

CIA/PB 131891-T58

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CENTRAL INTELLIGENCE AGENCY

SCIENTIFIC INFORMATION REPORT



18 November 1960

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Use of funds for printing this publication approved
by the Director of the Bureau of the Budget July 31, 1958.

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.

SCIENTIFIC INFORMATION REPORT

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I. BIOLOGY

Biophysics

1. Anatoxin Purity Determined by Spectrophotometric Methods

"Spectrophotometry and Luminescent Analysis of Anatoxins," by V. M. Vadimov, Division of Radiation Microbiology and Immunology, Institute of Epidemiology and Microbiology imeni Gamaleya; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 31, No 8, Aug 60, pp 35-40

Preliminary paper electrophoresis followed by spectrophotometry and luminescent analysis was tested as a method to be used in quality control of anatoxin production. Tetanus and diphtheria anatoxins were selected for use in the experiments. Maximum absorption of the tetanus anatoxin occurred at a wave length of 278 microns; the diphtheria anatoxin contained formalinized protein and had a mixed absorption spectrum in the short wave region. Electrophoresis was carried out in an acetate buffer with a pH of 5.2 and an ion concentration of 0.03-0.04 at 80 V for 16 hours. The strips were then dried in air at 20° C and scanned in ultraviolet light; eluates in physiological solution were measured with a SF-4 spectrophotometer. Maximum absorption was seen on the spectrograms between the limits of the third and the eighth zones.

The results of these experiments are shown by tables, graphs and illustrations, and are discussed thoroughly in the text. The following conclusion is given:

CPYRGHT

"The above-described research on molecular spectral analysis of tetanus and diphtheria anatoxins, and also the data on their luminescent characteristics, are of interest for further development of the methodology of physical-chemical analysis (control) in determining the degree of purification of anatoxins."

2. Electrophoretic Purification of Foot-and-Mouth Disease Virus

"Purification of the Foot-and-Mouth Disease Virus by the Method of Electrophoresis," by A. G. Makakhov, and N. M. Klimov, Tr. Vses. In-ta Eksperim. Veterinarii (Works of the All-Union Institute of Experimental Veterinary Medicine), No 22, 1959, pp 189-194 (From Referativnyy Zhurnal Biologiya, No 17, 10 Sep 60, Abstract No 79840)

CPYRGHT

"The foot-and-mouth disease virus maintains its biological characteristics if electrophoresis is carried out at a temperature not higher than 5° C with the use of a medinal-acetate buffer (3.5 g of medinal, 4.0 g of CH₃COONa, 150 g of a 0.1 HCl solution diluted to one liter with distilled water) with a pH of 7.6.

CPYRGHT

Electrophoresis was done simultaneously with 16 strips of paper 40x2 cm and a direct current voltage of 300 V, a current of 5 mA; the duration of electrophoresis was 18 hours. The virus was observed to move with the α - and β -globulin fractions of the blood serum of guinea pigs infected with type A virus (the animals were sacrificed 48-72 hours post infectionem). White mice infected with eluates of α - and β -globulin fractions died within 36 hours of infection. Mice infected with eluates of other fractions survived. Some virus particles have a rate equal to the α -globulin of the blood serum, and others, to the β -globulin; virus particles with electrophoretic mobility corresponding to β -globulin are found in the highest concentrations. The authors consider it possible to purify the virus of bal-last proteins by the method of electrophoresis."

3. Immuno-electrophoresis for Quantitative Protein Determination

"Immuno-electrophoresis of Precipitating Sera on Paper," by Yu. S. Tatarinov, Chair of Biochemistry, Astrakhan Medical Institute imeni A. V. Lunacharskiy; Moscow, Laboratornoye Delo, Vol 6, No 3, May/June 60, pp 37-39

On the basis of their observation that fractionation of specific proteins on paper is relatively complicated and does not result in pure precipitate allowing a quantitative determination of the proteins which enter into the antigen-antibody complex, the authors experimented with paper immuno-electrophoreses and paper chromatography to study specific serum protein reactions. Three aspects of the research are discussed in this article: (1) simultaneous electrophoresis of precipitating sera and antigen; (2) electrophoresis of immune serum impregnated with antigen; and (3) electrophoresis of antigen on paper impregnated with different protein fractions of precipitating serum.

The following conclusions are given:

1. The specific reaction of precipitating antibodies with antigen in paper electrophoresis reveals characteristic zones of precipitation.
2. The combination of paper immuno-electrophoresis and paper chromatography permits the observation of the distribution of specific precipitate on the electrophoregram. Determination of the protein in the precipitate makes it possible to evaluate the antibody content.

4. Apparatus for Measuring Biocurrents

"Diagnostic Radiolocator," (unsigned article); Moscow, Meditsinskiy Rabotnik, No 17 (1929), 23 Sept 60, p 4

CPYRGHT

"In the course of the development of disease processes in the human organism, modifications of the bioelectric potentials which have their origin in the cells and tissues of the human and animal organisms, take place at specific points of the skin which are closely linked with the foci of the affections. A simple cathode millivolt meter which with great precision determines the constant and modified magnitudes of the biocurrents, and which makes it possible to measure the degree of the modifications--signals of the encroaching disease -- has been designed by the personnel of the Institute of Physiology imeni A. Bogomolets of the Ukrainian Academy of Sciences. Charts which indicate the location of these points on the skin, their nerve connections, and the magnitudes of the biopotentials in healthy and sick persons have been developed. The new apparatus is now being used for diagnostic purposes at the Kiev City Hospital imeni October Revolution, and in the therapy of radiculitis, neuritis, bone diseases, diseases of the joints, muscles, etc. In many cases it helps the physician to determine the area for action on the focus of the disease, to assess the intensity of the disease process, and to select the proper method of therapy. The experimental shop of the institute is now assembling these apparatuses for the scientific-Research institutes and medical establishments of the republic."

5. Electroencephalography Discussed in Recent Book

"Elektroentsefaloskopiya (Electroencephalography), by M. N. Livanov and V. M. Anan'yev, Medgiz; Moscow, 1959, 108 pp

This book, which reports the development of a new device for recording bioelectric potentials, is introduced with the following note:

CPYRGHT

"A description of a new method of studying the dynamics and spatial relations of the nerve processes in the cerebral cortex is given in this book by M. N. Livanov and V. M. Anan'yev. This method (electroencephalography), which has already been used in a number of scientific institutions in our country, is based on the use of an electroencephaloscope designed by the authors--a new apparatus for multiple point recording of bioelectric potentials of the human and animal brains.

"The results of experimental and clinical investigations which have demonstrated the possibility of extensive practical use of the encephaloscope, particularly for the purpose of observing diseases and injuries of the brain (epilepsy, neoplasms, concealed trauma, etc.) are reported in the book.

"The book is intended for physicians and biologists interested in the use of electrophysiological methods in clinical and laboratory practice."

The introduction to the book explains the authors' purposes in designing this apparatus and in publicizing its advantages. The table of contents is as follows:

CPYRGHT

Introduction	3
The development of electrotoposcopy	5
Multichannel electrotoposcopy	5
Commutation electrotoposcopy	9
What is basically required of electroencephalography	19
Principles of operation of the electroencephaloscope	20
Circuitry and construction of the electroencephaloscope	25
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CPYRGHT The authors offer these conclusions:

"The examples of the experimental and clinical use of the encephaloscope which have been presented do not exhaust all the data obtained in research in which it was used over the course of 2 years. In particular, it performs an important service in the electrophysiological study of conditioned reflexes.

"However, it must be assumed that the examples presented are sufficient to evaluate correctly the possibilities revealed by this new electrophysiological methodology in the field of investigation of brain processes.

"The authors of this book hope that the use of electroencephalography in other areas of physiology and medicine (electrocardiography, electromyography, etc.) will also fully justify itself.

"In conclusion, we consider it necessary to make it still more clear that the apparatus described is only the initial development and that there exists, therefore, a great possibility for improvement. The authors of this book have already developed an apparatus with 100 leads, and have demonstrated the possibility of constructing an apparatus with several hundred leads.

"Such an apparatus will be able to give a precise picture of the spatial distribution of the variations in potential in excited tissues. These future multichannel apparatuses will not differ greatly, in their size, number of tubes and design, from the first 50-channel apparatuses. Extensive possibilities are disclosed here as a result of the application of the multiple commutation principle developed by the authors. The synchronization of several commutating pulses is the basis for this. As a result of this, a large number of combinations, which ensure passage into the signal amplification section from a large number of channels, is successfully achieved with a small number of circuit elements.

"The authors suggest that electroencephaloscopic methodology will in time be applied in theoretical and practical research, and they hope that this book will assist in acquainting wide circles of scientific and clinical workers with this methodology."

The book is well illustrated and contains a bibliography of 39 Soviet and 38 foreign authors.

Microbiology

6. Succindehydrase Activity Centers in Bacteria Studied

"Detection of Succindehydrase Activity Centers in E. Coli," by V. M. Kushnarev, Department of Dry Biopreparations and Laboratory of Luminescence and Electron Microscopy, Institute of Epidemiology and Microbiology imeni N. F. Gamaleya, Academy of Medical Sciences USSR; Moscow, Byulleten' Eksperimental'noy Biologii i Meditsiny, No 8, 1960, pp 106-107

With the aid of 2,3,5, -triphenyltetrasol chloride, a specific reagent for succindehydrase in E. coli cells, a cell was found to have one to three succindehydrase "activity centers." Since succindehydrase activity is associated with the mitochondria fraction in tissues, one can speak of such centers in bacterial cells as functional equivalents of mitochondria.

7. Rumanians Study Tick-Borne Encephalitis Virus

"Concerning Some Characteristics of Tick-Borne Encephalitis Virus Isolated in Rumania," by N. Draganescu; Bucharest, Studii si Cercetari de Inframicrobiologie, Vol 9, No 3, 1960 pp 417-422

The author studied the moment of the appearance and the persistence of tick-borne encephalitis virus isolated in Rumania in the blood of white mice inoculated intracerebrally and subcutaneously.

In the animals inoculated either intracerebrally or subcutaneously, the virus is present in the blood from the first hour after infection and persists until the death of the animal.

By inoculating the mice through the respiratory tract, one obtains both clinically and pathomorphologically the characteristic lesions of pneumo-encephalitis with an interstitial infiltration of the lung and inflammatory lesions specific to this virus in the central nervous system.

Four successive intrapulmonary passages produced no changes in the neurotropic properties of this inframicrobial pathogen.

8. Role of RNA in Anti-Virus Vaccines

"Ratio Between the Immunogenic Activity of Anti-Virus Vaccines and Their Infectivity," by R. Portocala; Bucharest, Studii si Cercetari de Inframicrobiologie, Vol 9, No 3, 1960, pp 365-373.

The author discusses the role of the ribonucleic acid of viruses in anti-virus vaccines. If a vaccination is to be effective, it must be done with a virus which has largely conserved its infectivity via its RNA, which, however, subjects the cell to the synthesis of the homologous virus. On the other hand, the viruses which have lost their inductive property cannot promote intracellular immunogenesis.

The study led to the conclusion that the cell itself is the seat of the immunity in viral diseases; it is only in the interior of a cell with intact physiological characteristics that the RNA can exercise its inductive action and finally cause the synthesis of a virus, which becomes an antigen through its protein.

II. CHEMISTRY

Electrochemistry

9. A. N. Sysoyev's Work on Semiconductors and Fuel Cells

"A. N. Sysoyev (1901-1959)," by I. S. Galinker, S. S. Urazovskiy, P. P. Budnikov, L. I. Kadaner, and A. I. Gorbanev; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 9, Sep 60, pp 2130-2133

On the occasion of the death of A. N. Sysoyev on 4 Jan 1960, his work in the field of electrochemistry is reviewed. At the time of his death, Sysoyev was head of the Chair of Electrochemical Production, Khar'kov Polytechnic Institute imeni V. I. Lenin. He has carried out a number of investigations (referred to as important) on semiconductors. He discovered that tungsten, aluminum, and thallium that have been oxidized at elevated temperatures exhibit semiconductor properties. He conducted extensive investigations on the effects which impurities, the temperature of oxidation, deformation, and a number of other factors exert on the rectifying properties of semiconductors. He proved that in electrolytic rectifiers, the electrolyte plays only an auxiliary role in the rectification effect. At one time, Academician A. F. Ioffe referred to Sysoyev's work as outstanding because of the methods applied and the novelty of the ideas embodied in it. He stated that Sysoyev is the leading worker in the field of the chemistry and technology of solid rectifiers in the USSR.

Soyoyev has been interested in carbon-oxygen cells and the nature of the so-called flame current.

[SIR Note: A list of publications by Sysoyev follows the review of his activity. Publications on semiconductors (10 references), electro-thermic processes and electric furnaces (20 references), electrolytic deposition of metals (17 references), and miscellaneous subjects (12 references) are included in this list.]

Fuels and Propellants

10. Use of Heavier Petroleum Fractions for Jet Fuel Recommended

"Catalytic Cracking or Reforming?" by B. M. Rybak and A. L. Khalif, All-Union Scientific Research Institute of the Gas Industry; Moscow, Khimiya i Tekhnologiya Topliv i Masel, Vol 5, No 8, Aug 60, pp 66-70

In this article, which disputes the necessity of expanding the catalytic cracking of heavy fractions in the USSR petroleum industry and criticizes A. V. Agafonov's recommendation to that effect made in the paper "Catalytic Cracking as One of the Means of Providing of Raw Material for Petrochemical Synthesis" (cf Khimiya i Tekhnologiya Topliv i Masel, No 9, Sep 1959), the following statement is made:

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"As far as jet ("reaction engine") and diesel fuels are concerned, it is not necessary to use in all cases fractions boiling at 140-350° for their production, as has been assumed by Agafonov. Without impairment of the quality of jet and diesel fuels obtained from nonparaffinic crudes and some of the crudes with a low paraffin content, one may use the 180-430° fractions for the production of these fuels, the more so since, in addition to fuels for high-speed diesels, heavier fuels to be used in diesel engines with a high power output and stationary diesels will be required to an increasing extent."

11. Adsorption of Ozone on Silica Gel at Low Temperatures

"The Physical Chemistry of Concentrated Ozone; Part 9 -Investigation of the Adsorption of Ozone on Silica Gel at Different Temperatures," by N. I. Kobozev, Ye. N. Yeregin, M. G. Terekhova, and A. N. Mal'tsev, Moscow State University; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 9, Sep 60, pp 1893-1899

In the work described, the adsorption of ozone on silica gel at low temperatures was investigated. The silica gel was saturated at a constant temperature in an ozone-oxygen stream until an adsorption equilibrium was established; the adsorbed quantity was then determined by gas analysis. Analysis was carried out by oxidation of potassium iodide and titration of the freed iodine with sodium thiosulfate. The adsorption isotherms at minus 120°, minus 130°, minus 140°, and minus 150° were determined. It was established that the adsorption of ozone on silica gel decreases by a factor of 7-8 when the temperature is reduced from minus 120° to minus 150°. Adsorption on silica gel makes it possible to obtain concentrated ozone in a form convenient for chemical applications.

12. Effect of the Diameter of the Vessel on the Yield of Nitrogen Oxide in the Explosive Oxidation of Nitrogen in Mixtures With Ozone

"The Physical Chemistry of Concentrated Ozone; Part 10 -The Effect of the Diameter of the Vessel on the Yield of Nitrogen Oxide in the Explosive Oxidation of Nitrogen in Mixtures With Ozone," by B. V. Strakhov, V. P. Lebedev, and N. I. Kobozev, Moscow State University; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 8, Aug 60, pp 1706-1708

The relation between the nitrogen oxide (NO) yield and the diameter of the vessel during explosions of ozone-nitrogen mixtures in glass vessels at an initial pressure of 150 mm Hg was investigated. It was established that in the concentration range of 50-90% O₃, the yield of NO increases with the diameter at all concentrations, the maximum yield changing from 0.4 to 1.95% with a change of the vessel diameter from 10 to 44 mm. The increase of the

yield of NO is retarded when d approaches 14 mm, the concentration being the more pronounced the higher the concentration of O_3 in the mixture. Measurements at still greater diameters could not be carried out because of the inadequate strength of the glass vessels. On the basis of an extrapolation of curves that have been obtained, the assumption is made that the lower the concentration of ozone in the mixture, the greater will be the diameter at which the yield of NO reaches a maximum value. It is stated that this assumption must be checked in experiments carried out in metal vessels.

According to A. G. El'kenbard, R. I. Genkina, and M. V. Polyakov, who worked with $N_2 - O_2 - O_3$ mixtures, the yield of NO passes through a maximum with increasing diameters of the vessel because the chain mechanism, which applies to explosions in vessels with a small diameter, changes to a thermal (heat explosion) mechanism. It was brought out later that the dependence of the NO yield on the diameter can be explained from the standpoint of the heat explosion theory (cf Ya. B. Zel'dovich, P. Ya. Sadovnikov, and D. A. Frank-Kamenetskiy, *Okisleniye Azota pri Gorenii - Oxidation of Nitrogen During Combustion*, Publishing House of the Academy of Sciences USSR, Moscow-Leningrad, 1947).

13. Oxidation of Methane in the Presence of Nitromethane

"Application of the Kinetic Isotope Tracer Method in the Investigation of the Oxidation of Methane in the Presence of Nitromethane," by V. B. Miller, P. I. Levin, G. P. Konareva, M. B. Neyman, and N. S. Yenikolopyan, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 9, Sep 60, pp 1980-1986

Oxidation of hydrocarbons is considerably accelerated in the presence of nitrogen oxides, alkyl nitrites, or alkyl nitrates. Investigation of the oxidation of methane in the presence of NO_2 led to the conclusion that the interaction of nitrogen oxides with methane in the first stage of the reaction results in the formation of nitromethane, which acts as a homogeneous catalyst of the reaction. To check the correctness of this hypothesis, the effects of the addition of nitromethane on the kinetics of the oxidation of methane were studied. It was found that nitromethane disappears rapidly in the beginning of the reaction and that formaldehyde and oxides of carbon are formed at the same time. After this, during a period of 1-1.5 min, the concentration of nitromethane remains practically constant. The relatively constant concentration of nitromethane during a period of 0.5-1.75 min can be explained in two different ways. One explanation would be that nitromethane is excluded from the reaction and for that reason does not decompose. Another, more probable explanation is that nitromethane is used up and regenerated at approximately equal rates. By using $C^{14}H_3NO_2$, it could be established that the nitromethane which catalyzes the oxidation

of methane is not only decomposed, but also forms during the course of the reaction. The rates of the formation and decomposition of methane in the presence and absence of oxygen were determined. It was found that in the presence of oxygen, the rate of the formation of nitromethane is 2-3 times greater than in the absence of oxygen. It is assumed on the basis of the results obtained that in the presence of oxygen, approximately 30% of the nitromethane containing tracer carbon is formed by isotope exchange and approximately 70% as a result of radical reactions.

It was established that at $T = 473^{\circ}$, isotope exchange takes place between $C^{14}H_3NO_2$ and CH_4 according to the following equation:



It was found that for every nitromethane molecule that is decomposed, 2-3 molecules of methane are oxidized.

14. Dependence of the Lower Concentration Limits of Ignition of Gas-Air Mixtures on the Molecular Structure of the Combustible Component

"Dependence of the Lower Concentration Limits of Ignition of Gas-Air Mixtures on the Molecular Structure of the Combustible Component," by N. V. Solov'yev and A. N. Baratov; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 8, Aug 60, pp 1661-1670

Starting from N. N. Semenov's thermal explosion theory, a relationship has been established for alkanes, normal alcohols, iso-alcohols, formates, and acetates between the lower concentration limits of ignition and the content of carbon atoms in the molecule of the combustible substance. The fact that there is a quantitative relationship of this kind has been confirmed by experimental data. It was established that with an increasing content of carbon atoms in the molecule of the combustible substance, the lower concentration limits decrease monotonously according to a hyperbolic relationship. Application of M. Kh. Karapet'yants' comparative method indicated that the relationship which has been found is valid for all the homologous series that have been investigated. The expressions that have been derived, when employed in combination with Karapet'yants' comparative method, may serve for the calculation of the ignition limits of a great number of substances belonging to other homologous series when the limit of one substance of the series is known. The values of temperature and concentration limits of a number of hydrocarbons and oxygen-containing derivatives of these hydrocarbons have been determined for the first time.

Herbicides

15. Herbicidal Activity Lowered by Replacing Ester Oxygen With an Amide Group

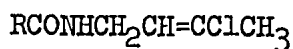
"Research in the Field of Synthesizing Herbicides. Report 5. Gamma-chlorocrotyl Amides of Aroxy- and Haloacetic Acids," by V. V. Dovlatyan and T. O. Chakryan, Chair of General Chemistry, Armenian Agricultural Institute; Yerevan, Izvestiya Akademii Nauk Armyanskoy SSR-Khimicheskiye Nauki, Vol 13, No 2/3, 1960, pp 187-191

Haloaryloxyacetic acids, upon being introduced into the soil, tend to act somewhat slower on weeds than when used to treat the surface portion of the plants. The main reason for the weak herbicidal activity of these compounds appears to be their low stability in soil. In addition, the amides and certain anilides of the acids cited are considerably more stable and effective in soil.

In addition to the foregoing, a number of herbicides are known which manifest an expressed activity only under soil conditions, and they also contain the amide functional group. Among such compounds one can list the derivatives of urea and carbamic acid: isopropylphenylcarbamate, isopropyl-3-chlorophenylcarbamate, dichloralurea, and others.

Thus, on the basis of the data presented, one could suppose that the presence of the amide group in the molecules of a number of compounds, apparently, contributes to their activity and stability in the soil.

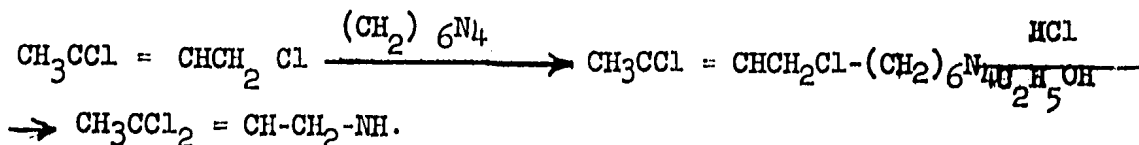
The authors were motivated by these considerations to synthesize the gamma-crotyl amide of aroxyacetic and haloacetic acids with the following general formula:



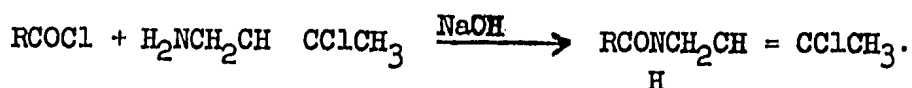
where R = ArOCH₂, CClH₂, CCl₂.

Proceeding from the above statements, the authors expected that the obtained amides would manifest in the soil a higher herbicidal activity than the earlier synthesized, corresponding gamma-crotyl esters of aroxy- and haloacetic acids.

The gamma-crotyl amine necessary for the synthesis of the desired amides was obtained from 1,3-dichlorobutene-2 according to the method based on the use of hexamethylenetetramine:



By condensing the obtained amine with aroxyacetyl- and haloacetyl-chlorides in the presence of sodium hydroxide, gamma-crotyl amides were synthesized:



Tests indicated that for the purpose of aroxyacetylation of gamma-chlorocrotyl amine, the ethyl esters of the acids can be successfully used in place of the acid chlorides.

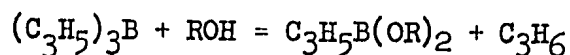
Preliminary tests of the herbicidal properties of the synthesized amides, conducted by G. A. Darbinyan of the Institute of General Soil Science of the Ministry of Agriculture of the Armenian SSR, indicated that by replacing the ester oxygen of the gamma-crotyl esters of aroxy- and haloacetic acids by the amide group negatively affects the activity of this series of compounds.

Industrial Chemistry

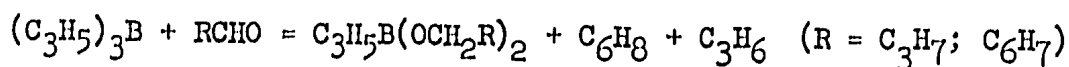
16. Research on Triallylboron

"Investigations in the Field of Boron Compounds; New Derivatives of Triallylboron," by Academician A. V. Topchiyev, Ya. M. Paushkin, A. A. Prokhorova, E. I. Frenkin, and M. V. Kurashev, Institute of Petrochemical Synthesis, Academy of Sciences SSSR; Moscow, Doklady Akademii Nauk SSSR, Vol. 134, No 2, 11 Sep 60, pp 364-367

Triallylboron prepared by a method previously described by the authors (cf Doklady Akademii Nauk SSSR, Vol 129, No 3, 1959, p 598) was reacted with alcohols, acids, and aldehydes. The reaction of triallylboron with alcohols leads to the formation of diesters of allylboric acid according to the equation



By the reaction of triallylboron with aldehydes esters of allylboric acid, propylene and cyclohexadiene are formed according to the following equation:



Esters of allylboric acid that have been synthesized (9 esters are described) are being investigated from the standpoint of their application as monomers for the synthesis of polymers containing boron.

17. Device for Determining the Elasticity of Rubber at Temperatures Below Freezing

"A Device and Method for the Determination of High Elasticity Characteristics of Rubber at Low Temperatures," by G. M. Bartenev and N. M. Novikova, Scientific Research Institute of the Rubber Industry; Moscow, Kauchuk i Rezina, No 7, Jul 60, pp 28-33

A modified device UPKM-3 and an accelerated method of testing rubber for stability at temperatures below 0°C are described. It was established that identical results are obtained by the method of determining the loss of elasticity in compression and the method of determining elastic recovery, so that a single universal method of testing on the UPKM-3 device can be recommended. A method for determining the tendency of rubber to crystallize is proposed.

Inorganic Chemistry

18. Preparation of Rhenium Hexafluoride by the Fluorination of the Metal With Chlorine Trifluoride

"Preparation of Rhenium Hexafluoride by the Fluorination of the Metal With Chlorine Trifluoride," by N. S. Nikolayev and Ye. G. Ippolitov, Institute of General and Inorganic Chemistry imeni N. S. Kurnakov; Moscow, Doklady Akademii Nauk SSSR, Vol 134, 11 Sep 60, pp 358-359

Powdered rhenium was reacted with gaseous chlorine trifluoride (it does not react with liquid ClF₃). The reaction was conducted in a stream of nitrogen. It proceeded at 300°. A volatile liquid containing ReF₆ and an excess of ClF₃ distilled over. To prepare pure ReF₆, recrystallization from liquid hydrogen fluoride was carried out. ReF₆ · xClF₃ crystallized from the hydrogen fluoride. This product was decomposed into ReF₆ and ClF₃ by distillation in a hydrogen stream at 50° in a platinum tube. The ReF₆ separated in this manner still contained some chlorine and hydrogen fluoride; it was purified by keeping it in vacuum for 4 hrs at minus 70°. The melting point of the ReF₆ finally obtained was + 18.7 ± 0.1° in contrast to the 18.8° and 19° given in the literature.

19. Tantalum Iodide and Formation of Tantalum From the Iodide

"Formation of Tantalum Iodides and Iodide Tantalum," by D. M. Chizhikov, Corresponding Member Academy of Sciences USSR, and B. N. Rabinovich, Institute of Metallurgy imeni A. A. Baykov, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 134, No 2, 11 Sep 60, pp 368-370

The investigation described was carried out with the purpose of establishing the temperature at which the interaction of tantalum with iodine begins, of studying the tantalum iodide or iodides that are formed, and of determining the properties of tantalum formed by the decomposition of tantalum iodide. It was established that the reaction between tantalum and iodine begins at 370°. The presence of a new compound was established by X-ray diffraction analysis of products of the interaction of Ta with I at 530-550°. Chemical analysis led to the conclusion that an iodide of a composition corresponding to the formula $TaI_{2.8-3}$ had formed. Tantalum formed by the decomposition of tantalum iodide was deposited on a monocrystalline tungsten filament and a polycrystalline tantalum filament. It was found that the tantalum crystals were arranged in a regular manner on the surface of the tungsten and were in a disoriented state on the tantalum surface.

20. Titanium-Chromium-Boron Alloys

"Some Data on Alloys in the System Titanium-Chromium-Boron," by N. V. Cherkashina, N. A. Nedoumov, and F. I. Shamray; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 9, Sep 60, pp 2025-2031

In the work described, an investigation of the constitutional diagram of the ternary system Ti-Cr-B has been begun. No systematic data on this system are available. Preliminary results obtained in an investigation of the microstructure and thermal behavior of alloys along the cross-sections Cr-TiB₂ and Cr-Ti₂B are reported. According to data published in the literature, titanium borides are superior to other borides in that they have higher melting and a better heat resistance. Ductile chromium has a high mechanical strength and exhibits a considerable resistance to oxidation at elevated temperatures. Furthermore, chromium borides are resistant to the action of acids. Under the circumstances, an investigation of the combined effects exerted by chromium and titanium on ternary alloys in the system Ti-Cr-B appeared of interest.

