. Behavior. T

Abs Jour : Ref Zhur Biol., No 6, 1959, 27060

Author : Livshits, N.N.

Inst : Academy of Sciences USSR

Title : Conditioned-Reflex Activity of Dogs under the Influence  
of a Field of Ultra-High Frequency on the Region of  
Cerebellum.

Orig Pub : Dokl AN SSSR, 1957, 112, No 6, 1145-1148

Abstract : In influence on the region of cerebellum of dogs of an  
ultra-high frequency field with frequency of 50 Mgc,  
power 7-12 v. for the duration of 5-10 min, disturbance  
of motor functions and changes of salivary alimentary  
conditioned reflexes (CR) were not noted. After irra-  
diation, or by the 2-3rd day in dogs of strong type, a

Card 1/2

- 133 -

USSR/Human and Animal Physiology (Normal and Pathological) T  
Nervous System. Higher Nervous Activity. Behavior.

Abs Jour : Ref Zhur Biol., No 6, 1959, 27060

1-2 day long decrease of CR to various stimuli and weakening of differentiating inhibition were noted. Under 25-45 v, appearance of an equating phase was noted. Repeated influences were ineffective. In dogs of weak type, changes in CR under 10-14 v. were not discovered; however, under 25-45 v, total loss of CR in the course of 2-3 days was observed. Decrease of reactivity in repeated doses were not observed. Influencing with large doses (40-50 v. 10 min) were accompanied by defensive reactions and disturbances of coordination movements. In dogs with unstable CR, multiple irradiation of 10-20 v may lead to prolonged normalization of CR. -- R.M. Meshcherskiy

Card 2/2

KUZIN, A.M., prof., otvetstvennyy red.; LIVSHITS, N.N., red.; SHAPIRO, F.B., red.; EYDUS, L.Kh., red.; IOFFE, V.G., red. izd-va; POLYAKOVA, T.V., tekhn. red.

[Radiobiology; proceedings of a conference] Radiobiologiya; trudy konferentsii. Moskva, Izd-vo Akad. nauk SSSR, 1958. 286 p.

(MIRA 11:5)

1. Vsesoyuznaya nauchno-tekhnicheskaya konferentsiya po primeneniyu radioaktivnykh i stabil'nykh izotopov i izlucheniya v narodnom khozyaystve i nauke, 1957. 2. Institut biofiziki AN SSSR (for Kuzin)

(RADIATION--PHYSIOLOGICAL EFFECT)

LIVSHITS, N.N.

Effect of the ultrahigh-frequency field on the function of the nervous system. Biofizika 3 no.4:426-437 J1-Ag '58 (MIRA 11:8)

1. Institut biologicheskoy fiziki AN SSSR, Moskva.  
(MICROWAVES--PHYSIOLOGICAL EFFECT)  
(NERVOUS SYSTEM)

LIVSHITS, N.N.

Various problems connected with the statistical treatment of the results of conditioned reflex experiments. Zhur. vys. nerv. deiat. 10 no. 5:792-799 S-0 '60. (MIRA 13:12)

1. Institut biofiziki Akademii nauk SSSR, Moskva.  
(CONDITIONED RESPONSE)

PHASE I BOOK EXPLOITATION SOV/5868

Livshits, N. N.

Vliyaniye ioniziruyushchikh izlucheniye na funktsii tsentral'noy nervoy sistemy (Effect of Ionizing Radiation on the Functions of the Central Nervous System) Moscow, Izd-vo AN SSSR, 1961. 179 p. Errata printed on the inside of back cover. 3500 copies printed.

Sponsoring Agency: Akademiya nauk SSSR. Institut biologicheskoy fiziki.

Resp. Ed.: G. M. Frank, Corresponding Member, Academy of Sciences USSR; Ed. of Publishing House: T. S. Tsuzmer; Tech. Ed.: L. A. Sushkova.

PURPOSE : This book is intended for specialists in radiation medicine and for those interested in the effects of ionizing radiation on the nervous system.

Card 1/7



Effect of Ionizing Radiation (Cont.)

SOV/5868

COVERAGE: The book is a review and summary of the most important publications from 1954 to 1959 on the effect of radiation on the functions of the central nervous system and is, in the opinion of the editor, one of the most complete reviews of its kind. The present work is an enlarged and reworked version of a monograph which the author wrote at the suggestion of the editors of the biophysical journal Advances in Biological and Medical Sciences. In the compilation of this work, the author attempted to draw only on sources which have been published in their entirety; authors' abstracts and reviews of papers and studies have been used only in exceptional cases. Citations from the sources are made without any regard to the date of publication of a given work, but only as the content and exposition require. A brief review of the literature in the field and some indications of the best bibliographic sources on various phases of the problem have been included. No personalities are mentioned. There are 356 references: 269 Soviet, 78 English, 5 German, 2 Italian, 1 French, and 1 Czech.

Card 2/7

Effect of Ionizing Radiation (Cont.)

