CENTRAL INTELLIGENCE AGENCY

SCIENTIFIC INFORMATION REPORT

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PLEASE NOTE

This report presents unevaluated information extracted from recently received publications of the USSR and Eastern Europe. The information selected is intended to indicate current scientific developments and activities and is disseminated as an aid to research in the United States.

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I. BIOLOGY

Biochemistry

1. Shifts in Energy Levels Linked to Radio-Protective Capacity of Substances

"Energy Levels of Metastable States of Biological Objects and the Mechanism in the Action of Certain Radio-Protective Substances," by I. I. Sapezhinskiy and N. M. Emanuel', Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 132, No 6, 21 Jun 60, pp 1441-1443

In previous research by the authors (DAN, Vol 131, No 5, 60, 1168), it was shown that the action of gamma irradiation on proteins, DNA, and RNA leads to the rise of metastable (biradical) states which are analogous to those observed due to photostimulation of these important chemical cell components.

In this research, the authors studied the energy levels of metastable states to find the pathways of energy migration and the most vulnerable sites in various complex biological structures, and also, the fact that such research may point to possible lines for research on radio-protective substances.

Results of various tests are discussed and are presented in a table. They show the close coincidence of the wave lengths (493, 495) which correspond to maximum phosphorescence for DNA, radio-protective agents, and also for the propyl esters of gallic acid. The authors presume that the transfer of energy from the triplet level of DNA to the triplet energy levels of the protective substances, as a result of which injury to DNA is substantially diminished, is the most probable explanation. In doing this, the molecule of the protective substance is transferred from the basic singlet level to the triplet level.

Preliminary tests indicate that the addition of propyl gallate and isopropyl gallate to a protein solution substantially diminishes the life span, (t), of the metastable states; and the extinction time of protein photophosphorescence, in which (t) is diminished by a factor of 1.5-2.0, is clearly evident.

2. Joint Presence of Cytochromes and of Succinic Dehydrogenase Revealed in Cytoplasmic Membranes

"The Cytochrome System in the Cytoplasmatic Membranes of Micrococcus Lysodeikticus," by N. S. Gel'man, M. A. Lukoyanova and A. I. Oparin, Institute of Biochemistry imeni A. N. Bach, Academy of Sciences USSR; Moscow, Biokhimiya, Vol 25, No 3, May/Jun 60, pp 482-486

The purpose of the research described was to trace the components of succinic oxidase in the cytoplasmatic membranes and to explain their connection with succinic dehydrase, the primary dehydrase of succinic acid.

The authors present the following conclusions:

"Cytochromes of the b, c, and a groups were detected in the cytoplasmatic membranes of the cells of bacterii Micrococcus lysodeikticus. The joint presence of cytochromes and of succinic dehydrase indicates the localization of the succinic oxidase system in the membranes. The suppression of succinic oxidase activity during cell lysis is probably linked with a disruption in the organization of the enzyme complexes and with the disruption of the terminal link -- the cytochrome oxidase."

Microbiology

3. Studies of the Diffusion Factor Affecting B. pestis

"The Problem of the Relationship of the Plague Microorganism to Hyaluronic Acid and the Presence of a Diffusion Factor," by I. V. Domaradskiy, G. A. Yaromuk and Z. I. Vasil'yeva, Irkutsk Scientific Research Antiplague Institute; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 31, No 7, Jul 60, pp 113-117

The significance of the diffusion factor (reported by Korobkova) in the immunopathogenesis of plague is discussed. In considering various pathogenetic factors affecting B. pestis, the authors included a study of hyaluronidase, which is reported in this article. They found that theoretical results disagreed with those of Korobkova.

The presence of hyaluronidase was determined in 20 strains of B. pestis, one atypical strain of Streptococcus, and strains of Staphylococcus aureus and Cl. perfringens. The B. pestis strains were avirulent strains EV, 1, 17 50.74; and avirulent strains TsD, 94-96, 119, 125, 143, 435, 483, 485-488, 1435, and 1525. The McLean method of hyaluronidase determination was employed, with modifications proposed by Mogilevskiy, Kogan and the authors, which eliminated a number of drawbacks inherent in the Smirnov method.

The gas gangrene pathogen was cultured on a Kitt-Tarozzi medium; Huttinger and Martin media were used for culturing three other species. B. pestis was cultured on liquid and solid media, and Streptococcus and Staphylococcus, on solid media containing 5% blood. Culturing on solid media was carried out for 24-48 hours; on liquid, for 20. When solid-media were used, the microbial cell concentrations were $2 \cdot 10^9$ and $5 \cdot 10^{10}$ per ml.

The following conclusion is offered:

"Experiments with standard and freshly isolated B. pestis strains, carried out on a parallel basis with three species of microorganisms known to form hyaluronidase afforded a basis for stating that B. pestis does not contain the enzyme hyaluronidase, which causes depolymerization of hyaluronic acid in vitro and facilitates stain diffusion in vivo."

4. Influenza Virus Reproduced From RNA

"Reproduction of Influenza Virus With the Aid of Viral Ribonucleic Acid." Report III. Morphological Aspects of the Virus Reproduced," by R. Portocala, S. Dumitrescu, N. I. Ionescu, I. Samuel, V. Boeru; Bucharest, Comunicarile Academiei Republicii Populare Romine, Vol 10, No 5, May 60, p 457

The authors used an electron microscope to study the morphology of influenza virus obtained from RNA extracted from one strain of pure type A antigen. The morphological picture and the dimensions of the elementary bodies of the strain obtained in this manner did not differ, on the whole, from those of the initial strain. The average size of the virus obtained in the first culture and also of the virus obtained after the first passage on chick embryo was 100.7 ± 0.7 mμ. These values are the same as those of the initial virus from which the RNA was obtained.

Serological investigations substantiated the antigenic similarity of the strain prepared from RNA to the initial strain. The morphological data obtained by the authors verified their supposition that a receptive cell synthesizes a complete influenza virus from the nucleic acid molecule introduced.

Three graphs show the frequency of appearance of elementary bodies of the initial strain, of the viral RNA, and of the final virus. Four electron photomicrographs of the various elementary bodies are included.

5. Foot-and-Mouth Virus Studies

"The Problem of the Modifiability of Types of Foot-and-Mouth Disease Virus," by V. I. Kindyakov and S. M. Filippovich; Nasledstvennost' i Izmenchivost' Rasteniy, Zhivotnik i Mikroorganizmov (Heredity and Modifiability of Plants, Animals and Microorganisms), 1959, pp 354-359 (from Referativnyy Zhurnal Biologiya, No 8, 25 Apr 60, Abstract No 33593, by G. A. Koslovskiy)

"This review of the authors' research presents data collected for 20 years (1937-1959) on types and variants of foot-and-mouth disease virus isolated in Kazakhstan and neighboring areas. It was established that types O and C foot-and-mouth virus exists for a comparatively brief period under natural epizootic conditions, changing into variants of type O or OA. It was determined by observations of foot-and mouth disease epizootics that the repeated entry of the virus into the immune animal organism creates specific conditions for metabolism which makes possible the formation of new antigenic properties of the virus. In experiments on guinea pigs and cattle, the modification of type characteristics of the foot-and-mouth virus is achieved by repeated introduction of the same strain into an immune animal. Modification of the foot-and-mouth virus occurred in experiments on guinea pigs with standard type strains: with type O, after 16-35 infections; with type A, after 9-49 infections; with type C, after 5-9 infections; with variant O, after 15-27 infections; on cattle: with type O, after 10-11 infections; with a variant of type O, after 3 infections; with a variant of type A_2, after 3-4 infections; with type C, after 4 infections. Variations of the virus depended on the species of the animal and the immunological condition of the organism. Modification occurred more rapidly in cattle than in guinea pigs; in one immune organism, several strains of virus with different antigenic properties, which were preserved without change for a long time, were obtained by repeated infection with the same type of virus."

6. Decomposition of Foot-and-Mouth Virus in Tissue Culture

"The Dynamics of Decomposition of the Foot-and-Mouth Virus in Single-Layer Cultures and Suspensions of Trypsinized Calf Kidney Tissue," by V. A. Sergiyev and M. I. Yasbenkina, Dokl. VASKhNIL (Reports of the All-Union Academy of Agricultural Sciences imeni Lenin), No 4, 1959, pp 16-18 (from Referativnyy Zhurnal Biologiya, No 2, 25 Jan 60, Abstract No 4985, by B. F. Semenov)

"Single-layer cultures or cell suspensions of trypsinized calf kidney tissue were infected with a swine strain of type A foot-and-mouth virus adapted to calf kidney cells. In the one-layer culture liquid, the highest

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virus titer ($10^{6.5}$ to $10^{7.5}$ ID_{50} per ml) was observed within 24 hours after the beginning of the experiment; during the next 4-6 hours it remained at the level attained, but decreased sharply after 72 hours (10^{20} to 10^{26} ID_{50} per ml). The maximum quantity of virus appeared in the cell suspensions within six to eight hours after infection; the titers decreased after 12 hours. It was shown that the one-layer culture cells remaining intact 24 hours after the addition of infectious material continued to produce virus after replacement of the medium, but in very limited amounts."

7. Cholera Vaccine Production Studied

"A Study of the Technological Process of Cholera Vaccine Production by the Deep Method," by Z. Ye. Taranyuk, Sb. Tr. Gor'kovsk. N.-I. In-ta Epidemiol. i Gigiyeny (Collection of Works of the Gor'kiy Scientific Research Institute of Epidemiology and Hygiene), No 3, 1959, pp 70-80 [from Referativnyy Zhurnal Khimiya -- Biologicheskaya Khimiya, No 6, 25 Mar 60, Abstract No 7802]

"The possibility of culturing Vibrio cholerae in an aerated liquid culture medium is indicated. The greatest number of microorganisms are reproduced in seedings of Vibrio cholerae in bouillon, the polyfabricate of which contains 300-500 mg% amino nitrogen. Cultures of different ages, cultured under different conditions, can be used as seeding material. The culturing of Vibrio cholerae in a reactor can be continued for not more than 12 hours; after 12 hours the intensity of cell proliferation diminishes. It is demonstrated that the more microbial cells the initial culture contains, the higher its immunogenicity. In 56.6% of the microbial suspensions, the content of microbial bodies decreased from 10 to 70% after treatment with formalin with respect to the initial number of microorganisms. An increase in the amount of formalin up to 1% during sterilization of microbial suspensions of Vibrio cholerae minimizes the decrease in the standard of microbial suspensions prepared from certain strains of Vibrio cholerae and does not affect the immunogenicity of the vaccine."

8. Role of Proteins and Nucleic Acids in Heredity of Virus Characteristics

"Genetic Problems in Virology," by K. S. Sukhov, Nasledstvennost' i Izmenchivost' Rasteniy, Zhivotnykh i Mikroorganizmov (Heredity and Modifiability of Plants, Animals and Microorganisms), 1959, pp 161-168 (from Referativnyy Zhurnal Biologiya, No 8, 25 Apr 60, Abstract No 33564)

"This article is a critical review of the role of proteins and nucleic acids in the determination of inherited characteristics of viruses. Verification of the fact that bacteriophages and pure viral RNA and DNA completely devoid of protein can stimulate the infection process does not yet have a definitive experimental basis. It has been proposed that the internal protein observed in tobacco mosaic virus is a nonremovable component of the virus, without which its further development and replication is impossible. The author calls such a structure a 'generative nucleoproteid'."

II. CHEMISTRY

Fuels and Propellants

9. Detonation Parameters of TNT - Hexogen (RDX) Mixtures

"Parameters of the Detonation of Trinitrotoluene-Hexogen Mixtures," by A. N. Gremin and G. A. Adadurov, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR-Otdeleniye Khimicheskiy Nauk, No 6, Jun 60, pp 1130-1131

It was established that the index of the polytropic curve of the explosion for mixtures of trinitrotoluene with hexogen can be calculated from the known values of this index for the individual components.

10. Kinetics of the Thermal Decomposition of Dinitroxydiethylnitramine

"Kinetics of the Thermal Decomposition of Dinitroxydiethylnitramine," by F. I. Duobovitskiy, Yu. I. Rubtsov, V. V. Barzykin, and G. B. Manelis, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR - Otdeleniye Khimicheskiy Nauk, No 6, Jun 60, pp 1126-1128

The kinetics of the thermal decomposition of dinitroxydiethylnitramine were investigated by three different methods, viz., on the basis of gas evolution, the changes in weight, and the heat that was evolved. It was established that the reaction is one of the first order. The velocity constants of the reaction were determined. The energy of activation and the exponential factor were calculated.

11. Chain-Thermal Propagation of Flames in the Case of Two Active Centers

"The Theory of Chain-Thermal Propagation of Flame; Part I -- Two Active Centers" by L. A. Lovachev, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR - Otdeleniye Khimicheskikh Nauk, No 6, Jun 60, pp 1022-1029

For a chain reaction with two active centers which successively react with the initial substances and regenerate each other, a relation has been derived on the basis of which the velocity of flame propagation can be determined under consideration of the diffusion of these active centers and also of the rate of generation and velocity of quadratic termination of chains. The theoretical values of the velocity of flame propagation

have been calculated for two cases of the combustion of chlorine-hydrogen mixtures. These values were found to be in satisfactory agreement with experimental data. The characteristics of the relations between the velocity of flame propagation and the pressure and temperature of combustion have been considered from a qualitative standpoint, starting from a solution in which the diffusion of two active centers was considered and compared with the results that follow from the analysis of a simplified scheme postulating an active center of one species only.

12. Mechanism of Propagation of Burning in Heterogeneous Exothermal Systems

"Relaxation Mechanism of Propagation of Burning in Heterogeneous Exothermal Systems: Part 2" by Z. I. Fur (Leningrad,); Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 6, Jun 60, pp 1299-1306

The hypothesis proposed, relating the velocity of propagation of burning with the heat transfer in the condensed phase and only indirectly accounting for the kinetics of the chemical reactions over the temperature of combustion T_p and the temperature of the reaction products T_{∞}, made it possible to give a systematic explanation of the phenomena observed during the burning of some heterogeneous exothermal systems, including phenomena that did not lend themselves to interpretation by theories relating the velocity of propagation of burning only with chemical reaction kinetics. Calculations carried out with the aid of the formulas obtained showed satisfactory agreement with experimental data. All this makes it reasonable to expect that the proposed model for the mechanism of burning corresponds partially at least to the actual physical processes taking place in these systems.

At the same time the hypothesis involves a number of assumptions that do not have a sufficient physical basis. That means that it requires further development and that a certain amount of caution must be observed in applying the results obtained.

Probably the most correct approach to further development of the hypothesis, indicated by O. M. Todes, would be in accounting for the reaction kinetics and rate of heat transfer in the condensed phase. From such a generalized concept would follow as particular cases the Zeldovich hypothesis and the hypothesis proposed here.

13. Kinetics and Mechanism of Methane Oxidation

"Kinetics and Mechanism of Methane Oxidation; Part 3 -- Detailed Mechanism of the Reaction," by L. V. Karmilova, N. S. Yenikolopyan, A. B. Nalbandyan, and N. N. Semenov, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 6, Jun 60, pp 1176-1185

Based on kinetic data and modern energy concepts in regard to elementary reactions of radicals with stable molecules, a scheme has been proposed for the most probable mechanism of the gaseous phase oxidation of methane, account being taken of the branching effect exerted by formaldehyde in the process.

The validity of the proposed mechanism has been confirmed by the quantitative agreement of theoretical with experimental values for a large number of reaction parameters.

14. The Combustion Limits of Some Three-Component Gas Mixtures

"The Combustion Limits of Some Ternary Gas Mixtures," by A. Leszlo and A. Nemeth, Hungarian Petroleum and Natural Gas Research Institute at Veszprem; Budapest, Magyar Kemiai Folyoirat, Vol 66, No 7, Jul 60, pp 254-259

The combustion limits of the mixtures $H_2 - O_2 - CH_4$, $H_2 - O_2 - N_2$, $C_2H_2 - O_2 - H_2$, $C_2H_2 - O_2 - N_2$, and $C_2H_2 - O_2 - CH_4$ were determined. It was established that Le Chatelier's formula is applicable to the mixtures $H_2 - O_2 - CH_4$ and $C_2H_2 - O_2 - H_2$, but not to $C_2H_2 - O_2 - CH_4$. In the case of this particular mixture, empirical data must be used. The values determined for the mixtures $C_2H_2 - O_2 - N_2$ and $H_2 - O_2 - N_2$ were brought into a form necessary for the calculations and represented graphically. The diluent effect of methane on combustible gases was compared with that of nitrogen. It was established that in some cases methane exerts a stronger effect than nitrogen.

15. Pyrolysis of Fluorohydrocarbons

"Pyrolysis of Fluorohydrocarbons," by A. V. Fokin, Doctor of Chemical Sciences, and Yu, M. Kosyrev, Candidate of Technical Sciences; Moscow, Khimicheskaya Promyshlennost, No 3, Jun 60, pp 186-192

By using specially designed equipment, the pyrolysis of polytetrafluorethylene was investigated at atmospheric pressure and in vacuum. The temperatures were established at which the highest yields of individual products of the pyrolysis are obtained. It was found that the maximum quantity of perfluorocyclobutane (corresponding to a yield higher than 57%) is formed at 600°, the maximum quantity of perfluoropropylene (45%) at 700-710°, and the maximum quantity of perfluoroisobutylene (33%) at 750°. The pyrolysis of perfluorocyclobutane was investigated in the same temperature range (600-750°), and the change in the composition of the pyrolysis products as affected by the temperature was studied. It was established that there is a close similarity between the process of the pyrolysis of polytetrafluoroethylene and that of perfluorocyclobutane.

Conclusions which have an important bearing on the practical possibilities of using polytetrafluoroethylene as a raw material for the production of tetrafluoroethylene, perfluoroethylene, perfluoropropylene, and perfluoroisobutylene were arrived at on the basis of the experimental results obtained.

The processes of conversion by pyrolysis of some perfluorinated olefins, which, in turn, are products of the pyrolysis of polytetrafluoroethylene, were investigated in a wide range of temperatures.

The results of the investigation described enable one to consider the question as to whether one should use the wastes formed in polytetrafluoroethylene production not only for the recovery of tetrafluoroethylene, but also as a raw material for the production of perfluoropropylene and perfluoroisobutylene, which are at least as valuable as tetrafluoroethylene.

16. Polymers Containing Phosphorus

"Compounds Containing Phosphorus, Important Raw Materials for the Plastics Industry", by Ye. L. Gefter; Moscow, Plasticheskiye Massy, No 5, Jun 60, pp 47-55

The subject of low-molecular and high-molecular compounds containing phosphorus (particularly organophosphorus compounds) that are of importance for the plastics industry and possibilities of the application of these compounds are reviewed on the basis of USSR and non-USSR publications. A bibliography consisting of 37 USSR and 100 non-USSR references follows the article. Information is given on monomers, low-molecular phosphorus compounds applied in the plastics industry, and phosphorus-containing polymers. The importance of the polymers in question as heat-resistant and fireproof materials is pointed out.

This paper was presented by the author at the Second Conference on the Chemistry and Applications of Organophosphorus Compounds held at Kazan' in November 1959.

17. Research in the Field of Mechanochemistry at the Chair of High-Molecular Compounds, Moscow State University

"Chemistry and Fancy," by G. Aleksandrov; Moscow, Ekonomicheskaya Gazeta, No 49 (721), 27 Jul 60, p 4,

Startling results have been obtained in work done at the Laboratory of the Chair of High-Molecular Compounds, Moscow State University, under the direction of Academician V. A. Kargin. For instance, Prof F. Kozlov demonstrated a material which was prepared by inducing the formation of chemical bonds between quartz sand and rubber. Metals, carbon black, and sodium chloride are also capable of forming chemical bonds with organic substances, so that materials with continuous chemical bonding throughout their bulk are formed. Formation of chemical bonds of this type can be brought about by mechanochemical methods. Ordinarily quartz sand is a chemically inert material. However, freshly disintegrated grains of quartz sand exhibit a strong reactivity at the new surfaces which have formed as a result of the disintegration. The disintegrated sand becomes not only a catalyst of chemical reactions, but also actively participates in reactions, forming a bond with liquid organic monomers. As a result, an integral chemically bound solid material is formed. This is the simplest form of a mechanochemical process. Processes of this type take place irrespectively of the nature of the organic and inorganic substances that are combined. It was formerly held that acetone cannot be polymerized. Experiments conducted at Moscow State University refuted this view: by applying mechanochemical methods, acetone could be transformed into a polymer.

At specialized branch scientific research institutes, mechanochemical processes are being applied for the preparation of new plastics, varnishes and paints.

Workers at the Chair of High-Molecular Compounds are at present engaged in investigations on the microstructure of polymers and materials derived from polymers. By using data obtained in these investigations, synthetic materials with a very long useful life and great mechanical strength will be developed.

One of the advantages of mechanochemistry is that products representing unusual combinations of substances can be obtained without the use of high pressures and temperatures.

Inorganic Chemistry

18. Standard Enthalpy of the Formation of Silicon Tetrafluoride

"The Standard Enthalpy of the Formation of Silicon Tetrafluoride," by A. F. Vorob'yev, V. P. Kolesov, and S. M. Skuratov, Thermochemical Laboratory imeni V. F. Luginin, Moscow State University; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 7, Jul 60, pp 1402-1408

The heat effects accompanying the following interactions of silicon tetrafluoride were measured: with metallic sodium; with a 19% solution of hydrofluoric acid; with an 0.4% solution of hydrofluoric acid; with a solution of sodium fluoride saturated with sodium fluorosilicate; and with water. As a result of the determination of the heat effect which arises when dry sodium fluoride is exposed to an atmosphere consisting of silicon tetrafluoride, it was established that no reaction between sodium fluoride and silicon tetrafluoride takes place at room temperature. By using two independent methods of measurement, it was established that the standard enthalpy of the formation of silicon tetrafluoride amounts to minus 372.4 $\pm$ 0.4 kilocalories per mol. The standard enthalpy of the formation of sodium fluorosilicate was determined at minus 681.1 $\pm$ 0.4 kilocalories per mol.

19. Tellurite Glasses

"Formation of Glasses in the System TeO_2, Al_2O_3," by V. P. Zlomanov, O. I. Tananayeva and A. V. Novoselova; Moscow State University, Moscow; Zhurnal Neorganicheskoy Khimii, Vol 5, No 7, Jul 60, pp 1632-1633

Formation of glasses consisting of TeO_2 and Al_2O_3 was investigated. The properties of the glasses are distinguished by a greater transparency to infrared radiation as compared with silicate glasses. The transmission in the infrared region of a glass having the composition 94% of TeO_2 + 6% of Al_2O_3 was determined.

20. The Hydrate of Lithium Peroxide

"Solubility Isotherm of the Ternary System Li OH-H_2O_2 - H_2O at 30.5°. An Investigation of Lithium Peroxide Hydrate," by T. A. Dobrynina, Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR - Otdeleniye Khimicheskikh Nauk, No 6, Jun 60, pp 961-965

Investigation of solubilities in the ternary system Li OH-H_2O_2-H_2O and determination of the composition of the solid phases by the residue method at the temperature of 30.5° made it possible to establish the existence of the hitherto unknown lithium peroxide hydrate $Li_2O_2.H_2O$. A lithium peroxide hydrate of the composition $Li_2O_2 \cdot 8 H_2O$, which has been described in the literature, could not be isolated. The identity of the compound $Li_2O_2 \cdot H_2O$ was confirmed by results obtained in differential thermal and qualitative X-ray diffraction phase analyses.

21. A Czechoslovak Monograph on the Mineralogy of Radioactive Elements

Nerosty Radioaktivnich Prvku Jejich Vznik a Vyvoj (Minerals of Radioactive Elements and Their Origin), by J. Kaspar, unsigned review; Moscow, Atomnaya Energiya, Vol 9, No 1, Jul 60, p 77

This book of 155 pages published at Prague in 1959 by Statui Nakladatelstvi Technicke Literatury, is the first monograph on the minerology of radioactive elements ever issued in Czechoslovakia. In this book, principal attention is paid to the geochemical characteristics of radioactive elements and to descriptive mineralogy.