21. Boron-Silicon-Carbon Alloys

"Alloys in the System Boron-Silicon-Carbon," by K. I. Portnoy, G. V. Samsonov, and L. A. Solomnikova, All-Union Institute of Aviation Materials and Institute of Powder Metallurgy, Ceramics, and Special Alloys, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 9, Sep 60, pp 2032-2041

A microscopic, X-ray diffraction, microdurometric, and chemical investigation of alloys in the B_4C -Si and SiC-B cross-sections of the ternary system B-Si-C system has been carried out. The melting points and electrical properties of these alloys were also investigated. The existence of two ternary compounds was established. These compounds have the formulas B_5SiC_2 and $B_3Si_2C_2$. They exhibit a great hardness (which reaches 7000 kg/mm^2 so far as the first of the two compounds is concerned), a high heat resistance, and a high resistance toward the action of acids and mixtures of acids. It was established that the alloys in the cross-sections mentioned have semiconductor properties. The thermal EMF of the chemical compounds discovered reaches a magnitude of 150-200 $\mu\text{v/degree}$.

Boron-silicon-carbon alloys are of great practical importance because of their great hardness, chemical stability, heat resistance, and semiconductor properties exhibited by the binary limiting systems.

Insecticides

22. Water-Soluble Pesticidal Dusts

"Method of Producing Water-Soluble Pesticidal Dusts Containing the Ammonium Salts of Substituted Dinitrophenols," by Karol Ullrich and Frantisek Matousek, Czechoslovakian Patent 88029, 15 December 1958 (from Referativnyy Zhurnal -- Khimiya, No 12, 25 Jun 1960, Abstract No 49111 by F. Ryshkĕ)

Over a 2-hour period, 13.9 kg of a 50% product of petroleum sulfonation (wetting agent), 5.6 kg of $(\text{NH}_4)_2\text{SO}_4$, and 16.7 kg of water are added to a mixture of 13.9 kg of dinitro-o-cresol (I), 36.1 kg of water, and 13.9 kg of 22.4% aqueous NH_3 at $30\text{-}35^\circ$ with constant stirring. The reaction mixture is stirred for approximately 4 hours more at 40° ; the paste produced is dried and crushed. Dinitro-o-sec-butylphenol, dinitro-o-cyclohexylphenol, or dinitro-o-sec-amylphenyl can be used instead of dinitro-o-cresol.

Nuclear Fuels and Reactor Construction Materials

23. Spectrophotometric Investigation of the Formation of Complexes by Uranyl With Ethylenediaminetetraacetic Acid

"Spectrophotometric Investigation of the Formation of Complexes by Uranyl With Ethylenediaminetetraacetic Acid," by A. G. Kozlev and N. N. Krot; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 9, Sep 60, pp 1959-1963

The formation of complexes by uranyl with ethylenediaminetetraacetic acid was investigated spectrophotometrically. It was established that under definite conditions, the complexes UO_2H_2Y , $[UO_2]_2Y$, and $[UO_2Y]^{2-}$ are formed. They were isolated in the solid state in the form of the compounds $UO_2H_2Y \cdot nH_2O$, $[UO_2]_2Y \cdot nH_2O$, and $K_2 [UO_2Y] \cdot nH_2O$. The dissociation ("instability") constants of $[UO_2]_2Y$ and $[UO_2Y]^{2-}$ were calculated.

24. Hydration of Uranyl Nitrate in Organic Solvents During Extraction From Salt Solutions

"Hydration of Uranyl Nitrate in Organic Solvents During Extraction From Salt Solutions," by V. M. Vdovenko and Ye. A. Smirnova; Leningrad, Radiokhimiya, No 3, May 60, pp 291-295

It was established that during the extraction of uranyl nitrate from solutions containing salting-out agents capable of binding water, the degree of hydration of uranyl nitrate in diethyl ether diminishes with increased concentrations of the salting-out agent in the aqueous solutions. At equal concentrations of salting-out agents, the degree of lowering of hydration depends on the capacity of the salting-out agent to bind water. The degree of hydration of uranyl nitrate extracted with dibutyl ether from solutions containing salting-out agents is not affected by a dehydrating effect exerted by the salting-out agent.

25. Thermodynamics and Kinetics of the Dissolution of Uranium Oxides in Acidic Solutions

"Some Problems of the Thermodynamics and Kinetics of the Dissolution of Uranium Oxides in Acidic Solutions," by V. I. Spitsyn, G. M. Nesmeyanova, and Ye. A. Kanevskiy; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 9, Sep 60, pp 1938-1942

Using data published in the literature, the isobar potentials of the dissolution of UO_2 , UO_3 , and U_3O_8 in sulfuric acid solutions of different concentration were calculated under consideration of the formation of complexes. The values of ΔZ and ΔZ^0 for these processes were compared with

the results of the dissolution of UO_2 and U_3O_8 in solutions of sulfuric acid at concentrations of 150-1000 grams per liter. It was established that the experimental data are in agreement with the results of thermodynamic calculations. The values obtained for the isobar potentials of the dissolution of UO_2 , UO_3 , and U_3O_8 , particularly in dilute solutions of acids, indicated that it is advisable to use oxidizing agents when UO_2 and U_3O_8 are dissolved. At the same time, attempts to correlate experimental data on the dissolution of U_3O_8 with normal redox potentials of oxidizing agents used to expedite solution did not indicate that there is a well-defined relationship between them. The effect of the temperature on the solution of these oxides under the conditions applied indicate that kinetic factors play a decisive role when some oxidizing agents are used.

26. Selective Acid Leaching of Uranium From Ores

"Investigation of the Behavior of Minerals Accompanying Uranium During the Process of Acid Leaching of Ores," by G. M. Nesmeyanova and N. K. Chernushevich; Moscow, Atomnaya Energiya, Vol 9, No 2, Aug 60, pp 137-138

The principal minerals accompanying uranium are the oxides and carbonates of iron and also the sulfides of heavy metals. Their behavior in hydrometallurgical processes has been studied by a number of investigators; however, none of the investigations in question was carried out under conditions corresponding to the leaching out of uranium. In the work described at present, the behavior of magnetite, hematite, limonite, siderite, pyrite, and covellite during leaching with sulfuric acid, nitric acid, and sulfuric acid to which manganese dioxide had been added was investigated. The concentration of the leaching agent was varied from one gram per liter to 400 grams per liter; this corresponds to concentrations used in processes for the selective leaching out of uranium. The results obtained are reported with particular attention to the dissolution of iron by the acid.

27. Effect of Hydrocarbon Diluents on the Extraction of Uranium, Plutonium, Zirconium, and Cerium With Tri-n-Butylphosphate From Nitric Acid Solutions

"The Effect of Aliphatic and Aromatic Hydrocarbons on the Extraction of U (VI), Pu (IV), Zr (IV), and Ce (III) With Tri-n-Butylphosphate From Nitric Acid Solutions," by V. B. Shevchenko, A. S. Solovkin, I. V. Shilin, L. M. Kirillov, A. V. Rodionov, and V. V. Balandina; Leningrad, Radiokhimiya, No 3, May 60, pp 281-290

The effect of aliphatic and aromatic hydrocarbon diluents on the extraction of U (VI), Pu (IV), Zr (IV), and Ce (III) with tributylphosphate (TBP) from nitric acid solutions was investigated. It was established that there

is a definite correlation between the capacity of the TBP- diluent mixtures to extract the nitrates in question and the polarities ϵ and P of the organic phase. It was also established that deviation from the ideal law in the distribution of the salts (nitrates) at high concentrations of the extracting agent are due to changes in the polar characteristics of the organic solution during the process of extraction. The anomalous behavior of zirconium nitrate during the extraction of this salt with solutions of TBP in organic solvents having a low polarity is discussed.

28. Spectrophotometric Investigation of the Formation of Nitrate Complexes of Plutonyl in Acetone

"Spectrophotometric Investigation of the Formation of Nitrate Complexes of Plutonyl in Acetone," by V. M. Vdovenko, A. A. Lidovskiy, and M. G. Kuzina; Leningrad, Radiokhimiya, No 3, May 60, pp 301-306

By applying the spectrophotometric method, the formation of nitrate complexes of plutonyl in acetone was investigated. Pyridinium nitrate was used as the donor of nitrate groups. The composition of the compounds that form under these conditions was determined. It was found that in the system under investigation, there is formation of plutonyl nitrate and of the complex compound trinitrateplutonyl. These compounds are very stable in acetone solutions.

The absorption spectra of the compounds that are formed were investigated and the spectrophotometric characteristics of these compounds determined. It was established that the absorption spectrum of the complex compound trinitrateplutonyl is very complicated and differs substantially from the absorption spectra of plutonyl perchlorate and plutonyl nitrate. As distinguished from trinitrateuranyl, trinitrateplutonyl does not exhibit during the formation stage any increase in the intensity of the absorption bands that are ascribed by some investigators to metal-oxygen bond vibrations in the plutonyl ion.

The work described in this paper was carried out in 1957.

29. Distribution of Plutonium During Extraction With Tributyl Phosphate; Part II- The Effects of the Temperature on the Distribution of Plutonium

"The Distribution of Plutonium During Extraction With Tributyl Phosphate; Part 2.-- The Effect of the Temperature on the Distribution of Plutonium," by E. I. Moiseyenko and A. M. Rozen; Leningrad, Radiokhimiya, No 3, May 60, pp 274-280

Measurements of the distribution factor of Pu (IV) in the acidity range of 0.1-10.0M of HNO_3 and concentrations of uranyl nitrate in the range of 0.021-1.26M at temperatures of 20°, 30°, 50°, and 70° showed that at

acidities up to 5 M the distribution factor drops with the temperature in the absence of uranyl nitrate and that at acidities higher than 5 M it increases with the temperature. The first effect is explained by a reduction of the distribution factor with the temperature and the second by increases in the activity coefficients. The thermodynamic constants of the distribution of Pu (IV), the coefficients of activity in the aqueous phase, and the heat of extraction have been calculated in an approximate manner.

30. Spectrophotometric Investigation of Formation of Nitrate Complexes of Plutonyl in Aqueous Solutions in the Extraction of Pu (VI) With Dibutyl Ether

"Spectrophotometric Investigation of the Formation of Nitrate Complexes of Plutonyl in Aqueous Solutions in the Extraction of Pu (VI) With Dibutyl Ether," by V. M. Vdovenko, A. A. Lipovskiy, and M. G. Kuzina; Leningrad, Radiokhimiya, Vol 2, No 3, May 60, pp 307-311

The formation of complex compounds of Pu (VI) in nitric acid solutions was investigated. It was established that in nitric acid of the concentration 11-12 N Pu (VI) is present principally in the form of plutonyl nitrate. When the concentration of nitric acid is increased further the concentration of the complex compound trinitrateplutonyl, which has a tendency to form at these concentrations of nitric acid, also increases. In aqueous solution, Pu (VI) has only a small tendency to form complex compounds with nitrate ions. The stability of the nitrate complex compounds of Pu (VI) exceeds that of the corresponding uranyl compounds. The distribution of Pu (VI) between aqueous solutions containing nitric acid and dibutyl ether was investigated. It was established that as the concentration of nitric acid increases in the aqueous phase, the concentration of the complex compound trinitrateplutonyl increases in the organic solvent.

The work described in this paper was carried out in 1957.

31. Extraction of Plutonium With Tri-n-Octylamine From Hydrochloric Acid Solutions

"Extraction of Plutonium With Tri-n-Octylamine From Hydrochloric Acid Solutions," by V. B. Shevchenko, V. S. Shmidt, and E. A. Mezhev; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 8, Aug 60, pp 1911-1913.

It had been established earlier that plutonium (IV) can be readily extracted with tri-n-octylamine (TOA) from nitric acid solutions (A. S. Wilson, Report No 530, presented at the Second Geneva Conference on Peaceful Uses of

Atomic Energy, 1958). In the work described at present it was found that plutonium (IV) can be easily extracted with tri-n-octylammonium chloride from hydrochloric acid solutions. Apparently the extraction of tetravalent plutonium is due to the formation of a complex compound consisting of one molecule of plutonium (IV) chloride and 2 molecules of TOA. HCl. Trivalent plutonium is practically not extracted at all by TOA. HCl from hydrochloric acid solutions.

32. Extraction of Nitric Acid With Tri-n-Octylamine

"Extraction of Nitric Acid With Tri-n-Octylamine," by V. D. Shevchenko, V. S. Shmidt, E. A. Nenarokomov, and K. A. Petrov; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 8, Aug 60, pp 1852-1856

Results obtained in experimental work on the extraction of nitric acid with tri-n-octylamine dissolved in o-xylene and carbon tetrachloride are reported.

33. Formation of the Complex Compound Trinitrateneptunyl

"The Formation of the Complex Compound Trinitrateneptunyl," by V. M. Vdovenko, A. A. Lipovskiy, and M. G. Kuzina; Leningrad, Radiokhimiya, Vol 2, No 3, May 60, pp 312-314

Formation of a complex compound of neptunyl in acetone was investigated. Pyridinium nitrate was used as a donor of nitrate groups. It was established by the spectrophotometric method that there is formation of the complex compound trinitrateneptunyl. It was also established that the increase of the distribution factor of Np(VI) between the aqueous solution and dibutyl ether with increased concentrations of nitric acid is due to formation of trinitrateneptunyl.

34. Oxalate Compounds of Tetravalent Neptunium

"Oxalate Compounds of Tetravalent Neptunium," by P. I. Kondratov and A. D. Gel'man; Leningrad, Radiokhimiya, Vol 2, No 3, May 60, pp 315-319

The solubility product of neptunium oxalate at 19° and the concentration dissociation ("instability") constants of neptunium oxalate complexes were determined.

35. Two-Temperature Methods for Production of Heavy Water

"Two-Temperature Methods for the Production of Heavy Water,"
by K. I. Sakodinskiy and N. M. Zhavoronkov, Physical Chemistry
Institute imeni L. Ya. Karpov; Moscow, Uspelkhi Khimii, Vol 29,
No 9, Sep 60, pp 1112-1137

Methods for the production of heavy water, the fundamental relationships underlying the two-temperature method, and material flow sheets involved in the production of heavy water are reviewed in detail. The requirements of different countries in heavy water are compared. The low requirement for heavy water in England, where heavy water reactors are built mainly for experimental purposes, is contrasted with the high requirement in Sweden, where such reactors are being built for power generation. The increasing importance of a large-scale production of heavy water from the standpoint of satisfying a future demand for thermo-nuclear fuel is pointed out.

It is stated that although the enrichment of deuterium by two-temperature exchange between hydrogen sulfide and water was originally investigated in Germany and the US during World War II, this method was applied for the first time on an industrial scale in the USSR. The first large industrial unit at which this method was applied has been built in the USSR in 1946-1949. It is being successfully operated at present. Application of the hydrogen sulfide-water exchange method in the US and Western Europe is reviewed. This method is compared with other two-temperature procedures, such as the exchange between a liquid thioalcohol and water proposed by H. Urey, the use of dithioethyleneglycol in a two-temperature process developed by Pintsch-Bamag A. G., and the two-temperature process proposed by H. S. Taylor which is based on hydrogen exchange in the system cyclohexane-benzene-hydrogen.

After subjecting to detailed consideration the prospects of the application of individual methods for the production of heavy water on a large scale, the authors come to the conclusion that two-temperature exchange between water and hydrogen sulfide is the only method for the production of heavy water known at present that is capable of assuring production of unlimited quantities of heavy water at a low cost. They regard it as certain that this method will be applied in preference to others in the future. In the authors' opinion, low-temperature distillation of hydrogen produced at ammonia plants will also be applied. In discussing the two-temperature exchange between hydrogen and ammonia combined with the distillation of ammonia to increase its deuterium content, they point out that a nitrogen-hydrogen mixture can be used in this process without the expensive purification required in low-temperature distillation of hydrogen. An additional advantage would be that no special equipment is needed beyond that ordinarily available at nitrogen fertilizer plants producing synthetic ammonia. On the basis of the considerations presented, the authors conclude that the hydrogen-ammonia exchange method also has possibilities.

36. Stability of Compounds Formed by Chlorides of Titanium, Zirconium, and Hafnium With Phosphorus Oxychloride

"The Effect of the Solvent on the Stability of Compounds Formed by the Chlorides of Titanium, Zirconium, and Hafnium With Phosphorus Oxychloride," by B. A. Voytovich, Institute of General and Inorganic Chemistry, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 9, Sep 60, pp 1981-1986

On the basis of a thermal analysis of binary systems consisting of titanium chloride, zirconium chloride, or hafnium chloride and phosphorus oxychloride, it was established that addition compounds of the general formulas $\text{MeCl}_4 \cdot \text{POCl}_3$ and $\text{MeCl}_4 \cdot 2\text{POCl}_3$ are formed in these systems. It was found that the stability of these compounds increases from titanium to hafnium. The effect of a solvent on the stability of these compounds was investigated, using nitrobenzene as the solvent. It was established that the stability of the compounds in solution, as indicated by the dissociation ("instability") constants, changes in the same manner as that of the compounds in an undissolved state.

37. Extraction of Hafnium With Tributylphosphate

"Extraction of Hafnium With Tributylphosphate," by S. S. Korovin, Ye. N. Gribenik, and L. N. Komissarova, Chair of the Technology of Rare and Dispersed Elements, Moscow Institute of Fine Chemical Technology imeni M. V. Lomonosov; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 8, Aug 60, pp 1876-1881

Results of experimental work on the distribution of macroquantities of hafnium between nitric acid solutions and tributylphosphate are reported. Data on the extraction of zirconium are given for comparison. On the basis of the data on the extraction of zirconium and hafnium, the dependence of the distribution factors of these two elements on the nitric acid concentration was investigated. A study of this subject is of interest from the standpoint of the application of tributylphosphate for the separation of hafnium from zirconium by extraction.

38. Beryllium Oxide and Its Properties

"Beryllium Oxide and Its Properties," by P. P. Budnikov and R. A. Belyayev; Leningrad, Zhurnal Prikladnoy Khimii, Vol 33, No 9, Sep 60, pp 1921-1940

The properties of beryllium oxide are reviewed with particular attention to its behavior under the action of radiation and the action of high temperatures. The characteristics of beryllium oxide as a nuclear reactor material are compared with those of other high-melting oxides. It is pointed out

that beryllium oxide is of advantage as a nuclear reactor material (moderator) because of its noninflammability, favorable cross-sections of neutron capture and neutron dispersion, and high resistance to thermal shock. Its properties as a material for refractory ceramics are discussed. The concluding paragraph calls attention to the high toxicity of beryllium compounds. The review is based principally on work reported in non-USSR publications. A bibliography consisting of 49 non-USSR references and 12 USSR references follows the article.

39. Effect of Fast Neutrons on Characteristic Temperatures of Iron and Copper

"Investigation of the Effect of Fast Neutrons on the Characteristic Temperatures of Iron and Copper," by Sh. Sh. Ibragimov, A. G. Karimov, and V. S. Lyashenko; Sverdlovsk, Fizika Metallov i Metallovedeniye, Vol 10, No 2, Aug 60, pp 316-317

The effect of a neutron field on the characteristic temperatures (Debye temperatures) of Armco iron and electrolytic copper was investigated. Parallel with this, the presence of distortions of the third type (nonordered static displacements of atoms in the crystal lattice was investigated and the microhardness of the metals determined. Determination of the characteristic temperature and of distortions of the third type was made by the X-ray diffraction method. It was found that irradiation with a total dose of fast neutrons amounting to 1.4×10^{19} n/cm² does not produce any change in the characteristic temperature of iron. In the case of copper, some decrease in the characteristic temperature was observed after irradiation with total doses equal to 0.70×10^{19} n/cm² and 1.4×10^{19} n/cm². However, the decrease observed was within the limits of experimental error. Irradiation was carried out at 40-70°. To arrive at a definite conclusion, samples will have to be irradiated with larger doses at lower temperatures.

There were distortions of the third type in the lattice as a result of irradiation. Changes of microhardness could be correlated with static displacements of atoms. On the basis of the results obtained, the conclusion was made that the increase in the hardness of the metals investigated was due, to some extent, to the formation of distortions of the third type. This assumption is in agreement with results obtained by the authors in an investigation in which the irradiated metals were annealed and the activation energy of defects strengthening iron was determined (Ibragimov, Lyashenko, and A. I. Zav'yalov, Atomnaya Energiya-- in print).

40. Effect of Fast Neutrons on the Properties of Metals

"The Effect of Fast Neutrons on the Properties of Metals,"
by Sh. Sh. Ibragimov and V. S. Lyashenko; Sverdlovsk, Fizika
Metallov i Metallovedeniye, Vol. 10, No 2, Aug 60, pp 183-186

Data are reported on changes in the strength, hardness, and electrical resistance of some metals under the action of fast neutrons at temperatures in the range of 40-70°. It was established that the radiation-produced increment in the values describing these characteristics is determined by the crystal structure and the melting point of the metal. The manner in which the strength and hardness change under the effect of the total dose of radiation differs from the manner in which the electrical resistance changes. Reversal by annealing of the increases of microhardness and electrical resistance in the samples investigated was found to take place at two different temperatures. It is assumed that the defects which strengthen the irradiated metal are not of the Frenkel type.

The results obtained by testing the metals investigated (Al, Cu, Ni, Fe, Mo, and W) are listed in a table.

41. Effect of Neutron Radiation on Molybdenum

"The Effect of Neutron Radiation on the Structure of Molybdenum,"
by F. P. Butra; Sverdlovsk, Fizika Metallov i Metallovedeniye,
Vol 10, No 2, Aug 60, pp 223-225

It was found that irradiation of molybdenum with neutrons results in a sharp increase of the diffuse dispersion of X rays and an increase of the lattice spacing by 0.03%. These phenomena are explained by statical distortions of the crystal lattice, which are stable up to 600° and are removed completely by annealing at 850°.

42. Calculation of the Properties of Substances Differing in Their Isotopic Composition

"On the Approximate Calculation of the Properties of Substances Differing in Their Isotopic Composition," by M. Kh. Karapet'yants and Yen Kuo-sen, Chemicotechnological Institute imeni D. I. Mendeleev (Moscow) and Szechwan University, Cheng-tu; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 7, Jul 60, pp 1647-1648

The isotopic effect in the characteristics of substances is usually expressed by the values

$$\frac{G_D}{G_H} = A \quad \text{and} \quad G_D - G_H = B,$$

where G_H is the property G of a substance containing one isotope (for instance, hydrogen) and G_D the same property of a substance containing another isotope (for instance, deuterium). In cases when the isotopic effect was investigated for a large number of substances or over a wide range of conditions, it was found that A and B are not constant. In the majority of cases, one can obtain satisfactory results when the changes in A and B are calculated by means of the approximate linear equation

$$G_D = aG_H + b$$

Application of this equation is illustrated on the relation between the critical temperature of halides of deuterium and hydrogen and that between the indexes of refraction of ordinary water and heavy water as affected by the wave length. When a very extensive temperature range is involved, the precision of the calculation can be increased by employing the equation

$$\lg G_H = a \lg G_H + b$$

An approximate calculation can be made of the properties of a substance with a different isotope content. For instance, when a different degree of deuterization (designated by x) has to be considered, the dependence of a and b on x must be determined.

When the $G - t$ dependence of substances is known, the equation

$$G_t = a G_{t_0} + b$$

can be used.

Organic Chemistry

43. Addition of Dialkylthiophosphorous Acids and Acid Esters of Ethyl- and Phenylphosphinous Acids to Olefins

"New Method of Synthesizing Esters of Phosphinic and Thiophosphinic Acids. XXXIV. Addition of Dialkylthiophosphorous Acids and the Acid Esters of Ethyl- and Phenylphosphinous Acids to Unsaturated Hydrocarbons," by A. N. Pudovik and I. V. Konovalova, Kazan' State University; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 7, Jul 60, pp 2348-2352

The authors demonstrated that dialkylthiophosphorous acids and the acid ester of ethyl- and phenylphosphinous acids are added to olefins in the presence of benzoyl peroxide or on exposing them to ultraviolet light. The addition products -- the ester of alkylthiophosphinic, dialkylphosphinic and alkylphenylphosphinic acids -- are obtained in yields ranging from 40 to 60%.

The addition of dialkylthiophosphorous acids and the acid esters of ethyl- and phenylphosphinous acids to olefins occurs according to the radical mechanism, contrary to Markovnikov's rule.

Three tables listing the yields and physical characteristics of the esters of alkylthiophosphinic acid $\left[\overline{\text{RP}}(\text{S})(\text{OR}')_2 \right]$, the esters of alkylphenyl- and dialkylphosphinic acids $\left[\overline{\text{R}}(\text{R}')\text{P}(\text{O})\overline{\text{OR}'} \right]$, and the alkylphenyl- and dialkylphosphinic acids $\left[\overline{\text{R}}(\text{R}')\text{P}(\text{O})\overline{\text{OH}} \right]$ accompany the article.

L. M. Nikitina participated in the experimental portion of the work.

44. Method Improved for Synthesizing Graft Copolymers

"A New Method of Synthesizing Graft Copolymers," by V. V. Korshak, K. K. Mozgova and M. A. Shkolina; Moscow, Vysokomolekulyarnyye Soyedinyeniya, No 6, Jun 60, pp 957 - 958

The proposed new method for synthesizing graft copolymers consists of heating samples of polyamide or polyester films or fibers for some time in air or nitrogen and then subjecting them to block copolymerization with vinyl monomers. The resultant copolymers possess higher mechanical strength than the initial compounds.

Radiation Chemistry

45. Gas Evolution During the Radiolysis of Organic Substances and Its Relation to Thermal Decomposition and Melting

"The Mechanism of Gas Formation During the Radiolysis of Organic Substances and Its Relation to the Aggregate State of These Substances," by A. B. Taubman, L. P. Yanova, R. S. Maslovskaya, and P. Ya. Glazunov, Institute of Physical Chemistry, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 134, No 2, 11 Sep 60, pp 397-399

It was found by Taubman and Yanova that irradiation with electrons of polymers such as polymethylmethacrylate and polytetrafluoroethylene results in decomposition which is accompanied by a sharp increase of gas evolution above a certain temperature. In the work described here, n-octane, n-decane, paraffin, nitrobenzene, and p-dichlorobenzene were irradiated with fast electrons at different temperatures. It was found that there is a sharp increase in the rate of gas evolution at the melting point of the substances investigated. Because the melting points of the substances in question are low, thermal decomposition could not have taken place at the temperatures corresponding to increased gas evolution. It is concluded that the sharp increase of gas evolution in irradiated polymers is due to softening and reduced viscosity rather than thermal decomposition of the polymers.

46. Ionizing Radiation Used to Produce Transformations in Polyvinyl Chloride

"Chemical Transformations of Polyvinyl Chloride Induced by Ionizing Radiation," by Z. S. Yegorov, Yu. M. Malinskiy, V. I. Karpov, A. E. Kalmanson, and L. A. Blyumenfeld, Physicochemical Institute imeni L. Ya. Karpov, Insititute of Chemical Physics, Academy of Sciences USSR; Moscow, Vysokomolekulyarnyye Soyedinyeniya, No 6, Jun 60, pp 891-897

The infrared spectra of both irradiated with fast electrons and non-irradiated polyvinyl chloride have been obtained. Changes in the chemical structure of polyvinyl chloride, taking place both in air and in a vacuum at various temperatures, were investigated with the aid of absorption spectra in the visible region and electronic resonance.

The chemical changes which occur in the molecular structure of polyvinyl chloride as a result of irradiation with fast electrons are dependent basically on the liberation of HCl and the formation of double bonds.

The color changes which occur during the storage of irradiated polyvinyl chloride are associated with processes taking place with the participation of free radicals. The radical concentration diminishes with time with the concurrent formation of chromophores which are evidently polyene in nature. The reactions are accelerated by an increase in temperature. In a vacuum, recombination of the radicals probably takes place; in the presence of atmospheric oxygen, the oxygen reacts with the free radicals forming peroxide radicals.

Radiochemistry

47. Method for Determination of Absolute Quantities of Ionium (Th ²³⁰₉₀)

"A Method for the Determination of Absolute Quantities of Ionium (Th ²³⁰₉₀)," by K. B. Zaborenko and N. V. Filippova, Moscow State University; Moscow Zhurnal Analiticheskoy Khimii, Vol 15, No 2 1960, pp 203-206

The method proposed makes it possible to isolate ionium in a state of radiochemical purity by its electrolytic deposition on a cathode without a carrier in a form suitable for α -counting. The electrolyte contains: pulse-producing quantities of thorium isotopes, 10-100 mg of cerium salt, about one g of $(\text{NH}_4)_2\text{SO}_4$ at pH 3.4 and 1/3 by volume of ethyl alcohol. The temperature of the electrolyte is 70°, the cathode current density is 200 mA/cm², the time of the electrolysis is 30 min. The absolute quantity of ionium is calculated directly from the results of the α -activity measurement making all the necessary corrections, or indirectly by comparing with a standard ionium preparation. The method was tested on samples of naturally occurring materials.