SOV/5868

TABLE OF CONTENTS:

Preface	3
Introduction	5
Ch. I. Effect of Irradiation on the Functions of the Cerebral Hemispheres	8
Effect of acute total-body irradiation	8
Effect of fractionized and chronic total-body irradiation	21
Effect of internal irradiation	30
Effect of acute and fractionized doses of irradiation to the head	34
Effect on higher nervous activity of irradiation of nerve units situated outside the cortex	45
Effect on the cortex of local irradiations of sections of the body	47

Card 3/7

Effect of Ionizing Radiation (Cont.)	SOV/5868	
Dependence of radiation reactions of the cortex on the type of higher nervous activity and the functional state of the nervous system		50
Ch. II. Effect of Irradiation on the Functions of the Medulla, the Cerebellum, and on Certain Other Parts of the Brain		53
Ch. III. Effect of Irradiation on the Functions of the Spinal Cord		61
Ch. IV. Effect of Irradiation on the Afferent Systems		64
Ch. V. General Observations on the Effect of Ionizing Radiation on the Nervous System		68
Ch. VI. Effect of Irradiation in the Embryonic and Early Post Partum Periods on the Functions of the Central Nervous System		73

Card 4/7

Effect of Ionizing Radiation (Cont.)	SOV/5868	
Ch. VII. Ionizing Radiation as an Irritant of the Central Nervous System		80
Ch. VIII. Effect of Irradiation on the Nervous Regulation of the Involuntary Functions and Nutrition of the Tissues		87
Effect of direct irradiation on the nerve centers		88
Effect of irradiation on the nervous regulation of the functions of the cardiovascular system and on breathing		90
Effect of irradiation on temperature regulation		102
Effect of irradiation on the nervous regulation of the functions of the stomach and the intestinal tract		106
Some data on the participation of the reflex arc in the radiation reaction of the blood system		110
Role of the nervous system in the radiation reactions of certain internal secretion glands		115
Effect of irradiation on the nervous regulation of the permeability of the histohematic barriers		117

Card 5/7

Effect of Ionizing Radiation (Cont.)	SOV/5868	
Effect of irradiation on the nervous control of cell division in the tissues		118
Some data on the role of the central nervous system in compensating processes during irradiation		118
Ch. IX. Effect of Irradiation on Blood Circulation of the Brain and on the Permeability of the Hemoencephalic Barrier		124
Ch. X. In Vivo Investigation of Certain Elementary Radiation Reactions of the Central Nervous System		126
Ch. XI. Dependence of Radiation Reactions of the Central Nervous System on the Dosage, Time Factor, and Dose History		130

Card 6/7

Effect of Ionizing Radiation (Cont.)

SOV/5868

Conclusion

141

Bibliography

157

AVAILABLE: Library of Congress

SUBJECT: Biology and Medicine

Card 7/7

IS/wrc/jw  
1/8/62

LIVSHITS, N.N.; MEYZEROV, Ye.S.

Effect of prolonged action of conditioned stimuli previously combined with X irradiation on the leucocyte and lymphocyte content of peripheral blood. Radiobiologiya 1 no.2:223-226 '61. (MIRA 14:7)

1. Institut biologicheskoy fiziki AN SSSR, Moskva.  
(X RAYS--PHYSIOLOGICAL EFFECT) (LEUCOCYTES)  
(CONDITIONED RESPONSE)

S/865/62/002/000/019/042  
D405/D301

AUTHORS: Luk'yanova, L.D., Livshits, N.N., Apanasenko, Z.I.  
and Kuznetsova, M.A.

TITLE: Long-range effect of space flight on higher nervous  
system and some unconditional reflexes

SOURCE: Problemy kosmicheskoy biologii. v. 2. Ed. by N. Sise-  
kyan and V. Yazdovskiy. Moscow, Izd-vo AN SSSR, 1962,  
192-205

TEXT: The higher nervous activity of rats prior to, and  
after flight on the Second Space Ship was investigated, as well as  
the vestibular reflexes, the latent period of the unconditional  
motric defensive reflex and the spontaneous bioelectric muscular  
activity of guinea pigs. Simultaneously, the morphological state  
of the peripheral blood, weight, and general condition were studied.  
The experiments were conducted on white male-rats by Kotlyarevskiy's  
method. Conclusions: The flight on the Second Space Ship did not  
lead to appreciable changes in the conditional reflex activity of

Card 1/2



Long-range effect ...

S/865/62/002/000/019/042  
D405/D301

the two white rats during the period of the experiments (from the fourth day after landing to the natural death of the animals). The flight of the guinea pig on the Fourth Space Ship did not lead to changes in the latent period of the unconditioned reflex. An increase in the spontaneous bioelectric activity of the extremity muscles was observed in the guinea pig after the flight. In the latter, a decrease in the latent period of the vestibular reflex and an increase in its activity was also observed. It is suggested that the change in the characteristics of the vestibular reflex, observed in the guinea pig after the flight, is related to functional changes in the afferent or central neurons, and possibly in both these types of neurons. There are 7 figures.

Card 2/2

LIVSHITS, D. N.

SESSION E-5-7: Bioelectric Effects II.

(a)  
The Time Factor in the Reaction of the Central Nervous System to Radiation

N. N. Livshits, E. S. Melzerov, Z. I. Apanasenko, and M. A. Kuznetsova

The latent period of the flexory defensive reflex in rabbits subjected to 400 r total X-irradiation, given either in a single dose or in doses of 10 r daily, five times weekly, was substantially the same for the two methods of exposure. The electrical conductivity of the encephalic cortex of white rats showed that a 600 r  $\gamma$ -irradiation of the animals at 0.5 r/min affects the dynamics of the electric resistance of the brain considerably more than the same dose given daily was found to be less affected than after acute irradiation at a dose rate of 83 r/min. The leucopaenic reaction of peripheral blood of the animals in all three cases was found to be more sudden in the case of acute exposure, i.e. for higher dose rates.