The introductory part gives brief information on processes of radioactive decay. The radioactive decay series of uranium, actinium, thorium, and neptunium are discussed in this part. Following this, the geochemistry of uranium and that of thorium are outlined in two separate chapters. Both chapters give general information on the content of uranium and thorium in different rocks and the behavior of these two elements in process of magma differentiation and sedimentation. More than half of the text of the book is concerned with the description of uranium and thorium minerals. The description of minerals is accompanied by illustrations showing crystals and reproducing color photographs of minerals. In the short chapter which follows this part of the book a brief description is given of the paragenesis of uraninite (nasturan) and the stages of mineralization of the principal hydrothermal deposits of uranium. A map showing uranium provinces and their characteristics is appended. At the end of the book, typical flow sheets of processes of the technological conversion of uranium ores are given. The book will be of use to those engaged in work on ores of radioactive elements and also to students, geologists, meteorologists, geochemists, and chemists.

22. Separation of Uranium, Vanadium and Phosphorus by Means of the AV-17 Anion Exchange Resin

"Adsorption of Uranium, Vanadium, and Phosphorus by the Strongly Basic AV-17 Anion-Exchange Resin," by A. V. Gordiyevskiy and V. I. Savel'yeva; Moscow, Khimicheskaya Promyshlennost' No 3, Jun 60 pp 204-208

Application of the ion-exchange resin AV-17 results in separation of uranium from the principal quantity of vanadium to the extent of 96-97% and practically complete separation of uranium from phosphorus. As an eluent for the removal of adsorbed uranium from the resin in the case of

separation from carbonate solutions, it is best to use a 2 M solution of sodium chloride or a 1 M solution of sodium nitrate containing 0.05 M of sodium carbonate. When this solution is used, uranium is removed to an extent greater than 99%. Uranium that had been adsorbed from sulfuric acid solutions is best removed by an eluent solution containing nitric or hydrochloric acid in a concentration of 2 M or a solution containing ammonium nitrate in a concentration of 1 M and nitric acid in a concentration of 0.1 M. In the case of adsorption from hydrochloric acid solutions removal of uranium from the resin is best carried out by washing with distilled water. The AV-17 resin is chemically resistant in hydrochloric acid solutions up to a concentration of 10 M and nitric acid solutions up to a concentration of 8 M. The solutions which were treated in the manner described contained uranium in the form of complex anions, vanadium in the form of vanadate ions, and phosphorus in the form of phosphate ions. The AV-17 resin was synthesized at the Scientific Research Institute of Plastics imeni M. V. Frunze by the amination of a chloromethylated copolymer of styrene and divinylbenzene. It characteristics are described.

23. Aquo-Oxalato-Sulfates of Uranyl

"Aquo-Oxalato-Sulfate Compounds of Uranyl," by I. I. Chernyayev V. A. Golovnya, and R. N. Shchelokov, Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, Academy of Sciences USSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 7, Jul 60, pp 1454-1466

The following aquo-acido coordination compounds of uranyl containing oxalato and sulfato groups were synthesized for the first time:

$K_2 [UO_2 (C_2 O_4) (SO_4) (H_2 O)_2] \cdot H_2O$;

$Rb_2 [UO_2 (C_2O_4) (SO_4) (H_2O)_2]$

$Cs_2 [UO_2 (C_2O_4) (SO_4) (H_2 O)_2]$;

$Cs (NH_4) [UO_2 (C_2 O_4) (SO_4) (H_2 O)_2]$

Some of the physicochemical properties of these compounds were investigated. Several tetra-acido coordination oxalate and sulfate uranyl compounds were synthesized which already had been prepared by other investigators. Their composition was checked, and some of their properties were investigated. The prepared mixed aquo-oxalato-sulfate compounds of uranyl were compared with aquo-oxalate and aquo-sulfate coordination compounds. By determining the molar electrical conductivity of the compounds, it was established that there is a regular decrease in the stability of complex ions in aqueous solutions in the following sequence:

$$[UO_2 (C_2O_4)_2 (H_2O)_2]^{2-} >$$
$$[UO_2 (C_2O_4) (SO_4) (H_2O)_2]^{2-} >$$
$$[UO_2 (SO_4)_2 (H_2O)_2]^{2-}$$

24. Uranyl Thiocyanates

"The Thiocyanate Compounds of Uranyl," by V. P. Markov and Ye. N. Traggeym, Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, Academy of Sciences USSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 7, Jul 60, pp 1467-1473

Conditions have been found for the preparation of uranyl thiocyanate by establishing which prolonged crystallization can be eliminated. It was found that the composition of uranyl thiocyanate corresponds to the formula $UO_2 (CNS)_2 3 H_2O$. New derivatives of uranyl pentathiocyanate were synthesized which have the following formulas:

$$(C_{10} H_8 N_2H)_3 UO_2 (CNS)_5;$$
$$(C_{13} H_9 NH)_3 UO_2 (CNS)_5 H_2O;$$
$$[(C_2H_5)_3 N H]_3 U O_2 (CNS)_5 H_2O$$

"Uranyl Thiocyanates," by V. P. Markov and Ye. N. Traggeym, Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, Academy of Sciences USSR: Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 7, Jul 60, pp 1493-1501

The following thiocyanate coordination compounds of uranyl have been synthesized: $NH_4 [UO_2 (CNS)_3 2 H_2O]$;

$Rb [UO_2 (CNS)_3 2 H_2O]$;

$K [U O_2 (CNS)_3 2 H_2O]$;

$(N H_4)_2 [U O_2 (CNS)_4 2 H_2O]$;

$Cs_3 [UO_2 (CNS)_5]$.

Their properties were investigated.

25. Spectrophotometric Investigation of the Reaction Between Thorium and Arsenazo

"Spectrophotometric Investigation of the Reaction of Formation of a Complex Between Thorium and Benzene - 2-arsonic acid - (1-azo-2)-1,8-dihydroxynaphthalene - 3, 6- disulfonic Acid (Arsenazo)" by A. Ye. Klygin and V. K. Pavlova; Moscow, Zhurnal Neorganicheskoy Khimii Vol 5, No 7, Jul 60, pp 1516-1521

Spectrophotometric investigation of the system $ThCl_4$ - H_6R - HCl - H_2O established that thorium reacts with arsenazo according to the equation $Th^{4+} + H_4 R^{2-} = Th H_4 R^{2+}$. The resulting compound is formed with a maximum yield at pH = 1.9. The reaction of its formation has a velocity constant of 7.0×10^6. The product that is formed has a molar coefficient of light extinction equal to 2.26×10^4 at 590 millimicrons and of 1.94×10^4 at 600 millimicrons. The data obtained make it possible to recommend arsenazo as an idicator for the complexometric determination of thorium and to estimate the optimum conditions for the photocolorimetric determination of thorium with arsenazo. The optimum concentration of arsenazo for the photocolorimetric determination was found to be 1×10^{-4} mols per liter.

26. The Systems BeO-Sm_2O_3 and BeO-Gd_2O_3

"Investigation of the Systems BeO-Sm_2O_3 and BeO-Gd_2O_3," by S. G. Tresvyatskiy, V. I. Kushakovskiy, and V. S. Belevantsev; Moscow, Atomnaya Energiya, Vol 9, No 1, Jul 60, pp 54-55

The constitutionsl diagrams of the systems in question were determined in the temperature range of 1,300-2,500°. It was found that the eutectics formed in these systems contained 35 mol % of samarium oxide or gadolinium oxide and 65 mol % of beryllium oxide. The melting points of the eutectics (1,420 ± 10° for beryllium oxide -- samarium oxide and 1,490 ± 10° for beryllium oxide - gadolinium oxide) proved to be as low as in the system BeO-La_2O_3.

27. A USSR Conference on the Analysis of Rare and Semiconductor Elements

"Conference on the Analysis of Rare and Semiconductor Elements," by Z. I. Podgayskaya; Moscow, Zhurnal Analiticheskoy Khimii, Vol 15, No 3, May-Jun 60, pp 383-384

The Conference on the Analysis of Rare and Semiconductor Elements, held on 7-11 December 1959 at Moscow, was organized by the Gosplan USSR, the State Scientific Technical Committee at the Council of Ministers USSR, and the Academy of Sciences USSR (the Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy and the Commission on Analytical Chemistry). About 1,000 persons representing 285 institutions, laboratories, and geological services participated in the conference. Scientists from China, Poland, Czechoslovakia, Bulgaria, the GDR, and Yugoslavia were present.

General papers on the analytical chemistry of individual elements were given by scientists engaged in work on these elements. Among them were reports on the analytical chemistry of thorium, by D. I. Ryabchikov and Ye. K. Gol'braykh; on the analytical chemistry of niobium and tantalum, by I. P. Alimarin and G. N. Bilimovich; on the analytical chemistry of indium, gallium, and thallium, by A. I. Busev; on the analytical chemistry of rare-earth elements, scandium, and yttrium, by D. I. Ryabukhin; on the analytical chemistry of beryllium, by V. G. Goryushin; on the analytical chemistry of zirconium and hafnium by S. V. Yelinson; on the analytical chemistry of germanium, by V. A. Nazarenko; on the analytical chemistry of lithium, rubidium, and cesium, by N. S. Poluektov; on the analytical chemistry of titanium, by B. N. Melent'yev and A. I. Ponomarev; and on the analytical chemistry of rhenium, by D. I. Ryabchikov.

In a resolution passed by the conference, recommendations were made to expand work on the development of new highly sensitive and highly selective reagents and reactions for the determination of a number of rare elements, including more specific reagents and reactions for the photocolorimetric determination of niobium and tantalum, indium and gallium, zirconium and hafnium, rare-earth elements, rhenium, titanium, antimony, scandium, and elements present as harmful impurities in pure metals and semiconductor materials. The recommendation was also made to develop new reagents for the photocolorimetric determination of germanium which would have a higher sensitivity and form soluble complexes with germanium that have a stable coloration.

28. Organophosphorus Compounds Tested as Herbicides

"Herbicides and Plant Growth Regulators. Report XXXV. Synthesis of Several Triphenylphenoxyalkylphosphonium Salts," by N. N. Mel'nikov and V. A. Kraft, Institute of Plant Physiology of the Academy of Sciences, USSR; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 6, Jun 60, pp 1918-1921

During recent years organic phosphorus compounds have found ever greater use in agriculture as plant pest control agents, and more recently as weed control agents and defoliants. Owing to their capacity to be taken in by plants, organophosphorus herbicides are characterized by a rapid action which has caused much interest.

In connection with the systematic study of the herbicidal properties of various classes of organic compounds, the authors undertook to synthesize and study a series of organic phosphorus compounds. First in the series of compounds to be synthesized were those with the general formula, $(C_6H_5)_3P$ (X) $(CH_2)_nOAr$ (I), from which, in analogy with the corresponding amino salts, one could expect physiological activity in relation to plants.

The synthesis of these compounds was accomplished by the interaction of triphenylphosphine with the corresponding aryloxyhaloalkanes

A total of 12 previously undescribed triphenylaryloxyalkylphosphonium halides were synthesized and characterized. Their physical properties are listed tabularly. Tests (one of which is described generally in the text) of these compounds on germinating wheat and radish seeds indicated that their physiological activity is low.

29. Compounds with Insecticidal Activity

"Diesters of N-Dialkoxy- and N-Diaroxyphosphinylcarbaminylphosphonic Acids," by A. V. Kirsanov and L. Pa Zhuravl'ova, Institute of Organic Chemistry, Academy of Sciences, Uk SSR; Kiev, Dopovidi Akademii Nauk Ukrainskoi RSR, No 4, 1960, pp 487-489

The authors studied the interaction of diesters of isocyanatophosphoric acids with diesters of phosphorous acids and showed that the diesters of N-dialkoxy- and N-diaroxy- phosphinylcarbaminylphosphoric acids are formed in this reaction:

$$(RO)_2PONCO + (R'O)_2POH \rightarrow (RO)_2PONHCOPO(OR')_2.$$

The reaction is accelerated in the presence of sodium alcoholate or triethylamine.

According to the authors, preliminary test indicate that these compounds possess insecticidal activity.

A total of 22 new compounds were synthesized. Their properties are listed in tabular form.

30. Examination of Complex-Forming Capacity of Aminoalkylphosphino-Carboxylic Acids Reported

"Synthesis and Examination of the Complex-Forming Capacty of Some Organophosphorus Compounds. Report 2," by M. I. Kabachnik, T. Ya. Medved', G. K. Kozlova, V. S. Balabukha, Ye. A. Mironova, and L. I. Tikhonova, Institute of Organoelemental Compounds of the Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR - Otdeleniye Khimicheskikh Nauk, No 4, Apr 60, pp 651-657

The earlier published work of the authors [in source, 1958, p 1073] presented some data obtained during the examination of the complex-forming capacity of ethylenediaminobisalkylophosphinic and several other aminoalkylphosphinic acids. The results obtained indicated that ethylenediaminobisalkylphosphinic acids form stable complex compounds with ytterbium and yttrium. In their continued interest, the authors have synthesized aminoalkylphosphinic acids in the hope of obtained new complex-forming compounds and also of comparing the properties of the prepared organophosphorus acids with analogous aminocarboxylic acids.

A total of nine new aminolkylphosphinocarboxylic acids were synthesized and their complex-forming capacities were studied chromatographically. The complex-forming capacity of the aminophosphinic acids was found to be higher than that of the corresponding aminocarboxylic acids.

31. New Procedures for the Radiation Vulcanization of Tires

"Evaluation of the Relative Efficiency of Different Sources of Nuclear Radiation From the Standpoint of Their Application in the Process of Radiation Vulcanization of Tires," by A. Kh. Breger, M. Ya. Kaplunov, B. I. Vaynshteyn, and Ya. M. Vizel', Scientific Research Physical Chemistry Institute imeni Karpov, Scientific Research Institute of the Tire Industry, Moscow Institute of Chemical Machine Building; Moscow, Kauchuk i Rezina, Vol 19, No 4, Apr 60, pp 17-22

In the investigation described, tubeless tires were vulcanized by exposure to nuclear radiation. As the source of radiation an indium-gallium alloy (16 atom % of In) was used that had been passed through a nuclear reactor and then circulated through irradiation units of different configurations in the vulcanizer (ch., A. Kh. Breger, Yu. S. Ryabukin, S. G. Tul'kes, and Ye. N. Volkov, Report No 80, presented at the International Conference On the Application of Powerful Sources of Radiation in the Industry, Warsaw, September 1959). Alternatively spent fuel element assemblies (TVS) from a nuclear reactor of the type VVR-Ts with a thermal capacity of 10 Mw were used. Comparative evaluation of the two types of γ - radiation sources indicated that circulating indium-gallium is more efficient from the standpoint of application in the vulcanization of tires by irradiation; a γ - radiation energy efficiency factor (η) amounting to approximately 2.0% was obtained. It is estimated that a sufficient capacity of the circulating gallium-indium irradiation unit can be achieved by employing the leakage neutrons of a 100 Mw nuclear reactor. However, the use of gallium-indium circuits is regarded as more complicated from the technical standpoint than the application of TVS radiation sources.

It was found that when a TVS radiation source from a VVR-Ts reactor is used, it is best to construct the irradiation unit in the form of two parallel planes (η = 0.3%). When the irradiation unit has the form of two coaxial cylinders, the efficiency is somewhat lower (η = 0.2%).

The efficiency can be increased by developing an appropriately shaped mold and using a construction material which absorbs γ - radiation to the least possible extent. It is held that the data obtained in the investigation described can be used in designing an installation for the vulcanization of experimental tire batches by the application of nuclear radiation.

32. The Radiation Chemistry of Oxygen - Chlorine Compounds

"The Radiation Chemistry of Oxychlorine Compounds; Part 1 -- The Action of X-Rays on Aqueous Solutions of Sodium Chlorite" by L. T. Bugayenko, Ye. P. Kalyazin, and N. A. Bakh, Moscow State University; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 6, 1960, pp 1243-1249

The effects of X-rays generated at a 65 kV peak on 10^{-3} M aqueous $NaClO_2$ solutions have been investigated. In solutions saturated with nitrogen and with hydrogen oxidation of the ClO_2^- ion to ClO_2 and ClO_3^- ion as well as reduction to ClO^- and Cl^- ions take place. Hydrogen peroxide appears only after the ClO^- ions are completely decomposed. G values depend on the amount of energy absorbed. In oxygen-saturated solution the yields of chlorite oxidation and reduction products have much lower values. In this case, hypochlorite does not appear and hydrogen peroxide forms from the beginning of the irradiation. A mechanism has been proposed in which ClO_2 is considered as an intermediate product in the oxidation of ClO_2^- to ClO_3^- and ClO and ClO^- as intermediate products in the reduction of ClO_2^- to Cl^-.

Radiochemistry

33. Application of Tritium for the Investigation of Water Movement Along a Stratum

"Experimental Utilization of Tritium for the Study of Movement of Injected Water Along a Stratum," by N. A. Vasil'yeva, E. V. Sokolovskiy, and V. N. Maydebor; Moscow, Geologiya Nefti i Gaza, Vol 4, No 7, Jul 60, pp 55-59

Experience acquired by the Groznyy Petroleum Scientific Research Institute (GrozNII) in the application of tritium for the investigation of the movement of injected water along a stratum is reported. Detailed information is given on the taking of samples, determination of tritium in the samples, the counters used for measuring radioactivity, etc. The method is regarded as efficient. Tritium was found superior to other radioactive tracers (e. g. I^{131}, which has too short a half-life) for this application.

Communications

34. Quantum Amplifiers

"Ruby Amplifies Radio Signals," by V. Braginskiy and B. Bukhovtsev', Moscow, Yunyy Tekhnik, No 5, May 60, pp 46-48

The most suitable electron orbits (shells) for quantum amplifier application were found to be the orbits of the chromium and iron ions. Such ions are found in transparent crystals of Al_2O_3, where some of the aluminum atoms in the crystal lattice are replaced by chromium, thus forming a ruby; and if some of the aluminum atoms are replaced by iron atoms, sapphire is formed. These admixture ions are arranged in a strictly regular order, thus eliminating the interaction of ions upon each other and permitting correct orientation of the external magnetic field.

In such a centimeter-range quantum amplifier electromagnetic radiation from an auxiliary transmitter together with a signal wave are fed to a ruby crystal placed in a silver-plated waveguide. The ruby crystal, at proper adjustment of the magnitude of the external magnetic field, produces considerable power amplification of weak signal waves. The whole amplifier is placed in a thermostatic container filled with liquid helium, which maintains the temperature at about -269°C.

The very low noise factor of the quantum amplifier permits its use for radio communications at extremely long ranges. Calculations have shown that the application of such amplifiers will permit radiocommunications for distances up to many million kilometers.

35. Extrapolation-Prediction of Communications Signals

"Some Problems of Predicting Communications Signals," by R. A. Kazaryan, Probl. peredachi informatsii (Problems of Transmitting Information), Moscow, 1959, pp 49-56 (from Referativnyy Zhurnal - Elektrotekhnika, No 6, 25 Mar 60, Abstract No 6.4588)

If a signal is a random correlative function, it can be transmitted with reduced mean output power by the use of decorrelation. The difference between the signal and the signal value predicted by an extrapolator is fed into the communication line; at the other end, the signal is reconstructed by an identical extrapolator. A signal with rational-fractional spectral density can best be extrapolated by filters, realizing an operator in the form:

$$a_n(t + \Delta t) = \sum_{i=0}^{N-M-1} a_i s^{(i)}(t) + A \int_0^{\infty} f(\Delta t)\, s\,(t - \Delta t)\, d\,\Delta t,$$

where $s^{(i)}(t)$ is the i-order derivative of the signal, and $f(\Delta t)$ is the weighted function. The random series is extrapolated according to the formula

$$s_n(t + m) = \sum_{i=1}^{N} a_i s(t-t_i),$$

realized by means of a delay line and summation circuits. Interferences in the communication line which effect the accuracy of a transmission involving decorrelation, can be combatted by quantizing the signal according to level, or by transmitting the entire signal level periodically, thereby clearing the memory of the extrapolator. An example is given of calculating the prediction of a voice-signal transmission with a correlation function

$$\tilde{B}(\tau) = C_e^{-\alpha(\tau)} \cos \beta\, \tau/C = 20; \quad \alpha = 930; \quad \beta = 830\ \pi/.$$

Components

36. Amplitude Separation in TV Camera Tubes

"Amplitude Separation of the Signals in a Two-Tube Color-TV Camera," by V. V. Odnol'ko and A. N. Basov, Sb. tr. Leningr. elektrotekhn. in-t svyazi (Collection of Works of the Leningrad Electrical Engineering Institute of Communications), No 4 (37), 1958, pp 28-34 (from Referativnyy Zhurnal - Elektrotekhnika No 6, 25 Mar 60, Abstract No 5.2655)

The signals of the red and blue components of the color image are obtained from one standard (LI-17) superoptikon. The color separation was performed by a fine-raster light filter inserted in the plane of the intermediate image of the optical system. The photocathode of the LI-17 was uniformly exposed to red or blue light to produce pedestals for the pulses corresponding to the red or blue signals. The pulses were divided by means of an amplitude selector in the video channel of the camera with a maximum limiter in one channel and a minimum limiter in the other. A satisfactory color separation was obtained with resolutions of 100-120 lines in each color. Some conclusions are drawn on the promise of amplitude selection for two-tube color-TV cameras.

37. Amplifier for Use in Electrical Modeling Devices Described

"Direct Current Amplifier With Broadened Frequency Characteristics," by V. G. Belyakov and I. M. Vitenberg; Moscow, Priborostroyeniye, No 5, May 60, pp 14-17

The authors discuss some of the requirements placed on amplifiers used for operations of addition, integration, sign reversing, and multiplication by a constant coefficient in electrical modeling devices. Modeling devices based on repetitive operation may use amplifiers having a rather small amplification factor but broadened frequency characteristics. One method of improving the frequency characteristics of dc amplifiers is to decrease the anode resistances and change the circuits of interstage connections. Results of the development of such an amplifier by the Electrical Modeling Section of the Scientific Research Institute of Computer Machine Building (Chief Design Engineer, Doctor of Technical Sciences V. B. Ushakov) are given. The amplifier was designed for use in the electrical modeling device MN-11, which has repetitive operation and is equipped with an automatic scanning circuit.

Amplification factor of the amplifier is 15,000 and drift is 3 mv over 10 minutes of operation and no more than 10 mv during 8 hours of operation. The upper limit of the pass band for a 100 v signal is one kilocycle for an amplification factor of 10,000 and 10 kc for an amplification factor of 1000, while the error introduced as a result of decreasing the amplification factor did not exceed 0.01 and 0.1% correspondingly.

38. FS-K2 Cadmium Sulfide Photoresistance Unsatisfactory for High-Speed Automation

"Inertial and Light Characteristics of Cadmium Sulfide Photoresistances," by A. A. Butylev, Prom. osveshcheniye L. (Industrial Illumination in Leningrad), 1958, pp 110-113 (from Referativnyy Zhurnal -- Elektrotekhnika, No 6, 25 Mar 60, Abstract No 5.2734)

A study was made of the inertial and light characteristics of the FS-K2 photoresistance used to measure the brightness of working surfaces under low-level artificial illumination. In spite of its high integral sensitivity and favorable sensitivity distribution in the visible spectrum, the FS-K2 has one essential shortcoming its slow response. From the reduced characteristic it is apparent that the form of the characteristic changes with reduced illumination, but the length of the nonsteady state during illumination below one lux lasts for several hours. For wide limits of illumination, the dependence of resistance on illumination is rectilinear, the analytical expression of which has the form $R = 8E^{-0.8}$ (R expressed in megohms and E in lux). In industrial models of the FS-K2 no direct proportionality between the photoelectric current and illumination was observed for low illuminations (up to 25-30 lux).

The slow response of the FS-K2 at low illumination values (up to 10 lux) precludes the possibility of application for light metering and high-speed automation.

Instruments and Equipment

39. Instrument Developed for Determining Dynamic Characteristics of Servo Systems

"Instrument for Determining Amplitude and Phase Frequency Characteristics," by K. I. Kurakin; Moscow, Priborostroyeniye, No 5, May 60, pp 10-12

An instrument for determining the amplitude and phase frequency characteristics of servo systems is described. Basic components include an oscillographic indicator with power supplies, a measuring head, and an electromechanical unit consisting of a sinusoidal wave generator with a range of 0 to 10 cycles, a device for measuring phase shift and the ratio of signal amplitudes at the input and output of the system being tested, and a switching circuit.

The phase error of the instrument is negative and equal to 0.5° /cycle, and the amplitude ratio accuracy is ± 1% of the true value. The instrument operates from a 220-v, 400-cycle network and has a power requirement on the order of 250 va.