48. Application of a Pulse Neutron Source for Oil Well Logging

"Application of a Pulse Neutron Source for the Investigation of Oil Boreholes," by B. G. Yerozolimskiy, A. S. Shkol'nikov, and A. I. Isakov; Moscow, Atomnaya Energiya, Vol 9, No 2, Aug 60, pp 144-145

The pulse neutron method is of advantage for the investigation of rocks surrounding petroleum boreholes. The pulse method was tested by carrying out model experiments on a mixture of sand with paraffin and a mixture of sand with paraffin and salt. These mixtures represented sandstone with a 20% porosity and sandstone with the same porosity, but saturated with water having a salt content of 200 grams per liter. It was found that the readings of an indicator showing the density of thermal neutrons for the two models differed by a factor of ten at a time $t = 800$ microseconds. This is compared with differences of 40-50% obtained with ordinary neutron test well logging and differences by a factor of 2-3 obtained when induced sodium activity is measured.

A deuteron accelerator tube with a tritium target was used as a source of neutrons, which had an energy of 14 Mev.

III. ELECTRONICS

Communications

49. Tropospheric Scatter Propagation Utilizing Angle Diversity Method

"Reception by Combining the Angle-Diversity Signals of Incoming Waves for Long-Distance Tropospheric Propagation of VHF," by A. S. Nemirovskiy; Moscow, Elektrosvyaz', No 8, Aug 60, pp 19-25

The application of a new method of diversity reception on long-distance, tropospheric-propagation lines is described in some detail. This method includes the angle diversity of the incoming wave in both horizontal and vertical planes. A number of charts are given showing the relationship between the gain resulting from application of the angle diversity method and that of the antenna directivity. It was shown that the angle diversity method is effective only for highly directive antennas (for half-power width of radiation pattern not greater than 0.6°).

There exists an optimal value for combined reception utilizing the angle diversity method, beyond which the reliability of communication deteriorates. It was also found that angle diversity in the horizontal plane produces superior reception, while the advantages of angle diversity in the vertical plane are not so pronounced.

The author thanks S. V. Borodich and I. A. Gusyatskiy for assistance.

50. Ultrashort-Wave Antenna With Controlled Directivity Pattern Described

"Highly Efficient Ultrashort-Wave Antenna With Low Level of Fringe Radiation and Controlled Directivity Pattern," by V. D. Kuznetsov and V. K. Paramonov; Moscow, Elektrosvyaz', No 7, Jul 60, pp 18-28

Results of calculation and an experimental investigation are given of a wide-band image antenna intended for use on ultrashort-wave communication lines with ionospheric scattering. The antenna is part of a horizontal parabolic cylinder with a linear exciter made in the shape of a corner reflector, one edge of which is the surface of the ground.

The antenna has the following properties:

1. It is a closed system providing a low level of side and rear radiation.

2. The location of the exciter close to the ground simplifies the antenna feed system, installation, and operation.

3. Removal of the exciter from the direction of main radiation of the antenna weakens reverse reaction of the parabolic mirror on the exciter and decreases the influence of the exciter on the directivity pattern.

4. With the linear exciter in the form of a horizontal series of vibrators, it is possible to control the directivity pattern in the horizontal plane by electrical means, that is, by phasing the currents in the vibrators.

51. Recent Soviet Patents in the Field of Communications

"Authorship Certificates" (unsigned article); Moscow, Electro-svyaz', No 8, Aug 60, p 74

Class 21a¹, 11₀₁, No 126909. B. P. Terent'yev and E. A. Demin.
Device for Printing Telegraph Symbols on Electro-Chemical Paper.

Class 21a¹, 32₃₅, No 126910. Yu. M. Braude-Zolotarev. "Dissector"
Type Transmitting Device.

Class 21a¹, 33₄₀, No 126520. V. G. Nalivkin. Method of Aperture Correction of Facsimile Signals.

Class 21a¹, 35₁₀, No 126912. O. N. Timakhov and V. A. Leppik, Pulse Selector Operating on the Basis of Pulse Duration

Class 21a¹, 36. No 126523. V. I. Mutanov. Phase-Sensitive Contractless Commutator.

Class 21a¹, 36. No 126915. V. P. Rynkevich. Pulse Generator.

Class 21a⁴, 8₀₂, No 126526. A. S. Stepanov and V. N. Tarakanov.
Magnetostrictive Resonator.

Class 21a⁴, 14₀₁, No 126145. Yu. V. Yampol'skiy. DC Cathode Modulator.

Class 21a⁴, 29₀₄, No 126914. V. G. Vol'p'yan and L. N. Aleksandrov.
Selective Amplifier.

Class 21a⁴, 35₁₁. No 126527. V. L. Denninburg and O. B. Orzhevskiy.
Electronic High-Voltage Stabilizer.

Class 21a⁴, 35₁₄. No 126147. V. S. Popov. Parametric Stabilizer
of Current or Voltage.

Class 21a⁴, 48₆₇. No 126529. Ye. Ya. Ivanov and Ye. G. Glezerman.
Method of Climatic Protection of Antennas.

52. First Graduating Class of the Tashkent Institute of Communications

"First Graduating Class of Tashkent Electrical Engineering
Institute of Communications," by A. N. Kudinov; Moscow,
Vestnik Svyazi, No 9, Sep 60, insert sheet

The Tashkent Electrical Engineering Institute of Communications,
organized in 1955, is one of the newest higher education institutions
in the USSR. The institute has now more than 1,700 regular students, and
its first graduating class this year had 113 persons. The institute's
undergraduate curriculum generally calls for 5 years of study.

Components

53. Semiconductor Plug-in Subassemblies for Transport Automation

"Standard Units Built With Semiconductor Devices for Auto-
mation and Remote-Control Circuits," by V. Ya. Ovlasyuk and
A. N. Pronin; Moscow, Vestnik Vsesoyuznogo Nauchno-
Issledovatel'skogo Instituta Zheleznodorozhnogo Transporta,
No 5, 1960, pp 17-22

Utilization of standard plug-in electronic units, built with semi-
conductor components, will permit introducing automation at a more
accelerated pace to rail-transport systems.

The All-Union Scientific-Research Institute for Railway Transport
has developed the following standard plug-in electronic units: universal
triggers (flip-flop) of P201 and P13 types, trigger with one stable
position, multivibrators, amplifiers, inverters, diode logical circuits,
and capacitive pulse-shaping circuits. Such standard electronic plug-in
subassemblies were mounted on 120 X 76 mm pertinax laminated plates,
holding from one to four separate electronic units.

At the present time, the Central Scientific Research Institute of the Ministry of Communications is working on the problem of utilizing pertinax plates with printed circuits.

54. Accelerometer Patented

"Accelerometer" (unsigned item); Moscow, Byulleten' Izobrazheniy, No 19, 1959, p 42

An item in the Soviet patent abstract journal headed "Class 42c, 42. No 122889 (618985/26 of 9 Feb 1959) Enterprise, P. O. Box No 828" reads as follows:

CPYRGHT "A seismic type of accelerometer with wire-resistor pick-up units fastened between the housing and the seismic mass. The peculiarity of this accelerometer is that, in order to increase the movement of the seismic mass at low deformations of the wire pick-up unit, the latter are placed at an acute angle to the axis of sensitivity of the accelerometer."

CPYRGHT

55. Electrical Forming of Germanium Diodes

"The Problem of Electrical Forming of Point-Contact Germanium Diodes," by V. M. Grika, S. S. Gutin, V. M. Matoshin, and M. G. Serbulenko, Novosibirsk Electrical Engineering Institute; Tomsk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Fizika, No 4, 1960, pp 98-106

Electrical forming of germanium or selenium point-contact diodes, by application of properly selected pulses, results in an appreciable increase of the reverse voltage of the diode. Such an increase is in excess of the value that can be expected on the basis of the presently accepted theory of the metal-semiconductor junction; however, it can be explained by formation of p-region at the point-contact area. Insufficient understanding of the mechanism of electrical forming results in production of point-contact diodes with nonuniform characteristics.

The aim of this work was to define more accurately the actual mechanism of electrical forming and to formulate the conditions of electrical forming under which point-contact diodes of predetermined parameters could be obtained. The present method of mass production of the D-2 germanium diodes includes electrical forming with individual ac pulses (50 cycle) of 0.05 sec duration and current amplitude of 1.5 a at 35 to 70 v. The diodes thus processed have widely scattered parameters.

Approved For Release 1999/09/08 : CIA-RDP82-00141R000100670001-0
Investigation has revealed that the principal requirement for good electrical forming is the formation of a molten zone at the boundary between metal and crystal; however, the temperature at this zone should not exceed the melting point of the metal filament.

56. Vacuum Tubes With Rod-Shaped Electrodes

"Vacuum Tubes With Rod Electrodes," by V. Sukhanov and A. Kireyev; Moscow, Radio, No 7, Jul 60, pp 34-38

The Soviet vacuum-tube industry has developed a new type of direct-heated super-miniature tubes with electron-optical focusing. These tubes are referred to as vacuum tubes with rod-shaped electrodes. The electron-optical focusing tubes possess a number of advantages over the regular grid-type vacuum tubes, which permit individual electronic units and subassemblies of smaller over-all dimensions and lower weight.

These tubes also possess high frequency-stability, sensitivity, and reliability and are economical in power consumption. The new vacuum tubes with rod-shaped electrodes are designated as 1Zh17B, 1Zh18B, 1Zh24B, and 1Zh29B. Some of the specifications for these tubes are as follows, respectively: heater voltage -- 1.08, 1.08, 1.05, and 1.08/2.16 v; plate voltage -- 90, 90, 120, and 150 v; cathode current -- 5, 5, 1.4, and 8 amp; and resistance in the circuit of first electrode -- 1.0, 1.0, 2.2, and 1.0 Mohm.

57. Magnetic Semiconductor Amplifier With Improved Characteristics

"Magnetic Semiconductor Amplifier," by R. A. Lipman and M. V. Ol'shvang; Moscow, Avtomatika i Telemekhanika, Vol 21, No 7, Jul 60, pp 1073-1083

The article examines the circuit of a magnetic semiconductor amplifier operating as a key with continuous control. The amplifier is based on one proposed by R. E. Morgan ("A New Control Amplifier Using a Saturable Current Transformer and a Switching Transistor," Communications and Electronics, No 39, 1958) and uses a relaxation oscillator with pulse-width modulation.

A theoretical analysis of the operation of the circuit is made, and results of experiments are given, indicating the advantages of the circuit compared with Morgan's circuit. These include increased stability due to the considerably smaller ranges of the duration of controlled time of polarity reversal and frequency of self-oscillations. Average power loss in the triode has also been decreased.

This article is from a report presented at the All-Union Seminar on Magnetic Elements of Automation and Computer Technology on 13 October 1959.

Control Systems

58. Analysis Made of Relay Systems With Extremal Control

"Study of Periodic Processes in Extremal Control Relay Systems," by I. S. Morosanov; Moscow, Avtomatika i Telemekhanika, Vol 21, No 7, Jul 60, pp 951-957

A comparative analysis is made of two types of extremal control relay systems according to the indexes of periodic behavior. On the basis of this analysis, the author determines the area in which self-oscillations exist in such systems for any type of linear components of the extremal object. To increase the frequency of oscillations (stabilize the system), it is suggested that measures for preventing repetitive switching and a pulse method of correction be used. A circuit is given for the realization of such measures.

59. New Circuits With Contactless Relay Elements Described

"Transistorized Contactless Relay Elements," by Ye. V. Miller; Moscow, Avtomatika i Telemekhanika, Vol 21, No 7, Jul 60, pp 1035-1045

The Chair of Electrification of Industrial Enterprises of the Northwest Correspondence Polytechnic Institute has developed a system of contactless relay elements using standard semiconductor diodes and triodes which differs from existing systems in the possibility of making simple combinations of the elements for different relay circuits. Operation of the elements is independent of ambient temperature up to +50°C. The system lacks an individual "no" element, and the elements "and", "or," and "instruction" are designed with the two outputs "yes" and "no." An example of the application of the relay elements for a standard automation circuit is given.

Instruments and Equipment

60. Contactless System for Measuring Parameters of High-Voltage Circuits

"Remote Contactless System for Measuring Parameters of High-Voltage Circuits," by V. M. Geraskin and D. V. Karetnikov; Moscow, Izmeritel'naya Tekhnika, No 6, Jun 60, pp 33-35

A single-channel, contactless system has been designed for remote measuring of the parameters of high-voltage circuits utilizing the photoelectric method of modulating the ray of light from a TMN-tube. The experiment consisted in measuring eight parameters of an ionic source of a high-voltage tube. For telemetering purposes, the measured parameters were converted with the aid of simple transducers into voltage pulses having a maximum amplitude of 10 v. The reading of the transmitted value for each parameter was on the basis of the mean value of current. The current pulses were admitted to each instrument at a rate of 107 per second. The pulses were distributed to demodulators with the aid of a thyatron annular circuit and coincidence gates.

It was shown experimentally that the error of the system does not exceed 6% for each channel.

61. Device for Fast Measurement of Standing Wave Ratio

"Device for Measuring the Voltage Standing Wave Ratio," by V. I. Pronenko and L. N. Bryanskiy; Moscow, Izmeritel'naya Tekhnika, No 7, Jul 60, pp 48-49

The measurement of generator standing wave ratio can be carried out with the aid of a wave guide having a movable, short-circuited, contactless plunger, along the axis of symmetry of which is located a hole of a diameter smaller than the critical. In this hole is placed a segment of coaxial line, which is terminated at one end by a coupling stub and at the other end by a wide-band detector chamber. The cavity inside the plunger acts as a cut-off attenuator. Its attenuating power may be varied by shifting the coaxial line with respect to the plunger. Such regulation of attenuation permits selection of the desired coupling of the detector chamber with the wave-guide cavity for various levels of generator power.

The described instrument was built with wave guides of 23 X 10 and 72 X 34 mm cross section; its standing wave ratio was about 23. The error of measurement was about 3.5%. The time required for each measurement was only 20 sec, which compares favorably with the several minutes needed with conventional instruments.

62. Circuit Described for Generation of Millimicrosecond Pulses

"On the Question of Generating Millimicrosecond Pulses," by Yu. K. Bogatyrev; Kiev, Izvestiya Vysshikh Uchebnykh Zavedeni -- Radiotekhnika, No 2, Mar/Apr 60, pp 291-292

Basic results are given of an experimental study of a pulse generator with delayed feedback for the purpose of determining the possibilities of increasing the pulse amplitude while maintaining their duration. Results showed that the use of a high-frequency correcting element (an inductance) in the circuit decreased the minimum duration of generated pulses and increased their repetition rate. To increase pulse amplitude, tubes with a wide spread of grid characteristics were used. In the author's opinion, pulses with a duration of 5-10 millimicroseconds and greater amplitude and repetition rate should be possible using the described circuit.

Materials

63. Polycrystalline Silicon as Photoelectric Transducer

"Photoelectric Transducer Made of Polycrystalline Silicon," by A. Ya. Gilberman, A. K. Zaytseva, and A. P. Landsman; Moscow, Fizika Tverdogo Tela, Vol 2, No 8, Aug 60, pp 1751-1754

The problem of efficient utilization of polycrystalline silicon, which costs only one fifth of the single-crystal silicon, is of great importance in manufacturing photoelectric transducers and solar batteries.

In this experiment, polycrystalline p-type silicon was used, and the p-n junction was effected by thermo-diffusion of the vapors of phosphorus. The detrimental effect of an intercrystalline junction was eliminated by a special network of current collectors. The whole assembly consisted of individual small polycrystalline photocells connected in parallel with each other.

Study has shown that polycrystalline silicon is quite suitable for manufacture of solar batteries and that the maximum power generated per square centimeter of illuminated surface is about 5 milliwatts.

Radar

64. Method Derived for Forming Arbitrary Pulses at High Power Levels

"A Method for Synthesizing Circuits for Forming Pulses of Arbitrary Shape With Arbitrary Loads," by S. R. Kats; Kiev, Izvestiya Vysshikh Uchebnykh Zavedeniy -- Radiotekhnika,

CPYRGHT No 2, Mar/Apr 60, pp 202-226

"A method is given for designing a circuit for forming a given arbitrary process with a resistance, complex, or nonlinear load. The method is based on the use of time characteristics. The transfer characteristic is represented in the general case in the form of a near-periodic function and consists of two parts: sinusoidal and co-sinusoidal. Engineering formulas for designing the circuit and experimental data are given."

65. Accuracy of Coordinate Determination for Circular-Scanning Radar

"Accuracy in the Automatic Determination of Coordinates During Circular Scanning," by Yu. M. Kazarinov and Yu. A. Kolomenskiy; Kiev, Izvestiya Vysshikh Uchebnykh Zavedeniy -- Radiotekhnika, No 2, Mar/Apr 60, pp 168-176

An analysis is made of the accuracy of automatic determination of coordinates for a radar station operating with a circular scanning system. The analysis is made on the assumption that the signal and a normal fluctuating noise act simultaneously on the station input, and the tracking system has a first, second, or third order astatic state (storage for position, position and velocity, and position, velocity, and acceleration, respectively). Graphs and formulas obtained by the authors may be used to find, not only the tracking error for certain system parameters and a given signal-to-noise ratio, but also the optimum speed of rotation of the antenna. Results are accurate for comparatively large signal-to-noise ratios.

Wave Propagation

66. Round Wave Guides for Frequency Range of 3,400-3,900 Mc

"Round Wave Guides for Radio-Relay Communication Lines," by A. A. Metrikin and N. S. Tarasov; Moscow, Radiotekhnika, No 7, Jul 60, pp 10-15

An increase in the number of simultaneously operating communication trunks on radio-relay lines can be accomplished by utilizing vertical and horizontal polarization of transmitted and received signals. For this type of communication, the same antennas are utilized for both transmission and reception. Either round or rectangular wave guides can be used to energize the antenna for two polarizations. For the rectangular wave guides, the H_{01} waves are utilized; and for the round wave guides, the H_{11} waves. However, the round wave guides are preferable for this type of operation because for the same cross section they have lower attenuation. The specific requirement for a round wave guide transmitting waves of two polarizations is the absence of appreciable cross-polarization.

This work was devoted to experimental investigation of a 70-mm round wave guide operating in a frequency range of 3,400 to 3,900 Mc. Investigation was conducted with copper wave guides 40 and 60 meters long, having wall thickness of either 2.5 or 3.0 mm.

The experiment revealed that the level of the parasitic E_{01} wave is 30 to 40 db below the field level of the H_{11} wave. Such a relatively insignificant level of the parasitic E_{01} wave obviates the necessity of using any special filters for its suppression.

67. Explanation Made of Experimental Results of Tropospheric Propagation

"Long-Distance Tropospheric Propagation of Ultrashort Waves -- Theoretical Explanation of Experimental Results," by A. I. Kalinin; Moscow, Elektrosvyaz, No 7, Jul 60, pp 38-46

The present article attempts to give a theoretical explanation of experimental results on the tropospheric propagation of ultrashort waves. The experimental data appeared in the previous issue of this journal.

The author considers the inhomogeneous structure of the troposphere and the nature of turbulence and makes a classification of the various theories of long-distance tropospheric propagation. Relationships between signal level and distance and height of antennas, inductive capacitance of the air, and wave length are examined.

The author concludes that large amounts of experimental material and results of tests of the first radio lines using this phenomenon attest to the possibility and expediency of the wide application of tropospheric radio relay lines, particularly in relatively inaccessible regions.

IV. ENGINEERING

Aeronautical and Mechanical Engineering

68. Random Parameters in Elastic Oscillatory System (Aircraft/Air)

"Random Behavior of Parameters in Certain Aeroelasticity Problems," by Yu. M. Romanovskiy, Moscow State University, Physics Faculty; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye, No 4, Jul/Aug 60, pp 133-135

A method is described for estimating the influence of random parameters on the behavior of an oscillatory system composed of an elastic aircraft and ambient air. It is shown that, in near-critical states (divergence, flutter), fluctuations of the horizontal velocity of an aircraft which are due to atmospheric turbulence reduce the stability factor of the system and can lead to a fluctuation of parameters. An estimate of the influence of the altered parameters on a system with several degrees of freedom cannot be assumed accurate, unless a prior study is made of the effect of the parameters on the natural frequencies of the system.

Since the intensity of atmospheric turbulence is not everywhere uniform, an aircraft encounters various zones of very high turbulence, within which the turbulence may cause greater effects than can be accounted for by generalized data (Press and Houbolt, "Some Applications of Generalized Harmonic Analysis to Gust Load on Airplanes," J. Aeronaut. Sci., Vol 22, No 1, 1955, pp 17-26). A more accurate estimate of the effect of the turbulence on the aircraft must take into account the nonstationary character of this effect.

69. Configuration Irregularities of Large Cylindrical Sections

"Study of the Geometry of Large-Scale Cylindrical Hardware," by A. K. Dobrovolskiy and A. N. Tyukov, Moscow Higher Technical School; Moscow, Izvestiya Vysshikh Uchebnykh Zavedeniy, Mashinostroyeniye, No 7, 1960, pp 40-52

The problem of measuring and mathematically handling empirical data on some geometric parameters of large structural sections with low rigidity, such as shells, aircraft sections, etc., is discussed, and a new method, based on harmonic analysis, is proposed for determining

the diameter of, for example, an approximately two-meter aircraft section with an accuracy of 0.1 millimeter. The accuracy of the method is checked for two curvilinear contours. The general problems connected with methods of measuring and mathematically treating the results of measurements of irregularities in flatness are also discussed.

70. Small-Scale Experiments On Evaporative Cooling of Porous Cones

"Experimental Investigation of Evaporative Cooling of the Surface of a Porous Cone In a High-Temperature Gas Flow," by V. M. Polyayev, Moscow Higher Technical School; Moscow, Izvestiya Vysshikh Uchebnykh Zavedeniy, Mashinostroyeniye, No 7, 1960, pp 149-159

Evaporative film-cooling was studied on small (60-millimeter diameter sintered bronze cones with angles of 20, 30, 60, 90, and 180 degrees, with a variation of the gas-flow temperature in the range 600-1,250 deg C, and gas-flow velocities of 120-450 meters per second. Criteria equations are derived on the basis of the findings:

71. Turbine Blade Profile and Pressure Distribution at the Blade Locks

"On the General Nonuniformity of the Distribution of Pressures at the Locks of Turbine Blades in Connection With the Influence of the Blade Profile," by A. S. Leykin, Moscow; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye, No 4, Jul/Aug 60, pp 149-153

On the basis of an analysis of the results of earlier experiments, formulas are given for determining the maximum coefficients of nonuniformity of pressure in the locks in connection with the influence of blade profile. A description is given of the main procedures of the earlier experiments (Leykin, A. S., Voprosy Prochnosti Materialov i Konstruktsiy /Problems of the Strength of Materials and Structures/, Moscow 1959; Prochnost' Pri Povyshennoy Temperature, Sb. Statey No 26 /Strength At Elevated Temperature, Collection of Articles No 26/, Moscow 1959).

72. Stability Loss of Accelerated Free Rod With Terminal Tracking Force

"Stability Losses of a Free Rod, Moving With Acceleration, Under the Influence of a Tracking Force," by K. N. Gopak, Dnepropetrovsk; Moscow, Izvestiya Akademii Nauk SSR, Otdeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye, No 4, Jul/Aug 60, pp 136-137

This article treats the problem of the dynamic stability of a free rod, one end of which is subjected to a tracking force. Inertia forces resulting from acceleration increase together with the tracking force, and when the latter reaches a critical value, the rectilinear rod loses stability. An approximate solution is given.

73. Accelerometers of Soviet Machine Science Institute

"Damping of Accelerometers With High Natural Frequencies," by A. I. Mironov and M. I. Subbotin, Moscow; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye, No 4, Jul/Aug 60, p 132

The Laboratory of Machine Dynamics of the Institute of Machine Science, Academy of Sciences USSR, has developed damped accelerometers with natural frequencies of up to 500 cycles per second. The damping is done with comparatively low-viscosity liquid. The accelerometers were designed according to an earlier-described method (Subbotin, Vtoraya Nauchno-tekhnicheskaya Konferentsiya Aspirantov i Mladshikh Nauchnykh Sotrudnikov IMASH AN SSSR /Second Scientific-Technical Conference of the Aspirants and Junior Scientific Associates, Institute of Machine Science, Academy of Sciences USSR/, Vol 1, 1959; Priborostroyeniye, No 6, 1959). There is reason to believe that the method of damping used for these accelerometers could be used for damping those with natural frequencies up to one kilocycle per second.

74. Elastic-Plastic Deformation of Alloy EI-437B

"Some Peculiarities of the Process of Elastic-Plastic Deformation of Alloy EI-437B Under Cyclic Loading With Constant Amplitude," by P. I. Kotov, Moscow Aviation Technological Institute; Moscow, Izvestiya Vysshikh Uchebnykh Zavedeniy, Mashinostroyeniye, No 7, 1960, pp 78-86

An analysis of certain peculiarities of the process of a cyclic elastic-plastic deformation of high-temperature alloy EI-437B at a constant stress amplitude (beyond the elastic limit) at normal and elevated temperatures

showed that considerable plastic deformation occurs in the stress stage, if the temperature change is synchronized with the loading process (the stress stage corresponds to heating). Greatest plastic deformation was observed during increased amplitude of the loading and at the highest test temperatures (700 and 800 deg C). Line graphs show detailed behavior with varied test parameters.

Computers and Automation

75. Conference on Automatic Computers in Czechoslovakia

"Consultation on Automatic Computers," by Engr A. Flex;
Prague, Statistický Obzor, No 5, 15 May 1960, pp 226-
227

The Czechoslovak State Statistical Office is now preparing a 5-year and a long-range plan for development of mechanization and automatization of record-keeping. The plan is to be presented for government approval on 1 June 1960. This is the first Czechoslovak plan which provides for record-keeping and computation employing automatic computers. In view of the fact that Czechoslovakia does not currently have automatic computers and thus has not had experience with their selection, installation, programming, efficient control, etc., particular attention should be devoted to these matters in the plan preparation so that the finished plan may be fully realistic.

According to the plan, production of the EPOS automatic computers is to begin in Czechoslovakia in 1962. The price of the average computer will be several million crowas, with the actual price depending upon the equipment of the machine. Experiences gained in other countries, indicate that development and production of automatic computers are difficult. No less difficult is the efficient utilization of this equipment in automatization of record-keeping and computation procedures.

Since by the end of the Third Five-Year Plan several dozen of these automatic computers are to be produced, it will be necessary to provide future users of these highly efficient machines with maximum assistance and information on the performance of the EPOS computer even though the plan for production of this machine is now only being prepared. When provided with adequate information, the sectors of the economy and individual enterprises will have a sound basis for preparation of plans. In the past such information was not current and did not reflect the actual status in development of the machines.

In view of these conditions, the State Statistical Office held a conference on 16 February which was attended by specialists from the development, production, and technical distribution sectors of the automatic computer field, and by representatives from all ministries and enterprises which plan to equip their computation centers with such computers. Thus, the conference was attended by 220 such representatives from all sections of the country. In order that the conference might be correctly oriented, the State Statistical Office conducted an extensive campaign to secure possible questions regarding the various phases of the computer program; 120 specific inquiries were obtained as a result of this campaign. These inquiries were classified into specific topic groups and passed on to specialists in the appropriate fields of automatization. The lectures given in the course of the conference contained primarily new, heretofore unpublished information. The lecture topics were: (1) Opening address, Engr A. Flax, State Statistical Office; (2) Study and training problems resulting from the installation of the EPOS automatic computers, Engr O. Slavicek, Research Institute for Mathematical Machines, Prague; (3) Technical information on the EPOS automatic computer, V. Stiebral, Aritma National Enterprise, Prague; (4) Significance of a communications network for efficient utilization of automatic computers, Engr B. Kubin, Research Institute for Communications, Prague; (5) Providing training for automatic Computer personnel at advanced schools in Prague, Engr J. Skabrada, Advanced School of Economics, Prague; and (6) Preparation and installation of automatic computer in Czechoslovakia, B. Sloup, Office Machines Enterprise.

Following the lectures, other specialists joined in the discussions. These concentrated their attention upon problems of training personnel to work with these machines, the supply of professional literature, the utilization of analog computers, and long-distance transmission of information.