Thus, within the dose range of 160-600 r, we found, in all three tests used, either an equivalent or a higher degree of damage to the central system with the chronic, protracted or fractionated irradiations than with the acute irradiations. In contrast, the injuries in peripheral blood are more substantial in the case of acute irradiations.

*Institute of Biophysics, Academy of Sciences, Moscow, USSR*

report presented at the 2nd Intl. Congress of Radiation Research,  
Harrogate/Yorkshire, Gt. Brit. 5-11 Aug 1962

URBAKH, Viktor Yul'yevich; LIVSHITS, N.N., doktor biol. nauk, otv. red.;  
URMANTSEV, Yu.A., red. izd-va; GOLUB', S.P., tekhn. red.

[Mathematical statistics for biologists and medical men] Matema-  
ticheskaya statistika dlia biologov i medikov. Moskva, Izd-vo  
Akad. nauk SSSR, 1963. 322 p. (MIRA 16:2)  
(Biomathematics)

L 17052-63

EWT(m)/BDS/ES(j) AFPTC/ASD/

S/205/63/003/002/012/024

AFWL AR/K

AUTHORS: Livshits, N. N., and Meyzerov, Ye. S.

57  
56

TITLE: The effect of chronic irradiation<sup>9</sup> of the head with Co<sup>60</sup> on the higher nervous activity of dogs

PERIODICAL: Radiobiologiya, v. 3, no. 2, 1963, 224-229

TEXT: The chronic  $\gamma$ -irradiation of dogs head's for 7-7.5 hours per day 6 days per week with a daily dose about 5 r causes definite and prolonged hindering of the function of the cerebral cortex, which is expressed in the increased number of cases of disruption of the higher nervous activity (phase phenomena, poor differentiation, lag or absence of the natural motive feeding reflex). A comparison of the results of this work with previous published data show that in chronic irradiation of the head with the same method in the same total dose, but with doubling the intensity of dose, the increase of irradiation increases with sharp total x-ray irradiations in doses of 200-400 r. There was no damaging effect observed on the function of cerebral cortex as compared with the chronic irradiation of the head in doses of 500 r with smaller intensity of radiation. After fractionated irradiations with large intensity of dose the normalization of conditioned reflex activity occurs no later than during chronic irradiation of the head with smaller intensity of doses.

Card 1/2

L 17057-63

The effect of .....

S/205/63/003/002/012/024

The authors believe that the cause, for increased rate of realization of dose in definite limits does not increase the reaction of blood to irradiation, is the activation of compensating processes. The article contains 1 figure and a 20-item bibliography.

ASSOCIATION: Institut biologicheskoy fiziki AN SSSR (Institute of Biological Physics, Academy of Sciences USSR), Moscow

SUBMITTED: April 5, 1962

Card 2/2

LIVSHITS, N.N., doktor biol. nauk, otv. red.; IZOSIMOV, G.V., red.

[Effect of ionizing radiation and dynamic factors on functions of the central nervous system; problems of space physiology] Vliianie ioniziruiushchikh izlucheni i dinamicheskikh faktorov na funktsii tsentral'noi nervnoi sistemy; voprosy kosmicheskoi fiziologii. Moskva, Nauka, 1964. 196 p. (MIRA 17:11)

FRANK, G.M., otv. red.; KUZIN, A.M., otv. red.; KUZNETSOV, I.V.,  
doktor filos. nauk, red.; LIVSHITS, N.N., doktor biol.  
nauk, red.; VEDENOV, M.F., kand. filos. nauk, red.;  
SHATALOV, A.T., mlad. nauchn. sotr., nauchn. red.;  
KREMYANSKIY, V.I., mlad. nauchn. sotr., nauchn. red.

[The essence of life] O sushchnosti zhizni. Moskva, Nauka,  
1964. 350 p. (MIRA 17:8)

1. Akademiya nauk SSSR. Nauchnyy soviet po filosofskim vop-  
rosam yestestvoznaniya. 2. Institut filosofii AN SSSR (for  
Kremyanskiy, Shatalov). 3. Chlen-korrespondent AN SSSR (for  
Frank, Kuzin).

URBAKH, Viktor Yul'yevich; LIVSHITS, N.N., doktor biol. nauk,  
otv. red.; BOL'SHEV, L.H., kand. fiz.-mat.nauk, red.

[Biometric methods; statistical processing of experi-  
mental data in biology, agriculture and medicine] Bio-  
metricheskie metody; statisticheskaya obrabotka opyt-  
nykh dannykh v biologii, sel'skom khoziaistve i medi-  
tsine. Moskva, Nauka, 1964. 415 p. (MIRA 18:1)



11 4729-86 EEC(k)-2/SWP(1)/FCC/PSS-2 SCTB TT/DD/RE/GW

ACC NR: AP6031663

SOURCE CODE: UR/0216/66/003/005/0625/0643

AUTHOR: Frank, G. M.; Livshits, N. N.; Arsen'yeva, M. A.; Apanasenko, Z. I.;  
Belyayeva, L. A.; Colovkina, A. V.; Klimovitskiy, V. Ya.; Kuznetsova, M. A.;  
Luk'yanova, L. D.; Meyzerov, Ye. S.