40. Photoelectric Properties of Evaporated Zinc Selenide Films

"Photoelectric Properties of Zinc Selenide Films Produced by Evaporation in Vacuum," by G. A. Zholkevich, Uch. zap. Vologodsk. gos. ped. in-ta. (Scientific Reports of the Vologda State Pedogogic Institute), 1958, Vol 23, pp 129-149 (from Referativnyy Zhurnal - Elektrotekhnika, No 6, 25 Mar 60, Abstract No 5.2740)

The main photoelectric properties of the ZnSe photosensitive layers in photocells and methods of obtaining specimens of photosensitive layers on the signal plates of photosensitive tubes are discussed. The volt-ampere characteristics are derived for two specimens produced by evaporation in vacuum with excess selenium and by applying ZnSe to a film of pure selenium. A study is made of the effect of a strong field which produces a deviation from Ohm's law for the photosensitive layer at voltages of 2-4 v, and of the nature of the dependence of conductivity on voltage. The spectral distribution of the photocurrent during the illumination of the film by a platinum electrode is shown. The time characteristics of the charging and discharging of the specimens were plotted in order to explain the nature of the space charge produced during polarization. Under an illumination of several hundred lux in a steady-state regime, the photoelectromotive force amounts to tenths of a volt.

41. Oscillatory Circuits Incorporating Thermistor

"Oscillatory Circuit With Thermistor," by A. G. Shashkov and A. S. Kasperovich, Power Engineering Institute, Academy of Sciences Belorussian SSR; Minsk, Inzhenerno-Fizicheskiy Zhurnal, No 7, Jul 60, pp 37-42

Self-sustained oscillatory circuits incorporating polarized thermistors and capable of generating frequencies in the range of 0.1 to 10 cps were examined for their dynamic volt-ampere characteristics. The thermistors for such oscillatory circuits should have a small time constant (less than one second) and high resistance.

The thermistors now manufactured in the USSR do not fully satisfy these requirements; however, the type KMT-11 thermistor used in this experiment was supplemented with other devices which modified its characteristics to to comply with the desired standards.

A method is proposed for calculating the voltage and current of such self-sustained oscillators. Since the amplitude of oscillations of such circuits reaches substantial values, they can be used as master oscillators. The dependence of frequency and stability of oscillations on the conditions of heat-exchange is a favorable factor for wider application of such oscillatory circuits.

42. Precision Electronic Tachometer

"High-Speed Programmed Electronic Tachometer With Decatrons," by I. Ya. Breydo and N. K. Ksenzhuk; Moscow, Izmetitel'naya Tekhnika, No 5, May 60, pp 17-20

In this electric-pulse tachometer the registration of pulses from the pick-up unit and frequency division is carried out with the aid of decatrons. The tachometer is equipped with a programming device which permits automatic registration of pulses during a given time interval, counting cessation during the storage interval, and then a new period of registration after the readings have been cleared off the dial. Depending on the number of pulses generated by the pick-up unit, the tachometer can measure the speed of rotation from 0.1 to 2.10^4 rps, with an accuracy of 10^{-2}%. The tachometer is actuated by pulses of any polarity with amplitude from 0.5 to 80 v. The pulse duration may vary from 5 to 20 microsec and the duration of the leading edge can vary from 0.1 to 5 microsec.

The electronic block of the device consists of an input, counting, timing, programming, and supply units. The overall dimensions of the device are 580 X 280 X 310 mm and it weighs 12 kg.

The application of this device is not limited to the measurement of speed of rotation. It can measure frequencies in a range up to 25 kc and count non-periodic pulses, such as from a counter of nuclear particles. With certain changes in the circuit arrangement, it is possible to measure phase relationship at low frequencies, and the angle of slip in electric motors.

43. Survey of Semiconductor Photocells

"Semiconductor Photocells," by V. K. Subashiyev and M. S. Sominskiy, Poluprovodniki v nauke i tekhn. (Semiconductors in Science and Technology), Vol 2, Moscow-Leningrad, 1958, pp 115-216 (from Referativnyy Zhurnal-Elektrotekhnika, No 6, 25 Mar 60, Abstract No 5.2747)

The survey of value-type (rectifier) photocells includes the following: the nature of light, processes occurring in a p-n junction, mechanism of the photoelectromotive force in the theory of rectifier photoeffect; design and manufacture of rectifier photocells, parameters and characteristics of rectifier photocells, transients during rapid variations of illumination; the sensitivity of selenium, thallium sulfide and silver sulfide rectifier photocells; the characteristics of the main domestic rectifier photocells. A description is given of germanium rectifier-photocell-photodiodes and a photodiode with two p-n junctions, which was developed at the Leningrad Physicotechnical Institute. Photoelectric transducers of solar energy are also discussed. The maximum efficiency of such transducers (without accounting for a number of losses) amounts to about 25%, assuming the proper choice of material, which means that the output in bright sunlight amounts to 250 per square meter. The reasons for energy losses are explained. The discussion also includes silicon rectifier photocells and others, such as those of polycrystalline cadmium sulfide (with an efficiency of 6%).

44. US Book on Infrared Absorption Spectra Reviewed

Infrared Absorption Spectra, by H. M. Hershenson, Academic Press, 1959, 111 pp, reviewed by Yu. A. Pentin; Moscow, Novyye Knigi za Rubezhom, Seriya A. Matematika, Mekhanika, Astronomiya, etc., No 7, Jul 60, pp 85-86

"It is evident that this manual is far from complete, because, first, many periodicals of various countries, including those of the USSR, were not properly exploited; and, second, literature prior to 1945 is not mentioned at all.

"However, even in this form, the manual is highly valuable; it greatly facilitates the search for the desired spectral data. Undoubtedly, all those who have to deal with infrared spectroscopy will duly appreciate the usefulness of this manual; it is absolutely necessary that this manual be published in the Soviet Union."

45. British Book on Physics of Electrons Reviewed

Electron Physics, by O. Klemperer, Butterworth, 1959, 248 p, reviewed by N. A. Kaptsov; Moscow, Novyye Knigi za Rubezhom, Seriya A, Matematika, Mekhanika, Astronomiya, etc, No 7, Jul 60, pp 48-50

"The reviewed book is a very good text book on the subject of electron physics, and, at the same time, it is a rather valuable monograph covering the achievements in this important field of physics from the moment of its inception up to very recent years. Therefore, this book is to be strongly recommended for publication in Russian."

Materials

46. New Piezoelectric Materials

"Some Problems in Crystallochemistry of Piezoelectric Materials," by I. S. Rez; Moscow, Kristallografiya, No 1, Jan/Feb 60, pp 63-70

At present, only about ten piezoelectric single crystals and about six types of piezoelectric ceramics have practical application, while none of these materials possesses all the desired properties. One important condition leading to successful discovery of new piezoelectric materials is the development and application of effective criteria for the search for new materials.

The following groups of materials are suggested as the most promising sources for piezoelectric materials: amino acids, salts and complexes of amino acids, salts and complexes of amines, peroxide type compounds, piezoelectric active salts of heteropoly acids, piezoelectric active platinum complexes, piezoelectric active double salts of the langbeinite type, piezoelectric active meta-substituted benzenes, seignettoelectrics of perovskite type of simple composition, seignettoelectrics of perovskite type of complex composition, nonperovskite type seignettoelectrics, piezoelectric materials of the stibionatalite and fergusonite type, piezoelectric material of lead antimonate type, piezoelectric material of nephelite type, piezoelectric material of melilite-galenite series, piezoelectric crystals grown from fused melts, a series of compounds isostructural to alpha-quartz, and piezoelectric compounds which may be obtained by hydrothermal synthesis.

47. Production of Indium Antimonide of a High Degree of Purity

"Concerning the Problem of the Production of Indium Antimonide of a High Degree of Purity," by M. S. Mirgalovskaya and L. I. Matkova; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 7, Jul 60, pp 1551-1554

A method for the purification of indium antimonide by the zone refining method has been developed. Large crystals were obtained under optimum condition of purification. The properties of these crystals are listed. Purification of indium antimonide was also carried out by Czochralski's method. Single crystals were obtained, the characteristics of which are compared with those of indium antimonide purified by the method of zone refining.

48. Thermoelectronic Conversion of Heat Energy Into Electric Energy Using Thorium Carbide

"Thermoelectronic Conversion of Heat Energy Into Electric Energy Using Thorium Carbide," by N. D. Morgulis and Yu. P. Korchevoy; Moscow, Atomnaya Energiya, Vol 9, No 1, Jul 60, pp 49-51

The problem of the direct conversion of nuclear (heat) energy into electric energy by using thermoelectronic emission has received considerable attention lately. In a review published by N. D. Morgulis (cf., Uspekhi Fizicheskikh Nauk, Vol 70, 1960, pp 679), the following cases were discussed:

1. Employment as a cathode of a pure high-melting metal, viz., tungsten, in a container filled with cesium vapor.

2. Use as a cathode of a two-component low-temperature (e.g., Ba-W) metal film "l-cathode" [beam cathode?] in a container filled with cesium vapor.

In the investigation described, diodes surrounded by cesium vapor were used. As a cathode a narrow tungsten band was used in the middle part of which a thin layer of Th C_2 had been deposited. The anode was of tantalum and had protective rings at the ends. The distance between the electrodes was of the order of 1.5 mm. The temperature of the cathode was determined with an optical micropyrometer on the assumption that ThC_2 has the emission characteristics of a black body. The electronic characteristics of ThC_2 and the energy conversion characteristics of the device described, which was constructed in the form of a cesium-filled electronic

tube, were determined and are described. An efficiency of energy conversion (η) amounting to 10-15% and an effective power output at the cathode (ω) equal to 10 w/cm^2 were obtained in the range of 2000° K. These values are higher than those obtained in the experiment in the review mentioned above and are regarded as favorable.

Gratitude is expressed to Prof. G. V. Samsonov (Institute of Powder Metallurgy, Cermets, and Special Alloys, Academy of Sciences Ukrainian SSR) for preparing and furnishing the Th C_2 that was used.

49. Production of Thorium Carbides

"Production of Thorium Carbides," by G. V. Samsonov, T. Ya. Kosolapova, and V. N. Paderno; Leningrad, Zhurnal Prikladnoy Khimii, Vol 33, No 7, Jul 60, pp 1661-1664

The carbides of thorium, particularly Th C_2, are of interest in electronics as materials for cathodes.

Investigation of conditions for the preparation of pure thorium monocarbide Th C by the reduction of thorium oxide with carbon in vacuum established that the optimum temperature for the formation of ThC is 1,800°. A charge of stoichiometric composition having a weight of 15-20 grams is used and this charge is kept at the temperature mentioned above for 2 hours. Optimum conditions for the formation of pure thorium dicarbide Th C_2 are produced by heating briquettes of stoichiometric composition for two hours at a temperature of 1800° (this refers to charges amounting to 15-20 grams) The behavior of both Th C and Th C_2 in different media was investigated. It was established that both carbides are rather unstable.

50. Selenium Photocells

"Effect of Bromine on the Characteristics of Selenium Photocells," by G. B. Abdullayev, M. Ya. Bakirov, I. Kh. Geller and Ya. I. Nasirov; Baku, Doklady Akademii Nauk Azerbaydzhanskoy SSR, Vol 16, No 4, 1960, pp 323-326

The purpose of this research was to determine the effect of bromine additions on the photoelectric properties of selenium photocells. For this purpose samples of selenium with bromine addition in the amount of 0.017, 0.025, 0.032, 0.060, 0.076, 0.100, 0.500, 1.0, 2.0 and 3.0% were prepared. The alloying was carried out at 300° C employing 99.992% pure selenium and pure bromine. Charts were drawn illustrating the dependence of photocurrent and photo-emf on the concentration of bromine.

It was shown that with increase of bromine concentration in the selenium up to 0.025%, the photocurrent and photo-emf increases. Further additions of bromine decrease both photocurrent and photo-emf. Small bromine additions speed up the process of thermal forming and improve the process of electrical forming.

51. Dutch Book on Ferrites Reviewed

"Ferrites", by J. Smit and H. P. J. Wijn, Philips Technical Library, 1959, 369 p, reviewed by A. A. Gusev; Moscow, Novyye Knigi za Rubezhom, Seriya A, Matematika, Mekhanika, Astronomiya, etc., No 7, Jul 60, pp 52-55

"On the whole, the book, unquestionably, is of great interest to a wide circle of our specialists -- physicists working on investigation of the physical properties of ferrites, chemists and engineers occupied with the problems of technology and production of ferrites for various applications, radio-physicists, and radio engineers designing radio-engineering and electronic devices incorporating ferrites, especially those designing computers.

"Some drawbacks of the book can be corrected partly in a Russian edition, the need for which is unquestionable."

Wave Propagation

52. Coupling of Rectangular Waveguides

"Coupling of Rectangular Waveguides by Means of Opening in the Large Wall," by A. N. Akhiyezer, Khar'kov State Institute of Measures and Measuring Instruments, Moscow, Zhurnal Tekhnicheskoy Fiziki, Vol 30, No 7, Jul 60, pp 851-854

A series of formulas were derived for determining the coupling effect of two rectangular waveguides joined by means of a single opening in their large wall. The experimental directional coupler consisted of two 10 X 23 cm waveguides made of electrolytic copper coated inside with a protective 0.1 micron thick palladium film. The experiment was carried out at a frequency of 9,370 Mc. The voltage standing-wave ratio in such directional coupling was observed at 1.02.

The control measurements were carried out at 12,800 Mc and 37,500 Mc to check the effect of frequency variation on the measurements. The discrepancy between the calculated values and the actual measurements did not exceed 2.2 db.

[For additional information on materials see Chemistry, Nuclear Fuels, etc.]

Automatic Control Engineering

53. Optimalization Quality in System With Stabilizing Regulator Examined

"Experimental Study of a System of Automatic Optimalization With a Stabilizing Regulator as the Optimizing Device," by V. M. Ordyntsev; Moscow, Priborostroyeniye, No 5, May 60, pp 24-27

The functional circuit and principle of operation of a system of automatic optimalization of a single-channel object is described. The experimental system is an operating model with a special electromechanical model as the object of optimalization and local regulator, and an electronic regulator type ER-IIIK serves as the automatic optimizing device.

A study is made of the change in quality of optimalization in relation to the tuning parameters of the optimum regulator. Results are given in the form of diagrams of the optimum indicator recorded during movement of the system from a deflected position to an optimum position.

It is concluded that (1) automatic stabilizing regulators may be used successfully for the automatic optimalization of objects of a given class, (2) the tuning parameters of stabilizing regulators are the real means by which optimalization quality may be improved, and (3) the staging method of designing optimalizing systems provides a higher quality than single-circuit systems with the same object. The system is recommended for use with pneumatic elements in, for example, the optimalization of chemical objects where the use of electronics is not safe.

54. Dynamic Programming in "Bang-Bang" Control Problem

"Application of Electronic Analog Computers in Control Systems of the Bang-Bang Type," by G. V. Savinov, Chair of Applied Mechanics, Moscow University; Moscow, Vestnik Moskovskogo Universiteta, seriya Matematika, Mekhanika, No 3, May/Jun 60, pp 67-71

The control problem of the "bang-bang" type, presented in the article by R. Bellman, I. Glicksberg, and O. Gross ("On the "Bang-Bang" Control Problem," Quart. Appl. Math., Vol 14, No 1, p 2, 1956), reduces to a search of pulse influences on a linear dynamic system, which rapidly brings it to an equilibrium position.

This problem is a partial case of the more general problem of dynamic programming where it is required to define influences guaranteeing the necessary character of motion of the system (see R. Bellman, "Dynamic Programming," Princeton Univ. Press, 1957, and Ya. N. Roytenberg, "Certain Problems of the Theory of Dynamic Programming," Prikladnaya matematika i mekhanika, Vol 23, No 4, p 655, 1959). Analogous problems were considered in the theory of optimal processes (see V. G. Boltyanskiy, R. V. Gamkrelidze, L. S. Pontryagin, "On the Theory of Optimal Processes" DAN SSSR, Vol 110, No 1, p 7, 1956, N. N. Krasovskiy, "On the Theory of Optimal Control," Avtomatika i Telemekhanika Vol 18, No 11, p 959, 1957, and A. A. Fel'dbaum, "Concerning the Synthesis of Optimal Systems With the Help of a Phase Space Avtomatika i Telemekhanika Vol 16, No 2, p 129, 1955).

During the practical realization of the indicated methods the problem concerning the production of devices forming the necessary influences arises.

In the present work the possibility of utilizing electronic analog computers for certain problems of this type which in this case become partial systems of control is proven.

The dynamic system described by the following linear differential matrix equation is considered:

$$\dot{X} = A(t)\ X + F(t), \qquad (1)$$

where X, A(t), F(t) are the matricies

$$X = \| x_i \|, \quad A = \| a_{ik}(t) \|, \quad F(t) = \| f_i(t) \|.$$

The general solution of equation (1) has the form

$$X(t) = \theta(t) \left[\theta^{-1}(t_o) X(t_o) \int_{t_o}^{t} \theta^{-1}(\tau)\ F(\tau)\, d\tau \right]. \qquad (2)$$

Here $\theta(t)$ is the fundamental matrix of the homogeneous matrix equation obtained from (1) for $F = 0$ and θ^{-1} is the inverse matrix.

We note that express (2) is equivalent to the following:

$$\frac{d}{dt} (\theta^{-1} X) = (\theta^{-1} F). \qquad (3)$$

The problem concerning selection of the influences F(t), bringing the system to the equilibrium position or accelerating the process of arrival of the system to the equilibrium position in the case of stable systems is considered.

55. Electronic Modeling of Product and Quotient of Exponential Functions

"Electronic Devices for Modeling the Product and Division of Exponential Functions," by Gr. Staynov, Al. Derzhanskiy, and M. Dimitrova, Dokl. Bolg. AN, (Reports of the Bulgarian Academy of Sciences), Vol 11, No 6, 1958, pp 465-468 (from Referativnyy Zhurnal-Elektrotekhnika, No 6, 25 Mar 60, Abstract No 4.5283)

An electronic device for modeling the product of exponential functions is considered, which consists of two identical univibrators. When triggered, the univibrators produce negative rectangular pulses, the lengths of which are proportional to the logarithm of the base of the exponent. The voltage, which is proportional to the product of the exponential functions, is regulated at the output capacitor of the transformer circuit according to the time which elapses between the trigger pulses and the rectangular pulses of the univibrators. It is shown that, by analogy, it is possible to obtain the product of more than two exponential functions. The device for modeling the division of exponential functions is also represented by a circuit using two univibrators.

Results are given of experimental tests of the devices. The maximum relative error does not exceed two percent.

56. Importance of Time Constants in Physically Separated Control System Components

"Control Loops with Equal Time Constants," by V. Strejc, Czechoslovak Academy of Sciences, Prague; Berlin, Zeitschrift fuer Messen, Steuern, Regeln, No 5, May 60, pp 196-199

It is shown that process control systems have a minimal critical amplification as long as their delay sections have equal time constants. The higher the order of the differential equation for the control system, the smaller the critical amplification. In practice, such conditions will be found in cases where the control system has small time constants which are equal in magnitude to the time constants of the delay sections of the controller. In such control systems it is not possible to adjust the controller to a sufficiently high amplification, with the result that, in most cases, the control cannot satisfy operational requirements. In such cases, the control process can be improved by replacing one control section by another having a longer time constant and by using the replacement section to regulate the proportional-integral controller.

If all the time constants of the control system are equal in magnitude, the proportional-integral controller compensates only the continuous control deviations, while transient control-value deviations can reach relatively high values, once the proportional-controller constant can be adjusted only to a very low value.

57. Use of Noise for Determining Frequency Response in Control Systems

"The Importance of the Correlation Function for Control Engineering," by M. Peschel, DAMG, Berlin; Berlin, Zeitschrift fuer Messen, Steuern, Regeln, No 5, May 60, pp 191-196

One recent trend in control engineering appears to be the substitution of the traditional method of testing control loops on the basis of response to special test functions, primarily the sinusoidal function, by a new type of method which employs noise to determine frequency response. The most essential aid in this method is the so-called correlation function, which represents a generalization of the energy concept and a statistical index of noise. The method is based on a realtionship between the cross correlation function of input and output noise and the autocorrelation function of input noise, which simulates the connection between the output variable and the input variable of the control loop. This method is described here, beginning with some observations on the frequency response of linear systems and the usual method of measuring frequency response. After a critical discussion of this method, a mathematical description of noise is given which culminates in the Wiener-Khinchin equation, the actual basis of the new testing method. The application of this method requires special instruments, called correlators, which produce the correlation function out of the noise. Some known types of correlators are discussed.

This article is a redraft of a paper delivered 3 March 1960 at the Symposium on Control Engineering at the Institute of Technical Physics of Martin-Luther University, Leipzig.

58. Automation in Czechoslovakia

"Automation in Czechoslovakia," by M. Balda, Prague; Berlin, Zeitschrift fuer Messen, Steuern, Regeln, No 5, May 60, pp 224-247

The development of automation in Czechoslovakia faces the problems encountered by any relatively small country, the major one being the fact that the production of goods involves small numbers of many types of products rather than mass-produced fewer types in great numbers. Most of the automation work has been in machine tools, such as the SP-31

semiautomatic machine lathe for producing metal shafts. This machine has a "productivity" 40-60 percent greater than corresponding "foreign" machines. Automatic control for milling machines is provided by a NA-319 system which uses one signal in digital form, programmed on tape, for three machine coordinates. The spindle drive motor of the FW-1,000 milling machine, which uses the NA-319 control system, develops 45 kilowatts and turns up 11.5-3,000 rpm in 18 steps. The feed of the milling head and supports can be varied continuously from zero to 2,500 millimeters per minute, that of the headstock slide from zero to 1,500 millimeters per minute.

Transfer lines for handling large work pieces are also being automated. About 50 percent of the hydroelectric power plants have been automated, and some progress has been made in the automation of the chemical industry, particularly for the production of fertilizers and sulfuric acid.

During the extensive industrial reorganization of 1958, a new people-owned enterprise, Závody promyslové automatisace (Industrial Automation Works), was founded. Its primary function is the production of automation equipment, particularly for heat and power engineering and general control applications.

In the computer area, in addition to the punched-card machines, the SAPO computer and MEDA differential analyzer now in series production, development work is in progress on a whole series of digital computers for machine-tool control and for support of scientific research.

The Institute of Information Theory and Automation, Czechoslovak Academy of Sciences, headed by Professor Kozesnik, emphasizes research in automatic control theory, adaptive systems of statistical dynamics, information theory, and the theory of process control by means of computers. The computer center of the institute has, in addition to a number of other computers, a large Soviet Ural'digital computer.

59. Operational Data For Computing Constants of Equivalent Control Processes

"Computing the Constants of Equivalent Control Processes From Operational Measurements," by M. Salamon, Research Institute of Acetylene Chemistry, Novaky, Czechoslovak Peoples Republic; Berlin, Zeitschrift fuer Messen, Steuern, Regeln, No 5, May 60, pp 200-205

A brief description is given of two new methods of determining the transmission function of control systems which can be replaced by systems with the transmission functions

$$F(p) = \frac{V}{(pT + 1)^n}$$

and

$$F(p) = \frac{V}{(pT + 1)^{n-1}(pmT + 1)} .$$

The first method begins with the frequency response; it is shown that, for the determination of the time constant T, the order n and the ratio m of the time constant, it is necessary to know only two points of the frequency response. In a two-point control of the investigated system, a measurement in the steady state produces all the values required for the calculation of n, T and m.

The second method enlarges the applicability of the method of successive integration to include cases where the measured process does not go over from one stationary state to another during the measurement. This method affords the possibility of replacing expensive and complex correlators by simple recording instruments and of making the calculations on an ordinary calculator.

The article is a translation from Czech to German of an article which appeared originally in Automatisace (Prague), No 9, 1958, pp 273-278.

[For additional information on automatic control engineering and computers, see Electronics, Components.]

60. Characteristics of the One-Unit Frequency Changer

"One-Unit Frequency Changer (50/200 cps) and Its Characteristics," by N. S. Siunov and V. M. Pavlinin; Moscow, Vestnik Elektropromyshlennosti, No 5, May 60, pp 9-13

The development of a one-unit frequency changer has great practical significance from the standpoint of reducing total weight and over-all dimensions of frequency conversion installations.

The induction motor winding and the synchronous generator winding are mounted in close proximity to each other. The frequency changer stator has two 3-phase windings, one of the motor and the other of the generator. The ratio of pole-pairs of the two-windings is 4 to 1, so as to produce a change from 50 cps to 200 cps.