76. Soviet M-20 Automatic Computer

"The Newest Soviet Automatic Computer, the M-20," by Engr V. Capla; Prague, Statisticky Obzor, Vol 40, No 6, 15 Jun 60, p 276

Design, development, and construction of automatic computers began in the USSR in 1948. In 1951 a laboratory of the Mathematics Institute of the Academy of Sciences Ukrainian SSR built the first Soviet automatic computer, the MESM. The project was headed by Academician S. A. Lebedev. Despite the small capacity of the memory unit of this machine, it was used extensively for computations in statistical research and by institutes of the Academy of Sciences USSR and [by the academies of sciences?] of the other republics of the USSR.

Following the success with the MESM, Academician Lebedev was charged with responsibility for construction of the BESM, a large automatic computer. This project was completed in 1953, and the machine was used extensively for work in physics, mechanics, astronomy, etc. It contained 5,000 electron tubes and 10,00 germanium diodes. It had a CRT memory capacity of 1,024 words and a high-speed internal memory system. Furthermore, it had a slow internal memory system, employing magnetic drums, with a capacity of 5,120 words. An additional memory unit with a capacity of 376 words could be set up manually, employing germanium diodes. Up to four magnetic tapes with a [combined?] capacity of 30,000 numbers comprised the external memory system. This machine occupies about 200 square meters of space, and performs 7,000-8,000 operations per second.

Almost simultaneously with the construction of the BESM computer, the STRELA large automatic Computer was built in the laboratory of the Design Bureau of the USSR Ministry of Instrument Building and Automation Equipment. The project was headed by Yu. Ya. Bazilevskiy and the computer performed 2,000 operations per second. It was designed for solution of scientific and technical problems.

The following "M" series computers were built at the Laboratory for Control Machines and Systems of the Academy of Sciences USSR: the "M-1" built in the spring of 1952; the "M-2" built in December 1952; and the "M-3" built in 1957. This program was headed by I. S. Bruk, Corresponding Member of the Academy of Sciences USSR. The "M-1" and the "M-2" were small computers; and "M-3" was medium-size.

The medium-size TsEM-1 computer was built in 1953. The small URAL automatic computer was built at a laboratory of the Scientific Research Institute at the Penze plant which was producing the SAM key-punch machine. This project was headed by Engr B. I. Ramayev. Recently one of the most modern automatic computers, the KIEV, has been built, as has the small SETUN computer. In addition to general purpose computers which have been mentioned, the following special computers have been built: POGODA, KRISTALL, GRANIT, and the SESM. The last-named instrument performs computations for complex hydrotechnical construction and other designs in geodesy and mathematical physics.

The newest Soviet automatic computer, the M-20, is constructed on the basis of experience gained in the construction of the KIEV computer and according to the highest technology. Semiconductor circuit components were employed in its construction, and this permitted the dimensions of the machine and its power consumption to be substantially reduced. The memory system consists of several units, including ferrite cores, magnetic drums, and magnetic tape.

The designation M-20 consists of the letter "M" (for "machine") and the figure 20, which indicates that the machine performs 20,000 operations per second. Thus, its performance is two and one half times that of the BESM computer and 10 times that of the STRELA computer. The M-20 is designed for solution of various types of scientific and technical problems. Its high speed and accuracy permit a substantial reduction of detailed study and testing of complex models of the most complex technology. An important advantage of the M-20 computer is its use in program control of machine tools, control of automated production lines, and automation of entire industrial plants. It is of great significance in control of technological processes which are harmful to human health, such as some chemical processes and processes where high pressures or temperatures are necessary.

A large number of scientists and engineers headed by Academician Lebedev participated in the construction of this computer. This group has been nominated for the Lenin Prize.

Electrical Engineering

77. Production Technique of World's Largest Hydraulic Turbine

"Cast-Welded Water Wheels of Large Reaction Hydraulic Turbines for Bratsk Hydroelectric Station," by G. A. Bronovskiy; Moscow, Energomashinostroyeniye, No 7, Jul 60, p 34

The author states that for the first time in the Soviet Union the production of welded water wheels of 230,000-kw turbines, for the Bratsk Hydroelectric Station, has been mastered at the Leningrad Metal Plant. With respect to their size, weight and method of manufacturing, these wheels are unique in world practice of hydraulic turbine building. These wheels have diameter of 6,100 mm, height of 2,723 mm, and weight about 100 tons. The wheel consists of two halves, connected with bolts at the top and welded at the bottom. Each half of the wheel has seven chill-cast blades, which are welded to both upper and lower rings. All parts of the wheel are made of low-alloy, welding-type, grade 20Gs-L steel. The electroslag welding method is used in joining the wheel parts. The blades are first welded to the upper ring, then the blade edges are subjected to intermediate machining for perfect fit with the lower ring. The latter operation is carried out with the aid of flame cutting, which is automatically controlled by an original copying attachment.

For protection of certain sections of the blade from the destructive effect of cavitation, the austenitic steel 1Kh18N9T is welded on over these parts. This welding-on operation is carried out automatically with the aid of ribbon electrode.

Practically all operations of this new technological process of wheel manufacture (including the heat treatment of welded joints) were mastered at the plant with the assistance of the Institute of Electric Welding of Ye. O. Paton and the Central Scientific Research Institute of Technology and Machine Building.

Special metal molds were designed for casting the wheel blades.

78. New High-Voltage Laboratory in Tomsk

"New High-Voltage Laboratory in Siberia," by A. A. Vorob'yev, G. A. Vorob'yev, V. S. Dmitrevskiy and I. I. Kalyatskiy; Moscow, Vestnik Elektropromyshlennosti, No 7, Jul 60, pp 18-21

In 1960 at the Tomsk Polytechnic Institute a high-voltage laboratory was placed into operation which will be the largest in the Eastern Part of the USSR. The laboratory will conduct research on the problems of electric breakdown in gaseous and liquid insulations, breakdown and deterioration of solid dielectric materials used in high-voltage industrial installations.

The laboratory consists of a 460 sq m indoor hall and a 4,000 sq m outdoor testing yard. The main equipment of the new laboratory consists of a 5,000-kv impulse generator for outdoor testing, a 3,000-kv impulse generator for indoor testing and a 1,000-kv, 1,000-kva test transformer. The 5,000-kv impulse generator has a supporting structure in form of a tower 6 m in diameter and 22 m high. Inside the tower are mounted 40 capacitors, each for 125 kv and a capacitance of 0.64 microfarads. The voltage step-up and rectifying installation is located in the basement. The 5,000-kv impulse generator is designed for a power delivery of 200 kw sec.

The new high-voltage laboratory will permit widening the scope of investigations in the field of physics of dielectric materials, and will help to improve the training of electrical engineers specializing in the technique of high-voltage application.

79. Improved Design of Adjustable-Propeller Hydraulic Turbines for Use with Higher Water Head

"Ways of Improving Cavitation Characteristics of High-Head Adjustable-Propeller Water Wheels," by I. E. Etinger; Moscow, Energomashinostroyeniye, No 7, Jul 60, pp 5-8

The article discusses the possibility of application of adjustable propeller hydraulic turbines on dams with water head up to 65 meters. In such turbines the profile of the runner should be greatly modified and the blade thickness reduced.

At the present time adjustable-propeller turbines are built in the USSR for a maximum head of 32 meters. However, new propeller type turbines have already been designed for water head of 45 and 65 meters, and their actual construction is planned for some future date. The application of adjustable-propeller turbines to still higher water heads is restricted by the destructive cavitation phenomenon.

80. Induction Generators for Operation with Extra-High Speed Turbines

"Characteristics of Double-Supply Machines Operating as Generators," by N. S. Siunov and Yu. I. Yushmanov; Novocherkassk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Elektomekhanika, No 6, 1960, pp 88-92

The speed of turbine-generator (synchronous) sets is limited to 3,000 rpm when generating current at 50 cps, which is far from the optimum speed for best operating conditions. A suggestion is made of coupling an induction machine to a turbine running at a speed of 6,000 rpm in such a manner as to generate current at 50 cps. If the rotor of an induction machine with a single pair of poles is rotated at a speed of 6,000 rpm while a 50-cps, 3-phase current is fed to the rotor winding, then a magnetic field is built which rotates with a synchronous speed of 3,000 rpm. If this field rotates in the direction opposite to the rotation of the rotor, then the relative speed of the field to that of the stator winding will be the difference between the two speeds, i. e., 3,000 rpm; consequently, a 50-cps current is induced in the stator winding. Thus both the stator and rotor windings develop an effective electric current at 50 cps which can be fed to the power line.

These double-supply generators are well adapted for direct coupling to turbines operating at 6,000 rpm, a factor which helps to reduce the size of the turbine and to increase its efficiency. Double-supply generators do not require any special exciters.

V. MATHEMATICS

81. Rates of Variation of Tensors

"Ideas Concerning Different Rates of Variation of Tensors,"
by L. I. Sedov, Moscow; Moscow, Prikladnaya Matematika i
Mekhanika, Vol 24, No 3, May/June 60, pp 393-398

In arbitrary curvilinear systems of coordinates, an intrinsic connection is established between enumerated velocities of tensors. Other tensor velocities are introduced which have appreciable values, and it is shown that the ideas of Prager, on the basis of which he indicated the advantage of the determination of Jaumann (at the 1st All-Union Conference on Theoretical and Applied Mechanics, January 1960 in Moscow), are not sufficient to account for the idea of the velocity of a stress tensor. Additional notions given here afford the possibility of applying the rule of the use of derivatives in various senses of tensors for a parameter.

82. Dirichlet Problem Solved Numerically

"On the Numerical Solution of a Dirichlet Problem,"
by M. B. Gagua and M. G. Tsuladze, Computer Center
of the Academy of Sciences Georgian SSR; Tbilisi,
Soobshcheniya Akademii Nauk Gruzinskoy SSR Vol 24,
No 5, May 60, pp 513-518

Starting from a functional Pricare series (see, for example, Ye. Gursa, Kurs matematicheskogo analiza, Tom 3 (Course of Mathematical Analysis, Vol 3), Moscow-Leningrad, 1933), dual sequences of finite difference equations are constructed in the present work for the numerical solution of the homogeneous Dirichlet problem corresponding to certain differential equations in partial derivatives. A general system is presented, with the help of which it is possible to confirm in this or other partial cases the stability of those difference equations relative to the free term of the given equation, as well as the convergence of their solutions to the solution sought-for of the equation in question.

83. Numerical Solution

"Numerical Solution of Linear Boundary Problems for Ordinary Differential Equations of the Second Order," by A. G. Anisimov, Zaporozh'ye Machine Building Institute; Tbilisi, Soobshcheniya Akademii Nauk Gruzinskoy SSR Vol 24, No 4, Apr 60, pp 385-389

In the present work, a numerical method is given for the solution of boundary problems for the equation

$$y'' + \varphi(x)y = f(x) \quad (1)$$

where $\varphi(x)$ and $f(x)$ are continuous together with their first four derivatives on the segment defined by the inequality

$$a \leq x \leq b.$$

Three types of boundary conditions arise during consideration of equation (1). A method is presented for solution of equation (1) having the boundary conditions

$$y(a) = p, \quad y(b) = q, \quad (2)$$

although the same method has a general character.

Boundary problems for (1) are usually solved by the difference method. However, in this case, the solution of (1) with boundary conditions (2) simply leads to the solution of a system of linear algebraic equations having a large number of unknowns. The solution of such a system generally presents great difficulties of a calculation nature.

The proposed method is sufficiently simple and may be applied successfully in practice. It is based on the utilization of certain recurrent formulas presented in the present work. The process obtained converges.

84. New Method Presented

"Concerning the Approximation of Periodic Functions of Many Variables by Trigonometric Polynomials," by K. I. Babenko, Mathematics Institute imeni V. A. Steklov, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 132, No 2, May 60, pp 247-250

Several problems of the theory of approximation of periodic functions of many variables are considered. At the present time, the corresponding theory for functions of one variable is exhaustively developed, while for functions of many variables, the theory has fundamental questions unanswered. This is explained, in the opinion, of the author, by the fact that in the theory of approximation of functions of many variables, the problems have not been presented correctly. Examples are given.

85. Approximation for Class of Weighting Functions

"On Best Approximations With the Weight on a Straight Line," By. S. N. Mergelyan, Corresponding Member of the Academy of Sciences, USSR; Moscow, Doklady Akademii Nauk SSSR Vol 132, No 2, May 60, pp 287-290

Let $0 < h(x) < 1$, let $f(x)$ be continuous on the axis $-\infty < x < \infty$, and let

$$\lim_{|x| \rightarrow \infty} h(x) f(x) = 0.$$

The lower bound of the numbers

$$\sup_{-\infty < x < \infty} h(x) |f(x) - P_n(x)|$$

in the class of all polynomials of degree not greater than n is designated by $E_n(h, f)$.

In the case in which the relation $\lim_{n \rightarrow \infty} E_n(g, f) = 0$ is satisfied

for any continuous function $f(x)$ with the condition (1), it is said that the system of polynomials is complete with weight $h(x)$ on the line $-\infty < x < \infty$.

The velocity of the numbers $E_n(h, f)$ tending to zero, as $n \rightarrow \infty$ in the case of completeness, depends on the properties of the weighting function $h(x)$ and the properties of the approximating function $f(x)$.

The purpose of the present work is an estimate for the velocity of decrease to zero of $E_n(h, f)$, that is, the establishment of a theorem concerning the best weighted approximation for a defined class of weighting functions $h(x)$.

VI. MEDICINE

Aerospace Medicine

86. Effects of Weightlessness on Muscle Tonus

"Muscular Tonus Under Conditions of Weightlessness," by Ye. M. Yuganov, I. I. Kas'yan, and V. I. Yazdovskiy, Academy of Medical Sciences USSR; Moscow, Izvestiya Akademii Nauk, Seriya Biologicheskaya, No 4, Jul/Aug 60, pp 601-606

The authors of this article report experiments which were performed on a rabbit to determine the nature and extent of change in the muscular tonus of a living organism when it is subjected to the alternating action of gravity and weightlessness. On the basis of the data collected, it was concluded that vertical shifting of the eye of a rabbit in space indicates a decrease in the tonic tolerance of the ocular musculature during weightlessness. It is suggested that oculogravitational and agravitational illusions are connected with vertical shifts of the eye. These shifts are caused by reflex action of the otolith apparatus.

The nature and extent of counterrotation of the eye of a rabbit in space was recorded by direct filming. The muscular tonus was estimated from the condition of the tonic labyrinthine reflex of counterrotation of the rabbit's eye.

No experimental data on the subject has been found either in Soviet or in foreign literature. The only information available seems to consist of theoretical assumptions concerning the possibility of changes in muscular tonus during weightlessness.

It has been now generally recognized that weightlessness is not dangerous to life and that it does not cause any substantial change in the cardiovascular and respiratory systems.

Contagious Diseases

87. Recovery From Anthrax Accompanied by Bacteremia Reported

"The Cutaneous Form of Anthrax and Bacteremia," by V. N. Nikiforov, Institute of Experimental Biology and Medicine, Anthrax Department; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 31, No 8, Aug 60, pp 122-128

The research of a number of authors on septicemia in anthrax is referenced, after which the author's own observations of eight cases of the cutaneous form of anthrax with a completely favorable outcome are reported. Three complete case histories accompanied by charts are given. Analysis of these cases permitted the author to draw the following conclusions:

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"1. The isolation of the anthrax pathogen from feces and urine in cutaneous forms of anthrax in the human makes it possible to regard bacteremia not as an occasional phenomenon but as a component part of the pathogenesis of this disease.

"2. Clinical forms of anthrax are predetermined by the degree of virulence of the pathogen and by the condition of the organism's defense mechanisms.

"3. With the existing methods of treatment (antianthrax serum, penicillin, and their combination), prolonged isolation of the anthrax pathogen from feces can be observed, which factor must be considered in discharging anthrax patients."

88. Hemorrhagic Fever Cases Described

"Hemorrhagic Fever in Tul'skaya Oblast," by Ye. P. Leykekhman; Moscow, Klinicheskaya Meditsina, Vol 38, No 7, Jul 60, pp 94-99

Observations of 645 cases (12 fatal) of an acute febrile disease called Tula fever which has occurred in Tul'skaya Oblast for the past 10 years are discussed. Sharp increases in its incidence were noted in 1952 and 1958 and were related to the size of the rodent population.

Although the symptoms of the disease differ somewhat from those of Far Eastern and other hemorrhagic fevers, the authors consider it essentially the same and therefore suggest that it be called "hemorrhagic fever with a nephritic syndrome" instead of "Tula fever."

The clinical picture of the disease in 157 patients the author observed in a hospital in 1958 is reported in detail. Among therapeutic measures used in these cases were; early hospitalization and complete bed rest, particularly at the climax of the disease; dietary restrictions; calcium chloride, vicasol, vitamins, analgesics and dimedrol; large amounts of a 40% solution of glucose and physiological solution introduced enterally and parenterally; cardiac agents. Most of the patients were given synthomycin, levomycetin, biomycin, and penicillin; 39 received no antibiotics. Comparison of the clinical picture in these two groups failed to demonstrate conclusively that antibiotics had any effect on the course of the disease; in particular, the duration of the febrile period was identical. Antibiotics may have prevented the development of complications to some extent. According to the author's observations, sulfanilamide preparations and the application of heat to the lumbar region are contraindicated.

The following additional conclusions are given:

1. Almost no characteristic symptoms appear for the first 2 or 3 days; a diagnosis during this period must be based on epidemiological anamnesis.
2. Manifestations in the cardiovascular system, kidneys, and nervous system predominated in the type of hemorrhagic fever studied in Tul'skaya Oblast.
3. There is no specific therapy for hemorrhagic fever.
4. Further study of this disease is needed, particularly from the standpoints of etiology and pathogenesis.

Epidemiology

89. Q Fever Pathogen Isolated From Ticks in Uzbekistan

"Results of Examination of Several Species of Ticks for Q-Rickettsiosis in Uzbekistan," by V. A. Lysunkina, Tashkent Institute of Vaccines and Sera; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 31, No 5, May 60, p 121

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"The author examined *Argas persicus* ticks collected in uninhabited buildings for Q rickettsiosis in 1957 in Kashka-Dar'inskaya Oblast in Uzbekistan. As a result of experiments carried out on guinea pigs and white mice, a strain of *Rickettsia burneti* was isolated from the ticks examined. This strain maintained its viability after filtration through a Seitz filter. Before the experiments, the ticks were kept in the laboratory at room temperature for 465 days (the duration of observation);

consequently, the *Rickettsia burneti* isolated from these ticks remained viable for 465 days. A *Rickettsia burneti* strain isolated from the ticks and kept at 4° C in a suspension of pulverized ticks prepared in a 1:10 dilution in physiological solution remained virulent for 44 days.

"The data obtained attest to the possibility of spontaneous infectivity of *Argas* ticks and the possibility that rickettsiae are preserved in them for a long time."

90. Soviet Physicians Rushed to Afghanistan to Combat Cholera

"Physicians Rush to Help," by V. Golachev; Moscow, Moskovskaya Pravda, 7 Oct 60, p 4

This article reports that Soviet physicians and bacteriologists have been arriving in Kabul to assist in preventing the spread of a threatened cholera epidemic; cases have been reported in the capital and in several other areas of Afghanistan.

The group, led by Z. A. Plankina, also includes R. A. Sayamov and R. I. Kotlyarova, Candidates of Medical Sciences; and K. N. Gorelova and N. M. Shironina, laboratory technicians. They brought almost 8 tons of equipment and supplies, including 10,000 ampoules of medicines. They also brought "cholera bacteriophage," a highly effective preparation which was used to control an epidemic in Pakistan several years ago. As a result of its use there, no fatal cases occurred. The Soviet team has set up a well-equipped laboratory for diagnosis purposes.

Immunology and Therapy

91. Tularemia Vaccine Strain Used to Infect Experimental Animals

"Tularemia in White Mice Infected With a Vaccine Strain," by O. S. Yemelyanova, Institute of Epidemiology and Microbiology imeni Gamaleya; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 31, No 8, Aug 60, pp 111-116

On the basis of previous research by other investigators (N. A. Gayskiy, 1941 and 1944; I. N. Mayskiy, 1953 and 1954) and his own research (Yemelyanova, 1957), the author herein publishes data from his calculation of the number of mice which died after infection with a vaccine strain of the tularemia pathogen, the rates of death, and the results of corpse dissection, bacterioscopy, and seeding. Among mice infected with different doses of *B. tularensis* cultures, the number of those which died of tularemia caused by a vaccine strain in relation to the total number of animals in the experiment indicated the degree of residual virulence of the strain.

In the author's own experiments, vaccine strains No 15 (restored), No 155, and others were used. White mice were given a suspension of bacteria in physiological solution subcutaneously; the doses were expressed in an amount of microbial cells determined by an optical standard of typhoid bacteria.

The results of these experiments are discussed and are shown in two tables. The following conclusions are given:

1. The number of deaths among white mice after the introduction of a vaccinal tularemia strain depended on the dose.
2. The pathological-anatomical picture in mice which died from a vaccine culture of tularemia pathogen was similar to the picture of death from acute tularemia -- a dense infiltrate at the site of introduction, enlargement and induration of the spleen and liver were observed.
3. In contrast to the abundant seeding of organs and blood observed in mice which have died as a result of infection with a virulent strain, seeding was much less pronounced in mice which died from a vaccine culture.
4. Microorganisms in the blood, as a rule, were not observed by the bacterioscopic method. On examination of the spleen, positive (reliable) results were noted in 0-93%, which depended on the time of death of the mice.
5. Seedings of spleen from mice which died from a vaccine culture were positive in 87-97%, independent of the time of death; as many as 13% died when there was growth of extraneous flora, and 0.3%, when there was no such growth.
6. In accordance with previous data, the results of determining residual virulence of vaccine strains for white mice can vary depending on the nutritional condition of the animals.

92. Preservation of Brucellosis Vaccine

"A Stabilizer for Drying and Preserving Brucellosis Vaccine," by N. S. Semcheva and A. G. Goryunova, Institute of Epidemiology and Microbiology imeni Gamaleya; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 31, No 5, May 60

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"The objective of this research was a study of the effect of different variants of a sucrose-gelatin stabilizer on the preservability of Brucella in a vaccine. Six experimental series of vaccine were prepared. Each series was prepared with the following additives: sucrose, 10%, and

abortus vaccine strain 19-BA was cultured on a liver medium (pH 7.0-7.2) under stable conditions for 48 hours. The culture was then washed with the above-mentioned stabilizers. A suspension containing 17 billion Brucella per milliliter according to a bacterial optical standard of turbidity was used for the experiment. Drying was done in a Dolinov system by the methodology used at the institute: the vaccine was frozen at a temperature not higher than -30°C , and dried in a vacuum not lower than $100\ \mu$. The duration of drying was 30-40 hours. Residual humidity of the vaccine immediately after drying varied within the limits of 1.5-3%. After testing the survival of the Brucella after drying, the vaccine was put in a refrigerator at a temperature of $4-6^{\circ}\text{C}$. Seedings were done every 3, 6, and 12 months to test survival.

"Experiments on obtaining a dry, cutaneous brucellosis vaccine were performed at the same time with another stabilizer -- sodium glutamate in the following concentrations: 0.1, 0.25, 0.5, 1 and 5%. Vaccine was prepared with this stabilizer under the same conditions as in the previous experiments. The vaccine was stored for 6 months at different temperatures: in a refrigerator ($4-6^{\circ}\text{C}$), at room temperature ($18-20^{\circ}\text{C}$), and in a thermostat (37°C). A vaccine prepared with a stabilizer consisting of 3% gelatin and 10% sucrose was used as a control.

"As a result of this research, it was established that a stabilizer made of 20% sucrose and 1-3% gelatin protected Brucella from dying during the drying process better than the others; however, fewer survived after extended preservation (12 months) than after drying with a stabilizer made of 10% sucrose and 1-3% gelatin. The experiments in which sodium glutamate was used as a stabilizer of brucellosis vaccine did not afford positive results."

93. Skin Reactions to Tick-Borne Encephalitis

"On Erythematous Reactions of the Skin in Tick-Borne Encephalitis," by S. S. Magazanik and V. V. Pogodina, Sverdlovsk Institute of Curortology and Physiotherapy and Laboratory of Encephalitidies of the Institute of Virology, Academy of Medical Sciences USSR; Moscow, Klinicheskaya Meditsina, No 9, 1960, pp 59-64

The authors present data relating to erythematous reactions of the skin associated with tick-borne encephalitis. Normally erythema is seen in light forms of meningeal or atypical forms of diseases. Of special interest was the authors' first acquaintance with a case in which the only clinical manifestation of a latent course of tick-borne encephalitis was skin erythema. The specificity of the infection in this case was confirmed by the presence of a characteristic tick-borne encephalitis incubation period, the possibility of a remission course and serological reactions -- neutralization and complement fixation.

94. Chemical Structure of Adsorbents and Their Effect on Antibody Adsorption

"The Dependence of the Adsorption of Immune Antibodies of the Chemical Structure of the Adsorbents," by A. K. Adamov, Sanitary Epidemiological Laboratory; Moscow, Eyulleten' Eksperimental'noy Biologii i Meditsiny, No 8, 1960, pp 107-111.

The purpose of this work was to investigate the effect of various groups (hydroxyl, aldehyde, carboxyl, quinone, sulpho, nitro, amino, chlorine, and metallo, as well as compounds without functional groups and those containing several functional groups) contained in organic compounds on their ability to adsorb immune serum agglutinins.

As a result of the investigation it was determined that organic compounds which contain no functional groups and those devoid of chlorine and amino-groups did not adsorb agglutinins. The agglutinins adsorbed were not desorbed even though they were exposed to prolonged shaking in weak acid, alkali, hypertonic saline, and physiological solutions.

Oncology

95. Therapy of Cancer With Febrifugin

"Anticancerous Activity of an Alkaloid Febrifugin in Experiments on Animals," Ye. M. Vermel' and S. A. Syrkina-Kruglyak, All-Union Scientific Research Institute of Medicinal Plants; Moscow-Leningrad, Voprosy Onkologii, Vol 6, No 7, Jul 60, pp 56-61

The effectiveness of febrifugin when used in the therapy of malignant growths was tested on mice and rats. Febrifugin is an alkaloid obtained from *Dichroa febrifuga* Lour., a plant which grows in Southwest China, India, Sunday Islands, and other areas. Chemically it is 3- β -keto-gamma-(3-oxy-piperidyl)-propyl-4-quinazolone. It has long been used in China as an antimalarial drug. Experiments carried out in vitro established that febrifugin used at a temperature of 37 degrees killed 80-90 percent of the ascitic cells of Ehrlich's tumor within 3 hours; in experiments carried out on animals the drug inhibited the growth of the ascitic cells by 50-100 percent, depending on the dose of the drug used. The growth of the solid forms of Ehrlich's tumor was inhibited by febrifugin by 45 percent; Crocker sarcoma, by 65 percent; Harding-Passey melanoma, by 75 percent; ascitic rat hepatoma, by 55 percent; rat sarcoma, by 45 and 30 percent; and Walker's carcinoma, by 45 percent.

Pharmacology and Toxicology96. Derivation of Chemicals Used as Protective Agents Against Radiation

"Preparation of Beta-Aminoethylisothiourea and its Derivatives," by Penko Petkov, Farmatsiya (Pharmacy; Bulgaria), 1959, 9, No 4, 28-31 (from Referativnyy Zhurnal -- Khimiya, No 16, 25 Aug 60, Abstract No 66434, by M. Kaplan)

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"Beta-aminoethylisothiourea (I) a compound used as a protective chemical against radiation sickness, is obtained by reacting equimolar quantities of thiourea (II) with the hydrobromide $H_2NCH_2CH_2Br$ (III). It was found that in the course of reacting (II) and (III) a substance of undetermined composition with a melting point of 224 degrees is formed together with (I). To determine the character of the action of the NH_2 group in (I) on the physiological properties of the latter, substances with a formula of $H_2NC(=NH)SCH_2CH_2NR_2$ (IV) (where R is an alkyl radical) were synthesized. It was established that the protective properties of (I) are destroyed if the NH_2 is blocked. Some 100 grams of (II) and 38 grams of (III) are stirred in absolute alcohol, boiled for a period of 7 hours, the hot mixture is filtered, the filtrate is cooled, the crystals are removed, washed with absolute alcohol, dried, and the hydrobromide of (I) with a yield of 48 percent and a melting point of 169-170 degrees is obtained. A total of 292 grams of cold diethylaminoethanol is added in drops to 1,400 milliliters of the 45 percent HBr cooled to a temperature of zero, and stirred at a temperature of 3-4 degrees. Some 380 milliliters of the liquid is then driven off, the remainder is boiled for a period of one hour, 140 milliliters is again driven off, and the remainder is boiled for a period of one hour. In a similar manner, 120, 60, 50, 30, 20, and 10 milliliters of the liquid are driven off, the remainder is boiled for a period of 3 hours, and 460 milliliters is then distilled off. The remainder of the liquid is then cooled to a temperature of 70 degrees, 660 milliliters of acetone is added, stirred, cooled, left standing for about 16 hours; the crystals are then removed, washed with acetone, and the hydrobromide $BrCH_2CH_2N(CH_3)_2$ (V) with a yield of 82.3 percent is obtained. The hydrobromide $BrCH_2CH_2N(C_2H_5)_2$ is obtained in a similar manner. The yield is 81.2 percent. One mole of (V) and 1.1 moles of (II) are boiled in 95 percent alcohol for a period of 6 hours, treated as noted above, and the hydrobromide (IV) ($R=CH_3$) with a yield of 63 percent and a melting point of 181-182 degrees is obtained. The hydrobromide (IV) ($R=C_2H_5$) with a yield of 61.5 percent and a melting point of 170-174 percent is similarly synthesized."