70  
69  
B

ORG: Institute of Biological Physics, AN SSSR (Institut biologicheskoy fiziki AN SSSR)

TITLE: The combined effect of spaceflight factors <sup>✓</sup> on some functions of the organism

SOURCE: AN SSSR. Izvestiya. Seriya biologicheskaya, no. 5, 1966, 625-643

TOPIC TAGS: central nervous system, biologic oxidation, biologic metabolism, reflex activity, brain tissue, radiation effects, ~~ionizing~~ radiation biologic effect, *ionizing radiation*

ABSTRACT: Results of experiments studying the combined effect of spaceflight factors (acceleration, vibration, and radiation) on some functions of the organism (brain hemodynamics, CNS functions, and cell division of hematopoietic organs) are discussed. Tolerance of the CNS to accelerations depends significantly on changes of brain hemodynamics during accelerations. Brain blood flow in rabbits subjected to centrifugal accelerations in the head-foot direction (5 G in head region and 10 G in pelvis region) for 12 to 60 sec decreased. This reaction was insignificant during the first exposure, sharply increased during repeated exposure, and weakened after chronic exposure, thus indicating that tolerance to accelerations can be

Card 1/3

UDC: 611.8:629.195.2

L 47293-66

ACC NR: AP6031663

increased by training. Participation of CNS reflex mechanisms in these processes is probable. The 15-min exposure of guinea pigs to radial accelerations (8 G), centrifuged twice with a one-day interval, increased the spontaneous bioelectrical activity of extensor muscles; however, the effect was not lasting. It was lowered the day after the second centrifugation and was essentially the same as the control from the sixth day. The 15-min exposure of the animals to vibrations (70 cps, 0.4 mm amplitude), twice with a one-day interval, produced less distinct but more stable changes, with normalization more than 25 days after the first vibration exposure. Changes in myoelectric activity during spaceflight (Sputnik-4) incorporated features of both acceleration and vibration effects, appreciably exceeding them in intensity. Oxidation processes in brain tissues, judged by PO<sub>2</sub> and "oxygen test" results, were initially increased in intensity by the effect of vibrations (using the above parameters), and subsequently underwent phase changes, including depression of oxidation metabolism during the aftereffect period. Changes in unconditioned defense and vestibulotonic reflexes and upper nervous activity were observed later than 12 days after vibration. Inhibition of food-procuring conditioned and defensive unconditioned reflexes in the majority of animals, with pronounced paratibiotic phenomena, was also found. Exposure to 8-, 10-, and 20-G accelerations and vibration (700 cps, 0.005 mm, 60 min) resulted in decreased mitotic activity of bone-marrow cells for 30 days. Disturbances of cell division involved chromosomal stickiness and increase in the number of chromosomal aberrations. Ionizing radiations and the above dynamic factors produced a similar effect on oxidation metabolism in brain tissues and cellular division in hematopoietic organs. They differed

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L 47293-66

ACC NR: AP6031663

0

only in the level and dynamics of changes caused. The combined effect of irradiation and dynamic factors either did not exceed or was less than the effect of each of the indicated factors separately, a phenomenon seen as a radioprotective action of dynamic factors. The relations observed are similar to phenomena of dominance and parabiosis. Typical radiation reactions were intensified when irradiation was combined with factors having directly opposed effects. The variation and complexity of results of the combination of dynamic factors and irradiation are explained by the multiplicity of the mechanisms of the combined effect of radiation and nonradiation factors. The combined exposure to vibration and whole-body acute irradiation at a lethal dose shows that in a majority of cases the vibration effect on metabolism and CNS function was dominant at early stages, while that of irradiation prevailed at later stages. At the latest stages of exposure, the combined effect of vibration and irradiation was diverse and complicated. According to some indices, the trend of changes corresponded to the effect of one of the factors while the dynamics of the processes reflected the effect of the other one. Under the uniform action of both factors, the phenomena of partial summation of weakening of the radiation effect, and in several cases of a sharp increase of radiation effect by the opposite action of the vibration effect, were observed. Probable mechanisms of the phenomena described are considered. Orig. art. has: 13 figures.

[SW]

SUB CODE 06/ SUBM DATE: 14Dec65/ ORIG REF: 032/ OTH REF: 008/ ATD PRESS:

5095

Card 3/3

L 07474-67 EWT(1) SCTB DL/3D

ACC NR: AT6025374

SOURCE CODE: UR/0000/66/000/000/0068/0080

AUTHOR: Liyshits, N. N.; Meyzerov, Ye. S.

32  
B+1

ORG: none

TITLE: Influence of vortical <sup>2</sup>vibration and <sup>2</sup>noise on the conditioned reflexes of rats

SOURCE: AN SSSR, Institut biologicheskoy fiziki, Vliyaniye faktorov kosmicheskogo poleta na funktsii tsentral'noy nervnoy sistemy (Effect of space flight factors on functions of the central nervous system). Moscow, Izd-vo Nauka, 1966, 68-80

TOPIC TAGS: biologic vibration effect, conditioned reflex, rat, neurology, acoustic biologic effect, reflex activity, light biologic effect

ABSTRACT:

According to Soviet literature, vibration most often causes a decrease or distortion of positive conditioned reflexes. However, some researchers have reported cases of increased activity. Latent periods usually increase, but occasionally stabilize. The present study was designed to obtain additional data on the effects of whole-body vortical vibration on higher nervous activity.

Card 1/6.