A test conducted with a 1.5 kva frequency changer showed that there was no inductive coupling between the winding of the motor and the generator, and that the excitation current of the motor did not contain the harmonic frequencies of the generator. The curve of the generator emf did not contain any harmonics of the standard frequency (50 cps). The presence of two magnetic fields of different frequencies in the same magnetic circuit did not affect the magnetic reluctance.

The efficiency and the power factor of the one-unit frequency changer were found to be quite satisfactory, and the author recommends their production on an industrial scale.

61. Hydraulic Turbine Damage Caused by Hydraulic Shocks

"The Reverse Hydraulic Shock in the Draft Tube of Adjustable Blade Propeller Turbines," by V. A. Time; Moscow, Elektricheskiye Stantsii, No 3, Mar 60, pp 17-25.

The article contains the following passages:

"In the course of exploitation of adjustable-blade propeller hydraulic turbines, cases of emergency have been known in which serious damage to turbine parts was caused by the reverse hydraulic shock in the draft tube. Such shocks originate during a sudden removal of load, if the turbine parameters and the governor are not in proper conformity.

"Below is given a brief description of the damages to an adjustable-blade turbine having a runner-wheel 8,000 mm in diameter. This turbine is capable of developing a maximum of 58.5 Mw at 16.5 meters of water head and at operating speed of 62.5 rpm.

"Several trials of fast removal of load were carried out successfully prior to the described emergency. During the unsuccessful test (No 5), about six seconds after the sudden removal of a 46 Mw load, dull blows were heard in the turbine and sparking was observed at the exciter. Later it was found that this was caused by a rising of the rotor to a height of 20 mm. Servicing personnel observed seepage of water through the turbine cover, after which the turbine stopped automatically by closing the movable gates and by applying braking at an increased pressure of 10 kg/cm^2, which was considerably higher than the normal braking pressure of 5 kg/cm^2.

Examination of the turbine revealed the following damages: three blades of the working wheel were torn off and were carried to the left section of the draft tube, as were two pins from the torn blades. The pin of the third torn blade remained in the socket of the rotor wheel. A fourth blade, which remained on the rotor, was damaged along the inlet edge and along the periphery. Four vanes of the moving gates were knocked out of their place; the lower pins of these vanes were dislodged from the ballbearings, while the upper pins were still hanging.

"The nature of damage indicates the presence of great stresses directed downward, which were taken up by the turbine rotor."

Mechanical Engineering

62. Characteristics of Thermo-Anemometer

"Experimental Characteristics of a Thermo-Anemometer," by Yu. F. Anan'yev, Moscow Aviation Institute imeni S. Ordzhonikidze; Minsk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Energetika, No 6, Jun 60, pp 37-44

The study of mean and pulsating velocities of gaseous and fluid currents with the aid of a thermo-anemometer has been given greater attention in recent experimental analysis of gas-dynamic and thermodynamic processes. A current-heated tungsten filament of about 15 microns diameter and about 3 mm long can be used as the data pick-up unit. The signal from the data pick-up unit was taken off with the aid of a mercury contact device. Measurement of current, voltage and resistance for the data pick-up unit was taken with 0.5-class instruments. The experiment showed that for each velocity of fluid flow there is a certain corresponding value of current in the filament. This relationship becomes disturbed above a certain value of current, when the filament gets overheated.

63. Present Status of Semiconductor Refrigerators

"Investigation of Electrothermal Evaporating Installations," by V. S. Martynovskiy and V. A. Nayer, Odessa Technical Institute for the Refrigeration Industry; Minsk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Energetika, No 6, Jun 60, pp 104-109

The article contains the following passages:

"It should be noted that the power consumption efficiency of semiconductor refrigerating machines is still considerably below the efficiency of compressor or absorption type machines; therefore, the field of their application in the near future will be limited to small capacity installations.

"In this latter case the power consumption is not of prime importance; other factors become of greater significance, such as reliability and steadiness of operation, cost of installation, ease of control, and capability of the installation to provide either a cooling or a heating effect.

"Semiconductor refrigerators now consume roughly 2.5 to 3 times the power required by a compressor-type refrigerator."

Mining Engineering

64. Blasting By Means of Electromagnetic Waves

"Explosions Without Explosives," by A. Pospelov; Moscow, Ekonomicheskaya Gazeta, No 33, (705) 8 Jul 60, p 3

The scientist and engineer A. V. Varzin has worked for a number of years on the shattering of rocks by means of electromagnetic oscillations. Representatives of the former Ministry of Coal Industry became interested in his work. Starting with the shattering of small pieces of rocks, Varzin progressed to the disintegration of rocks weighing hundreds of pounds. He approached the solution of the problem of secondary disintegration of large pieces of ore and rock without the use of explosives. His device produces an effect equivalent to that of the strongest explosives. The development of the device Shakhter was followed by that of the more powerful device Gornyak. These two models were tested successfully in mines. By using Varzin's device, an ordinary rock-loader can be transformed into a crushing and cutting unit. In Varzin's opinion, the rate of cutting will at the very start of industrial application reach several meters per hour. This refers to the cutting of rock consisting

mostly of stone. It is certain that the rate of cutting can be made still faster if a method is found to expedite the removal of the cut rock. The power requirement per cubic meter will apparently not exceed a few kilowatt-hours; in other words, less power will be needed for blasting than is used now for the drilling of blast holes.

Varzin and his coworkers arrived at the conclusion that the more difficult the disintegration of a certain type of rock by mechanical means, the easier this rock can be shattered by means of electromagnetic waves.

Varzin has conducted experiments on the concentration of energy in the mass of the rock. He demonstrated to the newspaper reporter an operating model of a crushing and cutting device which radiates energy from its electrodes into the depth of the rock.

65. Shattering of Rock By the Application of High-Frequency Current

"Electricity Replaces Powder" (unsigned item); Moscow, Izobretatel' i Ratsionalizator, No 6, Jun 60, p 58

Polish engineers at the Institute of Mining in Katowice developed a method for shattering the hardest types of rock by applying high-frequency currents. This method is very convenient in cases when blasting with explosives cannot be carried out for safety reasons.

66. Asymptotic Behavior of the Solutions of the Cauchy Problem for Certain Quasilinear Equations

"Asymptotic Behavior of the Solutions of the Cauchy Problem for Certain Quasilinear Equations for Large Values of Time," by A. M. Il'in and O. A. Oleynik; Moscow, Matematicheskiy Sbornik, Vol 51 (93), No 2, Jun 60, pp 191-216

In the present work the behavior of the solutions of the Cauchy problem for a quasilinear parabolic equation with two independent variables is investigated as well as the behavior of generalized solutions of the Cauchy problem for a quasilinear equation of the first order for $t \to \infty$. In particular, the proof is conducted with the help of a theorem formulated by the authors in the work "Concerning the Behavior of the Solutions of the Cauchy Problem for Certain Quasilinear Equations during an Unbounded Increase of Time" DAN SSSR, Vol 120, No 1, 1958, pp 25-28. We will consider equations of the form

$$\frac{\partial u}{\partial t} + \frac{\partial \varphi(u)}{\partial x} = \epsilon \frac{\partial^2 u}{\partial x^2}, \quad \epsilon > 0, \tag{1}$$

$$\frac{\partial u}{\partial t} + \frac{\partial \varphi(u)}{\partial x} = 0, \tag{2}$$

appearing as the models for the equations of gas dynamics.

The problem concerning the behavior of the solutions of the Cauchy problem for $t \to \infty$ for equations (1) and (2) with $\varphi(u) = u^2/2$ and an initial function summable on the entire axis, was studied by E. Hopf in his work "The Differential Equation $u_t + uu_x = \mu u_{xx}$," Comm. on Pure and Appl. Math., Vol 3, No 3, 1950, pp 201-230, on the basis of the explicit formula for these solutions. P. D. Lax, in his work "Hyperbolic Systems of Conservation Laws, Part 2," Comm. on Pure and Appl. Math., Vol 10, No 4, 1957, pp 537-566, considered the asymptotic behavior of generalized solutions of the Cauchy problem for $t \to \infty$ for equation (2) on the hypothesis that the initial function $u_0(x)$ takes the mean value M, i.e. uniformly for all a

$$\lim_{L \to \infty} \frac{1}{L} \int_a^{a+L} u(x)\, dx = M.$$

For an equation of the form

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2} + F(u)$$

the behavior of the solutions was investigated in the work of A. N. Kolmogorov, I. G. Petrovskiy, and N. S. Piskunov, "Investigation of the Diffusion Equation Combined With Increase of the Quantity of Matter, and its Application to a Biological Problem," Byul. MGU, sektsiya matem. i mekh., No 6, 1937, pp 1-26. In connection with the theory of combustion, analogous problems were considered in the works by Ya. B. Zel'dovich, "On the Theory of Flame Propagation," Zhurn. fiz. khimii, Vol 22, No 1, 1948, and G. I. Barenblatt, Ya. B. Zel'dovich, "Concerning the Stability of the Flame Propagation," Prikl. matem. i mekh., Vol 21, No 6, 1957, pp 856-859.

In the present work the solution of the Cauchy problem in the half-plane $t \geq 0$ for equations (1) and (2) is considered with the initial condition

$$u\big|_{t=0} = u_0(x),$$

where $u_0(x)$ is a bounded measurable function of such a type that $u_0(x) \to u_+$ for $x \to +\infty$ and $u_0(x) \to u_-$ for $x \to -\infty$. We assume that $\varphi''(u) > 0$ and that $\varphi(u)$ has continuous derivatives up to the fourth order. Several theorems were shown valid without the assumption that $\varphi''(u) \neq 0$.

67. Limit Cycle for a System of Two Nonlinear Differential Equations

"Existence of a Limit Cycle for a System of Two Nonlinear Differential Equations," by S. A. Markosyan, Leninakan Pedagogical Institute imeni M. Nalbandyan; Yerevan, Doklady Akademiya Nauk Armyanskoy SSR, Vol 30, No 1, May 60, pp 13-18

In the present work sufficient conditions are established by a "geometric method" for the existence of a limit cycle of a system the form

$$\begin{aligned} \frac{dx}{dt} &= [f(x) + \varphi(y)]\, P(x, y) \\ \frac{dy}{dt} &= [g(x) + \psi(y)]\, Q(x, y). \end{aligned} \qquad (1)$$

One partial case of this system is also considered.

The problems of existence of limit cycles for the system (1) with $\varphi(y) = y$, $q(x) = x$ were considered in the works by the author appearing in DAN Arm SSR, Vol 23, No 4, 1956, pp 153-159 and Izvestiya Vysshikh Uchebnykh Zavedeniy, Matematika, No 2, 1959, pp 114-121.

In the present work it is assumed that the origin of coordinates for the system (1) is a unique singular point on the entire plane and that the right sides of the equations in question are defined, continuous on the entire plane, and satisfy the Lipschitz condition in every bounded part of that plane. Existence of the limit cycle is proved with the help of the known theorem of Bendictson. The limit cycle always exists in a ring-shaped region not containing the singular point, through the boundaries of which the integral curves only pass or only emerge. In this case the inner boundary of the ring may coincide with the singular point.

68. Expansion of a Boundary Value Problem for an Integrodifferential Equation in Terms of Eigenfunctions

"Expansion in terms of Eigenfunctions of a Boundary Value Problem for an Integrodifferential Equation Having a Retarded Argument," by A. B. Nersesyan, Institute of Mathematics and Mechanics, Academy of Sciences, Armenian SSR; Yerevan, Izvestiya Akademii Nauk Armyanskoy SSR, Seriya Fiziko-Matematicheskikh Nauk, Vol 12, No 6, Nov/Dec 59, pp 37-68

A boundary value problem of the Sturm-Liouville type is investigated for a differential equation of the second order having a retarded argument.

A problem of this type, in a somewhat less general presentation, was considered in the work by S. B. Norkin, "Concerning a Boundary Value Problem of the Sturm-Liouville Type for a Differential Equation of the Second Order Having a Retarded Argument," Izv. Vysshikh Uch. Zav., matematika, No 6(7), 1958; however, only asymptotic formulas for eigenfunctions were obtained by him. The problem concerning expansion in terms of eigenfunctions remained open.

Mutually conjugate boundary value problems for an integrodifferential operator having a retarded argument are presented in section 1 and asymptote for the eigenfunctions and eigenvalues is studied.

In section 2 a Green function is constructed for the considered integrodifferential operator.

In section 3 a biorthogonal system of eigen and adjoint functions of mutually conjugate boundary value problems is constructed and the asymptotic formulas are made more exact.

For the limitations defined in section 4 theorems are proved concerning the expansion in terms of eigen and adjoint functions, uniform convergence with ordinary Fourier series and convergence in the mean.

The author expresses appreciation for the advice given him by his teacher and M. M. Dzhrbashyan, Academician of the Academy of Sciences Armenian SSR.

69. Class of Systematic Codes Considered

"Concerning One Class of Systematic Codes," by V. I. Levenshteyn, Mathematics Institute imeni V. A. Steklov, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR Vol 131, No 5, Apr 60, pp 1011-1014

A class of systematic codes is considered with detection and correction of errors which are obtained during utilization of one of the algorithms of code construction proposed by V. I. Siforov in his work appearing in Radiotekhnika i Elektronika Vol 1, No 2, p 131, 1956. The power of the codes of the considered class is within those limits which are known at the present time for the maximum power of codes. Certain properties of these codes are investigated and methods to reduce overshooting during their practical construction are indicated.

70. Reduction of Order of Integrodifferential Equations

"Reduction of the Order of Integrodifferential Equations With Ordinary Derivatives satisfying a Given Lie Group," by Yu. K. Uzakov, Tashkent Textile Institute; Tashkent, Izvestiya Akademii Nauk UzSSR, seriya Fiziko-Matematicheskikh Nauk, Vol 2, May 60, pp 10-20

The first problems concerning application of the theory of S. Lie groups to integrodifferential equations with constant limits were considered in the work of I. S. Arzhanykh, "Application of Lie groups to integrodifferential equations" Nauchnaya Sessiya AN UzSSR 9-14 iyulya 1947, AN UzSSR, 1947. In the works by the author, appearing in Izv. AN UzSSR ser. Fiz.-Mat. Nauk, No 3 and No 4, 1958, integrodifferential equations of the first and second order were constructed satisfying a given Lie group.

In the present work construction of integrodifferential equations with ordinary derivatives, satisfying a given Lie group was investigated further, and in particular, an equation of the following form was considered:

$$H(x,y(x),\ y'(x),\ y''(x),\ \ldots,\ y^{(n)}(x)\ ) =$$

$$\int_a^b K(x,y(x),\ y'(x),\ y''(x),\ \ldots,\ y^{(k)}(x),\ \xi\ ,$$

$$y(\xi),\ y'(\xi),\ y''(\xi)\ldots,y^{(l)}(\xi)\ )\ d\xi\ ,$$

where a and b are constants, and the whole numbers n, k, l are fixed.

71. Analysis Problems of Markoff Processes

"Markoff Processes and the Problems of Analysis Associated with Them," by Ye. B. Dynkin; Moscow, Uspekhi Matematicheskikh Nauk, Vol 15, No 2(92), Mar/Apr 60, pp 3-24

The article was divided into the following sections:

1. Introduction

2. General problems of the theory of Markoff processes

3. Form of an infinitesimal operator, generalized diffusion processes

4. Harmonic, subharmonic, and superharmonic functions associated with a Markoff process

5. Additive functionals and associations with their transformation of Markoff processes

6. Stochastic integral equations

7. Boundary value problem theory of differential equations and asymptotic behavior of trajectories

8. Conclusion

72. Solvability of Mixed Problems Discussed

"Concerning the Solvability of Mixed Problems for Hyperbolic and Parabolic Equations," by V. A. Il'in; Moscow, Uspekhi Matematicheskikh Nauk, Vol 15, No 2(92), Mar/Apr 60, pp 97-154

 The content of the above work is as follows:

73. Distributions of Differences and Quotients of Order Statistics

"On the Distribution Functions of the Differences and Quotients of Order Statistics," by H-J Rossberg, Berlin-Leipzig; Berlin, Mathematische Nachrichten, No 1/2, Jan/Feb 60, pp 37-79

Let $x_1, x_2, \ldots, x_n$ be independent probability values with the same distribution function $P\{x_i < x\} = F(x)$ $(i = 1,2,\ldots,n)$. For each system of possible values $x_i = X_i$, let $\xi_k = R_k(X_1, \ldots, X_n)$ be the k^{th} value under the X_i values, if the latter are arranged according to magnitude (for example, $\xi_1 = \min(X_1,\ldots,X_n)$, $\xi_n = \max(X_1,\ldots,X_n)$). Thus always $\xi_1 \leq \xi_2 \leq \ldots \leq \xi_n$. The ξ_k $(k = 1,2,\ldots,n)$ are called order statistics and form a variation series with the fundamental distribution $F(x)$. The distribution function $F(x)$ is always thus interpreted in this work.

With the order statistics ξ_k, one can form the differences $d_{kh} = \xi_k - \xi_h$ and the quotients $q_{kh} = \frac{\xi_h}{\xi_k}$ $(k > h)$, the distribution functions of which are investigated here.

74. Application of Theory of Regular Products to Group Theory

"Concerning the General Theory of Regular Products of O. N. Golovin, Part III," by M. Benado, Bucharest; Berlin, Mathematische Nachrichten, No 1/2, Jan/Feb 60, pp 1-36

This third article represents an elaboration of the theory of regular products presented in the two earlier works (Mathematische Nachrichten, Vol 14, 1956, pp 213-234; Ibid, Vol 16, 1957, pp 137-194) and a description of its applicability to group theory. The approach is synthetic rather than analytic.

VI. MEDICINE

Aerospace Medicine

75. Reactions of Animals to Space Travel

"'Otvazhnaya' in Outer Space Again," by M. Grishina; Moscow, Meditsinskiy Rabotnik, 17 Jul 60, p 3

"Three were flying in outer space: the calm and unconcerned female rabbit, Zvezdochka, the fidgety dog, Malek, and a dog named Otvazhnaya which has become an old hand at taking these trips. Otvazhnaya has previously made five trips in outer space.

"The fearless traveler, together with her novice companions, went through the training cycle once more. Every day for several weeks the four-legged space travelers trained in a special room in full space regalia.

"A high-speed centrifuge is situated in the center of the room. Transmitters of medical devices are attached to the animals. The centrifuge is set at a definite rate of rotating motion. The effect of G-forces on the animal organism can be observed on the screen of the apparatus. Training was also conducted on the vibration platform, where the animals were subjected to vibration similar to that experienced in a rocket flying through space.

"The future astronauts were constantly trained to become accustomed to remain in a fixed position in a cradle situated in a section of the rocket which was kept closed for 2 hours.

"Otvazhnaya was very calm, as would be expected of an experienced space traveler. The novices Malek and Zvezdochka seemed somewhat excited. But soon even they became accustomed to unusual conditions.

"Finally the climax was reached. Well prepared and dressed in space suits, the animals arrived at the rocket launching site. The equipment and instruments were checked and the air-regenerating apparatus was switched on. One minute left... A signal given to start. A fiery whirl... the rocket rose beyond the clouds carrying off the three space travelers.

"A physician at a telemetering station watches over the reactions of his patients flying through space.

"Observations of the function of cardiovascular and respiratory systems during experimental flight on the ground which approximates actual flight in space is part of the program of biological surveys. This part of the experiment was conducted on dogs. Pulse rate, respiration, arterial pressure, and cardiac biocurrents were recorded.

"The data on changes in muscular tonus during weightlessness attracted the special attention of biologists. This part of the experiment was conducted on a rabbit.

"The telemetry system worked faultlessly. The slightest deviation in vitality did not escape the physician's attention.

"The parachute system also functioned perfectly. The container landed smoothly and gently. The animals, having freed themselves from the cradle, acted as though they had never left the ground. They did not suffer any kind of injury; there were no signs of even slight hemorrhages. No serious disturbances in physiological functions were noted in the animals. Otvazhnaya and Malek feasted on beefsteak and Zvezdochka ate radishes with fresh grass.

"The animals at present feel very well."

Behavioral Science

76. N. Wiener Speaks on Cybernetics in Moscow

"Cybernetics and Medicine," by D. Menitskiy; Moscow, Meditsinskiy Rabotnik, 17 Jul 60, p 4

"Members of scientific societies of psychologists and physiologists and scientists and students of the faculty of philosophy of the Moscow State University assembled on 5 July in the huge auditorium of Moscow University to hear Prof Norbert Wiener, the well-known American mathematician and one of the founders of modern cybernetics. Professor Wiener attended the International Congress on Automatic Control which was held recently in Moscow. The subject of Professor Wiener's talk was "The Problem of Self-Adjusting Systems." His talk attracted great interest. Having worked in close cooperation with biologists, Wiener displays great interest in various biological problems, particularly in neurophysiology and psychology.

"Prof Norbert Wiener expounded in his talk the basic principles of the structure of artificial self-adjusting systems (machines which change or 'correct' their own performance, while in operation, to produce the greatest beneficial effect) and self-reproducing systems. Professor Wiener also touched on some problems in psychology and economics which arise as the production and organization of mental work is further automatized.

"In response to a multitude of questions, Wiener set forth in detail his views on the significance of cybernetics in revealing the physiological mechanisms of memory, training, etc.

"He stated that even though cybernetics has not yet raised or solved a single new problem in biology, it has nevertheless made it possible to come close to solving a number of questions and to discovering previously unnoticed connections between phenomena.

"Concerning cybernetic machines and their analogy with the human brain, Wiener said that in the realm of the simplest or 'lower' mental activity, in the solution of problems in ordinary logic or in calculus, the advantage of a machine is accuracy and speed. In the realm of 'higher mental activity', i.e., in the field of creative power, the brain was and remains supreme, although it is impossible to delimit exactly the possibilities of artifical systems.

"After finishing his talk, Wiener visited the chair of physiology of the First Moscow Medical Institute imeni I. M. Sechenov and acquainted himself with the works of associates of Prof P. K. Anokhin. Wiener expressed his amazement at the progress that the Soviet scientists have made in the field of automation, which was so well demonstrated at the recently held international congress. He was particularly impressed by the bioelectrically controlled prosthetic equipment.

"N. Wiener awaits his trip to Leningrad where he plans to visit the Institute of Experimental Medicine, where the brilliant Russian physiologist Ivan Petrovich Pavlov evolved his theory of conditioned reflexes, and to speak before an audience of Pavlov's students and followers."

Epidemiology

77. Outbreak of Pappataci Fever

"Pappataci Fever in the City of Karshi," by G. Ye. Sarankin, Kashka-Dar'inskaya Oblast Polyclinic; Tashkent, Meditsinskiy Zhurnal Uzbekistana No 5, May 60, p 79

Two outbreaks of pappataci fever in the city of Karshi are reported. The outbreaks occurred in 1958 and 1959, with the outbreak in 1959 being considerably more severe than in 1958. Among the prophylactic measures recommended are the decisive control of mosquitoes and mosquito breeding areas, and an intensive sanitary-enlightenment campaign in the endemic areas.

78. Susceptibility to Infectious Diseases Approached Theoretically

"The Problem of the Susceptivility of Humans to Infectious Diseases," by S. V. Guslits, Teoreticheskiye Problemy Epidemiologii (Theoretical Problems of Epidemiology), Kiev, 1959, pp 101-111 (from Meditsinskiy Referativnyy Zhurnal, No 2, Feb 60, pp 73-74)

"The authors discuss the problem of the susceptibility of the human to conditionally pathogenic microorganisms which are always present among the microflora of the mouth and nasal passages, and to unconditionally pathogenic microorganisms which cause various infectious diseases. A preliminary decrease in the resistance of the macroorganism, without which a disease does not begin and progress, is necessary for the genesis of a disease caused by conditionally pathogenic microorganisms. Human susceptibility to unconditionally pathogenic microorganisms is universal if they [humans] do not acquire specific immunity during their lives. Adaptation to parasitization on the part of unconditionally pathogenic microorganisms was developed during the process of evolution with respect to the entire human race (or to animals). This ensured them an existence in nature as a species. There is no basis for thinking that adaptation to parasitization in the human or animal organism with respect to unconditionally pathogenic microorganisms was developed during the evolution process only as a result of weakening of macroorganism resistance.