97. Toxic Action of Mercaptophos

"Toxicological and Hygienic Assessment of Mercaptophos,"
by A. G. Khmaladze and V. Ye. Dzhibladze, Scientific
Research Institute of Sanitation and Hygiene, Ministry
of Health Georgian SSR, Tbilisi; Moscow, Voprosy Pitaniya,
Vol 19, No 3, May/June 60, pp 62-64

Experiments carried out on guinea pigs established that mercaptophos, an insecticide widely used in agriculture, is highly toxic to warm-blooded animals: the minimal toxic dose when administered by mouth was established at one milligram per kilogram of body weight; the minimal lethal dose, at 5 milligrams per kilogram of body weight. Repeated administrations of the chemical in doses of 0.3 milligram per kilogram of body weight for a period of 5 months failed to produce a picture of intoxication, although considerable changes in the blood content of hemoglobin, erythrocytes, and leukocytes, and a depression of the cholinesterase activity of the blood serum were noted. Mercaptophos has no effect on vitamin C in fruit.

98. Study of Gangliolytic Substances

"Amines With Gangliolytic Activity. III. Secondary Diamines With a Branched Chain," by N. K. Kochetkov, A. Ya. Khorlin, and L. A. Vorotnikova, Scientific Research Institute of Pharmacology and Chemotherapy, Academy of Medical Sciences USSR; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 7, Jul 60, pp 2303-2305

In previous reports in this journal the authors have described the synthesis of simple aliphatic and alicyclic secondary amines which contain a tertiary radical and exhibit intense ganglioblocking action. Similar activity among secondary amines has been discovered only very recently. In this research, the authors undertook to synthesize new representatives of this class of gangliolytics to examine the relationship between the pharmacological action and the chemical structure. They were also interested in investigating the changes in physiological activity caused by secondary amines having a branched chain in comparison with the monoamines, since they were well aware that in the case of the quaternary ammonium salts the ganglioblocking activity increases many times in passing from simple salts to the bis-quaternaries.

The synthesis of secondary amines of the type $C_2H_5NHC(R)_2(CH_2)_nC(R)_2$
 NHC_2H_5 was based on the Ritter reaction.

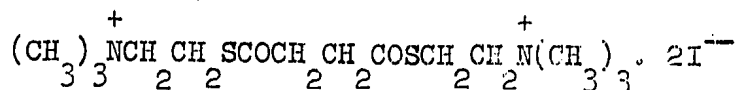
The diamines synthesized were subjected to pharmacological testing at the pharmacological division of the Institute of Pharmacology and Chemotherapy of the Academy of Medical Sciences USSR by D. A. Kharkevich. All the compounds manifested moderately expressed ganglioblocking action; however, the most active was the 3,8-di-(ethylamino)-3,8-diethyldecane dihydrochloride ($n = 4$, $R = C_2H_5$). An increase or decrease in the number of n led to a decrease in the ganglioblocking action.

99. Curare-like Compounds Synthesized by Armenian Group

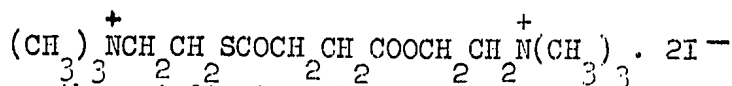
"Research in the Field of Derivatives of Dibasic Carboxylic Acids. Report 23. Alkylthiodialkylaminoethyl Esters of Succinic Acid," by A. L. Mndzhoyan, N. A. Babliyan, and A. A. Gamburyan, Institute of Fine Organic Chemistry, Academy of Sciences Armenian SSR; Yerevan, Izvestiya Akademii Nauk Armyanskoy SSR -- Khimicheskkiye Nauki, Vol 13, No 2/3, 1960, pp 177-180

The study of the pharmacological properties of a great number of aminoesters of carboxylic acids characterizes these compounds as selectively acting of N-cholinoreactive systems of the vegetative ganglia and adrenal glands, the vascular reflexogenic zones, and the transverso-striated muscles. Thus, these compounds offer the possibility of selecting effective curare-like preparations which stimulate respiration, pressor and other preparations.

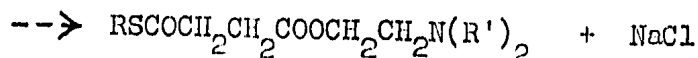
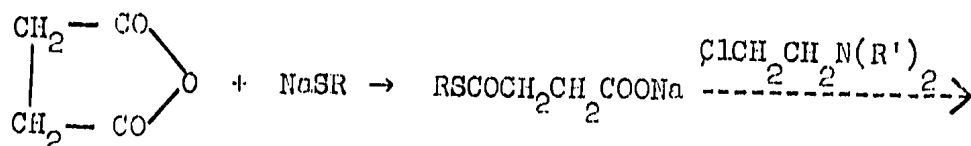
A comparison of the curare-like activity of ditilin and its sulfur-containing analog:



on the one hand, and the diiodomethylate of dimethylaminoethyl ester of monothiosuccinic acid:



on the other, indicates that if the dithio analog is somewhat weaker in its curarelike activity, then the monothio analog is considerably stronger than ditilin. This could be the result of slower hydrolysis of the thioester group or of the temporary blocking of cholinesterase. To confirm this, a clarification of the necessity for the presence of two quaternary ammonium groups and the possibility of replacing the aminoalkylthioester group by an alkylthioester group, the authors synthesized the alkylthio-dialkylaminoethyl esters of succinic acid. By reacting the succinic anhydride with sodium mercaptides in absolute toluene and later by the action of beta-dialkylaminoethyl chlorides:



without the separation of the intermediate products, a group of alkylthio-dialkylaminoethyl esters of succinic acid was synthesized having the following general formula:

$\text{RSCOH}_2\text{CH}_2\text{COOCH}_2\text{CH}_2\text{N(R')}_2$, where $\text{R}' = \text{CH}_3, \text{C}_2\text{H}_5$;

$\text{R} = \text{CH}_3, \text{C}_2\text{H}_5, \text{C}_3\text{H}_7, \text{iso-C}_3\text{H}_7, \text{C}_4\text{H}_9, \text{iso-C}_4\text{H}_9, \text{C}_5\text{H}_{11}, \text{iso-C}_5\text{H}_{11}$;
their iodomethylates, iodoethylates, and hydrochlorides were also prepared.

By this method it was possible to obtain the compounds mentioned with yields up to 60%, based on the succinic acid used. Lower end product yields were obtained in the case of the lower boiling mercaptides.

The results of the investigation of the curare-like activity of the synthesized compounds will be published separately, according to the authors. One table accompanies the report.

100. Research on Morphine Derivatives Being Conducted at Armenian Institute

"Derivatives of Morphine. Report II. 3-Methoxy-4,5-Epoxy-6,7-(2',3'-indolo)-N-methylmorphinane," by S. P. Ekmekdzhyan and G. T. Tatevosyan, Institute of Fine Organic Chemistry of Academy of Sciences Armenian SSR; Yerevan, Izvestiya Akademii Nauk Armyanskoy SSR-Khimicheskkiye Nauki, Vol 13, No 2/3, 1960, pp 201-205

The present report by the authors represents a portion of the research being performed on the synthesis of new polycyclic compounds which contain the cyclic nucleus of morphine condensed with other heterocyclic nuclei. The report describes 3-methoxy-4,5-epoxy-6,7-(2',3'-indolo)-N-methylmorphinane(I) in the molecule of which the cyclic skeleton of morphine, which retains all the functions of dihydrocodeine with the exception of the hydroxyl group at position 6, is combined with the indole nucleus found in the composition of many important alkaloids. In contrast to alkaloids of the indole series, compound (I) is not a derivative of tryptamine; it contains the gamma-(indolyl-3)propylamine, derivatives of which are being sought by the systematic research now being conducted.

Compound (I) was synthesized by condensing dihydrocodeine with phenylhydrazine. Elementary analyses of the compound were conducted by Tonokanyan and Arakelyan of Analytical Laboratory of the above-named Institute. In addition to the free base, the hydrochloride, picrate, and iodomethylate of compound (I) was obtained and characterized.

The pharmacological testing of these compounds will be published separately, according to the authors.

101. Pachycurare Antagonism Investigated

"The Nature of Pachycurare Antagonism With Certain Depolarizing Agents on the Rectus Abdominis of Frogs," by I. V. Komissarov, Chair of Pharmacology, Minsk Medical Institute; Moscow, Byulleten' Eksperimental'noy Biologii i Meditsiny, No 8, 1960, pp 93-97

The purpose of this investigation was to study the antagonism between pachycurare (d-tubocurarinchloride, paramyon and diplacin) and such depolarizing agents as acetylcholine and ditilin (succinicholine) in experiments on the rectus abdominis of frogs. The calculations show that $PA_2=PA_{10} > 0.95$ for all combinations studied and, consequently, the antagonism between pachycurare and the depolarizing agents does not appear to be strictly competitive. With low concentrations of pachycurare (in the order of 10^{-7} -- 10^{-6} mol/l), absorption is practically nonexistent and the antagonism of pachycurare (at these concentrations) with depolarizing agents appears to be strictly a competitive antagonism. With an increase in pachycurare concentration, competitive antagonism is disturbed as a result of changes in the monomolecular nature of the interaction of pachycurare with the cholinoreactive structures. This may involve both chemical and absorptive blocks of these structures simultaneously.

102. Production of Vitamin B₁₂

"Vitamin B₁₂ From Waste Waters," by M. P. Zakharova, Tr. Vses. N.-I., Vitamin. In-t. (Works of the All-Union Scientific Research Vitamin Institute), 1951, 6, 151-157 (from Referativnyy Zhurnal -- Khimiya, No 8, 25 Apr 60,

CPYRGHT Abstract No 31885)

"A method of isolating vitamin B₁₂ from waste waters (in the form of an aqueous concentration or in crystalline form) of an aeration station at a pilot plant and of testing the obtained vitamins have been developed. It was established that the preparations are biologically highly active: aqueous concentrations of the vitamin when added to the normal rations of

hogs increased the weight of the animals by 18 percent over that of the control animals. It was established also that the crystalline form of the vitamin corresponds to all the requirements of pharmacopeia. The injection of the vitamin into animals which recovered from theileriasis, but were suffering from progressive anemia contributed to the recovery of the animals and the restoration of normal circulation processes, according to data of the Daghestan Agricultural Institute."

103. Vitamin B₁₂ in Therapy of Acute Hepatitis

"Effect of Vitamin B₁₂ on Carbohydrate Metabolism in Acute Hepatitis," by L. Kelemen, A. Horvath, Cs. Nadnagy, Palencsar, D. Szilagy, and I Bodo, Med. Interna (Rumania), 1959, 11, No 10, 1513-1516 (from Referativnyy Zhurnal -- Biologiya, No 15, 10 Aug 60, Abstract No 74034, by E. Shaynbaum)

CPYRGHT

"The hyperglycemic curve (HG) in 80 patients between the ages of 7 and 67 years suffering from acute hepatitis was studied after the administration of 0.5 gram per kilogram of body weight of glucose. In those cases (47.5 percent) in which the HG failed to return to its initial level within one hour, the investigations were continued with the addition of 100-1,000 gamma of vitamin B₁₂ to the glucose solution. Children tolerated the glucose better than older persons. In 20 patients, the addition of the vitamin increased their tolerance to carbohydrates, restored to normal and improved the hyperglycemic curve; this effect was less expressed in six patients, while in nine patients the effect was only slightly expressed or was not expressed at all."

104. Therapy of Experimental Hyperkinesia

"Combined Application of Cholinolytics in Experimental Arecoline Hyperkinesia," by Yu. I. Lisunkin, Laboratory of Experimental Pharmacotherapy, Division of Pharmacology, Institute of Experimental Medicine, Academy of Medical Sciences USSR; Moscow, Farmakologiya i Toksikologiya, Vol 23, No 4, Jul/Aug 60, pp 321-327

The synergistic effect of cholinolytic drugs when used in the therapy of arecoline-induced hyperkinesia was studied. The following drugs were tested: diphacil, tropacin, pentaphene, atropine, diazil, scopolamine, and BETE (the hydrochloride of the tropic ester of benzoic acid). Albino male mice were used in the experiments. The experiments disclosed different degrees of synergistic action of the drugs, depending on the combinations of the preparations used; expressed synergistic action of

the potentiation type was noted in combinations of scopolamine and pentaphene; atropine and tropacin; diazil and diphacil; diazil and tropacin; diazil and scopolamine; and scopolamine and BETE. A high degree of mutually potentiated action was noted when the combination of atropine and pentaphene was used.

105. Therapy of Typhus Abdominalis

"On the Therapy of Patients Suffering From Typhus Abdominalis With Adrenocorticotrophic Hormone in Combination With Antibiotics," by B. D. Mebel', Vopr. Baketriol., Immunol., i Khimoterapii pri Kishechn. Infetsiyakh (Problems of Bacteriology, Immunology, and Chemotherapy in Intestinal Infections), L., 1958, 243-248 (from Referativnyy Zhurnal -- Biologiya, No 15, 10 Aug 60, Abstract No 73945, by I. Levin)

CPYRGHT

"Eighteen patients suffering from severe cases of typhus abdominalis were treated with adrenocorticotrophic hormone in combination with levomysetin. The hormone was intramuscularly administered for a period of 4-7 days (40-60-80 units). A beneficial therapeutic effect was noted in 17 patients. The temperature was restored to normal and symptoms of intoxication sharply diminished at an average of 40 hours after the initial administration of the hormone. In six patients the temperature again rose; it did not, however, reach the initial level, and was not accompanied by symptoms of intoxication. A repeated course of hormone therapy used on two patients produced a rapid therapeutic effect. A sharp diminution of the bacteremia index was noted under the influence of the hormone."

106. Monomycin and Colimycin Therapy of Infections

"Comparative Investigation of the Therapeutic Action of the Antibiotics Monomycin and Colimycin in Experimental Infections," by S. P. Shapovalova, Laboratory for the Experimental Study of the Therapeutic Properties of New Antibiotics, Institute for the Search of New Antibiotics, Academy of Medical Sciences USSR; Moscow, Antibiotiki, Vol 5, No 4, Jul/Aug 60, pp 21-23

The results of the experiments in which neomycin and colimycin were administered to mice experimentally infected with staphylococci, streptococci, and pneumococci bacteria are reported. It was established that neomycin and colimycin are highly effective when used in the therapy of infections caused by Friedlander's pneumobacteria; subcutaneously administered to the animals in doses of 3.4-4 milligrams per kilogram of body weight, they prevented the death of about 50 percent of the mice. Somewhat

larger doses were required to counteract the effects of staphylococcus sepsis and sepsis induced by Flexner's dysentery bacteria. The antibiotics were slightly effective in the therapy of experimentally induced pneumococci and streptococci sepsis. It was further established that the therapeutic effect of both antibiotics is about equal, although colimycin is more effective in cases of staphylococci induced sepsis.

107. Monomycin -- New Antibiotic

"Pharmacological Investigation of Monomycin -- a New Antibiotic," by V. A. Shorin, L. Ye. Gol'dberg, and V. Ye. Kremer, Institute of the Search for New Antibiotics; Moscow, Antibiotiki, Vol 5, No 4, Jul/Aug 60, pp 10-15

The toxicity and pharmacological properties of monomycin, an antibiotic obtained from the culture of *Actinomyces circulatus*, var. *monomycini* (Antibiotiki, Vol 6, No 4, Jul/Aug 60, p 37) were investigated in experiments carried out on mice, rabbits, and cats. The experiments established that monomycin has an effect on the organism similar to that of colimycin, micerin, and neomycin; its general effect is expressed by the depression of central nervous system, and neuromuscular conductivity; differing from colimycin, it has a considerably stronger effect on the vestibular apparatus of cats; like colimycin it has a hypotensive effect, but is considerably less toxic than the former. Monomycin has little effect on the automatic nervous system; monomycin preparations are not pyrogenic.

108. Amino Acids

"Synthetic Amino Acids" (unsigned article); Moscow, Meditsinskiy Rabotnik, 11 Oct 60, p 4

More than 18 new amino acids were synthesized at the Institute of Biological and Medical Chemistry. The more important of these are methionine, tryptophan, and asparagine. Methionine is a sulfur-containing amino acid used in the therapy of hepatic infections, hepatitis and cirrhosis in particular. Tryptophan plays an important part in the diagnostics of pregnancy toxicoses. With its help, it is possible to determine the insufficiency of vitamin B₆ in the organism. Asparagine is an essential component of the media used to cultivate tubercular bacteria and used in the preparation of the antitubercular vaccine. The latter two preparations are now being manufactured at the Moscow Chemical Plant imeni Voykov.

109. New Bacteriostatic and Analgesic Preparation

"Tsigerol" (unsigned article); Moscow, Meditsinskiy Rabotnik, 11 Oct 60, p 3

Tsigerol, a new therapeutic preparation used in the therapy of granulating and necrotizing traumas, trophic ulcers of different etiologies, burns, and radiation injuries, was prepared by a group of scientists at the Institute of Organic Chemistry imeni Zelinskiy. It was found to possess bacteriostatic and analgesic properties. Tsigerol is usually applied to the surface of a wound. If the injury extends over a considerable area (over 20 square centimeters) tsigeron should be applied in the form of a solution in vegetable oil at the ratio of 1:5, for pure tsigerom may evoke a burning sensation. It is nontoxic, and there are no contraindications to its use. It is now manufactured at the Moscow "Akrikhin" plant.

Physiology

110. Effect of High Stimulations and Curarelike Agents on Neuromuscular Transmission

"Facilitation and Depression of Neuromuscular Transmission During the Course of Rhythmical Stimulation in the Process of Intracellular Recording," by A. I. Shapovalov, Chair of Pharmacology, First Medical Institute, Leningrad; Moscow, Fiziologicheskii Zhurnal imeni I. M. Sechenov, No 9, Sep 60, pp 1112-1119

The facilitation and depression of neuromuscular transmission during rhythmical stimulation of the motor nerve was studied in experiments performed on a nerve-muscle preparation of a frog with the aid of intracellular electrodes, and it was determined that the facilitation of neuromuscular transmission at tetanic stimulation is presynaptic in nature.

Depression in neuromuscular transmission at high stimulation rhythms and under the effect of curarelike agents and calcium ions develop: (a) in the presynaptic nerve endings, (b) in the end-plate area, and (c) in the contact area between the end-plate and the adjacent cell surface.

The transformation of the stimulation rhythm, which is usually considered a result of the pessimal inhibition of synaptic transmission, can occur not only with the development of depression, but also as a result of the enhancement of neuromuscular transmission.

"The Effect of Ganglioblocking Agents on the Activity of Some Enzymatic Systems and the Quantity of Sulhydryl Groups in the Upper Cervical Ganglion," by N. B. Vysotskaya, Ye. I. Il'ina, and D. A. Karkevich, Laboratory of Special Pharmacology, Institute of Pharmacology and Chemotherapy, Academy of Medical Sciences USSR and Chair of Pharmacology, First Moscow Institute imeni I. M. Sechenov; Moscow, Fiziologicheskiy Zhurnal SSSR imeni I. M. Sechenov, No 9, Sep 60, pp 1076-1082

The effect of nicotine, tetraethylammonium, hexonium, pentamine, and mecamine on the activity of specific and nonspecific cholinesterase, acidic and alkaline phosphomonoesterase, and succindehydrase as well as the content of sulfhydryl groups in experiments in vitro on the upper cervical ganglion of cats was studied. The ganglioblocking agents were investigated in concentrations of $1 \cdot 10^{-2}$ to $1 \cdot 10^{-6}$.

As a result of the investigation it was discovered that none of the ganglioblocking agents had any effect on the above-mentioned enzymes; however, the content of sulfhydryl groups decreased somewhat, with hexonium proving to be the least active in this respect and nicotine and pentamine being the most active.

The introduction of substances containing sulfhydryl groups (cysteine and unithiol) or those aiding in its liberation (urea) did not restore the ganglionic transmission disturbed by the ganglioblocking agents.

The activity of the specific and nonspecific cholinesterase was determined by the Koelle method and the acidic and alkaline phosphomonoesterase by a modified Gomori method. Histochemical techniques and polarography were also used in the investigations.

112. X-Factor Formation in Frog Heart

"The Problem of the Mechanism of the Formation of X-Factor by the Action of Acetylcholine on the Frog Heart," by T. G. Putintseva, Laboratory of General and Comparative Physiology, Institute of Animal Morphology imeni A. N. Severtsov; Moscow, Fiziologicheskiy Zhurnal SSSR imeni I. M. Sechenov, No 9, Sep 60, 1064-1070

By the action of acetylcholine on the cardiac muscle, substances are formed in addition to the x-factor which decompose the x-factor when it is stored for a long period at room temperature or boiled, thus changing

certain of its properties. After purifying the x-factor from contaminating substances with the aid of activated charcoal, the period over which an x-factor solution can be stored increases from 20-24 hours to several months; in a dry state, the activity of the x-factor can also be maintained for several months. Purified, as opposed to contaminated, x-factor can maintain its activity while being boiled in a weak alkaline solution.

Metabolic poisons, such as sodium fluoride, monidoacetate, malonate, and potassium cyanide, have no effect on the formation of the x-factor in the cardiac muscle.

Poisons which interfere with oxidation processes (2,4-dinitrophenol and sodium azide) inhibit the formation of the x-factor, which indicates the relation of this substance to the metabolism of macroergic compounds.

113. Spatial Orientation in Vertebrates

"The Role of the Cerebellum in the Spatial Orientation of Higher Vertebrates," by I. S. Beritov, Institute of Physiology, Academy of Sciences Georgian SSR; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Biologicheskaya, No 4, Jul/Aug 60, pp 481-498

The author of this article states that all receptors are involved in the spatial orientation of a living organism, but that only the visual and labyrinthine receptors have substantial significance in this important function of the central nervous system.

It is known that the afferent path from the labyrinthine receptors runs partially through the cerebellum and ends in its posterior lobes (the nodulus, flocculi, and uvula), and even in the anterior lobe (the lingula). It is also known that excitation of these lobes of the cerebellum causes the same electrical potentials in the temporal lobes as does excitation of the labyrinthine receptors.

On the basis of this, it was decided to conduct experiments on dogs to determine the role of the cerebellum in spatial orientation. Results of these experiments showed that spatial orientation of the dogs on the basis of labyrinthine and auditory reception takes place because of the activity of the cortex of the ectosylvian and suprasylvian gyri of the cerebrum. The vestibular constituents of the cerebellum (lobulus, flocculi, uvula, lingula) play a definite role in the accomplishment of one of the main functions of the cerebral cortex. This function consists of the projection of perceived objects in the external environment, the creation of images of spatial relations among these objects, and the production of oriented movements in response to them. It is possible that the vestibular constituents of the cerebellum exert a mitigating effect on the elements of the vestibular analyser of the cerebral cortex by activating the reticular formations.

The conditioned reflex reaction to labyrinthine stimuli evidently does not involve the cerebellum. The cerebellum does not seem to be involved in the formation and differentiation of conditioned reflexes to sound stimuli.

After the entire cerebellum, or only the vestibular and auditory constituents, are removed, the vestibular and auditory perceptions of spatial relationships disappear at first, becoming partially restored within 2-5 months. This disappearance is caused, apparently, by impairment of the functional condition of the conducting nuclei of the brain stem and of the reticular formation. This is due to hemorrhage and disturbance of the blood circulation. The subsequent partial restoration of spatial orientation may be explained by resorption of blood lost, by restoration of circulation, and by cessation of the tonic inhibitory action of the cerebellum on the vestibular and auditory nuclei of the medulla oblongata. As a result, the stimulating action of these nuclei on the reticular formation, and through it on the cerebral cortex, may become intensified to such an extent that it compensates somewhat for the mitigating action of the cerebellum.

114. Spatial Analysis Studied

"The Physiological Mechanisms of Spatial Analysis," by E. Sh. Ayrapet'yants, A. S. Batuyev, V. A. Kislyakov, and K. Lebentrau, Laboratory of Interoceptive Conditioned Reflexes, Institute of Physiology imeni I. P. Pavlov, Academy of Sciences USSR and Chair of Higher Nervous Activity, Leningrad State University; Leningrad, Fiziologicheskiy Zhurnal SSSR imeni I. M. Sechenova, Vol 46, No 8, Aug 60, pp 908-916

According to this article, from information found in published literature, it can be deduced that spatial analysis in higher animals is the result of the integrated activity of a group of several analysors. Results of experiments on monkeys, cats, and dogs, and the observation of human behavior indicate that visual, vestibular, and motor analysors are responsible for the formation of temporary spatial associations and for bringing about analysis and synthesis of spatial factors. It is apparent that proprioceptive signalization plays an important part in spatial analysis and in the structure of the motor actions which are responsible for oriented movements of the organism in respect to surrounding objects.

115. Combined Noise Vibration Effects

"Some Characteristics of Neurodynamics in Persons Exposed to the Combined Action of Industrial Noise and Vibration," by G. I. Zuyev, Chair of Industrial Hygiene With the Clinic of Occupational Diseases, Leningrad Sanitary Hygiene Medical Institute; Moscow, Gigiyena i Sanitariya, No 9, Sep 60, pp 36-41

This article states that very little information can be found in scientific literature to explain the neurodynamics of shifts that arise in workers in industries which expose them to the simultaneous action of noise and vibration. A study of a group of young, physically well-developed workers in the metal casting industry was therefore undertaken. The results of clinical examination of these workers showed a few subjective and objective disturbances specific for the neurasthenic syndrome. The results of physiological examinations, including adaptometry and audiometry, revealed regular changes in the central nervous system and shifts in auditory function. Increased changes in the central nervous system paralleled an increase in the length of service in the metal casting industry. It is suggested that industrial establishments in which people are exposed to the simultaneous action of noise and vibration be constructed with sound-proof material and that workers employed in such establishments wear specially designed ear muffs.

116a. Noise Measurement Devices

"Devices for Noise Measurement," by I. A. Gradskiy; Moscow, Gigiyena i Sanitariya, No 9, Sep 60, pp 50-53

In the author's opinion, the successful solution of the problem of noise control depends, to a great extent, on the quality of devices and methods used in gauging noise. He proceeds, therefore, to acquaint the reader with the designations and most important technical characteristics of some acoustic devices used in the Soviet Union, the US, and in some West European countries.

It is customary to delineate the character of noise by the level of sound pressure and by the spectrum. In noise analysis, the greater portion of time is spent on reading instruments and on processing experimental data. The use of automatic recording instruments substantially reduces this time and improves gauging accuracy. An audio-noise meter consisting of a microphone, amplifier, rectifier, and an indicator has been used to gauge the level of sound pressure.

A recording instrument of the N-110 type has been developed in the USSR and is being manufactured by one of the plants of the Leningradskiy Sovnarkhoz. Some firms abroad are manufacturing multiple-unit devices for

acoustic gauging. These devices are spectrographs consisting of an audio-noise meter, an analyzer, and a recording instrument. The type 3310 spectrograph is manufactured by a Danish firm.

It has been found that the magnetic recording method with a magnetophone has great promise. A single recording of noise can be analyzed in detail in a laboratory and can be retained in case additional study is required.

The Ampex company in the US manufactures a portable magnetophone of the 600 or 601 type for use in acoustic gauging.

Audio-noise meters, analyzers, and other noise gauging devices must be checked and calibrated at least once a year in special acoustic laboratories.

116b. Speech Perception of Schizophrenics Investigated in Hungary

"New Method for the Investigation of Speech Perception,"
by Ervin Varga, Psychiatric Clinic, Budapest Medical
University; Budapest, A Magyar Tudomanyos Akademia Bio-
logiai es Orvosi Tudomanyok Osztalyanak Kozlemenyei,
Vol XI, No 1, 1960, pp 73-92

The author compared the speech, or rather, word perception of a selected group of schizophrenics and normal persons through a series of word tests he had devised. Choosing a group of homonyms, the author produced a conditioned reflex to the words in his subjects by blowing air into their eyes each time the words were spoken or projected on a screen. He also used the system of word association. Later, the subjects were instructed to depress a key or squeeze a bulb whenever the homonyms occurred in a sentence or a random list of words.