UDC: 612.014.482

L 07474-67

ACC NR: AT6025374

The conditioned motor reflexes of rats were studied using a seven-component stereotype. A positive stimulus consisting of a 1000-cps tone ("TOH+") and light from a 2 w lamp were each used 3 times per test. Differentiation consisted of a 400 cps tone ("TOH-"), applied once per test. Food was denied animals for 4 hr before experimentation.

A total of 16 half-grown rats were used; 6 were exposed to vibration and 10 served as controls. Three experimental animals were used as controls before vibration tests. One experimental animal had unique higher nervous activity patterns and was not included in the statistically processed results. The remaining 5 experimental animals had 2 similarly behaved partners each in the control group.

Experimental animals were exposed to whole-body vertical vibration with an amplitude of 0.4 mm and frequency of 70 cps for 15 min. During the experiments the control partners were exposed to noise (75 db) from the vibration stand in nearby individual containers. The first and second exposures to vibration were separated by a two-week interval; the second and third exposures were separated by a one-week interval. Some results of these tests are shown in the following figures.

Card 2/6

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ACC NR: AT6025374

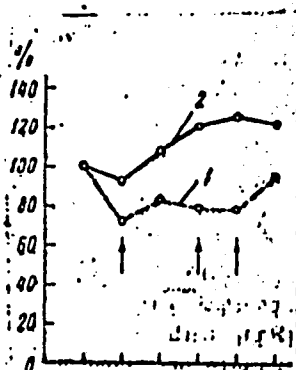


Fig. 1. The effect of vibration and noise on the mean total value of conditioned reflexes to positive stimuli. Abcissa- time after the test in weeks; Ordinate-mean total value of the strength of conditioned reflexes expressed in percent of the normal level (taken as 100%). The mean strength of the reflex before exposure to experimental parameters was determined from 20--30 tests on each mouse. Postexperimental values reflect 6 tests. 1 - mice exposed to both vibration and noise; 2 - mice exposed to noise; arrows-- exposures to experimental parameters.

Card 3/6

L 07474-67

ACC NR: AT6025374

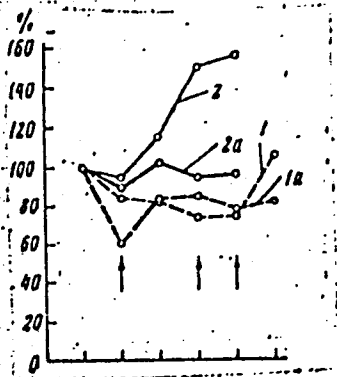


Fig. 2. The effect of vibration and noise on the mean strength of positive conditioned reflexes to a 1000-cps tone and light. Ordinate--mean strength of the conditioned reflex expressed in percent of the original value (taken as 100%). 1a, 2a -- 1000 cps tone; 1,2 light, Same conditions as for Fig. 1

Card 4/6

L 07474-67

ACC NR: AT6025374

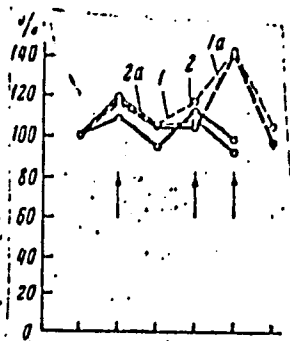


Fig. 3. The effect of vibration and noise on the mean latent periods of conditioned reflexes. Ordinate -- mean values of latent periods expressed percent of the original value (taken as 100%). 1a, 2a-1000 cps tone; 1,2-light; same conditions as for Fig. 1

From the figures it can be seen that there were significant differences between the combined effects of vibration and noise and the effect of noise alone. In the first case a general inhibition of conditioned reflexes was observed. The second parameter produced a significantly less pronounced local inhibition in the auditory analyzer. These changes in conditioned reflex activity of rats occurring under vibration/noise condi-

Card 5/6



L 07474-67

ACC NR: AT6025374

tions depend on individual features of higher nervous activity and on the initial level of conditioned reflex. In rats with a high level of conditioned reflex activity, development of protective inhibition was noted. In rats with a low level of conditioned reflexes, disinhibition of conditioned

reflexes and differentiation occurred.

Orig. art. has: 7 figures. [W.A. No. 22; ATD Report 66-99]

SUB CODE: 06 / SUBM DATE: 01Feb66

Card 6/6 *gd*

1. 07.77-67 INT (M) OD  
ACC NR: ATG025386

SOURCE CODE: UR/0000/66/000/000/0236/0251

AUTHOR: Livshits, N. N. and Moyzerov, Yo. S.

47

ORG: none

B+1

TITLE: Combined effects of ionizing radiations on the conditioned reflexes of rats

SOURCE: AN SSSR. Institut biologicheskoy fiziki, Vliyaniye faktorov kosmicheskogo poleta na funktsii tsentral'noy nervnoy sistemy (Effect of space flight factors on functions of the central nervous system). Moscow, Izd-vo Nauka, 1966, 236-251

TOPIC TAGS: biologic vibration effect, radiation biologic effect, ionizing radiation, rat, conditioned reflex, acoustic biologic effect, nervous system, physiologic parameter, light biologic effect

ABSTRACT:

Half-grown male Wistar rats were used in this experiment. The method of studying conditioned reflexes was identical to that described in a previous article.