"The author notes the necessity for strict limitation of the concepts of 'susceptibility' and 'resistance' of the macroorganism. If susceptibility is a uniform characteristic of a species, the extent to which the response reaction of the macroorganism is manifested, being generally analogous for each nosological form, is always individual and depends on different nonspecific effects on the part of the environment. The existence of the healthy carrier should be recognized only in diseases caused by conditionally pathogenic microorganisms. An absolutely healthy carrier in infectious diseases has not been factually demonstrated, and has no theoretical basis. The creation of immunity in infectious diseases is possible with the use of specific agents, whereas an increase in the resistance of the macroorganism is also possible through nonspecific agents."

Experimental Medicine

79. Anaerobic Infection

"Function of the Cortical Layer of the Adrenal Glands in Anaerobic Infection," by I. B. Fridlyand, Sb. Nauchn. Rabot Yaroslavsk. Med. In-ta (Volume of Scientific Works of the Yaroslavl Medical Institute), No 15, 1957, pp 93-100 (from Referativnyy Zhurnal Khimiya--Biologicheskaya Khimiya, No 11, 10 Jun 60, Abstract No 14973, by V. Barun)

"Guinea pigs were infected with gas gangrene by the intramuscular injection of a suspension of Bacillus perfringens type A in doses which killed the animals within 3 or 10-14 days after the infection. The blood serum content of Na and K fluctuated within the normal limits; this indicated that the functions of the cortical layer of the suprarenal glands were not disturbed. The average content of ketosteroids in the glands of the healthy guinea pigs was about 1.34 milligrams per gram, while that in the diseased animals was 3.35 milligrams per gram. After the animals were infected, the quantity of ketosteroids excreted during the first and second 24-hour periods increased; it then began gradually to decrease. The quantity of ketosteroids excreted with urine by the animals which were infected with the gas gangrene toxin was greater than that excreted by the animals which were infected with the microorganisms. The administration of desoxycorticosterone failed to prolong the lives of the animals."

Immunology and Therapy

80. Results of Leukemia Therapy in USSR

"The Treatment of Acute Leukemias," by G. V. Osechenskaya and N. S. Turbina, Hematological Clinic, Central Order of Lenin Institute of Hematology and Blood Transfusion, Ministry of Health USSR; Moscow, Problemy Gematologii i Perelivaniya Krov, No 6, Jun 60, pp 13-22

The author presents observations conducted on 170 patients with acute leukemia between 1948 and 1957. Steroid hormones and 6-mercaptopurine produced the best results in attaining clinical and hematological remission. The life of some patients was prolonged with the aid of these preparations.

"The Treatment of Chronic Leukemias and Lymphogranulomatosis by Ethylene-Substituted Phosphoramides," by P. M. Al'perin, M. Ya. Anshevich, and R. I. Rodina, Central Order of Lenin Institute of Hematology and Blood Transfusion, Ministry of Health USSR; Moscow Problemy Gematologii i Perelivaniya Krov, No 6, Jun 60, pp 25-29

The use of ethylene-substituted phosphoramides (TEPh and ThioTEPh) on 46 patients demonstrated that these preparations possess marked cytotoxic action and produce a direct beneficial therapeutic effect in the majority of cases suffering from chronic leukemias (myelosis and lymphadenosis), lymphogranulomatosis, and reticulosarcomatosis. This effect is manifested by an improvement in the general condition of the patient, a decrease in the size of the pathologically enlarged organs and tumor formations; in leukemias, a reduction in the number of leukocytes and at times a normal blood picture. Ethylenephosphoramides have an inhibitory effect on hemopoiesis; therefore, treatment should be conducted with constant blood picture control (especially of the number of leukocytes and thrombocytes). The effect of thiophosphoramides (Thio-TEPh) is milder and may be recommended in treating chronic leukemias and lymphogranulomatosis.

81. Toxic Forms of Diphtheria

"On the Problem of the Therapy of Toxic Forms of Diphtheria," by K. A. Amirdzhanov; Baku, Azerbaidzhanskiy Meditsinskiy Zhurnal, No 4, Apr 60, p 125

"A considerable increase in the incidence of toxic forms of diphtheria, i.e., those forms of the disease which are responsible for the greatest percentage of complications and mortality, has been noted in recent years, despite the decline in the general morbidity of diphtheria. Therapy of these severe forms of diphtheria, therefore, is one of the most urgent problems of the present time. Therapy of the toxic forms of diphtheria is of necessity a complex process including such procedures as the application of antidiphtheria serum, antibiotics, vitamins, and glucose. Glutaminic acid and hemotherapy have been widely utilized in recent years. Hemotherapy has been found highly effective: the course of therapy becomes more favorable, toxic manifestations disappear sooner, and affections of the peripheral and cardiovascular nervous systems are only one third to half as much. A decrease in lethality has also been noted. The application of glutaminic acid in the complex of therapeutic measures has made it possible to prevent the development of neuritis and polyneuritis, and if these diseases do develop, to alleviate their course."

82. Therapeutic Effects of Trypsin Inhibitor on Inflammatory Processes and Burns

"The Effect of a Trypsin Inhibitor Isolated From Potatoes, II. Effect on Burns and Other Inflammatory Processes," by J. Hladovec, Z. Horakova, and V. Mansfeld; Ceskosl. Fysiol. (Czechoslovak Physiology), Vol 7, No 5, 1958, pp 467-468; (From Referativnyy Zhurnal Khimiya--Biologicheskaya Khimya, No 12, 25 Jun 60, Abstract No 16347, by E. Galyas)

"The therapeutic effect of a trypsin inhibitor, from potatoes on various inflammatory processes and on burns in rats and rabbits was investigated. It was established that the intraperitoneal and especially the intravenous administration of the inhibitor exerted a significant therapeutic effect on inflammatory processes. The administration of the inhibitor per os was ineffective. The therapeutic efficacy was proportional to the inhibiting action on trypsin. The inhibitor was very effective in treating conjunctivitis caused by the application of oil of mustard to the eyes of rabbits. The therapeutic effect of the inhibitor on skin inflammation caused by oil of mustard was also shown. The effect of the inhibitor on burns was studied on rats. Prior to the infliction of burns, the rats received a solution of Evans' azure intravenously and the inhibitor was administered to the experimental animals. The weight of the inflamed portion of the skin and the staining intensity of the acetone extract of the scalded skin were determined. It was established that the inhibitor decreased the weight of the inflamed skin portion by 63%, and the staining intensity of the extract by 65%. The first report appeared in Referativnyy Zhurnal Khimiya--Biologicheskaya Khimiya, No 9, 1957, Abstract No 10083."

83. Book on Chemotherapy Reviewed

Methody Eksperimental'noy Khimioterapii (Methods of Experimental Chemotherapy), edited by Prof G. N. Pershin, reviewed by Prof Kh. Planel'yes; Moscow, Meditsinskiy Rabotnik, 12 Aug 60 p 4

"The book describes in detail methods for experimentally confirming the effectiveness of preparations against protozoic infections, spirochetosis, the principal bacterial infections, rickettsioses, virus infections, dermatomycoses, helminthoses, and malignant tumors.

"Separate chapters are devoted to methods for studying medicinal stability, mode of action, absorption and distribution in the organism, etc.

"In addition, there are detailed accounts of the main methods for obtaining experimental confirmation of the effectiveness of different methods of treatment. At the end of each section there is a short review of the literature.

"It is very valuable that the book includes a great number of methods since the exposition has been rather compressed. It should be noted that the description of each method is so clear and precise that even the beginning experimenter can be easily oriented. Over 20 authors have contributed to the book; however, this has not affected its continuity.

"The theoretical reasons for studying the bacteriostatic and bactericidal actions of antibacterial preparation have not been set forth clearly enough. Also questionable is the confirmation of the fact that resistant forms of staphylococci are less virulent. Clinicians well know that the resistant forms isolated from diseased patients either possess increased toxicity or do not differ from the usual pathogenic strains.

"Regardless of these or other questionable aspects, the book is valuable and the reviewer warmly recommends it to all laboratory workers and individual investigators who work in the field of chemotherapy. The reviewer ends with the regret that the book was printed in such a limited number of copies."

84. Czechs Produce Lyophilized Tick-Borne Encephalitis Antigen

"Preparation of Noninfectious Freeze-Dried Tick-Borne Encephalitis Antigen for the Complement-Fixation Reaction," by Emilia Cupkova; Prague, Ceskoslovenska Epidemiologie, Mikrobiologie, Imunobiologie, Vol 9, No 2, 1960, p 110

This article reports the preparation of lyophilized tick-borne encephalitis antigen for diagnostic use in the complement-fixation reaction. The antigen was extracted with ethylacetate and inactivated by ultraviolet irradiation; it was lyophilized in a Czechoslovak-manufactured apparatus.

The titer of the inactivated, lyophilized antigen varied from 1:16 to 1:64 in the presence of an excess of hyperimmune serum. The antigenic activity was maintained after 9 months of preservation. The advantages of this type of antigen are discussed.

85. Cancer Virus Investigated With Electron Microscope

"Study of Some Tumors in Humans and Animals Using an Electron Microscope," by T. G. Gasanov; Baku, Azerbaydzhanskiy Meditsinskiy Zhurnal, No 4, Apr 60, pp 118-120

This article points out that a detailed study of viruses is an important aspect of cancer research. The results of 100 electron microscopic studies made to date affirm that viruslike bodies are present in most diverse tumors found in humans and animals.

The author says that results of experiments conducted in the laboratory of L. A. Zil'ber showed that extracts of stomach polyps and human urinary bladder papilloma contain submicroscopic spherical bodies which closely resemble viruses. These bodies can be seen on the screen of an electron microscope. They appear in pairs, forming small masses of short chains.

Data obtained so far indicate that further research must be conducted combining the morphological approach with the serological.

86. Free Radicals Labeled as Individual Cancerogenic Agents

The Possible Role of Free Radicals in Cancerogenesis," by A. B. Syrkin; Moscow, Uspekhi Sovremennoy Biologii, Vol 49, No 3, May/Jun 60, pp 305-319

The author reviews and discusses the problem of cancerogenesis and the cause of predisposition to malignancy. Free radicals as the factor determining the blastomogenic capacity of certain more thoroughly studied cancerogenic agents is brought out.

Cancerogenic agents discussed include ionizing radiation, polycyclic hydrocarbons, aminoazo compounds, alkylating compounds, and certain other agents such as DNA.

According to the author's definition, cancerogenic agents (physical and chemical) are agents which under definite conditions and at proper stages can cause the formation of free radicals, or can themselves be transformed into free radicals.

It may be postulated that the creation of unfavorable conditions for the formation or for the reaction capacity of free radicals decreases the efficacy of cancerogenic agents. Further study along this line may clear the path to the discovery of the proper measure for the protection of the organism from the blastomogenic action of cancerogenic agents.

This does not mean that cancerogenic compounds themselves do not merit attention. Cancerogenic agents are the potential sources of free radicals. Therefore, it is essential to intensify research on the presence and the distribution of cancerogenics in the environment surrounding man; and finding means of removing them.

The formation of free radicals as the single mechanism in the action of various cancerogenic factors is not a new theory. Rather, it is a more comprehensive understanding of the action cause (etiology) which leads to a malignant transformation. The phase at which free radicals are formed is the subsequent decisive stage after which a completely new process (pathogenesis) commences and this leads to the transformation of normal growth into tumerous tissue growth.

87. Cancer Therapy

"On the Problem of the Therapy of Gynecological Patients with Triethylene Thiophosphoramide (TioTEFA)," by A. Kh. Mayransayev, Gynecological Department, Institute of Oncology, Academy of Medical Sciences USSR; Moscow-Leningrad, Voprosy Onkologii Vol 6, No 4, Apr 60, pp 30-38

TioTEFA (triethylene thiphosphoramide) was applied to 27 patients afflicted with carcinoma of the ovaries and different parts of the uterus. The results were as follows.

1. TioTEFA was found to be effective in the therapy of tumors; it provided, however, only temporary relief.

2. The therapeutic effect of the preparation was expressed by the disappearance of pain, decrease of the tumor mass, and the absorption of the ascites; the disease recurs, however, within 2-4 months.

3. Repeated therapy with TioTEFA is usually ineffective.

4. TioTEFA is only one of the components of the complex therapy of tumors; it cannot, however, be applied in combination with radiation therapy because of its sharply depressing effect on hemopoiesis.

5. The application of TioTEFA is contraindicated in cases in which it is found that the number of leucocytes and thrombocytes in one cubic milliliter of blood are 3,300 and 100,000, respectively.

6. The therapeutic effectiveness of TioTEFA does not depend on the age or condition of the patients.

88. Chemotherapy of Cancer

"Trends in the Investigation of the Chemotherapy of Cancer Carried Out in the German Democratic Republic," By V. Lyurs, Clinic of the German Academy of Sciences, Berlin; Moscow-Leningrad, Voprosy Onkologii, Vol 6, No 4, Apr 60, pp 38-43

Research on discovering chemotherapeutic preparations effective in cancer therapy is being carried out at the Institute of Medicine and Biology of the German Academy of Sciences (Berlin-Buchs), and the Institute of Microbiology and Experimental Therapy of the German Academy of Sciences in Jena. The basic trends of the research work being done are as follows: (1) the clarification of the mechanism of body resistance to the development of tumors, and the discovery of chemical and chemicophysical preparations which will assist the organism in the development of such resistance; (2) the role played by hormones in the chemotherapy of cancer; (3) the discovery of antibiotics for cancer therapy; and (4) the investigation of the effectiveness of antimetabolites and cytostatic compounds. Investigations of the problem are also being carried out at different universities and medical, physiological, and clinical institutes in the GDR.

89. Therapy of Nasopharynx-Larynx Malignancies

"On the Clinical Picture and Therapy of Malignant Tumors of the Pharynx," by Ye. S. Ogol'tsova, Department of Diseases of the Ear, Throat, and Nose, Central Clinical Roentgenological Hospital, Ministry of Railways USSR; Moscow, Vestnik Otorinolaringolii, Vol 22, No 4, Jul/Aug 60, pp 24-33

The clinical picture and results of observations of 140 patients suffering from maligancies localized in the nasopharynx and larynx are presented in the article. The development of the malignancies is characterized by a prolonged period of concealment and extensive and early metastasis, making their diagnosis and therapy very difficult. The methods of therapy depend on the localization and nature of the malignant formations. The best methods of therapy are: (1) external and teleradium irradiation, (2) short focus deep roentgenotherapy; (3) preoperative irradiation and the complete removal of the pharynx in cases of acute pharyngeal localization.

90. Effect of Some Organophosphorus Compounds on the Organism

"Correlation Between the Structure of a Number of New Organophosphorus Compounds, Their Anticholinesterase Properties, and Their Capacity to Induce Bronchial Spasms," by I. V. Semenov and N. K. Fruyentov, Fiziol. Rol'Atsetilkholina i Izyskaniye Novykh Lekarstven. Veshchestv (The Physiological Role Acetylcholine and the Search for New Medicinal Substances), L., 1957, 245-253 (from Referativnyy Zhurnal -- Biologiya, No 10, 25 May 60, Abstract No 47800, by V. Shashkov)

"Investigation of proserine and 12 preparations (derivatives of phosphoric, phosphinic, pyrophosphoric, and thiophosphoric acids) were conducted. The bronchospastic action of these preparations was appraised on the basis of the maximal doses which were required to induce complete bronchospasms in cats. Their anticholinesterase action was determined by the Plattner biological method. Armine [the ethyl paranitrophenyl ester of ethylphosphinic acid, Bol'shaya Meditsinskaya Entsiklopediya, Vol 2, Moscow, 1957, p 643], proserine, pyrophos, and the methylsulfomethylate of isosystox exhibited their greatest bronchospasmodic and anticholinesterase actions when used in concentrations of $2.6 \cdot 10^{-9}$ to $1.5 \cdot 10^{-8}$. All the other tested preparations exhibited a considerably weaker action (10-100-1,000 times and more) in regard to their anticholinesterase and their bronchospasmodic actions. A direct relationship between their capacity to inhibit cholinestersae and the ability to induce bronchospasm has been established. The ability of the preparations to affect cholinesterase activity as well as to induce bronchospasms was decreased when the oxygen atom which is linked to phosphorus by a double bond was replaced by a sulfur atom in the molecule. The bronchospasmodic and anticholinesterase actions of the preparations are enhanced when the bivalent sulfur compounds are transformed into sulfonyl compounds."

91. Ganglioblocking Preparations

"Certain New Ganglioblocking Preparations," by V. Trcka and M. Vanecek, Ceskosl. Farmac. (Czechoslovakia), 1959, 8, No 6, 316-325 (from Referativnyy Zhurnal -- Biologiya, No 10, 25 May 60, Abstract No 47840, by the authors)

"The ganglioblocking properties of the following preparations were studied: analogues of sulfonium, iodides of methonium, quaternary derivatives of Ω-aminoalkylhaloids, bis-quaternary derivatives of 1,4-aminobutane, derivatives of 3-phenyl-n-pentane, bis-quaternary salts of 1,5-diaminothiopentane, derivatives of 2-(p-aminophenyl)-ethyl amine, 2-aminoisocamphane, cyclohexylamine, 2,3,3-trimethylbutane, and others. The

ganglioblocking and hypotensive properties of the above-mentioned preparations were compared with those of hexamethonium and mecamylamine. The following preparations were found to be most active: 3-thiopentane-1,5-bis-(dimethylaminoethylammonium)-iodide (thiameton); the hydrobromide of 2-dimethylaminoisocamphane; the hydrochloride of 1,2,2-trimethylcyclohexyldimethylamine (penhexamine); the hydrochloride (or hydrobromide) of 2-methylamino-2,3,3-trimethylbutane (penbutamine)."

92. Anticholinesterase Preparations

"Effect of Ionizing Radiation on the Sensitivity of the Organism to Anticholinesterase Preparations of Prolonged Action," by Yu. I. Lisunkin, Yezhegodnik, In-t Eksperim. Med. AMN SSSR (Yearbook, Institute of Experimental Medicine, Academy of Medical Sciences USSR), 1957, L., 1958, 457-458, (from Referativnyy Zhurnal -- Biologiya, No 10, 25 May 60, Abstract No 48086, by A. Kasparov)

"The administration of tetraethylmonothiopyrophospate (pyrophos; I) in a dose of 80 gamma per kilogram of body weight caused the cholinesterase activity of the blood serum to decrease by 54.6 percent; 5 hours after the administration of (I), the cholinesterase activity of the serum was somewhat increased. Irradiation of mice with doses of 300, 500, and 1,000 r produced no changes in the cholinesterase activity of the blood serum of the mice; a slight decrease in the cholinesterase activity was noted when the animals were irradiated with 2,000 r. When the mice were irradiated with 5,000 r, the cholinesterase activity of the serum was 18 percent lower than in the control animals; this decline, however, could be noted only 2 hours after the irradiation; 6 hours later the cholinesterase activity of the serum returned to the initial level. The irradiation of the animals with doses of 5,000 r followed by the administration of (I) produced a greater change in the cholinesterase activity of the serum than the administration of (I) alone; 6 hours later, however, no noticeable change in the cholinesterase activity of these animals as compared with that of the nonirradiated animals, which received, (I) was noted. Cholinesterase activity in the cerebral tissues decreased by an average of 20 percent following the administration of (I). Cholinesterase activity in the cerebral tissues increased by an average of 22 percent after the animals were irradiated with 5,000 r. Under the influence of the combined action of (I) and radiation the cholinesterase activity in cerebral tissues was at a higher level (13.4 percent) than in normal animals, but a lower level than that in mice which were only irradiated. The reaction of the cholinesterase activity in the cerebral tissues and that of the blood serum differed."

93. Effect of Some Preparations on Central Nervous System

"Effect of Certain Complex Esters of R, R'-Aminoethanol and Diphenylacetic Acid on the Central Nervous System," by P. P. Denisenko, Section of Pharmacology, Institute of Experimental Medicine, Academy of Medical Sciences USSR; Moscow, Farmakologiya i Toksikologiya, Vol 23, No 3, May/Jun 60, pp 206-215

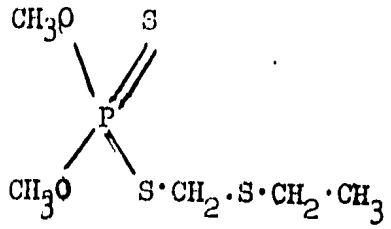
Comparative studies of the effect of a group of cholinolytic preparations (derivatives of R, R'-amminoethanol and diphenylactic acid) on the central nervous system were conducted. The substances studied were IEM-268, diphacil, methyldiphacil (IEM-265), aprophen [the hydrochloride of the beta-diethylaminoethyl ester of propionic acid, Lekarstvennyye Sredstva, by M. D. Mashkovskiy, Moscow, 1957, pp 210-211], diazil, methyldiazil (IEM-275), diprophen [the hydrochloride of beta-di-n-propyl ester of thiodiphenylacetic acid, Lekarstvennyye Sredstva, by M. D. Mashkovskiy, Moscow, 1957, pp 211-212], and pentaphen. Rabbits, guinea pigs, and rats were used in the experiments which established that all the preparations under investigation affect the functions of cholinoreactive systems of the cerebrum; the modifications in the functions of these systems cause changes in the behavior of the animals, cerebral bioelectrical activity, conditioned reflex activity of the animals, and reduce the affect of nicotine and arecoline on the nervous system. There is a distinct antagonism between the cholinolytic preparations and acetylcholine, nicotine, and arecoline, and a definite relationship between the chemical structure of the cholinolytic preparations and their pharmacological properties. On the basis of the investigations, two of the preparations, methyldiazil and methyldiphacil, are recommended for clinical application as tranquilizers with cholinolytic action.

94. Toxicological Investigations of New Soviet Insecticide M-81

"The Detection of an Organophosphorus Insecticide M-81 in Apples, Grape Juice, and Wine," by G. Ya. Isayeva and M. A. Trotsenko, Ukranian Scientific Research Institute of Nutrition, Kiev; Moscow, Voprosy Pitaniya, No 4, Jun/Aug 60, pp 59-61

At present, new insecticides, including preparation M-81, are undergoing industrial testing. This insecticide is less toxic than mercaptophos, M-74 (0,0-diethyl-bata-ethylmercaptoethyldithiophosphate) and others, and will be widely used for treating gardens and orchards. In connection with this program it became necessary to develop a method for detecting M-81 in apples, grapes, and products obtained from these fruits.

The active ingredient of preparation M-81 is 0,0-dimethyl-beta-ethylmercaptoethyldithiophosphate.



The insecticide was synthesized by T. A. Mastryukovaya at the Institute of Elementoorganic Compounds, Academy of Sciences USSR. The preparation is a clear oily liquid with an unpleasant odor, soluble in organic solvents. It is produced commercially in the form of a 50% concentrate with OP-7 as a vehicle; for agricultural purposes it is used in the form of a water emulsion.

As a result of this investigation, conditions were found under which it was possible to effect a chromatographic separation of the preparation from phosphorus compounds inherent in the plant proper. Ether and chloroform are recommended as solvents, while Mogilev-Podolsk diatomaceous earth is an acceptable adsorbent.

Following the preparations disintegration by means of strong mineral acids in the presence of potassium permanganate, it can be detected in the eluate by a test for phosphorus in the form of a phosphoric-molybdenic heteropolycomplex.

In agreement with data from the Ukrainian Nutrition Institute, the amount of M-81 in food products should not exceed 0.5 mg/kg.

"The Toxicological Characteristics of a New Insecticide M-81 and Its Effect on the Quality of Food Products," by A. A. Tostanovskaya, Ukrainian Scientific Research Institute of Nutrition, Kiev; Moscow, Voprosy Pitaniya. No 4, Jun/Aug 60, pp 61-65

Some data on the toxicity of preparation M-81 in warm-blooded animals is presented in this article. The minimum toxic dose for rats and mice in acute experiments is 10-20 mg/kg, minimum lethal dose is 30-40 mg/kg, a dose of 60 mg/kg caused the death of half the experimental rats while a dose of 100 mg/kg resulted in the death of all the animals. For cats and puppies, the toxic and lethal doses occur within the limits of 10-15 mg/kg. With repeated administration it was determined that the preparation possesses cumulative properties and can produce chronic intoxication. In prolonged chronic experiments (11-14 months) the toxic dose of M-81 for rats was equal to 3 mg/kg; for cats, one mg/kg; and the threshold dose, approximately equal to one and 0.5 mg/kg.

The toxicity picture of M-81 is similar to that observed when animals are exposed to other organophosphorus insecticides which involve the cholinesterase system of the organism.

Finally, it was determined that the maximum amount of M-81 in food products should not exceed 0.5-0.7 mg/kg.