By measuring the time interval between stimulus and response, the author found that in every instance the schizophrenics responded more quickly and accurately to the word stimuli than the normal subjects. He attributes this to damage to the delaying inhibition in schizophrenics which results in "desymbolization" or the state in which the concrete meaning of a word or the meaning it has assumed prevails over its semantic meaning.

117. Organophosphorus Poisoning

"Precautionary Measures in Handling Organophosphorus Poison," by Yu. S. Kagan, Candidate of Medical Sciences; Moscow, Zashchita Rasteniy ot Vrediteley i Bolezney, No 5, 1960, pp 45-46

The data which have been obtained in experiments on animals and the examination of the intoxication picture of humans by organophosphorus preparations permits us to conclude that these poisons principally damage the central and vegetative sections of the nervous system. Such symptoms of poisoning as salivation, crying, constriction of the pupils, contraction of the muscular fibers in internal organs (bronchi, intestines, etc.), slowing the work of the heart are the results of the overactivation of the parasympathetic system. Twitching of the hands and legs, tonic and clonic spasms, shortness of breath, and disturbances of speech and recognition arise as a result of the action by insecticides of the central nervous system.

If the organophosphorus compound should enter the body via the mouth, it is recommended that the affected person be given several glasses of water as quickly as possible and later caused to vomit by tickling the throat. A still better method is to wash the stomach with the help of a tube (this should be done by a medical worker). To remove the poison, it is necessary to drink a suspension of activated charcoal in water (2-3 tablespoons in a half glass of water).

Skin which has come in contact with thiophos, metaphos, mercaptophos, M-81, M-82, or carbophos should be immediately treated with 5-10% solution of aqueous ammonia or 5-10% solution of soda; the eyes should be immediately washed with water. In all cases of poisoning, the doctor should be called as soon as possible.

The intoxication picture, the first aid measures and treatment are basically analagous for the various organophosphorus compounds. Mercaptophos, octamethyl, and thiophos are more toxic than metaphos and carbophos and are extremely toxic even in small doses; their action occurs more rapidly which complicates treatment. The prognosis for intoxication by these preparations is always very serious. Especially dangerous is mercaptophos; severe intoxication in humans can develop by dropping as little as one gram of this poison on the skin.

Everything said above forces us to pay particular attention to precautionary measures, the very strict observance of the corresponding instructions and sanitary rules. Each worker must undergo a period of instructions. Youths under 18 years and pregnant women, as well as those breast-feeding children, are categorically forbidden to work with these chemical agents.

The treatment of vegetation with organophosphorus preparations should be done principally by the aviation method which ensures the best sanitary-hygiene conditions of work. Ground dusting or spraying is permitted only on small areas with the condition that the tractor is equipped with a cabin and the roofs of the tanks containing the poisonous chemical are tightly sealed. The application of organophosphorus insecticides with the aid of backpacks or any type of manual means is categorically forbidden. Dusting must only be conducted in the morning and in the evening since the warmer hours increase the content of poisonous fumes in the atmosphere. The length of the work shift for this particular type of work must not exceed 4 hours per day; the remaining time should be used in completing other tasks.

Each worker handling poisonous chemicals must be equipped with special clothing, a respirator, activated charcoal, and protective glasses.

118. Colorimetric Determination of Aminazine Described

"Method of Determining Aminazine in the Atmosphere," by L. I. Grebennik and P. S. Ugryumov; V Sb.: Khimiya i Meditsina [In the Collection: Chemistry and Medicine], Issue 9, Moscow, Medgiz, 1959, 35-37 (from Referativnyy Zhurnal -- Khimiya, No 8, 25 Apr 60, Abstract No 31330, by G. Kayeva)

Three basic methods for the quantitative determination of aminazine in the atmosphere are cited. The most convenient method under industrial conditions appears to be the colorimetric, based on the rose coloring of aminazine in aqueous solutions of H_2SO_4 . Measurement of the intensity of the color should be conducted in a photometer equipped with a green filter S-530 opposite the control. Selection of the air samples should be done with connecting Petrie absorbers containing 6 ml of H_2SO_4 diluted with water in a ratio of 6:1.

119. Tetraethyl Lead Poisoning

"Occupational Poisoning with Tetraethyl Lead," by G. T. Dinischiotu, L. Pilat, and A. M. Georgescu, Med. Interna, 1959, 11, No 6, 845-854 (Rumanian) (from Referativnyy Zhurnal -- Khimiya, No 8, 25 Apr 60, Abstract No 31309, by Z. Khaimskiy)

A history of tetraethyl lead (TEL) poisoning is presented; subjective and objective symptoms taken from five histories of the disease (the author's own data). During the treatment, excellent results were obtained

by the use of CaNa_2 -salt of ethylenediaminetetraacetic acid (I) which can also be used for prophylactic purposes; its use increases the elimination of Pb from the organism by 10-20 times and prevents psychiatric disorders (paroxysms are resumed if the administration of (I) is stopped). Rules of safety techniques and for personal hygiene when working with tetracthyl lead are presented.

120. Public Health in Bulgaria

"For the Well-Being of the People," by Dr Lyuben Stoyanov, Deputy Minister of Health and Social Welfare, Sofia; Moscow, Meditinskiy Rabotnik, 9 Sep 60, p 4

Great strides in the development of public health facilities and the improvement of the health of the people have been made in Bulgaria during the 16 years since the country was liberated by Soviet troops. Medical assistance to the people is now free, and all medical establishments are maintained by the government. Appropriations for public health are increasing yearly. Public health appropriations for 1960 are in excess of 1.2 million leva, or about 160 leva per capita of the population. More than 158 hospitals with a total of over 30,000 beds have been built; about 250 medical-sanitation points have been established at the industrial enterprises. In addition 282 sector hospitals, 884 maternity hospitals, about 400 outpatient clinics, and more than 1,200 medical points have been organized. There are now in Bulgaria 16 physicians per each 10,000 people. Each year Bulgarian schools are graduating about 750 physicians, 150 stomatologists, 370 pharmacists, many nurses, midwives, and feldshers. The mortality rate in the country has been decreased from 14.9 to 7.8 per 1,000 people. Such diseases as exanthematous fever, diphtheria, and other infectious diseases have been almost completely eradicated. Tuberculosis incidence has been considerably reduced.

121. Instructions Issued on Establishing Health and Epidemiological Standards

"Council of Ministers Decision No 541 of 5 May 1960"; Bucharest, Colectia de Hotariri si Dispozitii, Vol 9, No 16, 17 May 60, pp 264-486

The Rumanian Ministry of Health and Social Welfare, with approval by decision of the Council of Ministers, has issued a series of instructions regarding the establishment of health and epidemiological standards and the punishment of violations committed against these standards.

This work covers 223 pages and sets up provisions governing the following general topics.

Public hygiene -- drinking water; sewage systems; sanitation of populated centers; health standards for the operation of enterprises, institutions, and public organizations; the operation of sport sites, cultural and entertainment places, other public places, and public transportation; and hygienic and sanitary measures for human cadavers

Food hygiene

Labor hygiene

School hygiene

Epidemic diseases

Measures for proving and punishing violations of these standards

Radiology

122. Chemical Protection Against Radiation

"Protective Action of Aminoethylisothiuronium Against Ionizing Radiation," by Il. Belokonski, Voyen.-Med. Delo (Military-Medical Affairs; Bulgaria), 1959, 14, No 3, 13-17 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 17, 10 Sep 60, Abstract No 25104, by G. Kivman)

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"The protective action of aminoethylisothiuronium (I) against radiation was tested on mice, rats, and guinea pigs which were irradiated with lethal doses of X-rays; the chemical compound was administered to the animals intraperitoneally, subcutaneously, and per os. The intraperitoneal and subcutaneous administration of (I) 10-30 minutes, and per os 30 minutes to 2 hours before the irradiation prevented the death of 30-60 percent of the animals. In all cases the protective action of (I) was expressed in doses which were considerably smaller than the LD₅₀ doses: 100-200 milligrams per kilogram of body weight when administered intraperitoneally and subcutaneously, and 150-300 milligrams per kilogram of body weight when administered per os. The author recommends that the drug be practically tested on large experimental animals."

123. Prophylactic Use of Diphacil in Acute Radiation Sickness and Sicknesses Accompanied by Thrombocytopenia and a Hemorrhagic Syndrome

"Concerning the Prophylactic Stimulation of Thrombopoiesis by Diphacil Following the Action of Ionizing Radiation," by N. V. Traskunova, Laboratory of Pathological Physiology, Central Scientific Research Institute of Medical Radiology, Ministry of Health USSR; Moscow, Meditsinskaya Radiologiya, Vol 5, No 8, Aug 60, pp 26-29

Diphacil (diphenylacetic acid diethylaminoethyl ester) was administered subcutaneously as a means of preventing thrombocytopenia in rabbits subsequently X-irradiated by 600 r which produced acute radiation sickness.

Data obtained on various blood studies indicate the possibility of the prophylactic use of diphacil during radiation sickness and during clinical radiation therapy of a number of diseases which are accompanied by thrombocytopenia and a hemorrhagic syndrome (leukosis and Werlhof's disease, etc.).

124. Combined Use of Hyaluronic Acid and Tetracycline Effective Against Radiation Sickness

"The Effect of Certain Substances on the Permeability of the Intestinal Wall for Bacteria in Irradiated Mice," by E. Z. Rukhadze; Moscow, Meditinskaya Radiologiya, Vol 5, No 9, Sep 60, pp 85-86

Many investigators have shown that bacteremia in X-irradiated animals is due to the penetration of microorganisms from the intestine into the blood system.

The purpose of the research described was to study means of preventing the penetration of microorganisms into the blood of irradiated animals. To this end, the following substances were used: tannalbin (15 mg per mouse from the day of irradiation by 500 r, until the death of the animal); citrin (5 mg per mouse, administered once per os 2 hours prior to the irradiation of the animal), and hyaluronic acid (0.1 ml administered subcutaneously 24 hours prior to irradiation). These compounds decrease tissue permeability. Tetracycline was also administered (1.5 mg per mouse from the day of irradiation until the death of the animal) but in combination with citrin or with hyaluronic acid.

On the basis of the results of these experiments, the author draws the following conclusions:

1. The single prophylactic administration of citrin and of hyaluronic acid did not decrease the permeability of the intestinal wall all during the period of radiation sickness; therefore, it seems to be undesirable to treat bacteremia patients by this procedure.

2. During the experimental therapy of radiation sickness, of all the substances used in this research, the combination of hyaluronic acid with tetracycline proved to be most effective: the administration of these substances decreased the mortality rate of the irradiated animals by a factor of three as compared with the controls (irradiated, untreated animals).

3. The combined action of tetracycline with citrin led to a decrease of bacteremia, but did not exert a decisive effect on the outcome of radiation sickness.

125. Pre-Irradiation Administration of Peroxyhydrate of Urea Alleviates Radiation Sequelae

"The Effect of Hydrogen Peroxide on the Survival Rate of Rats and on Catalase Activity Under the Effect of Ionizing Radiations," by I. A. Pelishenko and V. V. Rudakov (Leningrad); Moscow, Meditsinskaya Radiologiya, Vol 5, No 9, Sep 60, p 87

The purpose of the research described was to modify the capacity of an organism to adapt to ionizing radiation by means of very small amounts of hydrogen peroxide. For this purpose, an addition compound of urea and hydrogen peroxide, peroxyhydrate of urea, was synthesized according to the method described by Tanatar (1908) in which the hydrogen peroxide content is approximately 35%. The survival rate on the 30th day postirradiation by 700 r of rats which were treated by this compound several times before irradiation was 73% as compared with 48% survival in the untreated controls.

Results comparing blood catalase activity, according to the method of Bekh-Zubkova, in irradiated untreated and treated animals and also in healthy animals that had not received and those that had received this compound (peroxyhydrate of urea) are presented in a table, and signify a 50% decrease of catalase activity after irradiation. The preliminary administration of peroxyhydrate of urea increases the catalase activity of healthy animals and leads to a smaller inhibition of enzyme activity postirradiation. It is possible that one factor for increasing the survival rate of the irradiated animals is a more intensive break-up of the peroxides which are formed.

126. Radio-Protective Action of Various Thioethylamine Derivatives

"The Effect of Lengthening or of Ramification of the Carbon Chain on the Protective Effect of Beta-Thioethylamine During Injuries Caused by Penetrating Radiation," by L. I. Tank; Moscow, Meditsinskaya Radiologiya, Vol 5, No 9, Sep 60, pp 34-37.

During the period 1955-1957, approximately 50 preparations of the beta-thioethylamine derivatives were prepared under the direction of F. Yu. Rachinskiy and studied with regard to their protective and therapeutic action against radiation sickness. Tests were conducted on mice irradiated by 700 r doses of filtered X rays, and the results are summarized as follows:

The results of the research described agree with those reported by Cohen, Vos, and van Bekkum, who detected a marked protective action exerted by 1-amino-2-thiopropane and 1-thio-2-aminopropane; 1-amino-2-aminobutane, with regard to its protective action and toxicity, differs slightly from beta-thioethylamine, i. e., the optimum protective dose of 168 mg/kg prevents the death of 60% of the irradiated animals, while a dose of 210 mg/kg causes spasms. 1-amino-2-thiobutane exerts a protective action only in doses of 630 mg/kg, which is more than four times the protective dose of beta-thioethylamine. Protective doses of 2-methyl-3-thio-4-aminobutane also are somewhat larger than the protective doses of beta-thio-ethylamine. The preceding compounds have no significant advantage over beta-thioethylamine as far as increasing the therapeutic range is concerned.

The introduction of a phenyl group into the carbon chain of beta-thioethylamine (to form 3-phenyl-3-thio-4-aminobutane) increases the toxicity of the compound and deprives it of its protective action. Since all of the compounds tested contain a free sulfhydryl group, they are unstable when stored.

127. Hypothermia Most Effective at Termination of Latent Period and Peak of Radiation Sickness

"The Effect of Hypothermia on the Development of Acute Radiation Necrosis of Skin," by L. A. Afrikanova, Ye. F. Vlasova and Ye. F. Uratkov; Moscow, Meditsinskaya Radiologiya, Vol 5, No 9, Sep 60, pp 43-46.

The purpose of the research described was to study the effect of hypothermia on the course of radiation injury of the skin developing against the background of acute radiation sickness. Tests were conducted on rats X-irradiated by doses equivalent to 400 and 250 r to produce radiation sickness, and 5,000 r immediately after whole-body irradiation to cause local necrosis. Hypothermia consisted of lowering the body temperature until the rectal temperature was 25-23° C.

The authors present the following conclusions:

Under combined radiation action, the course of both radiation sickness and of the local process is aggravated. During the course of radiation sickness, there are periods during which the additional stimulant--hypothermia--acutely aggravates the course of radiation sickness and increases the percent of the animals that die because of the combined injuries. Such periods are the first days of the latent period and the termination of clinical symptoms of radiation sickness. The application of hypothermia is inadvisable during these periods.

Hypothermia exerts a positive effect when it is applied during the termination of the latent period and at the peak of the development of radiation sickness.

128. Exudative Pleuritis Aggravated During Radiation Sickness

"The Characteristics of the Course of Exudative Pleuritis Following Radiation Action (Experimental Research)," by M. S. Lipovetskiy, Ya. I. Veksler, A. R. Sheyngerts, and L. I. Radyuk; Moscow, Meditinskaya Radiologiya, Vol 5, No 9, Sep 60, pp 47-54.

Four series of tests were performed on 55 rabbits to study the special characteristics of exudative pleuritis complicated by a background of radiation sickness (whole-body X-irradiation by 502 r).

The authors present the following conclusions.

Exudative pleuritis proceeding against a background of radiation sickness assumes a number of traits which are characteristic only of the combined injury: acute and rapid development of anemia, a severe course of pleuritis with a marked hemorrhagic nature, the formation of extensive blood clots in the pleural cavity, a significant retardation of the process of exudate resorption, frequent pneumonia complications, and a high mortality rate of the injured animals. The most severe course of the sickness was observed in those animals in which the experimental pleuritis was inflicted at the peak of acute radiation sickness.

Exudative pleuritis in irradiated animals aggravates and accelerates the course of radiation sickness, i. e., its latent period is shortened, the onset of leukopenia is more rapid and more acute, and the normalization of the red and white blood indexes is more protracted.

The pathomorphological picture of pleuritis against a background of radiation sickness is characterized by inflammatory processes of an essentially hemorrhagic nature with areas of hemorrhage and necrosis and with frequent involvement of pulmonary parenchyma in the process.

129. Plutonium Metabolism and Distribution in Bone Tissue

"Plutonium Content in Protein Fractions of Long Bones of Rats," by I. A. Tseveleva; Moscow, Biokhimiya, Vol 25, No 4, Jul/Aug 60, pp 636-639.

The nature of plutonium distribution in various fractions of the diaphysis of long bones of rats was studied. It was found that the major portion of the radioelement was fixed in the organic matrix (up to 90%).

Four protein compounds were isolated from the organic substance of bone: collagen, albuminoids, mucoids, and residual protein. The collagen comprised 90% of the bone proteins. The albuminoids, mucoids, and residual protein formed 2.0, 1.6, and 6.9%, respectively (calculated on the basis of nitrogen). All protein substances of the bone contained plutonium. Plutonium was bound with collagen (65-80%), with albuminoids (15%), with mucoids (3.4%), and with residual proteins (5%). The metabolically active protein (albuminoids) bound plutonium, per mg nitrogen, at a rate ten times as great as collagen, and residual proteins. The relative specific activity of mucoids was 2.5 times as great as that of collagen. This is explained, probably, by the participation of the SO_4 group of chondroitinsulphate in the fixation of plutonium.

130. Decreased Capillary Resistance a Factor in Spontaneous Hemorrhage During Radiation Sickness

"Change of the Physiological Resistance of Capillaries in Experimental Radiation Sickness Caused by Internal Beta-Irradiation With Radioactive Phosphorus," by G. G. Bazaz'yan, Laboratory of Physiology and Biochemistry of Blood Coagulation; Moscow, Vestnik Moskovskogo Universiteta, Seriya VI, Biologiya, Pochvovedeniya, No 2, Mar/Apr 60, pp 18-21

Capillary permeability and fragility in rats subjected to irradiation from radioactive phosphorus administered subcutaneously in amounts of 1, 3.18, and 5 microcuries per g live weight was studied. Results confirmed that during radiation sickness caused by internal beta-irradiation from radioactive phosphorus, capillary resistance is significantly reduced at certain known stages of the sickness, which contributes to the onset of spontaneous hemorrhage in the injured organism.

131. Changes in Reactivity of Irradiated Animals Subjected to Anesthetics

"Phasic Changes in the Reactivity of Irradiated Animals in Relation to Anesthetics," by K. K. Poplavskiy (Leningrad); Moscow, Meditinskaya Radiologiya, Vol 5, No 9, Sep 60, pp 85-85

The purpose of the research described was to study the reactivity of irradiated animals in relation to anesthetics administered during the various periods of acute radiation sickness with differing severity; the effect of different doses, types, and time of application of the anesthetics was determined.

Tests were conducted on 4,000 mice subjected to irradiation by 360, 720, or 1,440 r; and also to ether anesthesia inhaled for 15 minutes from air containing 0.2 ml/liter, 0.4 ml/liter, or 0.6 ml/liter; or to hexenal, 2% solution, in amounts of 90 gamma/g, 150 gamma/g; or 250 gamma/g.

Various aspects of reactivity changes in the anesthetized, irradiated animals are discussed.

Results indicate that the reactivity of irradiated animals is substantially changed as a result of anesthetics. These changes have a phasic nature and depend on the period of the sickness. During the peak of radiation sickness, the sensitivity of the irradiated mice to anesthetics is increased regardless of the specific characteristics of the anesthetics and the severity of radiation sickness. During the other periods of radiation sickness, the nature of reactivity changes depends on the properties and dose of the anesthetic, and on the severity of the injury.

132. Polonium Injury of Hepatic Bile-Formation Function

"Bilogenesis Function of the Liver in Dogs Subjected to Polonium Injury," by L. L. Fedorovskiy; Moscow, Meditinskaya Radiologiya, Vol 5, No 9, Sep 60, pp 59-62

The purpose of the research described was to study the bile-formation function of the liver in organisms injured by polonium. Tests were conducted on five dogs subjected to radiation sickness by the subcutaneous administration of a neutral solution of polonium in the amount of 0.04 millicurie/kg body weight. (Polonium invades organs which are rich in reticulo-endothelium, which includes the liver tissue.)

The author concludes that the results indicated phasic changes in the external secretory function of the liver in dogs subjected to injury by polonium. These changes involve the amount of bile secreted and its bilirubin and bile acids content. The phasic changes in bile secretion consist of an increase in bile secretion during the first few days of radiation sickness, followed by normalization of secretion, which is then replaced by acute suppression of bile secretion. The mechanisms for the development of these changes evidently are connected, on the one hand, with a disturbance of neuro-humoral regulation in the organism, and, on the other hand, with severe injury of the liver by polonium.

133. Shifts in Acid-Base Balance Following Acute and Chronic X-Irradiation

"Change in the Acid-Base Balance in Rabbits Subjected to Acute and Chronic X-Irradiation," by Ye. I. Floka, Chair of Biochemistry of Kishinev Medical Institute; Kishinev, Zdravookhraneniye Moldavskoy SSR, No 2, Mar/Apr 60, pp 51-56

As a result of analyzing his research data on the action of penetrating radiations, the author presents the following conclusions:

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1. A single whole-body X-irradiation of rabbits with 1,200 r leads to the onset of nongaseous acidosis on the second and fourth days after irradiation. On the 7th and 14th days after irradiation, the acid-base balance is normalized or the nongaseous acidosis is replaced by gaseous alkalosis.
2. A single whole-body X-irradiation of rabbits by 1,500 r leads to the onset, on the second to the fourth day after irradiation, of nongaseous acidosis which is retained by the majority of animals until the time of death.
3. The nongaseous type of acidosis which arises after irradiation is not connected with the accumulation of organic acids, especially of ketone bodies. Aggravated acetonemia was observed in some of the animals that were irradiated with 1,500 r doses only toward the time of death.
4. Fractional chronic irradiation of rabbits over a period of 15 days by 100 r daily resulted in no noticeable shifts in the acid-base balance.

134. Electrochemical Shifts in Protein Fractions of Irradiated Animals Antibodies

"Electrochemical Properties of Immune Proteins Which Are Synthesized in the Irradiated Organism," by L. G. Prokopenko, Chair of Biochemistry, State Medical Institute of Kursk; Moscow, Biokhimiya, Vol 25, No 4, Jul/Aug 60, pp 630-635

The purpose of the research described was to trace the dynamic changes in the electrochemical properties of various types of antibodies produced in healthy and irradiated organisms.

Results of the electrophoretic studies show that in healthy rabbits, the antiparatyphoid agglutinins and precipitins migrate in the electrical field with the gamma globulins after the first immunization. The third immunization shifts the migration of the antibodies in the healthy animals toward the beta globulins.

In rabbits irradiated with a 600 r dose, the antiparatyphoid agglutinins that were synthesized migrated with the gamma- and beta-globulins during the whole period of observation.

In animals X-irradiated with the lethal dose of 1,000 r, the agglutinins are localized in the gamma-, beta₁-, and alpha₂-globulin fractions. The third injection of antibody shifted the formation of the antibody so that it migrated with the gamma globulins. The precipitins in the injured rabbits were localized only in the gamma-globulin fraction.

135. Sensitivity of Sex Organs of Gamma-Irradiated Mouse Embryos

"The Estrus Cycle of Mice Subjected to Gamma-Irradiation During the Period of Embryonic Development," by F. B. Shapiro, Mauchn. Dokl. Vyssh. Biol. N. (Scientific Reports of Higher Schools of Biological Sciences), No 2, 1959, pp 101-105, (from Referativnyy Zhurnal -- Biologiya, No 14, 25 Jul 60, Abstract No 68098, by V. Semagin)

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"Mice were subjected to the effect of gamma-irradiation from Co⁶⁰ by a dose of 50 r on the 10th, 12th, and 14th day of pregnancy, and the sex cycle of their female progeny was observed. The frequency of the estrus cycle in the latter was decreased, especially in mice from mothers irradiated on the 12th and 14th day. Among those irradiated during the embryonic period, the ratio of females to males was diminished. The average number of normal cycles was diminished by a factor of 1.5 in each female. During 3 months of observations, the frequency of cycles was greater in the second generation than in that of the unirradiated and controls. The ovaries of mice embryos seemed more sensitive to irradiation than the ovaries of mature mice."

Surgery

136. New Anesthetic Apparatus

CPYRGHT "Anesthetic Apparatus UNA-1" (unsigned article); Moscow, Meditsinskiy Rabotnik, 16 Sep, p 4

"R. I. Savachenko, V. A. Mikhalev, and A. S. Perel'muter research workers at the All-Union Scientific Research Institute of Medical Instruments and Equipment, in cooperation with Prof I. S. Zhorov, designed a universal apparatus for the administration of anesthetics by inhalation. The new apparatus has been named "UNA-1." It is designed to provide required anesthetics in all types of operations and, in case of necessity, to regulate artificial respiration.

"UNA-1 will be used to administer the following four gases: nitrous oxide, cyclopropane, oxygen, and carbon dioxide. It has little effect on normal respiration and supplies the exact dose to be administered. Another advantage is that it makes possible the supply of a mixture of oxygen with air, ether with air, or a mixture of ether-air-oxygen. Clinical tests of the apparatus gave positive results, and its manufacture has been authorized."

Veterinary Medicine

137. Mechanism of Action of Hog Cholera Vaccine

"Research on the Phenomenon of Incompatibility Between the Lapinized Virus and the Pathogenic Virus of Hog Cholera," by S. Mihaita and M. Popa; Bucharest, Studii si Cercetari de Inframicrobiologie, Vol 9, No 3, 1960, pp 391-407

Hogs inoculated with a vaccinating dose of lapinized hog cholera virus are protected from subcutaneous infection with the classic virus, starting 72 hours after administration.

The phenomenon by which the lapinized virus gives early protection against hog cholera is due, in the first days, to the incompatibility between this virus and the pathogenic virus of hog cholera.

This incompatibility appears during an interval of 2-4 days between the action of the lapinized virus and that of the pathogenic virus on the organism.

From their work, the authors conclude that the lapinized virus replicates and spreads in the hog organism for 48-72 hours following inoculation; after a maximum percentage of virus bodies is circulating in the blood (the 6th-7th day) there is a quantitative reduction in favor of the antibodies which develop.

The rate of replication and diffusion of the classic hog cholera virus is 48-72 hours more rapid than that of the lapinized virus.

The vaccination of healthy hogs -- those which are threatened with infection or subjected to contact with infected hogs -- with lapinized virus preserves over 75 percent of the animals from infection by contact.

Miscellaneous

138. Institute for Study of the Problem of Aging

"To Prolong Human Life" (unsigned article); Moscow, Meditsinskiy Rabotnik, 23 Sep 60, p 3

An Institute of Gerontology and Experimental Pathology which is to become the center of research work on the problem of aging has been opened in Kiev. Three clinics where the problems of age modifications in the nervous system, internal organs, and the support-motor apparatus will be studied are attached to the institute. There are nine research laboratories, an outpatient division, and scientific-consultation sections attached to homes for the aged. Biological problems of aging, and the changes which take place in the cellular composition of the aging organism, protein synthesis, and antigenic properties of the tissues and cells will be investigated. A statistical department has been organized. The effect of physical activities and living conditions on the organism will be studied. The effectiveness of geriatric drugs, such as the antireticular cytotoxic serum, blood transfusions, vitamins, tissue extracts, hormones, and novocain, when applied to the aging organism will be studied. Data gathered and the results of investigations already carried out are being analyzed.

139. Pharmaceutical and Medical Supply
"Order on the Statute of the State Supply Office for Pharmaceutical and Medical Practice," by Sefrin, Minister of Health; Berlin, Gesetzblatt der Deutschen Demokratischen Republik, No 23, Part 2, 15 Aug 60, pp 257-259

This order, which became effective on 1 July 1960, discusses the tasks of the Supply Office for Pharmaceutical and Medical Practice of the GDR Ministry of Health, in Berlin; direction and organization; location, management, and supervision of the 12 supply depots; and supply committees for cooperation with local authorities.