The animals were divided into two groups. The first group was exposed to whole-body vertical vibration (70 cps, 0.4 mm) for 15 min. Immediately after exposure to vibration, the

Card 1/5

UDC: 612.014.482

L 07477-67

ACC NR: AT6025386

animals were exposed to a 50-r dose of ionizing radiation from an RUP-11 apparatus for 1.5 min. The second group, exposed to the same irradiation conditions, were placed near the vibration stand where they were subjected to noise (75 db) for 15 min. A control group was placed near the vibration stand and exposed to noise, and then placed in position for irradiation but not irradiated. Three tests were conducted in all. The interval between the first and second exposures was 14 days, and between the second and third exposures--7 days.

Half the animals in both experimental and control groups had high levels of conditioned reflexes, while the remaining animals showed somewhat lower levels. The method used to develop and eliminate conditioned reflexes was identical for all animals.

Uniformity of experimental and control animals was ensured by pairing animals with similar higher nervous activity patterns. Animals were used as controls before exposure to experimental parameters. An additional four animals, having lost partners due to disease or accident, were also studied but were not included in statistical data.

Card 2/5

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ACC NR: ATG025386

Both experimental and control animals remained healthy through the experiment. Table 1 shows body weight dynamics.

Table 1 - Body weight (% of original values)

Type of Exposure	1st		2nd		3rd		1wk		2 wks		3 wks			
	expo- sure	later	expo- sure	expo- sure	expo- sure	later	later	later	later	later	later			
vibration and radiation	102,1	104,2	102,0	103,7	104,7	105,1	104,4	101,0	104,0	104,0	103,8	102,1	100,5	105,5
radiation	102,3	102,1	103,8	105,7	100,8	-	-	-	-	-	-	-	-	-
control														

Card 3/5

L 07477-67

ACC NR: AT6025386

Some results of the experiment are summarized in Table 2.

Table 2. Differences in conditioned reflex changes as a function of exposure to radiation or radiation combined with vibration.

Index	Degree of Change		P (according to median)
	radiation	radiation plus vibration	
decreased mean total strength of conditioned reflexes	less	more	<0.01
decreased mean strength of conditioned reflexes to a positive tone	less	more	<0.05
decreased mean strength of conditioned reflexes to light	less	more	<0.01

Card 4/5

L 07477-67

ACC NR: AT6025386

It was found that the vibration effect predominated for six days after initial exposure to combined stresses. Similarity between conditioned reflex shifts in animals exposed to combined stresses and vibration alone was noted (previous article). This vibration dominance, which is more pronounced when lethal doses of radiation are used, has been previously observed by the author's colleagues.

After the second and third exposure to combined stresses, a cumulative effect on conditioned reflexes was noted. The locus and mechanism of the amplifying influence of vibration on radiation effects requires further, specialized investigations.

Orig. art. has: 7 figures and 2 tables. [W.A. No. 22; ATD Report 66-99]

SUB CODE: 06 / SUBM DATE: 01Feb66 / ORIG REF: 001

Card 5/5

ACC NR: AT6036640

SOURCE CODE: UR/0000/66/000/000/0259/0260

AUTHOR: Livshits, N. N.; Mayzerov, Ye. S.

ORG: none

TITLE: Combined effect of vibration and ionizing radiation on conditioned-reflex activity in rats [Paper presented at the Conference on Problems of Space Medicine held in Moscow from 24-27 May 1966]

SOURCE: Konferentsiya po problemam kosmicheskoy meditsiny, 1966. Problemy kosmicheskoy meditsiny. (Problems of space medicine); materialy konferentsii, Moscow, 1966, 259-260

TOPIC TAGS: space physiology, combined stress, biologic vibration effect, ionizing radiation biologic effect, conditioned reflex, central nervous system, rat

ABSTRACT:

Experiments were performed in order to determine the combined effects of radiation and vibration on higher nervous activity. Experiments were performed on rats of the "Wistar" strain. The animals were divided into four groups. Group I was subjected to vibration (70 cps, 0.4 mm, 15 min) followed by an x-ray dose of 50 r. Group II was exposed only to radiation (same dose as above). Group III was exposed to vibration alone (as above). Group IV served as controls. The animals were exposed to the stress factors three times, with a 14-day interval between the first and second exposures

Card 1/3

ACC NR: A16036640

and a seven-day interval between the second and third exposures.

After the first exposure to vibration, a weakening of conditioned reflexes was observed accompanied by a disruption of the proper power relationships. During the second week after exposure, a tendency was noted for higher nervous activity to return to preexposure levels.

Exposure to radiation caused an initial rise in conditioned-reflex activity, accompanied by correct power relationships. During the second week, a drop in conditioned-reflex activity was observed.

Rats which had been exposed to combined effects manifested primarily vibration influences during the first few days after the first exposure. During the second week after exposure, the dominant effect of vibration was replaced by a combination of vibration and radiation effects, with evidence of partial summation.

The second and third exposures to radiation caused a further drop in positive conditioned reflexes with a disruption of correct power relationships. Repeated exposures to vibration also caused a lowering of conditioned reflex activity accompanied by an increase in the number of phase

Card 2/3



ACC NR: AT6036640

phenomena, in approximately the same degree as after the first exposures.