95. Poisonous Substances Used in Agriculture

"On the Characteristics and Prophylaxis of Intoxications by Poisonous Substances Used in Agriculture," by A. Kuklinov; Tallin, Zdravookhraneniye Sovietskoy Estonii, No 3, May/Jun 60, pp 62-63

Further study of the effect poisonous substances on the organism is urged, especially in connection with the use of such substances in agriculture. About 400 types of chemical substances are now used in agriculture. These may be divided into the following groups: (1) insecticides which kill insects; (2) fungicides which kill microorganisms; (3) herbicides which suppress the growth of weeds. Many of these are highly poisonous and harmful to man. Among the poisonous substances used in the Soviet Union to protect the crops are hexachloran and DDT -- organochlorous compounds; dithiophos, carbophos, metaphos, chlorophos, thiophos, NIUIF-100 and many others -- all organophosphorus compounds; ethylmercurophosphate; and ethylmercurochloride (granozan, NIUIF-2). Organic mercury compounds are considerably more poisonous than mercuric chloride. Organophosphorus compounds are dangerous because of their ability to enter the organism through undamaged skin. It is essential that medical personnel thoroughly familiarize themselves with the effect of these poisonous substances on the organism.

96. Toxicology of Metaphos

"Data on the Toxicology of Metaphos and Labor Hygiene Upon Its Application in Agriculture," by L. T. Brakhnova, Dissertation Presented for the Degree of Candidate of Medical Sciences, Kiev; Kiev, Vrachebnoye Delo, Vol 42, No 7, Jul 60, p 151

"The author came to the conclusion that metaphos, an organophosphorus insecticide, is toxic to man and warm-blooded animals, but does not irritate the skin. For prophylaxis and early diagnosis of metaphos intoxications, the author recommends that the active cholinesterase of the morphological composition of the blood, the cardiovascular activity, and the condition of the automatic reactions be investigated, and that an erythrocyte sedimentation reaction be conducted. Therapy should include the use of pentaphen and tropacin -- new cholinolytic preparations, and atropine."

97. Effect of Cholinolytic Drugs on the Organism

"The Effect of Pentaphen and Merpanite -- New Cholinolytic Preparations on a Healthy Person," by A. R. Luzhis, Fiziol. Rol' Atsetilkholina i Izyskaniye Novykh Lekarstv. Veshchestv (The Physiological Role of Acetylcholine and the Search for New Medicinal Substances), L., 1957, 270-277 (from Referativnyy Zhurnal -- Biologiya, No 10, 25 May 60, Abstract No 47811, by V. Shashkov)

"The subcutaneous administration of pentaphen in a dose of 75 milligrams and merpanite in a dose of 40 milligrams to healthy persons fully depressed gastric motor activity for 1-1 1/2 hours, and decreased the amount of HCl in the gastric juice, the amount of free HCl in particular. Pentaphen (50 milligrams) decreased arterial pressure for a short time by 5-25 millimeters of mercury without modifying the pulse rate. Merpanite (20 milligrams) produced an increase in the pulse rate by 25 ictuses a minute without affecting arterial pressure. No changes in the electrocardiogram were noted under the influence of pentaphen and merpanite. Pentaphen (50 milligrams) had no effect on salivation; merpanite (20 milligrams) decreased unconditioned salivation by 57.7 percent. Pentaphen (50-75 milligrams) produced an intoxicating effect which was accompanied by dizziness and muscular asthenia. Similar doses of merpanite did not disturb the central nervous system."

98. Therapy of Bronchospasms

"Experimental Therapy of Proserine Induced Bronchospasm With New Cholinolytic Preparations," by Ye. P. Uspenskaya, Fiziol. Rol' Atsetilkholina i Izyskaniye Novykh Lekarstvennykh Veshchestv. (The Physiological Role of Acetylcholine and the Search for New Medicinal Substances), L., 1957, 219-228 (from Referativnyy Zhurnal -- Biologiya, No 10, 25 May 1960, Abstract No 47806, by V. Shashkov)

"The therapeutic effectiveness of the hydrochlorides, iodoethylates, and iodomethylates of pentaphen (I), diphasin (II), arpenal (III), novocain (IV), diphacyl (V), tetraethylammonium (VI), adrenalin (VII), and atropine (VIII) when used in cases of bronchospasms induced in cats by the administration of lethal doses of proserine (IX; 0.1 milligram per kilogram of body weight) was investigated. Relief from bronchospasm was noted when the preparations were used as follows: (I) -- the hydrochlorides in doses of 1.5-2 milligrams per kilogram of body weight, iodomethylates -- in doses of 0.05-0.1 milligram per kilogram of body weight, and iodoethylates -- in doses of 0.5 milligram per kilogram of body weight; (II) -- the hydrochlorides in doses of 10 milligrams per kilogram

of body weight, iodomethylates and iodoethylates -- in doses of 0.2 milligram per kilogram of body weight; (III) -- hydrochlorides in doses of 0.5 milligram per kilogram of body weight, iodomethylates in doses of 0.05, and iodoethylates -- in doses of 0.1 milligram per kilogram of body weight; (IV) -- in doses of 5-10 milligrams per kilogram of body weight; (V) -- in doses of 5-6 milligrams per kilogram of body weight; (VI) -- in doses of 10 milligrams per kilogram of body weight; (VII) -- in doses of 5-10 milligrams per kilogram of body weight; and (VIII) -- in doses of 0.03 milligram per kilogram of body weight.

"The capacity of the preparations to prevent the development of bronchospasm induced by proserine was also studied. The preparations were intravenously administered in doses of 3 milligrams per kilogram of body weight, and were followed by an injection (within 2-5 minutes) of (IX) in doses of 0.1 milligram per kilogram of body weight. The hydrochlorides of (II), (III), and (IV) were found to be less effective than the iodomethylates and iodoethylates. Among the latter the iodomethylates were the more effective. (IV) [sic], (V), and (VI), were found to be ineffective in similar experiments. The failure of (I) to relieve bronchospasm after a second administration was established."

"Therapy of Armine Induced Bronchospasm With Cholinolytic Substances in a Cat," by I. V. Semenov, Fiziol. Rol' Atsetilkholina i Izyskaniye Novykh Lekarstven. Veshchestv (The Physiological Role of Acetylcholine and the Search for New Medicinal Substances), L., 1957, 237-244 (from Referativnyy Zhurnal -- Biologiya, No 10, 25 May 60, Abstract No 47822, by V. Shashkov)

"In experiments carried out on decerebrated cats to which artificial respiration was applied, armine in doses of 0.4 milligram per kilogram of body weight induced bronchial spasms with lethal results. The subsequent two-sided vagotomy failed to remove the spasms, and only decreased them by 20-30 percent. The preliminary resection of the vagus nerves only served to retard their development. Tetraethylammonium decreased bronchospasms by 30-40 percent only for a short time; atropine (0.1 milligram per kilogram of body weight) completely removed them. Complete relief from bronchial spasms was provided by (in milligrams per kilogram body weight) the iodomethylate of pentaphen (0.3-0.4); the iodoethylate of pentaphen (I); merpanite (0.4); mephazin (0.2); arpenal (3); the iodomethylates and iodoethyaltes of arpenal (0.5), and the methylsulfamethylate of arpenal (1). Ganglieron and its iodoalkylates were not effective. The doses of the preparations which are necessary for relief from armine induced bronchspasms are 2-3-5-10 times larger than doses required for the relief of bronchospasms induced by proserine. It is possible that the direct cholinomimetic action of armine plays an important role in the mechanism of inducing bronchospasms by armine and its anticholinesterase action."

99. Effect of Some Drugs on Transmission of Impulses

"Antagonistic Effect of Cholinolytic and Anticholinesterase Substances on Transmission in the Superior Cervical Sympathetic Ganglion," by K. G. Tsirk, Fiziol. Rol' Atsetilkholina i Izyskaniye Novykh Lekarstven. Veshchestv (The Physiological Role of Acetylcholine and the Search for New Medicinal Substances), L., 1957, 174-179 (from Referativnyy Zhurnal -- Biologiya, No 10, 25 May 60, Abstract No 47799, by V. Shashkov)

"The hydrochloride (2.5-3.5 milligrams per kilogram of body weight intravenously), iodomethylate and iodoethylate (0.3-0.4 milligrams per kilogram of body weight intravenously) of pentaphen (I) disrupted the transmission of impulses in the superior cervical sympathetical ganglion of anesthesized cats. Proserine (II) and eserine (III) in doses of 0.05-0.1 milligrams per kilogram of body weight administered after the administration of (I) hastened the restoration of the tonus of the third eyelid which was depressed by (I). The administration of (II) and (III) (0.1-0.2 milligrams per kilogram of body weight) 1-2 minutes before or simultaneously with the administration with (I) strongly diminished or prevented the action of (I). It was histochemically established that (I) in doses which disturb the transmission of impulses in the ganglia produced no change in the amount of cholinesterase, in the ganglia, while (II) and (III) considerably depressed it. The simultaneous administration of (I), (II), and (III) depressed the true cholinesterase to the same degree as the injection of (II) and (III) alone."

100. Review of Book on Intoxication by Poisonous Chemicals

Klinika i Propfilaktika Otravleniy Yadokhimikatami (Clinical Picture and Prophylaxis of Intoxications by Poisonous Chemicals), by Prof I. Ya. Sosnovik, reviewed by A. M. Okulov; Kazan', Kazanskiy Meditsinskiy Zhurnal, Vol 41, No 2, Mar/Apr 60, pp 126-128

The object of the book, the author writes in his introduction, is to place in the hands of medical personnel information relevant to the clinical symptomatics of intoxication by poisonous chemicals used in agriculture, the early diagnosis of such intoxications, first aid methods, and effective methods of prophylaxis. The information is presented in the following sequence: physical and chemical properties of the poisons, their application, means of entry into the organism, means of excretion, toxicity, character of action, clinical picture of intoxication, diagnosis, first aid, and prophylaxis. The book contains a number of valuable appendixes: a list of drugs to be used in the therapy of intoxications, safety regulations for the treatment of seed and the handling of the treated seed, safety regulations for the disinfection of grain and other storehouses, and rules for the handling and storing of poisons.

The book, however, contains a number of serious shortcomings, and provides erroneous information in some cases. In cases of intoxication by dichloroethane and chloropicrin, for instance, the author recommends placing the patients in a dark room, the application of mustard plasters to the chest, massage of the extremities, inhalation of aromatic spirits of ammonia, and artificial respiration. These methods, however, involve a certain amount of risk, and it would be much better, the reviewer writes, to resort to methods of therapy used in the treatment of intoxications by war gases to which chloropicrin belongs. Erroneous information is also provided in regard to intoxications by preparations containing arsenic, cyanides, and other harmful substances. Despite these shortcomings, the book provides a good deal of information on the clinical picture, therapy, and prophylaxis of intoxications by poisonous substances used in agriculture and will be a valuable aid to all physicians, particularly those practicing in rural areas.

101. Nistatin, New Antibiotic

"New Preparation -- Nistatin," by Candidate of Medical Sciences S. Eydel'shteyn; Moscow, Meditsinskiy Rabotnik, 12 Aug 60, p 3

The Soviet medical industry has begun the manufacture of Nistatin, a new antibiotic. It comes in the form of a yellow or cinnamon-colored powder, slightly soluble in water but readily soluble in dimethylformamide or in an acid medium. Nistatin can be taken internally or used externally.

In the treatment of fungoid infections of the mucous membrane or skin, Nistatin is applied as a salve, emulsion, or suspension. The usual concentration of these medicinal forms is 100,000 units per gram of salve or per milliliter of solution. During the treatment of candidiasis it can be taken internally in doses from 100,000-1,000,000 units 3-4 times a day. Nistatin can be administered to children up to 3 years old in doses of 100,000 units 3-4 times a day. For fungoid infections of the vagina, Nistatin can be used locally in the form of tablets or balls containing 100,000 units.

It has been established that the simultaneous introduction of Nistatin with other antibiotics (in a dose of 100,000-500,000 units 2-3 times a day) prevents the development of candidiasis.

Recently, production of a combined tablet containing chlorotetracycline and hydroxytetracycline with Nistatin (100,000 units of each antibiotic per tablet) has begun.

102. Therapy of Cardiovascular Diseases With Nitranol

"On the Therapeutic Effectiveness of Nitranol -- a New Preparation," by Prof B. Yu. Ioffee and Candidate of Medical Sciences A. N. Garanyan, Chair of Hospital Therapy, Samarkand State Medical Institute imeni I. P. Pavlov; Tashkent, Meditsinskiy Zhurnal Uzbekistana, No 6, Jun 60, pp 40-42

Nitranol [the diphosphate of trinitrate of triethanolamine, Annotatsii o Lekarstvennykh Sredstvakh, by K. D. Sedova, Medgiz, Moscow, 1959, pp 59-60] was clinically tested on 60 patients suffering from different forms of cardiovascular affections. The patients were examined before the administration of the drug and on the completion of the course of therapy with nitranol. The drug was administered in doses of 2 milligrams four times in 24 hours. The observations established that nitranol was highly effective in the therapy of cardiovascular diseases. It produced no side reactions.

103. Effect of Some Stimulants on Water Diuresis

"Effect of Substances Which Stimulate the Central Nervous System on Water Diuresis," by Ye. B. Berkhin, Chair of Pharmacology, Medical Institute, Orenburg; Moscow-Leningrad, Fiziologicheskiy Zhurnal SSSR imeni I. M. Sechenov, Vol 46 No 5, May 60 pp 586-592

Dogs were used in experiments performed for determining the effect of strychnine, corazol, and phenamine on urine secretion and on the dynamics of diuresis after drinking large amounts of water. The experiments established that a single administration of strychnine in a dose of 0.05-0.1 milligram per kilogram of body weight, corazol in a dose of 3-6 milligrams per kilogram of body weight, and phenamine in a dose of 0.5 milligram per kilogram of body weight had no effect on water diuresis in the animals, particularly following the first hour after drinking water; corazol administered in conjunction with salsoline sharply reduced the inhibiting effect of the latter on water diuresis; the prolonged administration of strychnine and phenamine considerably increased water diuresis.

Physiology

104. Interoceptive Signalization

"On the Role of Interoceptive Signalization in the Feeding Behavior of Animals," by V.N. Chernigovskiy; Moscow, Zhurnal Vysshey Nervnoy Deyatel'nosti, Vol 10, No 3, May/Jun 60, pp 313-323

In experiments, dogs had a choice of several solutions containing milk and various amounts of sodium chloride (one, 2.5, and 3.5 percent). The animals readily drank the solutions passing on from the less concentrated to more saturated ones. The infusion of 300 ml of a 5 percent sodium chloride solution into the stomach through a fistula caused the animals within a few minutes (3-8) to refuse to take the most concentrated milk solutions of sodium chloride. When the sodium chloride solution was removed from the stomach, the former attitude to milk-sodium chloride mixtures was restored.

The change in attitude to such solutions was not a result of thirst or mechanical stimulation of the stomach receptors by the infused solution. The choice of the milk-sodium chloride mixtures disappears or is disturbed after section of the vagus nerves under the diaphragm which testifies to the reflex nature of the phenomenon in question. If a 27-percent glucose or saccharose solution is substituted for the 5 percent sodium chloride solution, the choice of the milk-sodium chloride mixtures in not disturbed.

105. Application of Theory of "Dynamic Physiological Structures"

"The Theory of "Dynamic Physiological Structures' And Its Application to the Study of Higher Nervous Activity in Man," by A. Kreyndler, Institute of Neurology imeni I.P. Pavlov of Academy of Sciences, Rumanian People's Republic, Bucharest; Moscow, Zhurnal Vysshey Nervnoy Deyatel'nosti, Vol 10, No 3, May/June 60, pp 324-329

"Investigation of verbo-verbal latencies by means of a complex method during an associative experiment in normal individuals has revealed that these latencies vary according to the dynamic structure to which the stimulating word belongs. Thus, 0.5 sec. is the latency for words belonging to the 'dynamic physiological structures' of alimentation and orientation, 1-5 sec. for words from the defensive structure, and 2-2.5 sec. for words from the social-professional and sexual structure.

The following parameters were used in the complex method: latency of the verbal response, range of latencies, successive inhibition, inhibition of orientation, response quality, response reproduction, intensity and latency of the skin galvanic reflex, and the form of the respiration tracings.

The main feature of this method consists of an attempt to find out not only the general characteristics of cerebral activity as a whole, but the peculiarities of each component of this activity as well.

Public Health, Hygiene, and Sanitation

106. Bacterial Contamination on Public Transportation

"The Use of the Yu. A. Krotov Apparatus for Bacteriological Investigation of the Air on Urban Transportation," by Ye. A. Shaposhnikov, Chair of Hygiene, Kuban' Medical Institute; Moscow, Laboratornoye Delo, Vol 6, No 2, Mar/Apr 60, pp 53-54

"The determination of bacterial contamination of the air on urban transportation, where a particularly large aggregation of people are found, has great epidemiological significance. However, investigation of the air on streetcars and trolley buses is hampered because the Yu. A. Krotov apparatus, which is used in most laboratories, is calculated for use on alternating current with a voltage of 127 or 220 V, whereas the only power supply on streetcars and trolley buses is direct current with a voltage of 500-550 V.

"We found a means of using the Yu. A. Krotov apparatus under these conditions.

"Experiments showed that by feeding direct current with a voltage of 110 V (instead of alternating current with a voltage of 127 V) directly into the sampling unit, bypassing the power input unit of the apparatus, the electric motor operates suitably. The required rate of aspiration of air (25 liters per minute) and the necessary rotation of the stand holding the Petrie dish are achieved. The excess voltage during operation from a power source of 550 V is damped by a special set of resistors mounted in a separate housing.

"Checking of the rate of aspiration of air and registration of deviation from the given rate as a result of line voltage variation (consisting of an average of ± 7.7%) is done with a micromanometer at 30-second intervals. The possibility of making a comparison with the

results of investigations of other objects with the same apparatus compensates for the inconvenience connected with this process and the necessity of increasing the number of analyses to increase the reliability of the data obtained.

"The area of use of the Yu. A. Krotov apparatus can thus be expanded."

107. Determination of Content of Lead and Bismuth Radioisotopes in Air of Mines

"Quantitative Determination of the Content of Lead and Bismuth Radioisotopes in the Air of Mines," by V.I. Baranov and L.V. Gorbushina; Moscow, Atomnaya Energiya, Vol 9, No 1, Jul 60, pp 56-57

In underground mining operations, radon and the short-lived products of its decay, namely, Ra A (Po^{218}), Ra B (Pb^{214}), and Ra C (Bi^{214}) + Ra C' (Po^{214}), are particularly dangerous from the radiobiological standpoint. Because the concentrations of products of decay or radon are lower than those which would correspond to radioactive equilibrium, one must make special determinations of the content of these products in the air. A procedure is described for collecting the radioactive isotopes in question by filtering the aerosols containing them through a BF filter. This is followed by a separate radiochemical determination of the lead isotopes (RaB and RaD) and bismuth isotopes (RaC and RaE).

Radiology

108. Disruption of Enzyme-Substrate Complex (Hyaluronidase-Hyaluronic Acid) Under X Irradiation

"X-Ray Effect on the Hyaluronidase-Hyaluronic Acid Enzyme-Substrate Complex and on the Basic Intercellular Substance," by V.P. Shekhonin, Tr.Gos.N.-I. In-ta Rentgenol. i. Radiol. (Works of the State Scientific Research Institute of Roentgenology and Radiology), No 10, 1959, pp 367-372 (from Referativnyy Zhurnal Khimiya -- Biologicheskaya Khimiya, No 11, 10 Jun 60, Abstract No 14810, by S. Krivobokova)

"To study the changes occurring in the intercellular substance under X-ray effects and also the role of the enzyme hyaluronidase in this process, tests were performed on various organs of rabbits. It was

shown that in healthy rabbits hyaluronidase was present in the large intestine, the testes, muscles, skin, and in the pyloric region of the stomach; it was detected in the form of traces in the urine and feces. Hyaluronidase activity dropped 3 days after X-irradiation of the testes by 3,000, 9,000, and 12,000 r. Simultaneously, hyaluronidase activity in the urine, feces, and the large intestine rose; and hyaluronidase activity appeared in the kidneys, lungs, and the blood. After X-irradiation by 9,000 r, hyaluronidase appeared in the adrenals and the liver. Basing his conclusions on the data obtained, the author states that Xrays cause the disruption of the enzyme-substrate complex (hyaluronidase-hyaluronic acid) and of the basic intercellular substance. The appearance of hyaluronidase in several organs confirms the weakening of the mechanisms which regulate the enzyme formation of hyaluronidase."

109. Hepatic Phospholipid Metabolism After Gamma Irradiation

"The Effect of Ionizing Radiation on the Metabolism of Hepatic Phospholipids" by A.S. Kaynova; Moscow, Biokhimiya, Vol 25, No 3, May/Jun 60, pp 540-544

In the research described, the author attempted to discover the changes in the metabolism of various fractions of phospholipids of rat livers during the first few days after a single total gamma irradiation.

 The author presents the following conclusions.

"The total phospholipid content of rat livers during the first few days after gamma irradiation by a dose equal to 1,000 r was not changed. However, the phospholipid content of the livers of rabbits even immediately after their irradiation by doses that exceeded 5,000 r decreased by 25%.

The lecithin fraction of the phospholipids in the rat liver rose by 33.7% 24 hours after irradiation; the sphingomyelin fraction rose by 41.6%; the cephalin fraction dropped by 56.6%. The lecithin fraction of the phospholipids of the rabbit livers rose by 13.4% immediately after their irradiation by 5,000 r, the sphingomyelin fraction rose by 66.5%, but the cephalin fraction dropped by 34.7%.

"The total intensity of phospholipid metabolism in rat liver increased during a period of 24 hours after irradiation by 1,000 r. After 2 and 4 hours, the relative specific radioactivity of the phospholipids increased by 100%; within 6 hours, it rose by 137%, and after 24 hours it rose by 42%. The inclusion of tagged phosphate in the sphingomyelin fraction of the liver 24 hours after irradiation was especially increased. The relative specific radioactivity of this fraction exceeded the normal value by 262.5%."

110. Changes in Activity of Endocrine Glands in Radiation Pathology

"Changes in the Activity of Endocrine Glands in Experimental Radiation Pathology," by Prof P.D. Gorizontov and T.N. Protasova; Arkhiv Patologii, Vol 22, No 4, Apr 60, pp 3-14

The authors review and discuss changes occurring in the hormonal activity of the adrenals, hypophysis, sex glands, and the thyroid gland and present possible theories to explain the effect of the endocrine system on certain processes during radiation sickness.

It is concluded that radiation damage should not be considered only as a syndrome of adaptation which is caused by a "stress" reaction. During the development of radiation sickness, there is no doubt that the direct action of radiation, and changes in the humoral environment, in the nervous system, and in the various endocrine glands (the role of which has been studied even less than that of the hypophysis and the adrenal cortex) play an important role.

111. Histological Changes in Central and Peripheral Nervous Systems of X-Irradiated Mature Dogs

"Morphological Changes in the Central and Peripheral Nervous Systems of Dogs During Acute Radiation Sickness," By V.P. Kurkovskiy, Chair of Physiology of Military Activities, Military Medical Order of Lenin Academy imeni S.M. Kirov, and Neurohistological Laboratory of Leningrad Scientific Research Neurosurgical Institute imeni A. L. Polenov; Moscow, Arkhiv Patologii, Vol 22, No 4, Apr 60, pp 15-21

Acute radiation sickness was induced by total X irradiation of six mature dogs by 400 r, and histological changes resulting in the central and peripheral nervous systems were studied.

Hemorrhages and degenerative changes were observed in the central (cerebrum and especially the cortex, cerebellum, and the spinal cord) and in the peripheral (sensory nerve endings in the vena cava, solar plexus and the intermesenteric plexuses) nervous systems.

The article describes these changes with regard to their distribution, frequency, location, and severity.

112. Chemical Protection of Organisms From Ionizing Radiation

Khimicheskaya Zashchita Organizma ot Ioniziruyushchikh Izluchenii (Chemical Protection of the Organism From Ionizing Radiation), by V.S. Balabukh (editor), unsigned review; Moscow, Atomnaya Energiya, Vol 8, No 6, Jun 60, p 582

This book (152 pages, price 4 rubles 30 kopecks) is a collection of articles published by Atomizdat at Moscow in 1960. The first part of the book constitutes a brief review of problems pertaining to the chemical protection from ionizing radiation. Experimental data on the synthesis of a number of chemical compounds suitable for this purpose and the results of biological tests to determine the effectiveness of these substances are reported in the first part.