140. Organizational Change in Hungarian Academy of Sciences

"From the Life of the Hungarian Academy of Sciences";
Budapest, Magyar Tudomány, Vol LXVII, No 9, Sep 60,

CPYRGHT 551

"At its 17 June 1960 meeting, the Presidium Council approved the transfer of the science of gerontology and the Gerontological Committee from the Biological Section to the Department of Biology and Medicine."

Physical Metallurgy

141. Increasing the Wear Properties of Chromium Platings

"Increasing the Wear Resistance of Electrolytic Chromium Coatings," by D. S. Plishko, Kiev Institute of the Civil Air Fleet; Moscow, Izvestiya Vysshikh Uchebnykh Zavedeniy, Mashinostroyeniye, No 7, 1960, pp 155-159

Laboratory tests showed that electrolytically coated chromium paired in dry friction with gray perlitic cast iron underwent a wear only 1/8-1/10 that when paired with bronze; the reason was found to be that during the friction process, the chromium surface became coated with a gray layer with a hardness of 1,500-1,800 kilograms per square millimeter.

142. Effect of Heat Treatment on Long-Time Strength of EI694R Steel

"Influence of Heat Treatment on the Value of the Long-Time Strength of Austenitic Steel EI694R," by A. A. Moiseyev, T. F. Semenova, Ye. D. Surovtseva, and N. V. Sukhobokova; Moscow, Elektricheskiye Stantsii, No 6, Jun 60, pp 24-26

The structure, mechanical, and heat-resistant properties, particularly long-time strength properties, of EI694R pipe depend greatly on heat-treatment regimes. EI694R specimens subjected to a stress of 25 kg/mm² and a temperature of 610 deg C had long-time strengths varying from 663 to 7,228 hours, depending on the heat-treatment parameters. The best long-time strength properties were obtained by austenitizing under the following conditions: heating to 1,150-1,170 deg C, holding for 2 minutes per square millimeter cross section, and cooling in water.

143. Ductility of Certain High-Temperature Steels

"Ductility of Certain High-Temperature Materials," by A. V. Stanyukovich; Moscow, Energomashinostroyeniye, No 5, May 60, pp 26-30

Results are given of a study of the ductility of a number of high-temperature steels at elevated temperatures and constant strain rates. Graphs show the change of ductility with respect to temperature, strain rate, and time (ductility diagrams).

Alloy representing low-alloyed ferritic steels, was tested after heat treatment (quenched at 940 deg C in oil, tempered at 630 deg C for 2 hours) in order to ascertain the minimum strain property through guaranteed higher yield point ($\sigma_s = 106$ and $\sigma_b = 115$ kg/mm²). Austenitic steels were represented by 1Kh18N9T (quenched at 1,050 deg C, tempered at 680 deg C for 3 hours) and EI612 (quenched at 1,150 deg C and age-hardened at 750 deg C for 20 hours).

Other nickel-base alloys listed here are alloy A (chromium-nickel alloyed with titanium), alloy G (chromium-nickel alloyed with niobium and containing a small amount of titanium), and alloys B and V (chromium-nickel containing large amounts of titanium, tungsten, and molybdenum).

At practically all operating conditions, EI10 does not yield less than 2 percent at tensile rupture. The most satisfactory operating temperature for EI612 is 500-580 deg C; for 1Kh18N9T, it is 500-600 deg C and 600-850 deg C for alloys B and V.

144. Serial Mass-Spectrometer Adapted for Metal Vapor Studies

"Experience in the Use of a Serial Mass-Spectrometer for Studying Vaporization of Substances With High-Vaporization Temperatures," by P. A. Akishin, L. N. Gorokhov, O. T. Nikitin, and Yu. S. Khodeyev, Chemistry Faculty of the Moscow State University; Moscow, Pribery i Tekhnika Eksperimenta, No 4, Jul/Aug 60, pp 98-102

Descriptions are given of changes incorporated in a serial MS-3 mass-spectrometer (originally designed for isotope analysis) for its use in studies of vapors of substances with high-vaporization temperatures. The changes consist of the following: (1) an ion source equipped with an effusion chamber, the temperature of which is measured during tests; (2) a device to block entrance of the molecular beam into the ionization chamber and filter out background interference; (3) a high-sensitivity circuit for registering the ion current when operating with substances having low vapor pressure at testing temperatures. In a check test of the modified mass-spectrometer, the value for the heat of sublimation of silver was found to be 65.0 ± 0.9 Kcal/gram-atom in the temperature interval of 1,115-1,123^oK as compared to the accepted value of 64.5 Kcal/gram-atom.

CIA/PB 131891-T58

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Approved For Release 1999/09/08 : CIA-RDP82-00141R000100070001-7
REPORT

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145. Techniques in Metal Vaporization

"Techniques in the Vaporization of Metals in a Vacuum (A Review)," by M. I. Vinogradov; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul/Aug 60, pp 3-13

A study is made of techniques used in thermal vaporization of metals in a vacuum to obtain condensed films and coatings. Primary attention is devoted to apparatus and the operation of vapor sources of metals with high-vaporization temperatures. Most of the material in this review is of foreign origin. The main Soviet contribution is taken from the collection Eksperimental'naya Tekhnika i Metody Isslodovaniy pri Vysokikh Temperaturakh (Trudy Soveshchaniya 26-30 Iyunya 1956 g.) [Experimental Techniques and Methods of Investigation at High Temperatures (Works of the Conference of 26-30 June 1956)] and concerns the design and operation of a vaporizer.

146. Corrosion of Steels in Phosphoric Acid

"The Corrosion of Steels and Alloys in Extraction [Extracted] Phosphoric Acid," by Ye. V. Zotova; Moscow, Khimicheskaya Promyshlennost', No 4, Jun 60, p 65 (329)

Corrosion tests (100 hours) were conducted under laboratory conditions on various steels and alloys in two solutions of phosphoric acid (32 percent P_2O_5 , 1.89 percent F, 2.2 percent SO_3 at 90 deg and 55 percent P_2O_5 , 0.8 percent F, 4.5 percent SO_3 at 105-110 deg) in liquid and vapor phases. Nickel-silicon alloys N30S5 and N60B5 have unsatisfactory corrosion resistance in both solutions. High corrosion resistance was noted for steels: 1Kh18N9T, Kh27N10, and particularly Kh16N14M2B, Kh23N10M3, Kh23N18M3, Kh27N10M3, Kh27N18M3, Kh23N10M3D3, Kh27N10M3D3, Kh23N18M3D3, Kh27N18M3D3, Kh20N28M3D3, and Kh23N28M3D3. Cast steels Kh23N23M3D3 and Kh23N28M3D3 also have a high corrosion resistance in both the liquid and vapor phases of the above solutions. Among the cast alloys, chromium cast iron 32T and 17Kh32T and chromium-molybdenum cast iron 10Kh29M3T and 23Kh33M3T have considerable greater resistance than alloys of the sormite type (42Kh30N8S3 and 30Kh30N8S3M3).

Steel mixer blades of an extractor were also tested for corrosion rates (grams per square meter per hour) in a suspension of extracted phosphoric acid (26-32 percent P_2O_5 , up to 2.5 percent SO_3 and 1.8 percent F) and suspended gypsum crystals at 84-90 deg C with a 1:2.5 ratio of liquid to solids. The corrosion rates vary from 9.60 for Kh23N18D2T to 0-0.7 for Kh23N28M3D3T and Kh18N28M3D3.

For apparatus used in the production of double superphosphates, austenitic steels Kh18N12M2T (EI-448), Kh23N28M2T (EI-628), and Kh23N28M3D3T (EI-629 or EI-943) are recommended.

Production Metallurgy

147. Explosive Forming of Sheet Metal at Khar'kov Aviation Institute

"Pressing of Sheet Material With a Gas Piston," by N. D. Lebedyanskaya and A. N. Zaytsev, Khar'kov Aviation Institute; Moscow, Izvestiya Vysshikh Uchebnykh Zavedeniy, Mashinostroyeniye, No 7, 1960, pp 87-95

A method is described for calculating the process of stamping sheet metal shapes by means of a gas piston (explosive forming), including the calculation of the required pressure and size of charge to produce the necessary pressure distribution on the work during the explosion. The method was tested by experimentation and showed an agreement of theoretical and empirical data which is satisfactory for practical purposes.

148. Applying Electric Current to Facilitate Machining of Stainless EI607A

"Improving the Workability of the Heat-Resistance Alloy EI607A During Machining," by V. N. Verezub, Khar'kov Aviation Institute; Moscow, Izvestiya Vysshikh Uchebnykh Zavedeniy, Mashinostroyeniye, No 7, 1960, pp 101-106

Results are given of a study of the machining of EI607A stainless under normal conditions and with an applied electric current (50-400 amps per square millimeter), with particular attention to the durability of the tool, the cleanness of the machined surface, and the temperature of the tool during the machining operations. The study led to the following conclusions: The workability of EI607A is improved by the application of an optimal current 200-300 amps per mm²) in the cutting area. Depending on feed and cutting rates, the same conditions improve the tool durability up to a factor of three; chip formation is noticeably improved; the cleanness of the machined surface is improved; the accretion of chip is eliminated; and vibration during machining is reduced within a certain limited cutting regime.

The application of current during machining can be used as preliminary machining process of EI607A under industrial conditions.

149. Optimum Machining Methods for a High-Silicon Alloy

"Study of the Workability of the Alloy S-15," by S. P. Shabashov and L. V. Poluyatova, Ural' Polytechnic Institute; Moscow, Izvestiya Vysshikh Uchebnykh Zavedeniy, Mashinostroyeniye, No 7, 1960, pp 129-138

Information is given on the relative workability and machinability of alloy S-15 by different methods. Relationships are established for the rate of removal of metal, the life of grinding wheels, and the parameters of grinding operations. S-15 contains 0.5-0.8 percent carbon, 14.5-16.0 percent silicon, 0.3-0.8 percent manganese, up to 0.1 percent phosphorus, and up to 0.07 percent sulfur; its melting point is 1,195 deg C, and its specific weight, 6.9; its bending strength is 23.3 kilograms per square millimeter. It has a high chemical stability, is produced in accordance with GOST standard 2233-43, is known in the USSR as "ferrosilid," and is used by the Sverdlovsk Pump Works.

The study showed that the best method of grinding S-15 is with grinding wheels of "KZ" silicon carbide with ceramic binder, a hardness of CM₁, and grain size of "46-60."

150. Electroslag Refining of High-Temperature Steels and Alloys

"Improvement in the Weldability of Austenitic Steels and Alloys as the Result of Electroslag Refining," by B. I. Medovar, Institute of Electric Welding imeni Ye. O. Paton, Academy of Sciences UkrSSR; Moscow, Svarochnoye Proizvodstvo, No 10, Oct 60, pp 16-18

Comparison tests were conducted on steels EI725 (Kh15N35V5T) and EI726 (Kh13N18V2Br) (before and after double electroslag refining) and alloy EI437B (Kh20N80T3Yu) (before and after single electroslag refining) to determine the effectiveness of the electroslag refining process as a measure to combat hot cracking in weldments of these materials.

The apparatus consists of a water-cooled crystallizer containing a certain quantity of nonoxidizing fluoride slag into which the tip of an electrode made of the material to be refined is immersed. After the arc is struck, droplets of metal from the consumable electrode pass through the slag layer where they are subjected to a refining action and then accumulate on the bottom of the crystallizer. The electrode moves upward as the level of metal rises, while at the same time crystallization of the metal proceeds in an axial direction (from top to bottom). The consumable electrode and slag surface are protected by an argon atmosphere.

It is claimed that it was just recently that studies were made of the electroslag refining process as a method of improving the deformability of austenitic alloys and steels and that very good results were obtained. It is also claimed that weldments made of metal refined by this process show high stability to hot crack formation. Although boron losses occur due to oxidation in this process, it is considered beneficial as it eliminates the cause of hot cracking, and at the same time, the heat resistance of the metal is either higher or remains unchanged. No data are given.

151. Determination of Free Boron in Boron Carbide, Boron Nitride, and Alloys on Their Basis

"Determination of Free Boron in Boron Carbide, Boron Nitride, and Alloys on Their Basis," by Ye. Ye. Kotlyar and T. N. Nazarchuk, Institute of Powder Metallurgy, Cermets, and Special Alloys, Academy of Sciences Ukrainian SSR, Kiev, Moscow, Zhurnal Analiticheskoy Khimii, Vol 15, No 2, 1960, pp 207-210

A method has been developed for determining free boron in boron carbide and boron nitride. The method is based on the oxidation of free boron with a mixture of perhydrol and nitric acid, while the boron combined in carbide or nitride is not oxidized. The determination of free boron ends in titration with alkali in the presence of invert sugar.

152. Investigation of the Ageing of Duralumin by the Nuclear Magnetic Resonance Method

"Investigation of the Ageing of Duralumin by the Nuclear Magnetic Resonance Method," by V. S. Pavlovskaya, V. N. Podd'yakov, and B. N. Finkel'shteyn, Moscow Steel Institute imeni I. V. Stalin; Sverdlovsk, Fizika Metallov i Metallovedeniye, Vol 10, No 3, Sep 60, pp 346-349

The method of nuclear magnetic resonance has been applied in the investigation of the ageing of duralumin. The intensity, width, and shape of the nuclear magnetic resonance lines were measured. Data were obtained concerning the influence exerted by the quadruple effect on the parameters of the resonance lines. Qualitatively, conclusions were drawn concerning the distortions of the crystal lattice produced by regrouping of atoms of the constituents in the process of the breakdown of the solid solution.

153. Controversial Data on Constitution of Binary Alloys

"New Thermodiffusion Data on the System Chromium-Molybdenum," by D. A. Prokoshkin and O. I. Sidunova, Moscow Higher Technical School; Moscow, Izvestiya Vysshikh Uchebnykh Zavedeniy, Mashinostroyeniye, No 5, 1960, pp 101-105

A metallographic analysis revealed a phase recrystallization during the diffusion of chromium into molybdenum at 1,400 deg C in a vacuum furnace. This indicates that there exists in the system Cr-Mo in the solid solution a region with special structure and properties, a region not heretofore revealed. The presence of this region is also confirmed by other analyses. It is thus concluded that chromium and molybdenum in the solid solution do not form the continuous series of solid solutions described in the literature.

154. Bauschinger Effect on EI-437B Alloy Under Cyclic Stress

"The Bauschinger Effect for the Alloy EI-437B During Cyclic Deformation in a Wide Temperature Range," by S. V. Serensen and P. I. Kotov, Moscow Aviation Technological Institute; Moscow, Izvestiya Vysshikh Uchebnykh Zavedeniy, Mashinostroyeniye, No 5, 1960, pp 65-74

Results are given of an investigation of the Bauschinger effect in alloy EI-437B during cyclic loading at both normal and elevated temperature. The nature of the elastic imperfections of this alloy at high temperatures is demonstrated, and a rapid stabilization of the Bauschinger effect during cyclic deformation is established. The test temperatures used were 20, 700, and 800 degrees centigrade. The elastic-plastic deformations were produced on a stand described earlier (Zavodskaya Laboratoriya, No 3, 1960), and the deformations were measured with an instrument described by Ivchenko and Kotov (Izv. Vuzov., Mashinostroyeniye, No 12, 1957).

155. New State Standard (GOST) for Welding Wire

"GOST for Steel Welding Wire" unsigned article; Moscow, Byulleten' Stroitel'noy Tekhniki, No 9, Sep 60, pp 14-15

Certain specifications are presented from GOST 2246-60 concerning the physical properties, dimensional tolerances, packing, and shipping (chemical compositions not included) of cold-drawn steel welding wire. This new

standard, as approved by the Committee on Standards, Measurements, and Measuring Instruments of the Council of Ministers USSR, establishes technical specifications for welding wire of 5 grades of carbon steel, 23 grades of alloyed steel, and 28 grades of high-alloy steel in diameters ranging from 0.3 to 12 mm. GOST 2246-60 replaces GOST 2246-54 as of 1 July 1960.

VIII. PHYSICS

Atomic and Molecular Physics

156. Complex Spectral Band Structure

"Complex Structure of Excitation Functions of Spectral Bands of N_2^+ , CO^+ , and NO^+ Molecular Ions," by I. P. Zapesochnyy and S. M. Kishko, Uzhgorod State University; Moscow, Doklady Akademii Nauk SSSR, Vol 134, No 2, Sep 60, pp 311-313

It was attempted to obtain more accurate data on the character of optic excitation functions of diatomic molecules by carrying out experiments of electron-collision induced excitation of the band spectra of N_2 , CO , and NO emitted by neutral or singly ionized molecules. The relative band intensities were determined by means of photoelectric recording. The most probable explanation of maxima of fine structure should be found in different elementary processes of dissociation or ionization of diatomic molecules.

157. Hungarian Investigates the Role of Multi-Polar Interactions in the Van Der Waals Attraction

"The Role of Multi-Polar Interaction in the Van Der Waals Attraction," by Ferenc Berencz, Institute of Theoretical Physics, Szeged University of Science; Budapest, Magyar Fizikai Folyoirat, Vol 8, No 2, 1960, pp 83-94

The author demonstrates that dipolar-octopolar energy is of the same magnitude as quadrupolar energy, and, consequently, when approximative methods are used, both types of energy can be taken into account or omitted. It was further determined that in the expression of the perturbative energy in the interaction of two hydrogen atoms, the dipolar-quadrupolar energy amounts to 53 percent of the dipolar-dipolar energy; the quadrupolar-quadrupolar energy is 13 percent of the dipolar-dipolar energy, while the dipolar-octopolar energy amounts to 23 percent of the dipolar-dipolar energy.

158. Hungarians Investigate Splitting of d^n Terms in Strong Complex Fields

"The Splitting of d^n Terms in Tetragonal, Trigonal, and Rhomboid Shaped Strong Complex Fields," by Ferenc Gilde, Institute of Theoretical Physics, Szeged University of Science, and Miklos Ban, Institute of General and Physical Chemistry, Szeged University of Science; Budapest, Magyar Fizikai Folyoirat, Vol 8, No 2, 1960, pp 95-114

"The properties of the complex compounds of metals having d electrons are determined to a large extent by these electrons. From the d^n ($n = 1, 2, \dots, 10$) electron configurations, we prepared all the strong field configurations resulting from the effect of a tetragonal, trigonal, and rhomboid shaped strong complex field. We determined into how many and what kinds of irreducible states these configurations split as a result of the influence of the strong field. To achieve this, we evolved a procedure for the classification of the products of splitting. Since this procedure contains only set-theory considerations, it is precise."

Magnetohydrodynamics

159. Accelerating a Conducting Gas by Means of Traveling Magnetic Field

"On the Acceleration of a Conducting Gas With a Traveling Magnetic Field," by V. B. Baranov, Moscow; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye, No 4, Jul/Aug 60, pp 14-18

On the basis of the equations of magnetohydrodynamics, this work considers the one-dimensional problem of the acceleration of a conducting gas by a traveling magnetic field. Formulas are obtained and graphics plotted for the velocity distribution, density, pressure, and temperature along a channel for three cases: acceleration in a channel of constant cross section, isothermic acceleration, and acceleration in a slightly expanding channel. The case is also considered in which the magnetic field induced in the conducting gas can be neglected; viscosity is not taken into account.

An induction pump designed by the Institute of Physics of the Academy of Sciences Latvian SSR (Kirko, I. M., Elektrichestvo, No 4, 1959) transports liquid sodium by means of an inductor which produces a magnetic field which moves along the channel and is directed perpendicular to the direction of flow of the sodium. The relative motions of the magnetic field and the liquid generate a ponderomotor force which compels the liquid to move along the channel. The velocity of the propagation of the field can be increased by increasing the frequency of the current applied to the inductor.

This article investigates the possibility of using such a method to accelerate a slightly conducting gas at velocities on the order of 10-12 kilometers per second.

160. Magnetovorticular Annulus as a Model of Ball of Lightning

"The Magnetovorticular Annulus," by Yu. P. Ladikov, Moscow; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye, No 4, Jul/Aug 60, pp 7-13

A study is made of the existence and stability of a stationary plasmoid with a toroidal configuration. The vector velocity v and the magnetic field intensity H are considered to be colinear; thus $H \parallel v = \chi \sqrt{4 \pi \rho} v$, where χ is a certain constant scalar value, and ρ is the density of the fluid in the annulus.

The existence of a similar plasma configuration was described by V. D. Shafranov ("Magnetovorticular Annuli," ZhETF, Vol 33, No 3/9, 1957), but the solution was not analyzed thoroughly; the notion was merely expressed that such an annulus can be stable only when the velocity of the gas in the annulus is higher than the corresponding alfen velocity $v \geq H / \sqrt{4 \pi \rho}$, i.e., when χ is less than or equal to unity. Here it is shown that a similar magnetovorticular annulus, assuming the usual perturbation limits, can be stable even when χ is greater than unity. It is also established that, in a number of cases, the pressure inside the annular plasmoid can be considerably higher than that outside and, consequently, a considerable temperature can prevail inside. This gives reason to consider the magnetovorticular annulus a possible model of a ball of lightning. Such a model can explain a number of phenomena observed during the occurrence of balls of lightning (movement inside closed rooms, magnetization of metallic objects, etc. [Stekol'nikov, I. S., Fizika Molnii i Grozozashchita (Physics of Lightning and Lightning Protection), Moscow-Leningrad, 1943]).

The real value of such a model can be realized only after the question of the duration of its existence has been investigated and subjected to experimentation.

The work here was under the direction of L. I. Sedov.

161. Utilization of Carnot Cycle in Induction Pumps

"One-Dimensional Flow of an Electrically Conducting Gas With Constant Velocity in a Moving Magnetic Field," by Ye. I. Yantovskiy, Khar'kov; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye, No 4, Jul/Aug 60, pp 166-167

An earlier work (Val'dek, A. I., "Flows and Forces in a Layer of Liquid Metal of Plane Induction Pumps," Elektromekhanika, No 1, 1959) treated the flow of an incompressible electrically conducting liquid in a plane duct of finite width under the effect of a moving magnetic field which was induced by an alternating three-phase current flowing in the walls of the duct (applicable to induction pumps). Here an analogous approach is used to consider the partial case of a flow of an inviscous compressible gas with constant electrical conductivity. The method affords, in principle, the possibility of realizing a generalized Carnot cycle in the extraction of energy from a flow of gas by means of a moving magnetic field.

162. Magnetoaerodynamics for Quasi-One-Dimensional Flow

"On the Quasi-One-Dimensional Stationary Flow of a Compressible Conducting Gas in a Duct of Constant Cross Section in the Presence of Transverse Magnetic and Electrical Fields," by I. B. Chekmarev, Leningrad; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 3, May/June 60, pp 546-547

The equations of the quasi-one-dimensional stationary flow of a conducting gas are integrated for the partial case in which the force of the external electrical field is proportional to that of the magnetic field.

163. Hungarian Investigates Speed of Small Amplitude Waves and Weak Disruption Surfaces

"Small Amplitude Waves and Weak Disruption Surfaces in Magnetohydrodynamics," by Janos Szabo, Institute of Theoretical Physics, Lorand Eotvos University of Science, Budapest; Budapest, Magyar Fizikai Folyoirat, Vol 8, No 3, 1960,

CPYRGHT pp 175-186

"We summarized the most important characteristics of small-amplitude waves spreading in an ideal medium. We then demonstrated that the speed of weak disruption surfaces is the same as the speed of such waves. We also investigated the relationship between the characteristics of the basic equations of magnetohydrodynamics and weak disruption surfaces."

164. Perturbations in Two-Dimensional Magnetohydrodynamic Flows

"On the Distribution of Perturbations in Two-Dimensional Magnetohydrodynamic Flows," by M. N. Kogan, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 3, May/Jun 60, pp 530-536

In earlier works of the author (PMM, Vol 23, No 1, 1959; PMM, Vol 24, No 1, 1960), it was shown that in two-dimensional flows of an ideal gas with infinite electrical conductivity, there are either two or four valid characteristics, along which the ratios are determined. In computing the flows according to linear theory, it is necessary to know along which of these characteristics the perturbations decay as they recede from the body to infinity. Here a study is made of the distribution of the perturbations from discontinuities in the line of flow. It is shown that shock waves can emanate from angular protuberances. On the other hand, at angular depressions, a reverse flow can occur with waves of the Prandtl-Meyer type.

An analysis of the distribution of perturbations is applied to the study of the character of flow along bodies with the magnetic field at small angles of incidence in relation to the velocity of the approach flow.

Mechanics

165. Effect of Random Forces on Gyroscopic Instruments

"On the Motion of Gyroscopic Instruments Under the Effect of Random Forces," by Ya. N. Roytenberg, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 3, May/Jun 60, pp 463-472

The motion of shipboard gyroscopic instruments under conditions at sea generally has been treated under the assumption that the rolling and pitching of the ship occur in accordance with a sinusoidal law. In the works of A. A. Sveshnikov (Trudy 1-y Mezvuzovskoy Konferents. po Gidroskopii [Works of the First Inter-VUZ Conference on Gyroscopy], 1956), it is shown that the rolling and pitching of a ship can be considered a stationary random process, and the correlation function and spectral density of this process are given.

This article considers the motion of a strong gyroscopic stabilizer, of a two-dimensional gyroscopic pendulum, and of a gyroscopic compass under conditions of irregular ship motions; the dispersion of the angle of stabilization of the strong gyroscopic stabilizer and of the gyroscopic pendulum are determined, and an expression is derived which describes the intercardinal deviation of the gyrocompass.

166. One Form of Routh-Hurwitz Criteria for Stability Problems

"On One Form of the Routh-Hurwitz Criteria," by V. O. Kononenko, Moscow; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye, No 4, Jul/Aug 60, pp 125-128

This article considers a form of the Routh-Hurwitz criteria in which the geometric properties of the right sides of the equations of motion are explicitly reflected. The use of this form often leads to simpler and more descriptive results. It is assumed that a previous analysis of the problem of stability has indicated a direct application of the Routh-Hurwitz criteria. An example shows that the use of the criteria in the form described facilitates the solution of the stability problem and affords the possibility of establishing a connection with the stability of a degenerate system.

167. Secondary Resonances in Systems With Periodically Changing Parameters

"Constrained Nonstationary Oscillations in Linear Systems With Periodically Changing Parameters," by Ye. G. Goloskokov and A. P. Filippov, Khar'kov; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye, No 4, Jul/Aug 60, pp 129-131

The problem of the detection of the amplitudes of oscillations during the transition through resonance in linear systems with constant coefficients has been solved for the case in which the frequency of the perturbation forces is assumed to change in accordance with both linear and parabolic laws (Filippov, A. P., Kolebaniya Uprugikh Sistem [Oscillations of Elastic Systems], Kiev, 1956; Trudy Khar'kovskogo Politekhnicheskogo Instituta, Ser. Inzh-fiz., Vol 14, No 2, 1958; Izv. AN SSSR, OTN, No 12, 1958).

This article considers the transition through resonance of a system, the motion of which is described by a Mathieu equation with a right side. This corresponds to the case in which rods, plates, or shells are subjected to a transverse force with varying frequency in addition to a longitudinal force with a frequency of 2Ω . The good agreement of a usual solution of the problem and a solution obtained with the aid of the MPT-9 analog computer confirm theoretical conclusions regarding the existence, in systems with periodically changing parameters, of secondary resonances, the amplitudes of which can be considerable.

168. Pressure in Ideal Liquid for Near-Isentropic Case

"Determining the Pressure in a Half-Space of an Ideal Liquid for the Case of Approximate Isentropy," by A. G. Bagdoyev and E. M. Nersisyan, Institute of Mathematics and Mechanics, Academy of Sciences Armenian SSR, Yerevan; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye, No 4, Jul/Aug 60, pp 3-6

The pressure distribution is considered for a compressible ideal liquid, assuming pressure isentropy. The flow of the liquid behind the front of a shock wave is represented as a simple wave for the case of supersonic automodeling distribution along the boundary. The shock wave and the pressure on it are determined for these conditions. The same result is obtained by a geometrical representation of expansion waves produced at the boundary of the liquid. The pressure distribution at the shock wave is also determined for subsonic flow.

169. Simplified Theoretical Scheme for Determining Impact of Drops on Solid Surface

"On the Impact of Drops on a Solid Surface," by M. I. Khmel'nik, Moscow; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye, No 4, Jul/Aug 60, pp 180-181

A simplified theoretical scheme is considered for estimating the influence of the impact of drops on a solid surface, namely, the impacting of an infinite liquid cylinder on a solid surface, the liquid assumed to be ideal and incompressible. It is also assumed that, at the moment of impact, the cylinder is deformed in such a way that its cross section represents a semicircle. It is found that, if an elastic impact of a solid cylinder with the same dimensions and density were produced on a solid wall, the impulse would be greater than that of drops of liquid by a factor of only 3.4.