Rats exposed to combined effects manifested a considerably less marked lowering of reflex activity than was observed as a result of exposure to either of the stress factors alone. According to this criterion, the effects of vibration and radiation showed results of complete summation. From certain other criteria it appeared that the effects of combined exposure resulted in an intermediate condition between the effects of vibration and of radiation. The predominant effects of vibration after repeated exposures to combined factors, which were noted by some experiments using other criteria, did not appear on the particular function being tested. In this case the effect of both factors showed summation. [W.A. No. 22; ATD Report 66-116]

SUB CODE: 06 / SUBM DATE: 00May66

Card 3/3

L 07476-67 EWT(1) SOTB DD/GD

ACC NR: AT6025370

SOURCE CODE: UR/0000/66/000/000/0003/0010

AUTHOR: Livshits, N. N. (Doctor of biological sciences)

36  
28  
B+

ORG: none

TITLE: Spaceflight factors on the central nervous system

SOURCE: AN SSSR. Institut biologicheskoy fiziki, Vliyaniye faktorov kosmicheskogo poleta na funktsii tsentral'noy nervnoy sistemy (Effect of space flight factors on functions of the central nervous system). Moscow, Izd-vo Nauka, 1966, 3-10.

TOPIC TAGS: central nervous system, vibration biologic effect, space medicine, ionizing radiation biologic effect

ABSTRACT:

This collection of articles was published by a group of bioastronautics specialists working at the Institute of Biological Physics, USSR Academy of Sciences. These reports reflect the latest developments in research on central nervous system reactions to the effects of space ionizing radiations and dynamic spaceflight factors. Much recent attention has been paid to the problem of vibration effects on the CNS. In spite of this growing interest, further studies are necessary to discover the adaptive mechanisms of the organism in response to this factor. The reports in this collection and in earlier research by Andreyeva-Galanina (1956, 1963), Andreyeva-Galanina,

Card 1/4

UDC: 612.014.482

L 07476-67

ACC NR: AT6025370

7

Drogichina et al. (1961), and Borshchevskiy et al. (1963) have shown that even small doses of vibration (less than those required to produce vibration sickness) have a profound effect on the CNS. M. A. Kuznetsova (1964) demonstrated that double exposure of guinea pigs to vibration altered the unconditioned motor defensive reflex no less markedly than a lethal dose of gamma radiation. More data reflecting further research along these lines is presented here in the abstracted articles of Kuznetsova, Livshits, and Meyzerov (p.10, 12, 29, and 36 of this report respectively).

One of the characteristic features of vibration is the considerable length of its aftereffect. Apanesenko (1964) and Kuznetsova (1964) found that a double exposure to vibration brought about shifts in vestibulotonic and defensive reflexes which persisted for 10--15 days. Prolonged postvibration changes in cerebral bioelectricity, conditioned, and unconditioned reflexes after single or multiple exposures to this factor are described in the works of Luk'yanova, Livshits, Kuznetsova, and Meyzerov (p.10, 12, 15, 16, 18, 29, and 36 of this report respectively). The coincidence of results obtained through different approaches demonstrates the common character of CNS responses to vibration.

Card 2/4

L 07476-67

ACC NR: AT6025370

Articles in this collection by Apanasenko, Livshits, and Meyzerov ( p. 7, 12, 29, and 36 respectively) are continuations of research reported in the first volume of this series. These studies strongly indicate that there are certain mechanisms which intensify CNS reaction to radiation, subduing or camouflaging protective mechanisms such as depression of oxidative processes in the CNS.

Equal interest has been shown in the dependence of CNS radiation reactions on time and the type of radiation; this is an important aspect of space radiation safety. The works of Apanasenko (1961), Kuznetsova (1961) and Livshits et al. (1962) demonstrated that the CNS, in particular, reacted to changes in dose power (differing from other systems of the organism in this respect). In this collection, particular emphasis is placed on the role of vestibular analyzer function in determining cosmonaut comfort and working capacity. Studies were conducted on vestibular function in response to various dose powers and durations of irradiation (p. 31 and 34 of this report).

Card 3/4

L 07475-67

ACC NR: AT6025370

Other articles singled out by the author of the introduction were Klimovitskiy's work on cerebral circulatory responses to radiation (p. 21) and three articles by Korolevskiy devoted to the comparative effects of gamma, neutron, and proton radiation on higher nervous activity -- a previously little studied area.

This volume of articles considered the following possible distinguishing features of space ionizing radiation effects: 1) difference in the rate of dose application; 2) change in the radiation spectrum; and 3) the combined effects of ionizing radiation and dynamic spaceflight stresses. All of these factors have a profound individual effect on the CNS. Dynamic factors in particular produce changes in the metabolism and function of this system. Continuation of research along these lines is strongly advised by the author. The problems considered here are also of interest in terms of general occupational hygiene.

[W.A. No. 22; ATD Report 66-997

SUB CODE: 06 / SUBM DATE: 01Feb66

Card

4/4 *gd*

ACC NR: AT6036639

SOURCE CODE: UR/0000/66/000/000/0257/0258

AUTHOR: Livshits, N. N.; Apanasenko, Z. I.; Kuznetsova, M. A.; Luk'yanova, L. D.;  
Meyzerov, Y. S.