The second part describes results of experimental research on methods for the elimination of radioactive isotopes from the organism. The state in which some radioactive isotopes are present in the blood and bone tissue is characterized. A physicochemical and biological evaluation of the effectiveness of complex-forming substances used for the elimination of isotopes from the organism is given.

This collection of articles is designed to serve the need of chemists who are engaged in work on the development of agents for chemical protection against radiation and on the synthesis of complex-forming compounds for that purpose. It will also be of use to biologists and other specialists working on problems in the field of radiobiology.

113. Acute Radiation Sickness Treated With Aureomycin

"Aureomycin in Complex Treatment of Acute Radiation Sickness of Dogs," by N.V. Rayeva, N.I. Bicheykina, M.I. Fedotova, and I.N. Usacheva; Moscow, Farmakologiya i Toksikologiya, Vol 23, No 2, Mar/Apr 60, pp 173-174

Studies of the therapeutic effect of aureomycin administered perorally, intravenously, and in combination with other therapeutic agents were conducted on dogs suffering from acute radiation sickness.

Results showed that more experimental dogs treated with aureomycin survived acute radiation sickness, the latent period of radiation sickness was more protracted, the clinical symptoms were milder, and the blood count was higher than in the untreated controls.

Special tests, however, showed that the intravenous administration of aureomycin lowered capillary resistance at the sites of injections and caused bleeding and thrombophlebitis, all of which restrict the recommendation of using aureomycin intravenously in the treatment of acute radiation sickness.

114. Vitamin B_1 Therapy of X-Irradiated Animals

"The Effect of Vitamin B_1 on the Animal Organism Subjected to the Effect of Ionizing Radiations," by A.F. Leshchinskiy and A.N. Borisenko, Chair of Physiology and Pharmacology, Odessa Pharmaceutical Institute; Moscow, Farmakologiya i Toksikologiya, Vol 23, No 2, Mar/Apr 60, pp 169-173

Studies were conducted on animal organisms (rabbits, guinea pigs, and mice) subjected to prolonged total X irradiation and treated with pharmacologically active doses of vitamin B_1.

It was found that vitamin B_1 did not exert a desensitizing effect on animals previously subjected to X irradiation; but the separate use of vitamin B_1 and then X irradiation suppressed the development of anaphylactic shock.

The administration of thioaminobromide to the irradiated animals aggravated the general condition of the animals, increased the mortality rate, lowered the blood cholinesterase activity, intensified leukopenia, and changed the leukocyte formula.

Veterinary Medicine

115. Live Vaccine Against Newcastle Disease

"Contact Immunization With Live Vaccine," by V.V. Sorokin, Byul. Nauchno-Techn. Inform. Vses. N.-I. In-ta Ptitsevodstva (Bulletin of Scientific-Technical Information of the All-Union Scientific Research Institute of Poultry Raising), No 3, 1958, pp 46-47 (from Referativnyy Zhurnal -- Biologiya, No 2, 25 Jan 60, Abstract No 5033, by N.V. Kozlyakov

"Chicks were immunized intramuscularly with a vaccine strain of Newcastle disease and were then kept with nonimmunized chicks. Clinically manifested disease was observed in all the chicks after 5-7 days. The antibody titer increase in chicks infected by contact occurred more

slowly and less intensively than in the vaccinated chicks. The fowl were infected with a virulent virus strain on the 30th day of the experiment. None of the vaccinated fowl died, whereas 38% of the fowl in contact with vaccinated fowl died. Chicks kept in the same room but in different cages did not acquire resistance and died after infection. Chicks placed with the vaccinated chicks on the 15th day after immunization did not become ill but did not acquire immunity."

[For additional information on Veterinary medicine, see Biology, Microbiology.]

Miscellaneous

116. Combined Dark-Field and Luminescence Microscopy Developed

"A Combined Apparatus for Microscopy in a Dark Field and With Luminescent Illumination," by F.V. Person Clinicodiagnostic Laboratory, Moscow Scientific Research Institute of Tuberculosis; Moscow, Laboratornoye Delo, Vol 6, No 2, Mar/Apr 60, pp 54-55

The author reports his development of a combined apparatus which makes it possible to view objects alternately in a dark field and with luminescent illumination. The apparatus consists of: an MBI-1 microscope with a darkfield condenser (OI-13), a projection lamp with a 30 V 400 W bulb, a polished heat filter, an RNSh-55 transformer, a voltmeter, and blue and yellow light filters. The arrangement of these components is described.

The best image, both in a dark field and under luminescent illumination, is obtained by the use of thin slides, uniform cover glasses, and fine preparations. Distilled water is used between the slide and the dark-field condenser instead of oil. The visibility of leukocytic granularity is offered as an example of the efficiency of this system.

117. Medical Personnel and Institutions

"A Few Statistics" (unsigned article); Moscow, Meditsinskiy Rabotnik, 26 Jul 60, p 2

"The number of physicians in the RSFSR has almost tripled as compared with the number of physicians in the republic in 1940. There are now 19 physicians per 10,000 people as compared with the 7.4 physicians in 1940. The number of intermediate medical personnel in the

republic is steadily growing. The number of feldshers, nurses, and midwives in the republic increased from 290,400 in 1940 to 779,200 in 1959. There are 260 schools for the training of intermediate medical personnel in the RSFSR. These are situated in different cities of the republic. More than 94,000 future physicians are now attending the 45 medical institutes of the republic. More than 15,000 physicians were graduated from these institutes in 1960. The number of institutes in the republic is rapidly increasing. The newly established Altay, Kemerov, Blagoveshchen, and Vladivostok Medical Institutes are functioning fully. The Chita Institute recently conducted its second graduation exercises. Such central oblasts of the RSFSR as Ryazanskaya and Kalininskaya now have their own medical institutes. The number of scientific research institutes has increased from 72 to 83 in the past 2 years, while the number of scientists has increased by almost 1,000 persons."

118. Soviet Medical Personnel Sent to Congo

"Good Journey, Soviet Medics!" by M. Grishina; Moscow, Meditsinskiy Rabotnik, 16 Aug 60, p 1

This article reports the departure of 20 Soviet medical specialists from Moscow for the Congo. The group is being sent under the auspices of the Red Cross and Red Crescent Societies to "transmit their experience and knowledge to the medical personnel of the young Republic of the Congo." Vasiliy Petrovich Shishkin, Doctor of Medical Sciences and leader of the delegation, characterizes the mission in these terms: "the Belgian colonizers did everything possible to deprive the people of the Congo of medical aid. We are ready to support the Congolese in their difficult moment, to transmit our experience to their medical specialists."

The following additional members of the delegation are listed: Tat'yana Yasnovskaya, surgical nurse and the youngest member (21), from the Institute of Surgery imeni A.V. Vishnevskiy; Andrey Dmitriyevich Arapov, who has done research in the field of hypothermia; Lev Nikolayevich Klassovskiy, a specialist in the prevention and treatment of epidemic diseases who has been working at a Central Asian scientific research institute; Vladimir Kirillovich Tatochenko, Candidate of Medical Sciences, a pediatrician interested in pulmonary tuberculosis in young children; and Nikolay Nikolayevich Plotnikov, scientific consultant of the delegation and a specialist in the treatment of tropical diseases who is very familiar with the distribution of tropical diseases in Africa.

A photograph of several members of the delegation accompanies the article.

119. Aktiv of Health Workers Will Meet In September

"On the All-Union Conference of the Aktiv of Health Workers" (unsigned article); Moscow, Problemy Tuberkuleza, No 4, Jul/Aug 60, p 12

"An All-Union Conference of the Aktiv of Health Workers will be held in the second half of September 1960 in Moscow at the Kremlin. The conference will discuss the report of the Ministry of Health USSR on progress in the fulfillment of the resolutions of the Central Committee CPSU and the Council of Ministers USSR 'On Measures for the Further Improvement of Medical Service and Protection of the Health of the Peoples of the USSR.'"

120. All-Union Society of Phthisiologists to Hold Expanded Plenum

Moscow, Problemy Tuberkuleza, No 4, Jul/Aug 60, p 13

By order of the Ministry of Health USSR, an Expanded Plenum of the Board of the All-Union Society of Phthisiologists will be held on 24-27 October 1960 to discuss the problem of improving specific prophylaxis of tuberculosis and organizing ambulatory treatment of tuberculosis patients.

Responsibility for preparation of the plenum has been given to the president of the Board of the All-Union Society of Phthisiologists, Corresponding Member of the Academy of Medical Sciences USSR, Prof F.V. Shebanov and the head of the Administration of Specialized Medical Assistance of the Ministry of Health USSR F.G. Zakharov.

The program of the plenum will be:

1. The status of work on specific prophylaxis of tuberculosis and measures for its improvement.

2. Results of clinical tests of an intracutaneous method of vaccination against tuberculosis.

3. Ambulatory treatment of tuberculosis patients.

Physical Metallurgy

121. Specific Conductivity of Titanium Trichloride - Alkali Chloride Melts

"Specific Conductivity of Titanium Trichloride -- Alkali Chloride Melts," by Yu. K. Delimarskiy, Member Academy of Sciences USSR, and R.V. Chernov, Institute of General and Inorganic Chemistry, Academy of Sciences Ukrainian SSR; Kiev, Doklady Akademii Nauk Ukrainskoy SSR, No 6, 1960, pp 795-797

The paper gives the results of measuring specific conductivities in the systems NaCl - $TiCl_3$ and KCl - $TiCl_3$ at 800°. An analysis of the data obtained shows that there is formation of the complex $TiCl_6^{3-}$ ions in the melt. This agrees with the results of the thermal analysis and calculations using Schroeder's equation.

122. Rhenium in Copper-Molybdenum Ores

"Balance of the Distribution of Dispersed Metals in Concentration Products," by V.I. Lutsenko and S.S. Akmayeva, Scientific Research Mining and Metallurgical Institute, Sovnarkhoz of the Armenian SSR; Yerevan, Doklady Akademii Nauk Armyanskoy SSR, Vol 30, No 2, Jun 60, pp 109-113.

It has been established in work done during 1957-1958 that rhenium, selenium, and tellurium, as well as some other rare and dispersed elements, are present in copper-molybdenum ores. The approximate contents of rhenium, selenium, and tellurium in concentrates of enrichment plants were determined in the course of investigations conducted at the Institute of Chemistry of the Academy of Sciences Armenian SSR, the Scientific Research Institute for Mechanical Concentration of Minerals, and the State Institute of Nonferrous Metals (of work done by M.V. Darbinyan, V.A. Melkonyan, and others). Methods for estimating the amounts of Re, Se, and Te present in different stages of ore enrichment processes are proposed and illustrated by actual examples based on analyses carried out at two plants. It is stated that molybdenum concentrates and intermediate products rich in molybdenum are of primary importance for the industrial extraction of rhenium: the copper

concentrates, which contain no more than 6% of the total rhenium derived from the ore, are of no importance from this standpoint. The following figures are given for the quantities of rhenium in grams per ton contained in concentrates and tailings at two enrichment plants: molybdenum concentrate, 246.00, 138.00; copper concentrate, 0.65, 0.52; total concentrate, 13.20, 9.24; waste tailings, 0.06, 0.04; adjusted value for the content in the original ore, 0.34, 0.26.

123. The System Beryllium - Boron

"Determination of Softening Temperatures in the System Beryllium - Boron in the Region Rich in Beryllium," by L. Ya. Markovskiy and G.S. Markevich, State Institute of Applied Chemistry; Leningrad, Zhurnal Prikladnoy Khimii, Vol 33 No 7, Jul 60, pp 1667-1668

The system beryllium-boron was investigated in the region up to 50 atomic percent of B by constructing a fusibility diagram. The composition of eutectics was determined. The fact that the compounds Be_5B and Be_2B form was confirmed. Determination of the temperature of softening by passing an electric current could not be carried out in the case of the compound BeB_2, because this compound exhibits semiconductor properties.

Production Metallurgy

124. High-Purity Indium by Chemical-Electrolytic Refinement

"Electrolytic Production of High-Purity Indium," by L.G. Plekhanov; Alma-Ata, Izvestiya Akademii Nauk Kazakhskoy SSR, Seriya Metallurgii, Obogashcheniya i Ogneuporov, No 1 (7), 1960, pp 56-58

Indium containing only 0.05% Pb, 0.001% Tl, 0.001% Si and 0.0001% Cu was obtained by a combined method of chemical and electrolytic refinement. Mercury was removed first in the initial process of dissolving "crude" indium in dilute hydrochloric acid. Cadmium and lead were removed by precipitation with hydrogen sulfide. A method

developed at the Institute of Metallurgy and Ore Dressing of the Academy of Sciences KazSSR based on the adsorption of ions by solid adsorbents was applied to remove thallium. Electrolytic deposition of indium from the chemically refined solution was performed in a glass vessel with platinum electrodes at a constant potential of -0.5 volts and temperature of 25° C. With this method, removal of the Fe, Zn, Hg, Cd, Mg and Ca which was present in the initial indium was 100%, Tl, 99.9% and Pb, 50.0%.

125. The Cyclone Method of Smelting

"Toward the Plenary Session of the Central Committee CPSU" (unsigned editorial); Moscow, Izobretatel' i Ratsionalizator, No 6, Jun 60, p 1.

"An example of a promising invention is that of the cyclone method of smelting for ore fines and concentrates. The method in question was developed by A. Tonkonogiy, A.rReznikov, G. Knorre, and M. Nadzharov. Cyclone smelting is 30-50 times more efficient than the conventional method and the yield of metal obtained by it is much greater."

126. UZD-NIIM-5 Ultrasonic Defectoscope

"Development of Ultrasonic Apparatus for Checking the Quality of Welded Joints," Tr. Seminara po fiz. i primeneniyu ul'trazvuka, posvyashch. pamyati prof. S. Ya. Sokolova (Works on the Seminar on the Physics and Application of Ultrasonics, Dedicated to Prof S. Ya. Sokolov) Leningrad, 1958, pp 109-116 (from Referativnyy Zhurnal - Elektrotekhnika, No 6, 25 Mar 60, Abstract No 5.3099)

A description is given of the UZD-NIIM-5 ultrasonic pulsed defectoscope designed for the examination of metallic objects and welded joints. The operating frequencies are 1.8, 2.5, and 3.2 megacycles; the minimum detectable defect area is 2 square millimeters. Indication is oscilloscope, flashing light, or acoustic signal. Methods of automating the checking of welded seams are discussed, including the use of mechanical scanning and recording on paper; the use of a mosaic probe, each element of which alternately emits and receives a pulse, with indication on the screen of the defectoscope UZD-NIIM-2, with television scanning; and the use of an oscillating beam.

VIII. PHYSICS

Geophysical Instruments

127. New Magnetic Device for Mineral Prospecting Developed

"Briefly About Everything"; Moscow, Izvestiya, 12 Aug 60, p 6

The Leningrad plant "Geologorazvedka" has created a unique magnetic-variation station for measuring the magnetic field in prospecting for mineral resources. Series production of the apparatus has been begun by the plant.

128. New Torsion Seismometer Awarded Patent

"Torsion Seismometer," by A. G. Ivanov; Moscow, Byulletin Izobreteniy, No 3, 1960, p 29

A recent patent, Class 42c, 42 (Measuring Instruments and Devices), No 125901 (2 January 1959), was awarded to A. G. Ivanov for his torsion seismometer. The instrument was novel in that for increasing its selective capability to torsional oscillations it is made in the form of two identical seisometers, firmly fastened together for recording longitudinal oscillations, switched in by the difference in electromotive force.

129. Instrument for Recording Earthquakes and Explosions Awarded Patent

"Device for Recording Earthquakes and Explosion," by A. N. Mozzhenko; Moscow, Byulleten' Izobreteniy, No 3, 1960, p 29

A patent, Class 42c, 42 (Measuring Instruments and Devices), No 125902 (26 January 1959), was given to A. N. Mozzhenko for a device for recording earthquakes and explosions with prerecording on magnetic tape and subsequent reproduction on photograhic paper. The instrument is unique in that for obtaining the necessary frequency spectra of the oscillations being recorded with the use of the simplest filters, a speed controller is used in the reproduction unit. This controller consists of a tone-motor for stabilizing the motion of the tape. Power for the controller is obtained from a powerful AC generator whose frequency oscillation can be changed within the necessary limits.

[illegible] New East German Telescope

"A Universal Telescope" (unsigned news item), Pitesti, Scinteia si Ciocanul, 7 May 60, p 3

Article in source reports that the East German enterprise, "Karl Zeiss," in Jena has built the third largest telescope in the world. The mirror of the scope has a diameter of 2.08 meters and a "grosimea" of 32 [illegible] meters. The block of glass from which it was made weighed 2,350 kilograms. Stars of the 21st magnitude can be photographed with the help of this mirror. The entire telescope weighs 84 tons, is mounted on a mobile platform, and is reportedly to be put into operation in the summer of 1960.

Nuclear Physics

[illegible] Two-Proton Radioactivity

"The Miracle Workshop," by O. Pisarzhevskiy; Moscow, Izvestiya, No 181, 31 Jul 60, p 4

By using high-energy accelerators, many scores of artificial neutron-deficient isotopes have been produced during recent years. The neutron-deficient isotopes contain a much smaller number of neutrons than would be required to confer stability on the nucleus. All isotopes of this type are positron-active, i. e., they undergo β-plus-decay.

During recent years, the idea was generally accepted in nuclear physics to the effect that when the neutron deficiency becomes great enough, a stage must be reached at which the nucleus acquires proton radioactivity. This means that instead of a transformation of protons into neutrons, there will be emission of protons by the nucleus, which then becomes more stable.

At a recent all-union conference on nuclear reactions [Second All-Union Conference on Low and Middle Energy Nuclear Reactions, Moscow, 21-28 July 1960], Prof V. I. Gol'danskiy, Doctor of Physico-Mathematical Sciences, presented a paper in which he stated that in addition to proton radioactivity, there must be a bi-proton (two-proton) radioactivity. This means that nuclei which have an even number of protons and are at a stage when emission of a single proton is impossible because of the law of transformation of energy may emit a pair of protons. It is rather paradoxical that a nucleus overloaded with protons should be incapable of emitting one proton, but may emit two of them at the same time. The task with which physicists are now faced is experimental detection of this phenomenon. According to Gol'danskiy, the most convenient way of detecting two-proton radioactivity

would be bombardment with high-energy multicharge ions of different nuclei introduced into a thick layer of photoemulsion or into the foils with which such an emulsion is interleaved. A Wilson chamber may possibly also be used.

The method of investigating the decay of nuclei by employing thick layers of photoemulsions originated in the USSR. Gol'danskiy traced the tracks which will be observed when the new phenomenon postulated by him is actually detected. He expressed the hope that investigation of two-proton radioactivity will yield information on the interactions between pairs of neutrons both within the nucleus, where nuclear forces of attraction are active, and outside of the nucleus, where electrostatic forces repel the protons from each other.

132. Space-Energy Distribution of Neutrons in Reactors Investigated

"Numerical Method of Solving Two- and Three-Dimensional Diffusion Equations," by N. I. Bulyeev; Moscow, Matematicheskiy Sbornik, Vol 51 (93), No 2, Jun 60, pp 227-238

A method for solving two- and three-dimensional equations of the elliptic type is proposed which is based on the utilization of factorization of the corresponding difference equations of the second order. The obtained system of difference equations of the first order, equivalent to the system of initial difference equations of the second order, is solved by the method of successive approximations. Convergence of the successive approximations is guaranteed by the choice of a certain parameter contained in the system of the problem's solution. Sufficient criteria for convergence of the assumed iteration systems are formulated.

The constructed iteration processes are more effective in comparison with the usual Liebman and Seidel iterations and in comparison with the methods given in V. N. Faddeyeva, Vychislitel'nyye metody lineynoy algebry (Calculation Methods of Linear Algebra), Moscow-Leningrad, Gostekhizdat, 1950. Already the first approximation, obtained according to the proposed methods, gives values for the function sought for, close to the exact solution of the difference system.

The proposed method permits one in particular, to operatively solve the diffusion equations for the space-energy distribution of neutrons in reactors, as well as different heat and hydrodynamic problems.

Theoretical Mechanics

133. Forced Harmonic Pressure Waves Studied

"The Theory of Forced Harmonic Pressure Waves of Small Amplitude Based on Euler's Gas Dynamic Equations Considering Heat Transmission With Radiation," by V. A. Prokof'yev, Chair of Aeromechanics and Gas Dynamics, Moscow University; Moscow, Vestnik Moskovskogo Universiteta, seriya Matematika, Mekhanika, No 3, May/Jun 60, pp 31-48

The motion of a harmonic pressure wave is investigated in the first part of the work, with the assumption that the frequency of oscillations and the condition of the medium are such that either the Bouguer wave number or product of the Bouguer and Boltzmann wave numbers may be considered either a large or small quantity. In such a case, it is possible to select a small parameter and to represent the roots of the characteristic equation in the form of a power series in terms of the parameter. In the second part of the work, the general case of any values of the Bouguer and Boltzmann wave numbers is considered, and a general picture of the motion of waves in different mediums as a function of the frequency of oscillations is obtained.

134. Shock Waves Investigated

"Detonations in an Easily Deformable Gas," by A. G. Bagdoyev, Institute of Mathematics and Mechanics, Academy of Sciences Armenian SSR; Yerevan, Doklady Akademii Nauk Armyanskoy SSR Vol 30, No 3, Jun 60, pp 73-76

Detonations in fluid (or ground) of a so-called easily deformable gas are considered. An equation for the state of an easily deformable gas under dynamic loads was proposed by Kh. A. Rakhmatulin. The equation has the form:

$$P - P_0 \quad A(S)\,(\rho^n - \rho_0^n) \qquad \text{for } \frac{dP}{dt} > 0 \qquad (1)$$

$$\rho = \rho_1 \qquad \text{for } \frac{dP}{dt} < 0 \qquad (2)$$

where P_0 and ρ_0 are the initial pressure and density of the ground, ρ_1 is a constant for the given particle, S is the entropy, and t is the time.

Self-repeating motions are considered in the article. It is easy to see that in those cases in which (1) (load) produces self-repeating motion, the entire equation of state (1) and (2) produces self-repetition. This follows from the fact that (2) does not produce new essential constants. It is obvious, for example, that for point detonation, the pressure at the particle decreases after passage of the wave; the state of the ground behind the shock wave is described by (2) (discharge).

135. Solution of Systems of Linear Differential Equations in Explicit Form

"Concerning the Representation of Solutions of Certain Systems of Linear Differential Equations by Power Series of a Parameter," by Kh. Sabirova, Fergana Pedagogical Institute imeni Ulugbek; Tashkent, Izvestiya Akademii Nauk UzSSR, seriya Fiziko-Matematicheskikh Nauk, Vol 2, May 60, pp 21-33

An explicit form of the solution of systems of ordinary linear differential equations as holomorphic functions of a parameter from which the coefficients of the considered systems depend holmorphically is sought. In section 1, the problem is studied in general form, and in section 2, one equation of high order is considered independently.

The necessity of investigating the reducible formulas presented in the article is dictated by the circumstance that the majority of the special formulas of mathematical physics is defined by systems of differential equations of the indicated type.

As is known, the method of a small parameter proves very effective in a number of cases, especially for nonlinear problems (see I. G. Malkin, "Metody Lyapunova i Puankare v teorii nelineynykh kolebaniy" [Lyapunov and Poincare Methods in the theory of Nonlinear Oscillations]), Moscow-Leningrad, ONTI, 1947; however, for linear equations, it is of significant interest to be able to obtain the solution in explicit form.

136. Picare Method Employed for the Solution of a System of Differential Equations

"Concerning the Solution of a System of Differential Equations by the Picare Method," by A. Khodzhayev, Chardzhou State Pedagogical Institute; Tashkent, Izvestiya Akademii Nauk UzSSR, seriya Fiziko-Matematicheskikh Nauk, Vol 2, May 60, pp 47-54

The purpose of this work is the integration of the system of ordinary differential equations

$$y_i' = \sum_{j,k}^{1,n} P_{ikj}(x)\, y_k\, y_j + \sum_{k=1}^{n} P_{ik}(x)\, y_k + P_i(x) \qquad (1)$$

for the initial conditions

$$y_i(0) = y_{io} \quad (i = 1, n)$$

and the application of the obtained results to the approximate integration of the system of ordinary differential equations of the problem concerning the rotation of a heavy solid body about a fixed point.