170. Motion of Vortex Under Surface of Liquid

"The Solution of the Problem of the Motion of a Vortex Under the Surface of a Liquid With Froude Number Close to Unity," by I. G. Filippov, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 3, May/June 60, pp 478-490

An approximate method is presented which affords the possibility of describing certain peculiarities of flow, on the basis of which a more rigorous solution can be devised.

171. Problem of Explosion Over the Surface of a Liquid

"On the Problem of an Explosion Over the Surface of a Liquid," by V. M. Kisler, Institute of Mechanics, Academy of Sciences USSR; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 3, May/June 60, pp 496-503

The problem is considered under the following assumptions: that the effect of the external explosion on the free surface can be substituted by a nonstationary pressure on a surface area changing with time; that the problem of the motions of the liquid is considered linear, in view of the great difference between the surfaces of the liquid and the gas; and that the liquid is incompressible, which is all the more valid an assumption, the lower the velocity of distribution of the shock wave along the free surface of the liquid in comparison with the velocity of sound in a real liquid.

172. Motion of Ideal Media During Point Explosion

"On the Properties of the Motion of Certain Ideal Media During a Point Explosion," by N. N. Kochina, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 3, May/June 60, pp 504-510

A point explosion is considered in an ideal medium, the properties of which are close to those of an ideal gas with an adiabatic index $\gamma = 7$. The unknown functions are expressed in terms of power series with respect to time, whereby the form of an arbitrary term of a series is determined.

173. BESM-1 Calculation of Problem of Flow Around Axially Symmetrical Body

"On the Calculation of the Flow Around Axially Symmetrical Bodies With a Receding Shock Wave on the Electronic Computer," by O. M. Belotserkovskiy, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 3, May/June 60, pp 511-517

The problem is set up to be solved by a method which would be uniquely applicable to the case of receding shock wave for both two-dimensional and axially symmetrical bodies of various configurations (smooth, irregular, combined), with various values of the adiabatic index $\chi (\chi > 1)$ and Mach numbers for the approach flow ($1 < M_{\infty} < \infty$). The two-dimensional problem was considered earlier by the author (PMM, Vol 22, No 2, 1958). The method and results of calculations for certain simple bodies (ellipsoid, sphere, disk) are given here. The BESM-1 calculation concerned the flow around ellipsoids of rotation (with relative vertical to horizontal

semiaxes $\delta = b/a = 0.5$ and $\delta = 1.5$), a sphere ($\delta = 1.0$), blunt-nose bodies ($\delta = \infty$) for various Mach numbers of the approach flow ($M_\infty = 3, 4, 6, 10, \infty$), $\chi = 1.40$, and in different approximations ($N = 1.2$).

Tables give numerical results of a calculation for flow around a sphere for $M_\infty = 4.0$ and $\chi = 1.40$ at $N = 2$.

174. Hypersonic Gas Flow With Exponential Shock Density

"On the Theory of Hypersonic Flows of a Gas With Exponential Shock Waves," by V. V. Sychev, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 3, May/June 60, pp 518-523

Two-dimensional and axially symmetrical hypersonic flows of a gas with exponential shock waves of high intensity are considered. On the basis of a study of the high-entropy portion of the flow at the surface of the body (subject to shock waves of given form), it is shown that the use, in flow problems, of explicit solutions for the corresponding non-stationary self-modeling motions of the gas necessitates a more accurate determination of the thickness of the high-entropy layer. A procedure is suggested for obtaining such a refinement and for plotting the configuration of the body, to which a pressure distribution, obtained on the basis of the theory of small perturbations, must be applied.

175. Water-Film Cooling of Cone in High Temperature Gas Flow

"Experimental Study of the Flow of an Evaporating Liquid Film Over the Surface of a Cone in a Gas Flow," by V. M. Polyayev, Moscow Higher Technical School; Moscow, Izvestiya Vysshikh Uchebnykh Zavedeniy, Mashinostroyeniye, No 5, 1960, pp 140-148

A study is made of a method of protecting a hot wall by applying a liquid film on its surface. The results are given of an experiment on the flow of a liquid film along the smooth surface of a cone in a high-temperature gas flow, and recommendations are made for producing a liquid (water) flow along the surface of the cone without separation.

Formulas are derived for determining the initial velocity of flow of a liquid (water) film in relation to the velocity of the gas flow. The installation described and illustrated by a flow chart produced gas flows of 150-450 meters per second and temperatures (friction) of 600-1,250 degrees centigrade.

176. Flows of Physically Different Gases Past and Through a Porous Sheet

"Study of the Laminar Boundary Layer on a Porous Sheet With Heat and Mass Transfer Taken Into Account," by V. S. Avduyevskiy and Ye. I. Obroskova, Moscow; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye, No 4, Jul/Aug 60, pp 25-34

A study is made of the laminar boundary layer on a porous flat sheet around which a compressible gas flows and through which a second gas is forced with physical properties different from those of the main flow. In the treatment of the basic differential equations, the expression for the diffuse flow, neglecting thermal diffusion, is taken from Hirschfelder and Curtis (Molecular Theory of Gases and Liquids, John Wiley and Sons, N.Y., 1955).

177. Atomization of Liquid Jet in Gas Flow

"On the Influence of the Atomization of a Liquid Jet, Introduced Into a Gas Flow, on the Flow Parameters Behind the Mixing Zone," by S. D. Malyuzhenets, Moscow; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye, No 4, Jul/Aug 60, pp 19-24

The problem of the influence of the fineness of atomization of a liquid jet injected into a one-dimensional gas flow on the flow parameters in the zone where the velocity of the gas and of the liquid pellets can be considered equalized is solved by introducing into the equations of conservation of energy a term which defines the surface energy at the boundary between liquid and gas. To simplify the calculations, the solution is obtained under the assumption that the velocity of the liquid in the jet can be neglected. The results of the calculations show that the breakdown of the jet into droplets has practically no influence on the flow in question, if the mean radius of the atomized particles is greater than 10^{-6} cm.

178. Heat-Exchange in the Two-Dimensional Problem of a Gas Lubricant

"Computing the Heat-Exchange in the Two-Dimensional Problem of a Gaseous Lubricant," by A. I. Snopov, Mordovskiy State University, Saransk; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye, No 4, Jul/Aug 60, pp 35-40

The case of a two-dimensional motion of a viscous gas between two rotating coaxial cylinders was treated by L. G. Stepanyants (Trudy LPI, Energomashinostroyeniye, Tekhnicheskaya Gidromekhanika, No 5, 1953) and

G. L. Grodzovskiy (PMM, Vol 19, No 1, 1955). This work presents a study of the motion of a viscous gas between two noncoaxial cylinders, assuming the gap between the cylinders to be small. The Reynolds equation (see N. A. Slezkin, Izv. AN SSSR, OTN, Mekhanika i Mashinostroyeniye, No 2, 1959) is used as a basis for the study, which provides an approximate solution of the problem for calculation in practice.

179. Capacitive Probe for Measuring Nonstationary Short-Lived Heat Flows

"Capacitive Method of Measuring Nonstationary Short-Lived Heat Flows," by N. A. Anfimov and A. P. Shevtsov, Moscow; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye, No 4, Jul/Aug 60, pp 163-165

A description is given of a method of measuring nonstationary heat flows down to 10 microseconds duration by means of a capacitor with silver films as plates and a ceramic dielectric. The method is based on the determination of three factors: (1) the change of capacitance with time (determined by oscillograph); (2) the density and specific heat of the dielectric, and a beta-factor, a constant which characterizes the dielectric material; and (3) the thickness of the dielectric (determined during the preparation of the device). The best dielectric for the purpose was prepared by the Laboratory of the Physics of Dielectrics of the Institute of Physics, Academy of Sciences USSR. In samples containing 90.4 percent SrTiO_3 plus 9.6 percent $\text{Bi}_2\text{O}_3 \cdot 3\text{TiO}_2$ and 96.5 percent SrTiO_3 plus 3.5 percent $\text{Bi}_2\text{O}_3 \cdot 3\text{TiO}_2$, the beta-factors were 3.20×10^{-3} and 4.51×10^{-3} , respectively. For the first sample, the density was 5.33 grams per cubic centimeter, and the specific heat, 0.130 plus-minus 0.005 calories per gram/degree.

180. Vortex Separation in Supersonic Flow Around Rectangular Wing

"On the Lift of a Rectangular Wing in a Supersonic Flow With Vortex Separation," by M. D. Ustinov, Moscow; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Mekhanika i Mashinostroyeniye, No 4, Jul/Aug 60, pp 174-175

A recent article by Mangler and Smith ("A Theory of the Flow Past a Slender Delta Wing With Leading Edge Separation," Proc. Roy. Soc., Ser A, Vol 251, 1959) treats the problem of the influence of vortex separation by a method analogous to that published earlier by the author (Izv. AN SSSR, OTN, No 9, 1958).

In the solution of formulas given here, the value of the lift, in the presence of vortex separation, is about 85 percent that given in accordance with linear theory. This discrepancy results from the substitution of a flow of an incompressible liquid in place of the actual flow of a gas. It is shown that the influence of the vortex separation in the flow regions considered is considerable and must be taken into account.

181. Copy of Hall's Tetrahedral Press Tested

"Concerning Hall's Tetrahedral Press for Obtaining Pressures up to 100,000 Atmospheres at a Temperature up to 2,000°C," by L. F. Vereshchagin, V. A. Galaktinov, and V. V. Popov, Institute of High Pressure Physics, Academy of Sciences USSR; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul/Aug 60, pp 106-109

An analysis is made of the construction and operation of a tetrahedral press which was built on the basis of Hall's design for investigating a method of obtaining pressure up to 100,000 atmospheres at a temperature up to 2,000°C. It was established that it was possible to maintain a pressure of up to 70,000 atmospheres in a substance at a temperature up to 2,000°C for a period of several hours. Hall's design was conceded to be sound, but certain difficulties were encountered in synchronizing the movement of the four hydraulic cylinders, in anvil binding, and in finding the proper anvil material which limited achieving pressures above 80,000 atmospheres.

182. General Plasticity Theory

"Questions of the General Theory of Plasticity," by A. A. Il'yushin, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 3, May/Jun 60, pp 399-411

The article elaborates certain aspects of earlier work of the author regarding the connections between stresses and small deformations in complex media (Prikladnaya Matematika i Mekhanika, Vol 18, No 6, 1954, pp 641-666; Acta Mechanica Sinica, Vol 3, No 3, 1959, pp 191-206). The discussion includes an isotropy postulate; isomorphism; certain consequences of the isotropy postulate; elastic-plastic properties in the case of loading along a broken straight line (with one point of discontinuity); deformation anisotropy and expressions of elastic deformation through stress; and the surface of loading, secondary plastic deformation, and certain partial cases.

Nuclear Physics

183. Accelerated Relaxation

"Relaxation of Elastic Stresses Under Neutron Irradiation,"
by S. T. Konobeyevskiy; Moscow, Atomnaya Energiya, Vol 9,
No 3, Sep 60, pp 194-200

The author discusses results of testing the effect of neutron irradiation on the relaxation of elastic stresses in flat springs from alloys of uranium and molybdenum and on the relaxation of microstresses which cause broadening of lines in the X-ray diagrams of rolled uranium. Theoretical and experimental data are compared.

184. Measurement of Neutron Age

"Measurement of Neutron Age in Graphite by a Pulse Method,"
by Z. Dlougy, Institute of Nuclear Problems CzSAN, Prague;
Moscow, Atomnaya Energiya, Vol 9, No 3, Sep 60, pp 182-188

The method of a pulse source, located in a prism, was used for measurement of thermal neutrons from reactions d-d and d-t in graphite. The ratio of thermal neutron density to time was used for computing the effective age of d-d neutrons $\tau_{\text{eff}} = 355 \pm 9 \text{ cm}^2$, converted to graphite density, equal to 1.6 gr/cm^3 . The slowing down of d-t neutrons in graphite may be approximately expressed by means of two groups of neutrons: neutrons which underwent at slowing down only one inelastic collision ($\tau_{\text{eff}} = 600 \text{ cm}^2$) and neutrons which underwent several inelastic collisions ($\tau_{\text{eff}} = 240 \text{ cm}^2$). For determining the age τ the relative contribution of both groups was assumed at, respectively, 0.65 and 0.25. The third group consists of neutrons slowed down only by elastic collisions. These neutrons may, in first approximation, be neglected because their contribution is small (about 0.1) and their age high.

185. Beam Storage

"High Frequency Beam Storage in Cyclic Accelerators," by
A. N. Lebedev; Moscow, Atomnaya Energiya, Vol 9, No 3,
Sep 60, pp 189-193

In the theory of high-frequency beam storage in accelerators with a constant magnetic field, the taking into account of perturbations of the stored beam by the consecutive acceleration cycles is of importance. The perturbation is basically reduced to an increase of energy scattering of the stored particles and to a variation of the mean energy. The general setting of the problem is presented and some particular solutions given.

186. Synchrotron Oscillations

"Experimental Study of Electron Oscillations in Cyclic Accelerators," by E. A. Korolev, A. G. Yershov, and O. F. Kulikov, Moscow State University imeni Lomonosov; Moscow, Doklady Akademii Nauk SSSR, Vol 134, No 2, Sep 60, pp 314-317

An experimental study of electron oscillations was carried out on the synchrotron C-60 of the Physics Institute imeni Lebedev of the Academy of Sciences USSR. The synchrotron is of the race-track type with a maximum energy of 660 Mev. Its characteristic data are: $R = 198$ cm; $H_{max} = 11000$ oersted; the magnetic field drop exponent $n = 0.655$; and acceleration time $t = 0.6$ sec. The peculiarity of this synchrotron is its two-stage electron acceleration. In the first stage, the resonator accelerates the electrons up to 185 Mev. At 0.12-0.16 seconds after injection, this resonator is switched off and the electron bunch captured again into the synchrotron acceleration by a second resonator. The time interval between switching off and on of the resonators is called "recapture."

Experimental results were compared with theoretical formulas. The oscillation attenuation was found to be faster than by the adiabatic law, but slower than by the exponential formula.

187. Hungarians Develop New System for Measuring Diffusion Length of Neutrons.

"Measurement of the Diffusion Length of Neutrons," by Gyula Csikai and Kalman Dede, Atomic Nucleus Research Institute of the Hungarian Academy of Sciences, Debrecen; Budapest, Magyar Fizikai Folyoirat, Vol 8, No 1, 1960, pp 1-11

Authors developed a stationary system, using a small quantity of material, for determining the diffusion length of hydrogen-containing mediums. The serviceability of the system was controlled by measurement of the diffusion length of water. A result of $L = 2.73 \pm 0.08$ centimeters was arrived at which agrees well with the results of the most recent measurements, as well as the measurements made by the authors in a continuous medium. The system is especially suitable for investigating neutron diffusion parameters of organic moderators.

188. Hungarians Investigate Polarized Positrons.

"The Annihilation of Polarized Positrons in Magnetized Substances," by Istvan Lovas, Central Physics Research Institute, Budapest; Budapest, Magyar Fizikai Folyoirat, Vol 8, No 3, 1960 pp 187-197

As a result of measurements made after it was discovered that parity was not conserved, it was found that particles resulting from beta decay are longitudinally polarized. Knowing this, the author decided to investigate the annihilation of positrons in magnetized substances for two reasons: (a) to make a detailed study of said longitudinal polarization of positrons; (b) to learn about the electrons participating in the irradiation. The author first determined theoretically how the angle correlation function of annihilating radiation depends on the polarization of the positron and the electron. He then made a series of measurements using ferromagnetic iron (Armco), ferrimagnetic magnetite, and copper as the "annihilators."

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He concluded that:	"Positrons resulting from beta decay are longitudinally magnetized; the direction of polarization points in the direction of the positron pulse. The 3-d electrons also participate in the irradiation. The rate of 3-d electron participation is about 5 percent. The radius of the iron ion is 1 \AA ."
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189. Hungarian at Dubna Investigates the Adiabatic Magnetic Cooling Process

"The Adiabatic Magnetic Cooling Process," by Istvan Kirschner, Joint Institute, for Nuclear Research, Dubna; Budapest, Magyar Fizikai Folyoirat, Vol 8, No 2, 1960, pp 117-124

Some modern nuclear physics and solid body physical measurements require the establishment of very low temperatures ($T \leq 1^\circ\text{K}$). The procedure for bringing about said temperatures involves the adiabatic demagnetizing of paramagnetic salts having an initial temperature of about 1°K . We investigated the demagnetizing procedure, the temperature obtainable in the case of an ideal paramagnetic, and the problem of entropy and energy changes.

190. Hungarians Design Highly Efficient Boron Counter

"High BF_3 Counters Suitable as Detectors for Neutron Diffractometers," by Janos Gordon and Pal Szabo, Solid [state] Physics Laboratory, Central Physics Research Institute, Budapest; Budapest, Magyar Fizikai Folyoirat, Vol 8, No 3, 1960, pp 211-216

Authors constructed a Fowler-Tunncliffe-type BF_3 counter of the kind described in literature for use with neutron diffractometers. They also constructed counters of their own design. These differed from the Fowler-Tunncliffe type in that the cathode cylinder consisted of two metallicity connected parts and that the glass window was placed at the point of contact of the two parts. The main part of the cathode cylinder was filled with BF_3 , while the "attachment" part communicated with free air. As a result of this, there was practically no neutron absorption in the attachment. The main effect of the attachment was to make the electrical field in the vicinity of the glass window practically the same as it was deeper within the tube. Thus, the ionization was even in all parts of the main tube, and there was no appreciable counting loss.

Measurements showed that while the two counters were equal in most respects, the counters designed by the authors were 1.6 times more efficient than the counter built according to the Fowler-Tunncliffe specifications.

191. Conference Held on High-Energy Physics

"Conference of High Energy Physics" (unsigned item);
Magdeburg, Volksstimme, 19 Sep 60

The Sixth international working conference on high-energy physics was opened in Weimar on 18 September. The conference was attended by noted physicists from the Soviet Union, Bulgaria, Hungary, Poland, China, and East Germany. Organizer of the conference was the Nuclear Physics Institute of the German Academy of Sciences.

Solid State Physics

192. Luminescence of Alkali Halide Crystals

"Mechanism of Recombination Luminescence of Activated Alkali-Halide Crystals," by Ch. B. Lushchik, G. G. Lidyay, I. V. Yaek, and E. S. Tysler; Moscow, Optika i Spektroskopiya, Vol 9, No 1, Jul 60, pp 70-76

Experimental results are discussed of recombination luminescence and photochemical transitions in alkali halide crystals, activated by the ions Ga⁺, Ge⁺⁺, In⁺, Sn⁺⁺, Tl⁺, and Pb⁺⁺, at excitation by X-rays and photoexcitation in the region of exciton and activator absorption bands and "zone-zone" bands. The role of electron, hole, exciton, and sensitized processes was analyzed in recombination phosphorescence of this class phosphors.

193. Luminescence of Zinc Oxide

"Luminescence Properties of Selenium Activated Zinc Oxide," by L. Ya. Markovskiy and N. S. Orshanskaya; Moscow, Optika i Spektroskopiya, Vol 9, No 1, Jul 60, pp 77-82

Data on luminescent properties of zinc oxide activated by Se are presented. It is shown that Se introduction into ZnO provokes the appearance in the spectrum of cathodic luminescence of the specific band of wave length about 610 mu. The maximum brightness of this band may be observed in the case of a double zone luminophor containing 0.2% Se and having, besides the Se zone, a zone of super stoichiometric zinc.

194. Luminescence of M-Centers

"Light Absorption and Luminescence of M-Centers in a Macroscopic Approximation," by V. L. Vinetskiy; Moscow, Optika i Spektroskopiya, Vol 9, No 1, Jul 60, pp 64-69

Computations were carried out of absorption bands and luminescence for a model of M-centers in macroscopic approximation. The obtained results were used for attempting a macroscopic analysis of F₂⁺ centers in alkali halide crystals by means of the variational method.

195. Luminescence of Naphtalene

"Influence of Impurities on the Luminescence of Crystalline Naphtalene," by M. T. Shpak and Ye. F. Sheka; Moscow, Optika i Spektroskopiya, Vol 9, No 1, Jul 60, pp 57-63

Studies of the effects of impurity concentrations and of the temperature of the specimen on the luminescence spectrum of crystalline naphtalene were carried out. A series of test showed that molecules of beta and alpha methylnaphthalene, as well as of beta and alpha naphthol, form two types of emission centers in the case of imbedding into the crystalline lattice of naphtalene.

196. Radiation Receivers

"Threshold of Sensitivity of Radiation Receivers," by Ye. S. Ratner; Moscow, Optika i Spektroskopiya, Vol 9, No 1, Jul 60, pp 101-107

The relation of the threshold sensitivity of radiation receivers, determined by the fluctuations of efficiently absorbed quanta, to the value of the constant background and to some characteristics of the system receiver-amplifier-recorder was studied.

Theoretical Physics

197. Hungarians Evolve Stationary Solution to the Boltzmann Equation

"The Relativistic Boltzmann Equation and Its Stationary Solution," by Ivan Abonyi, Theoretical Physics Institute of the Lorand Eotvos University of Science, Budapest; Budapest, Magyar Fizikai Folyoirat, Vol 8, No 1, 1960, pp 13-20

The author supplemented the relativistic form given to the Boltzmann transport equation with a nonvariable impact integral. The stationary solution of the equation formed in this way was determined, and from this, the relativistic form of the Maxwell distribution of velocity was arrived at.

198. Hungarian Physicist Relegates Antigravity to Comic Strips

"Antigravity?" by Gyorgy Marx, Institute of Theoretical Physics, Lorand Eotvos University of Science, Budapest; Budapest, Fizikai Szemle, Vol 10, No 6, Jun 60, pp 163-

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"It is not surprising that when the hypothesis of antigravity was advanced in scientific circles, it created a great sensation. Some American aircraft manufactures even hastened to report successful progress in this field at their plants. By making a report on this interesting episode, we are complying with the expressed desires of our readers....

"Many researchers accept the hypothesis that the matter of the universe consists equally of ordinary matter and antimatter. In his hypothesis of 1957, Bondi, the English astronomer, tried to explain why the antiparticles separated from the ordinary particles to distant parts of the universe as follows: 'Gravitational attraction exists between ordinary particles and also between antiparticles. However, gravitational repulsion exists between ordinary particles and antiparticles.' This is the hypothesis of antigravity.... It is an attractive hypothesis and promises the possibility of a logical explanation of one of the interesting problems of the universe....

"However, the physicists had some reservations. They did not know what to do with those neutral particles in which there is no distinction between ordinary particles and antiparticles. Light and the neutral pion field are manifestations of such matter. The great mass of these can be neither positive nor negative. Can they be zero? Does the gravitational field neither repulse nor attract the photon? But we know that it is attracted: the light of the stars curves towards the sun!

"The clarification of antigravity is very important from the theoretical point of view because its existence would conflict with the strict proportionality of the heavy and inert mass on which the general theory of relativity is based.... However, this alone is not decisive proof that antigravity does not exist; it means merely that if its existence were proved, the geometric explanation of gravity would have to be discarded....

"Amidst all the speculation, L. I. Schiff came to the aid of the experimental physicists with his study, published in the bulletin of the American Academy of Science. In this, Schiff pointed out that as a result of the vacuum polarization of electric fields within an atom, a virtual cloud of electron-positron pairs is brought into being around every electrically charged particle; thus these electron-positron pairs also are involved in the mass and weight of the charged particles. If the weight of the positron were negative, this would spoil the proportionality of the heavy and inert mass at the seventh decimal place. However, Schiff

cited measurements made by Lorand Eotvos in 1911 according to which, in the case of aluminum-magnesium alloy, the proportionality of the two masses persisted to a degree 50 times more precise than this. Schiff concluded from the Eotvos experiment that the heavy mass of the positron had the same charge as the electron. The experiment of Eotvos disproves antigravity.

"Those who believed in antigravity refused to be convinced. They argued that the measurements were made long ago, in a strange country, and were perhaps inaccurate. At the present time, Dicke of Princeton University is preparing to repeat the Eotvos experiment, changing only the shape of the weight which is to be suspended from the torsion scale.

"When the question of antigravity arose in connection with anti-protons at the 1959 Kiev international conference on elementary particles, I spoke to Schiff. I told him that in 1935 in Budapest, Renner, a pupil of Eotvos, had repeated his master's experiment with an even higher degree of accuracy. He proved the proportionality of the heavy, inert mass to an accuracy of $2 \cdot 10^{-10}$ in the case of a copper-bismuth alloy. This means that not even a half-thousandth of the antigravitational effect can exist. According to Schiff, the Americans are not acquainted with the results of the Renner experiment. However, Schiff himself considered them absolute proof."

"Thus the dream vanished. Antigravity has left the pages of scientific periodicals and has joined perpetual motion and dreams of making gold as a curiosity in the history of science.... Scientists are still seriously debating the possibility of creating gravitational waves so inconceivably shallow that their effects are still undemonstrable today. But antigravity, as a means of transportation based on the possibility of reversing the gravitational force, has, for the time being, moved from the columns of the popular journals to those of the comic sheets."

IX. MISCELLANEOUS

199. Polish Academy Linked More Closely to National Economy

"The Polish Academy of Sciences as the Organizer of Scientific Work"; Budapest, Magyar Tudomány, Vol LXVII, No 9, Sep 60, pp 553-554

Dr Janusz Groszkowski, professor, Vice-President of the Polish Academy of Sciences, gave the editors of Magyar Tudomány the following information about the recently enacted Polish Sejm law dealing with the role and tasks of the academy.

As a result of the new law, the position of the academy will be greatly strengthened and more clearly defined. It will act as the rallying institution of scientists, the planner and coordinator of scientific tasks, and the supreme organ of the research institutes.

The academy will now draw up and submit a national research plan to the government. It will coordinate this research and exercise control over the implementation of the plan.

Since the academy is to become an advisory body to the government, it will work much more closely than hitherto with certain government authorities and ministries. This cooperation will take place at the scientific committee level. These committees were formerly chiefly scientific in character, but will now become the organs for plan preparation and research coordination. Consequently, representatives from other government bodies such as the State Planning Committee, the Economic Council, and the Technical Committee will serve on the scientific committees together with the scientists.

The result of their work will be processed by the scientific research planning and coordinating center. The final selection of the most vital problems from among the proposals submitted will be made by the planning and coordinating committee of the academy, which will submit its motion to the Presidium of the academy. Finally, the Presidium will transmit its recommendations to the government. The planning and coordinating committee will be made up of representatives from the Ministry of Higher Education, the State Planning Committee, the Technical Council, and other ministries.

According to the new law, the planning and coordinating function of the academy now extends to institutes which are not part of the academy. However, this does not mean that the academy will take over responsibility for the activity of institutes operating under the jurisdiction of the ministries. The ministries will retain jurisdiction over their own institutions despite the fact that the academy will coordinate some of their research work, given them assistance and advice and, when necessary, re-organize the research so that work will progress more rapidly and efficiently.

The fact that scientific research is being put at the service of the nation's current needs will not jeopardize the development of basic research: Over 70 percent of the research conducted by the institutions of the academy will be basic research; on the other hand, research conducted by institutions under the authority of the various ministries is to be 70 percent applied research and 30 percent basic. The type of research conducted by institutions of higher education will depend on the nature of the educational establishment concerned.

Research topics which are directly connected with economic needs as set forth in the economic plan are to be incorporated in the 1961-1965 national plan.

At the present time, research recommendations related to the state plan deal with 100 problems. Half of them belong in the field of exact and technical sciences. These research topics account for 30 percent of the research incorporated in the state plan. They will be treated as priority topics, centrally coordinated, and all phases of the research work are to be under central control.

Concentration on selected research topics will stimulate research in closely related fields: work on radioactive isotopes will promote geology, agriculture, and archeology; etc.

200. Hungarian Academy Revises Award System

"From the Life of the Hungarian Academy of Sciences";
Budapest, Magyar Tudomány, Vol LXVII, No 9, Sep 60,
p 551

At its 27 May 1960 meeting, the Presidium of the Hungarian Academy of Sciences modified the academy's system of awards. In the future, the academy will award prizes in the following four instances:

Prizes may be awarded to scientific workers who achieve outstanding results in the solution of some important scientific theme which is part of the plan at their place of employment.

By awarding prizes, the academy intends to promote the completion of scientific work the solution of which the academy considers important, although said work does not fall within the scope of the plans of institutes and institutions receiving special support.

A Presidium award may be granted to persons who perform outstanding scientific organizational or administrative work within or without the central organs and institutions of the academy, provided said work is in the interest of the realization of the goals of the academy. A small portion of this award may be set aside to reward achievements which, although significant, do not come up to the standard for the full Presidium award.

The Presidium of the academy may award annually a gold medal and a cash prize of 15,000 forints to regular and corresponding members of the academy who, in general, are not eligible for any of the aforelisted prizes.

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