ORG: none

TITLE: Combined effect of vibration and ionizing radiation on the metabolism and  
function of the central nervous system [Paper presented at the Conference on  
Problems of Space Medicine held in Moscow from 24-27 May 1966]

SOURCE: Konferentsiya po problemam kosmicheskoy meditsiny, 1966. Problemy  
kosmicheskoy meditsiny. (Problems of space medicine); materialy konferentsii,  
Moscow, 1966, 257-258

TOPIC TAGS: space physiology, combined stress, biolog/c vibration effect,  
ionizing radiation biologic effect, muscle physiology, electrophysiology, central  
nervous system, rat, rodent

ABSTRACT:

Rats and guinea pigs were exposed to the complex effects of vibration  
(70 cps, 0.4 mm, 15 min) before, or both before and after, exposure to a  
single lethal dose (500--600 r) of ionizing radiation. The effect of this  
particular combination of stress factors was tested on oxidative processes  
in the brain tissues, on the characteristics of the vestibular reflex, and  
on the bioelectrical activity of skeletal muscles in a state of relative rest.

Card 1/3

ACC NR: A16036639

Results showed a complete dominance of the effects of vibration.

Completely analogous results for vestibular reflexes were obtained when vibration was combined with prolonged gamma irradiation (500 r over a 14-hr period). Vibrational effects were also dominant with respect to conditioned feeding reflexes when vibration was followed by irradiation with a dose of 50 r.

This masking of the radiation effect was observed in those cases in which the effects of the two factors tended to counteract each other. But the masking effect was also observed when influences of the two factors were analogous and could be distinguished from each other only by their magnitude or dynamics. In this last case no summation of similar effects was observed, which can be attributed to the protective effect of vibration. The protective effect was confirmed by the fact that vibration tended to weaken leukopenia produced by radiation.

At the same time results were not completely uniform. The combined effect of vibration and either acute or fractionated irradiation on the basic characteristics of the unconditioned defense reflex showed that vibrational effects were dominant in some cases and radiation effects were domi-

Card 2/3

ACC NR: AT6036639

nant in others. Radiation effects tended to dominate as the time after exposure increased. Investigation of the oxidative processes in the brain tissues showed no summation of analogous effects even at the later stages of the investigation. However, when observations were made of functional changes of various parts of the central nervous system, a complex combined effect of both factors was found, which does not fit the pattern of the protective effects of vibration.

The variety of changes in radiation effects due to the influence of vibration can be explained by the multiplicity of mechanisms of combined effects of radiation and vibration. The more significant factors which can affect the influence of radiation are: the oxygen effect, changes in the functional condition of the central nervous system due to effects of vibration, interaction between centers of the nervous system, the course of reparative and compensatory processes, and others. [W. A. No. 22; ATD Report 66-116]

SUB CODE: 06 / SUBM DATE: 00May66

Card 3/3



ACC NR: AP6028171

SOURCE CODE: UR/0205/66/006/003/0411/0417

AUTHOR: Livshits, N. N.; Korolevskiy, A. P.

ORG: Institute of Biophysics, AN SSSR, Moscow (Institut biologicheskoy fiziki AN SSSR)

TITLE: Specific effects of various kinds of irradiation <sup>19</sup> on animal higher nervous activity

SOURCE: Radiobiologiya, v. 6, no. 3, 1966, 411-417

TOPIC TAGS: rodent, rat, central nervous system, induced radiation effect, particular radiation biologic effect, radiation tissue effect, conditioned reflex

ABSTRACT: The study deals with comparative effects of gamma, neutron and proton irradiation of varying strength (to 300 rad) on conditioned reflex activity of mice and rats. Upon a conditioned stimulation, the animals moved to a bowl set on an upper level with a 35° slope. The latency reaction period, speed of motion and length of the animals' stay at the bowl were registered automatically prior to and after the tests, which were conducted in groups of 5 animals distributed according to their type of higher nervous activity. In addition to the above, the absence of reaction and number of balancing and paradoxal reactions were also counted. The average values for each index were determined from 50 tests per 5 mice. The radiation effect was qualitatively the same but quantitatively different. After irradiation with neutrons, the latency

Card 1/2

UDC: 577.391:591.51

ACC NR: AP6028171

period increased in the overwhelming majority of animals and the speed and length of the animals' stay at the bowl decreased. The number of intermediate stage phenomena increased as did that of absent reactions, thus indicating a weakening of stimulatory processes. Gamma irradiation had a weaker effect and occasionally led to sharpened reflexes. The effect of protons was weakest and was also different. In rats irradiated with 150 rad, some indices of the stimulatory process increased, due probably to imbalance between stimulation and deceleration. This study method permits a qualitative comparison of the irradiation effects from various sources through serial comparison. The disturbance in higher nervous activity of these rodents subjected to total gamma, neutron (1.25 Mev) and proton (510 Mev) irradiation at various doses was greater, the greater the linear density of ionization. The RBE was  $> 1$  for neutrons and  $< 1$  for protons. Orig. art. has: 6 figures and 4 tables.

SUB CODE: 06, 07, 18/ SUBM DATE: 07Mar65/ ORIG REF: 009/ OTH REF: 002

Card 2/2

MESIATSEV, Pavel Pavlovich; LIVSHITS, Nina Samuilovna; TSIPULYAVSKIY,  
L.M., red.; KREYS, I.G., tekhn.red.

[Course in radio engineering; manual for students of pedagogical  
institutes] Kurs radiotekhniki; posobie dlia studentov pedago-  
gicheskikh institutov. Moskva, Gos.uchebno-pedagog.izd-vo M-va  
prosv.RSFSR, 1960. 241 p.

(MIRA 14:2)

(Radio)

LIVSHITS, N.S.

Methodology of determining the velocity and direction of the  
wind at great altitudes. Trudy VShO no. 5000-3 1964  
(MIRA 18:1)