137. Perturbations of the Laplace Operator in a Multidimensional Space

"Concerning Certain Perturbations of the Laplace Operator in a Multidimensional Space," by R. M. Martirosyan, Institute of Mathematics and Mechanics, Academy of Sciences Armenian SSR; Yerevan, Doklady Akademiya Nauk Armyanskoy SSR, Vol 30, No 1, May 60, pp 3-12

Many investigations have been devoted to the study of the Sturm-Liouville operator; however, the corresponding operator $-\Delta u + cu$ has been studied with less completeness in a multidimensional space, even in the self-conjugate case. Only in recent years, several works (see I. M. Gel'fand, UMN, Vol 7, No 6, 1952, and M. V. Keldysh, DAN SSSR Novaya Seriya, Vol 77, No 1, 1951) were devoted to the investigation of this operator in the case in which c(Q) was a complex valued function. We also refer to the work of M. A. Naymark, DAN SSSR, Novaya Seriya, Vol 85, No 1, 1952, in which a one-dimensional operator is considered; more exactly, the operator $-y'' + cy$ was considered on the half line for different assumptions relative to the complex function c(x). In addition, the dissertation of the author was devoted to the study of the spectrum of the operator $-\Delta u + cu$. The present work contains a series of unpublished results of that dissertation, essentially complementary to the new facts and entirely complying with the known positions of quantum mechanics.

IX. MISCELLANEOUS

136. Elections of New Academicians to the Academy of Sciences, USSR

"New Academicians" (unsigned article); Moscow, Pravda, 12 Jun 60, p 2

The General Session of the Academy of Sciences (AS), USSR, elected 11 new academicians whose candidacies had been promoted by the departments. They are listed below along with a brief statement concerning their specialization.

(1) For the Department of Physicomathematical Sciences, B. P. Konstantinov and P. S. Novikov.

The Director of the Physicotechnical Institute of the AS, USSR, B. P. Konstantinov, is doing creative work in several areas of theoretical and experimental physics and physical chemistry.

In recent years, B. P. Konstantinov and his coworkers proposed and developed in detail a universal method for the qualitative and quantitative microanalysis of chemical elements according to the mobilities of ions in solutions; they created apparatus for rapid analysis by this method which has found extensive application in research institutes and plant laboratories. They have conducted much work on the study of the physicochemical properties of stable isotopes and the development of precise methods for isotope analysis.

In relation to the growing importance of very rapid electronic computers, mathematical logic has acquired special importance in the development of automatics. One of the leading specialists in the field of mathematical logic, algebra, and the theory of functions of real variables is P. S. Novikov. Fundamental results in the application of mathematical logic to algebra have been produced by him.

(2) For the Department of Geologico-geographical Sciences, Ye. K. Fedorov.

Ye. K. Fedorov, Director of the Institute of Applied Geophysics, AS, USSR, is a celebrated geophysicist and geographer and specialist in the field of physics of clouds, precipitation, and atmospheric electricity. He is the acknowledged leader and organizer of a new discipline in geophysics and physical geography -- the investigation of the physicogeographical environment with the aid of large-scale experiments performed under natural circumstances. His work on methods of artificial action on the meteorological processes and also the study of the atmosphere with geophysical rockets are valuable contributions to science. He has successfully combined scientific research with extensive scientific-organizational work.

(3) For the Department of Technical Sciences, A. Yu. Ishlinskiy, B. N. Petrov, V. A. Trapeznikov, and A. N. Vol'skiy.

The problems of automation of production attracts ever more and more attention of Soviet scientists who have opened a broad front of research in this field. An indication of the growing awareness of the Academy of Sciences in automatics and to questions of technical progress is the selection of three academicians specializing in "automatics." Among them is A. Yu. Ishlinskiy, known for a number of valuable investigations in the field of mechanics (general mechanics, theory of elasticity, theory of strength and plasticity, theory of soils, and the theory of friction). In addition, he has resolved a series of diverse problems on other questions, for example, on the motion of electrons in a magnetic field in connection with the tasks of focusing them, calculating the coefficients of mutual inductance applicable to the theory of inductive coupling.

The research of B. N. Petrov is quite important for the scientific development of automatic control. He has made a substantial addition to the scientific fundamentals of designing automatic control and tracing systems. He has participated in the introduction of a series of automatic machines for controlling the production of important articles. He has conducted penetrating research on methods for the approximate integration of differential equations, which has led to an important discovery.

Of unique importance are the works of B. N. Petrov on the problem of the automatic regulation and control of the processes of the new technology. These works produced the fundamental bases for the design of a new class of regulating and control systems.

V. A. Trapeznikov is known for his research in the field of automatic control and electric motor designing. The chief works of V. A. Trapeznikov in the field of electric motor designing have been devoted to the creation of very economical electric motors and transformers. He and his associates have developed the scientific bases for the mathematic modeling of control systems and have created the first Soviet computers with continuous action with the aid of which a large amount of work has been performed connected with the design of control systems for complex processes of the new technology.

V. A. Trapeznikov proposed the unit principle for the construction of technical automation equipment which has now become the basis for constructing similar devices. Under his leadership and with his participation, original principles were formulated for designing self-adjusting control systems and automatic-search systems for finding the minima and maxima of a function with many variables. The research conducted in this field has uncovered new ways of designing highly efficient automatic control systems.

A. N. Vol'skiy is a well-known scientist in the field of theoretical metallurgy and the metallurgy of nonferrous and rare metals. A considerable amount of his work has been dedicated to the study of chemical equilibria in alloys and the physicochemistry of metallurgical processes. On the basis of these investigations, he developed a physicochemical theory for the fundamental types of metallurgical alloys used in nonferrous metallurgy. Another series of investigations was devoted to the study of the physicochemical processes of the oxidation of sulfides, on the basis of which he developed a theory of sulfide ore roasting processes.

(4) For the Department of Biological Sciences, V. N. Chernigovskiy, N. M. Sisakyan, and Yu. A. Orlov.

Soviet biological science has made a number of new significant achievements. The cadres of scientists in this field are increasing. V. N. Chernigovskiy is a well-known physiologist whose efforts have been devoted to the study of problems involving the neural regulation of the functions of internal organs. His scientific works embrace various branches of the physiology of blood-formation and the physiology of interoceptors (sensory endings of internal organs). V. N. Chernigovskiy has concentrated principally on the study of the sensitivity of internal organs and an investigation of nerve signaling of the state of the internal environment of the entire organsim.

N. M. Sisakyan is known for his efforts in the field of plant biochemistry. The most outstanding scientific contributions made by N. M. Sisakyan and his closest associates on plant biochemistry have been the disclosure of the enzyme nature of drought-resistance of plants and the formulation of the biochemical theory for the resistance of cells to dehydration and the discovery of biochemical rhythym in plant metabolism.

Yu. K. Orlov is a leading specialist in the field of paleontology. His works in this field are characterized by innovation and a profound creative nature. During the detailed study of skeletons of fossilized animals, he was able to determine their musculature and the structure of the various segments of the brain. From this, he was able to draw conclusions on the form of life and the reasons for death of the fossilized animals. These investigations are a most important contribution to contemporary science.

(5) For the Department of Economic, Philosophical, and Legal Sciences, P. N. Fedoseyev.

P. N. Fedoseyev is the leading Soviet scientist in the field of historical materialism. One of the important aspects of the scientific activity of P. N. Fedoseyev is his active participation in the preparation of such works as the scientific biography of V. I. Lenin, "Osnovy Marksistskoy Filosofii" (Fundamentals of Marxist Philosophy), "Filosofskaya Entsiklopediya" (Philosophical Encyclopedia), and other works. A number of the writings of P. N. Fedoseyev have been devoted to questions of atheism and criticism of the ideologies of reformism and revisionism.

139. Public Health Appointments in the USSR

"Current Events" (unsigned article); Moscow, Meditsinskiy Rabotnik, 12 Aug 60, p 4

By order of the Minister of Health of the USSR, F. G. Zakharov has been relieved of his position as chief of the Administration of Specialized Medical Aid of the Ministry of Health USSR. He has been appointed deputy chairman of the Executive Committee [Ispolkom] of the Soviet Red Cross and Red Crescent organizations.

A. G. Safonov has been named head of the Administration of Specialized Medical Aid. He formerly was the chief of the Second Administration of the Ministry of Health USSR.

K. F. Smirnov, deputy chief of the State Sanitary Inspectorate of the Ministry of Health USSR, has been relieved of that post to become chief of the Second Administration.

140. Change in Journal Title Announced

"Readers Attention" (announcement); Moscow, Zhurnal Vsesoyuznogo Khimicheskogo Obshchestva imeni D. I. Mendeleyeva, Vol 5, No 1, 1960, backcover

The All-Union Chemical Society imeni D. I. Mendeleyev has announced that, beginning in 1960, the journal Khimicheskaya Nauka i Promyshlennost' (Chemical Science and Industry) would be renamed the Zhurnal Vsesoyuznogo Khimicheskogo Obshchestva imeni D. I. Mendeleyeva (The Journal of the All-Union Chemical Society imeni D. I. Mendeleyev). The style of the journal, subscription, periodicity, and regulations for the acceptance of manuscripts remain unchanged.

141. Gold Medal Awards in Physics

"Awarding of Gold Medals for Work in Physics," by V. V. Vlasov; Moscow, Uspekhi Fizicheskikh Nauk, Vol. 71, No 2, 1960, p 350

The general session of the Academy of Sciences USSR, held on 25 February 1960, awarded Gold Medals to the following scientists for work performed in 1959:

(1) the M. V. Lomonosov Gold Medal to Academician P. L. Kapitsa for his continuing research on low temperature physics;

(2) the S. I. Vavilov Gold Medal to Academician I. V. Obreimov for his continuing research in physics;

(3) the A. S. Popov Gold Medal to Doctor of Physicomathematical Sciences S. M. Rytov for work in the field of statistical radiophysics.

A second A. S. Popov Gold Medal was awarded to Dr Louis Essen (England) for his work on creating and applying an atomic standard of frequency.

142. New Institute in Azerbaydzhan

"Institute for the Development of Petroleum and Gas Deposits" (unsigned article); Baku, Izvestiya Vysshikh Uchebnikh Zavedeniy - Neft' i Gaz, No 4, 1960, p 48

The Institute for the Development of Petroleum and Gas Deposits has been created under the Azerbaydzhan Academy of Sciences.

The institute will have seven research laboratories: development of petroleum, gas and gas-condensate deposits, technological petroleum geology, hydrodynamics and petroleum mechanics, drilling, modeling of technological processes, thermodynamics of stratified systems, and physical chemistry of strata.

The institute will have the following tasks: the solution of grave problems concerning the theory and practice of developing petroleum, gas, and gas-condensate deposits (contents of stratified pressure, questions of subsurface hydrodynamics, especially of gas-condensate deposits and their rational development, etc.); formulation of plans for the exploitation of individual large deposits; improvement of methods for composing these plans and also the methods for calculating reserves of petroleum and gases; and resolving questions concerning technological petroleum geology.

143. Hungarian Scientists Honored

"Awards" (Unsigned Article); Budapest, Akademiai Kozlony, 31 Dec 59, pp 127-130

In recognition of their outstanding work in scientific research and scientific organization done in 1959, the President of the Hungarian Academy of Sciences awards presidential awards as follows:

I. Department of Linguistic and Literary Sciences

Iren N.-Sebestyen, doctor of linguistic sciences, 4,000 Ft.
David Fokos-Fuchs, doctor of linguistic sciences, 4,000 Ft.
Istvan Sipos, candidate in linguistic sciences, 3,000 Ft.
Katalin D.-Bartha, university instructor, 2,000 Ft.
Gabor Bereczki, candidate in linguistic sciences, 2,000 Ft.
Tibor Klaniczay, doctor of literary sciences, 2,000 Ft.
Bela Stoll, scientific researcher, 2,000 Ft.
Aladar Komlos, doctor of literary sciences, 4,000 Ft.
Zoltan Hera, on staff of Nepszabadsag, 2,000 Ft.
Ferenc Tokei, candidate in linguistic sciences, 3,000 Ft.
Pal Peter Domokos, teacher, 2,000 Ft.
Kalman Cs.-Toth, teacher, 2,000 Ft.
Janos Harmatta, doctor of linguistic sciences, 4,000 Ft.
Jozsef Fitz, candidate in literary sciences, 3,000 Ft.
Laszlo Mezey, candidate in literary sciences, 2,000 Ft.
Zoltan Falvy, scientific researcher, 2,000 Ft.

II. Department of Social and Historical Sciences

Samu Szemere, doctor of philosophical sciences, 3,000 Ft.
Laszlo Zsigmond, candidate in historical sciences, 3,500 Ft.
Gyorgy Ranki, candidate in historical sciences, 3,500 Ft.
Ivan Berend, candidate in historical sciences, 2,500 Ft.
Endre Varga, deputy director in chief of the National Archives, 2,500 Ft.
Istvan Gergely, scientific worker for the Economics Sciences Institute (Kozgazdasagtudomanyi Intezet) [Hungarian for institute names will be given in first instance only], 2,500 Ft.
Adam Schmidt, scientific worker for the Economics Sciences Institute, 2,500 Ft.
Gyorgy Simon, scientific worker for the Economics Sciences Institute, 2,000 Ft.
Kurt Siebenfreund, scientific worker for the Economics Sciences Institute, 2,000 Ft.
Tibor Papp, candidate in legal sciences, 2,500 Ft.
Laszlo Viski, candidate in legal sciences, 2,500 Ft.

Jeno Szilard, scientific worker for the Geographical Sciences Research Group (Foldrajztudomanyi Kutato Csoport), 2,500 Ft.
Istvan Asztalos, scientific worker for the Geographical Sciences Research Group, 2,000 Ft.
Ferenc Simor, candidate in geographical sciences, 2,000 Ft.
Andras Mocsy, candidate in historical sciences, 2,500 Ft.
Eva Foldes, candidate in educational sciences, 2,500 Ft.
Jozsef Szarka, candidate in educational sciences, 2,000 Ft.

III. Department of Mathematical and Physical Sciences

Rozsa Peter, doctor of mathematical sciences, 4,000 Ft.
Janos Aczel, doctor of mathematical sciences, 4,000 Ft.
Ferenc Szabo, chief of the Laboratory of the Central Physics Research Institute (Kozponti Fizikai Kutato Intezet), 4,000 Ft.
Dezso Kiss, candidate in physical sciences, 2,000 Ft.
Istvan Lovas, scientific worker for the Central Physics Research Institute, 2,000 Ft.
Bela Szabo, personnel chief official for the Nuclear Research Institute (Atommag Kutato Intezet), 3,000 Ft.
Istvan Kalaszi, chief engineer for the Central Physics Research Institute, 3,000 Ft.
Janos Balazs, scientific worker for the Mathematics Research Institute (Matematikai Kutato Intezet), 3,000 Ft.
Gabor Szasz, candidate in mathematical sciences, 3,000 Ft.
Janos Horvath, candidate in physical sciences, 3,000 Ft.
Matyas Bognar, candidate in mathematical sciences, 3,000 Ft.
Andras Bekessy, scientific worker for the Mathematics Research Institute, 3,000 Ft.
Karoly Nagy, candidate in physical sciences, 3,000 Ft.
Pal Szasz, doctor of mathematical sciences, 4,000 Ft.
Ferenc Ban, chief engineer for the Central Physics Research Institute, 2,000 Ft.
Gyorgy Zsigmond, scientific worker for the Central Physics Research Institute, 2,000 Ft.

IV. Department of Agricultural Sciences

Lajos Szentmartoni, scientific worker for the Agricultural Operations Institute (Mezogazdasagi Uzemtani Intezet), 2,500 Ft.
Janos Meszaros, director of the Veterinarian Research Institute, (Allategeszsegugyi Kutato Intezet), 4,000 Ft.
Pal Stefanovits, candidate in agricultural sciences, 3,000 Ft.
Ferenc Tarjani, teacher at the Horticultural and Vinicultural Academy, 2,000 Ft.
Mihaly Toth, teacher, candidate in agricultural sciences, 2,000 Ft.
Mrs Laszlo Nemeti, scientific worker for the Agricultural Operations Institute, 2,500 Ft.

Lajos Racz, scientific worker for the Agricultural Operations Institute, 2,500 Ft.
Jozsef Szegi, candidate in biological sciences, 3,000 Ft.
Zoltan Bojtos, scientific worker for the Martonvasar Agricultural Research Institute (martonvasari Mezogazdasagi Kutato Intezet), 3,000 Ft.
Jeno Bajai, candidate in agricultural sciences, 2,500 Ft.
Karoly Kovacs, scientific worker for the Martonvasar Agricultural Research Institute, 2,500 Ft.
Mrs Sandor Rajki, scientific worker for the Martonvasar Agricultural Research Institute, 3,000 Ft.

V. Department of Biological and Medical Sciences

Jozsef Knoll, candidate in medical sciences, 4,000 Ft.
Dr Peter Veghelyi, scientific worker for the No 1 Children's Clinic of the Budapest Medical Sciences University, 4,000 Ft.
Dr Karoly Nador, deputy department chief in the Experimental Medical Sciences Research Institute (Kiserleti Orvostudomanyi Kutato Intezet), 4,000 Ft.
Dr Lajos Takacs, scientific worker for the No II Internal Medicine Clinic of the Budapest Medical Sciences University, 3,000 Ft.
Dr Miklos Papp, scientific worker for the Experimental Medical Sciences Research Institute, 3,000 Ft.
Dr Ervin Stark, deputy director of the Experimental Medical Sciences Research Institute, 4,000 Ft.
Dr Endre Somogyi, instructor in the Legal Medicine Institute (Igazsagugyi Orvostan Intezet) of the Budapest Medical Sciences University, 3,000 Ft.
Dr Gyorgy Csaba, scientific worker for the Histology and Embryology Institute (Szovet es Fejlodestani Intezet) of the Budapest Medical Sciences University, 2,500 Ft.
Dr Janos Biro, scientific worker for the Urology Clinic of the Budapest Medical Sciences University, 2,000 Ft.

VI. Department of Technical Sciences

Mrs Mano Adam, external official of the Department of Technical Sciences, 2,000 Ft.
Gyorgy Bacsak, doctor of geological and minerological sciences, 3,000 Ft.
Laszlo Bartha, Jeno Neugebauer, and Janos Prohaszka, scientific workers for the Technical Physics Research Institute (Muszaki Fizikai Kutato Intezet), 5,000 Ft.
Elemer Bolcskey, teacher in the Construction Industry and Transportation Technical University, 2,500 Ft.

Antal Bummer, instrument maker for the Geodesic Research Laboratory (Geodeziai Kutato Laboratorium), 2,000 Ft.
Zoltan Csordas, scientific worker for the Instruments Industry Research Institute (Muszeripari Kutato Intezet), 2,000 Ft.
Karoly Kocsan, scientific worker for the Instruments Industry Research Institute, 2,000 Ft.
Alfred Czuppon, Magda Meszaros, Geza Partay, and Janos Tremmel, scientific workers in the micromorphology department of the Technical Physics Research Institute, 4,000 Ft.
Geza Entz, department chief in the National Monuments Commission, 2,000 Ft.
Andor Frigyes, lecturer in the Technical University, and Istvan Nagy, scientific worker for the Automatics Research Group (Automatikai Kutato Csoport), 3,000 Ft.
Zoltan Levai, chief engineer for the Auto-Transport Scientific Research Institute (Autokozledesi Tudomanyos Kutato Intezet), 2,000 Ft.
Pal Mazalan, candidate in technical sciences, 3,000 Ft.
Jozsef Peredi, scientific researcher for the Materials Strength Research Group (Szilardsagtani Kutato Csoport), 2,000 Ft.
Peter Roboz, scientific worker for the Technical Physics Research Institute, and Lajos Ernst, scientific worker for the Signal Technology Research Institute (Hiradastechnikai Kutato Intezet), 2,000 Ft.
Janos Schanda, scientific worker for the Technical Physics Research Institute, and Mrs Laszlo Balazs, scientific assistant in the Technical Physics Research Institute, 2,000 Ft.
Gusztav Szabo, retired university instructor, 2,000 Ft.
Maria Vogl (Mrs Foldvari), deputy department chief in the Geological Institute (Foldtani Intezet) and doctor of minerological and geological sciences, 2,000 Ft.
Istvan Szanto, lecturer in the Technical University, 3,000 Ft.
Rezso Szaday, group chief at the Lang Machine Factory, 2,000 Ft.
Karoly Szendy, doctor of technical sciences, 3,000 Ft.
Istvan Vacz, scientific worker for the Technical Physics Research Institute, 2,000 Ft.
Laszlo Vitalyos, scientific department chief in the Electric Industry Central Research Laboratory (Villamosipari Kozponti Kutato Laboratorium), 2,000 Ft.

VII. Department of Chemical Sciences

Karoly Polinszky, teacher in the Veszprem Chemical Industry University, 5,000 Ft.

Antal Vegh, university teacher, candidate in chemical sciences, 5,000 Ft.
Denes Beke, university teacher, candidate in chemical sciences, 5,000 Ft.
Janos Hollo, university teacher, doctor of chemical sciences, 5,000 Ft.
Imre Krausz, candidate in chemical sciences, 4,000 Ft.
Erno Pungor, teacher, doctor of chemical sciences, 4,000 Ft.
Mrs Gyula Hardy, candidate in chemical sciences, 3,000 Ft.
Lajos Majtenyi, scientific worker for the Physical Chemistry Faculty of the Lorand Eotvos Scientific University, 3,000 Ft.
Jozsef Petro, scientific worker for the Organic Chemistry Technological Faculty of the Technical University, 3,000 Ft.
Laszlo Maros, scientific worker for the Inorganic and Analytic Chemistry Faculty of the Lorand Eotvos Scientific University, 2,000 Ft.
Mrs Jozsef Menyhart, scientific worker for the Chemical Technology Faculty of the Technical University, 2,000 Ft.
Laszlo Polos, scientific worker for the General Chemistry Faculty of the Technical University, 2,000 Ft.
Karoly Lemper, candidate in chemical sciences, 4,000 Ft.

Biological Group

Istvan Boros, candidate in biological sciences, 3,000 Ft.
Andor Balint, university teacher, candidate in agricultural sciences, 3,000 Ft.
Janos Horvath, university teacher, candidate in biological sciences, 2,000 Ft.
Lajos Felfoldy, candidate in biological sciences, and Mrs Lajos Felfoldy, research assistant, 2,500 Ft.
Mrs Laszlo Szabolcsi, candidate in biological sciences, 3,000 Ft.
Tamas Keleti, candidate in biological sciences, 3,000 Ft.
Janos Balogh, doctor of biological sciences, 2,000 Ft.
Zoltan Kaszab, doctor of biological sciences, 2,000 Ft.
Andras Tigyi, candidate in medical sciences, 2,500 Ft.
Jeno Szabo, university lecturer, 2,000 Ft.
Olga Borsos, scientific worker for the Plant Biology Institute (Novenyelettani Intezet) of the Lorand Eotvos Scientific University, 2,000 Ft.
Vilmos Frenyo, candidate in biological sciences, 3,000 Ft.
Gyorgy Romhanyi, university teacher, candidate in medical sciences, 3,000 Ft.
Andras Zicsi, scientific worker for the Animal Systems Study Institute (Allatrendszertani Intezet) of the TTK (Natural Sciences School?) of the Lorand Eotvos Scientific University, 2,000 Ft.

Cybernetics Research Group

Balint Domolki, scientific worker, Laszlo Szanyi, scientific worker, and Andras Boka, scientific department chief, 5,000 Ft.
Sandor Podhradszky, institute engineer, Istvan Abraham, institute mechanic, Kalman Kardos, institute mechanic, Imre Molnar, institute engineer, and Gyozo Kovacs, scientific worker, 5,000 Ft.

Psychological Committee

Lucy P.-Liebermann, scientific worker, 4,000 Ft.
Dr. Edit Lenart and Dr Erzsebet Baranyai, scientific workers for the Child Psychology Institute (Gyermeklelektani Intezet), 3,000 Ft.

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For their outstanding scientific organizing work on behalf of the office of the Hungarian Academy of Sciences or for their successful scientific organizing and administrative activity:

Otto Tokes, chief of the Presidium Secretariat, 5,000 Ft.
Imre Molnar, chief of the Secretariat of the Scientific Qualifications Committee, 4,000 Ft.
Jozsef Garamvolgyi, professional secretary for the Department of Linguistic and Literary Sciences, 3,000 Ft.
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