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CENTRAL INTELLIGENCE AGENCY

SCIENTIFIC INFORMATION REPORT

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PLEASE NOTE

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

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Marine Biology

1. Chinese and Soviet Scientists Take Census of Chinese Marine Fauna

"A Preliminary Report on the Polychaete Fauna in the China Sea," by P. Uschakov, Institute of Zoology, Academy of Sciences, USSR, and Wu Pao-ling, Institute of Oceanography, Academia Sinica; Peiping, K'o-hsueh T'ungpao (Scientia), No 7, 11 Apr 60, pp 217-218

This item lists the Polychaeta found in the China Sea, noting their geographic distribution and abundance. The information was obtained from surveys of the marine fauna which were undertaken in 1957 and 1959 by the Sino-Soviet Marine Zoology Expedition and by the Institute of Oceanography of the Academia Sinica, respectively. The former covered the Yellow Sea, Gulf of Chili, and the coast of Hainan Island, while the latter surveyed the waters of the Gulf of Chili and the northern part of the Yellow Sea.

The authors cite five other papers written by them, which give more complete information on the surveys.

II. CHEMISTRY

Analytical Chemistry

2. Mechanism of Chromatographic Separation of Gases in Heat-Displacement Analysis

"Mechanism of the Chromatographic Separation of Gases in Heat-Displacement Analysis," by M. I. Yanovskiy, S. N. Oziraner, and Lu P'ei-chang; Leningrad, Zhurnal Prikladnoy Khimii, Vol 33, No 5, May 60, pp 1084-1091

Consideration of the mechanism of chromatographic separation of gases under the action of a moving homogeneous temperature field (heat-displacement analysis) indicated that at a sufficient length of the adsorption layer that state is stable at which every component forms an individual chromatographic band moving with a velocity equal to that of the displacement of the temperature field.

3. Polarography of Nitrates of Some Elements Employed in Nuclear Technology

"Concerning the Problem of the Polarography of Nitrates," by S. I. Zhdanov; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 4, Apr 60, pp 928-930

The view expressed by V. I. Gorokhovskaya, I. A. Korshunov, and N. I. Malyugina to the effect that polarographic reduction of the nitrate ion does not take place in the presence of multiple-charged cations is disputed. The author discusses the subject on the basis of data published by Gorokhovskaya in Trudy Kazanskogo Khimiko-Tekhnologicheskogo Instituta imeni S. M. Kirova, which were obtained in work dealing with the polarographic behavior of the nitrates of lanthanum, thorium, zirconium, niobium, and molybdenum, and an article published by Korshunov and Malyugina in Zhurnal Neorganicheskoy Khimii, No 4, April 1959, p 1077.

4. Conference on Organic Analysis in Moscow in Late 1960

"On the Conference on Organic Analysis" (unsigned article); Moscow, Zhurnal Obshchey Khimii, Vol 30, No 5, May 1960, back cover

The Commission on Analytical Chemistry of the Academy of Sciences USSR and the Chemistry Faculty of Moscow State University have proposed a conference on organic analysis for late 1960 in Moscow.

Reports on the following topics will be read and reviewed:

(1) Methods of organoelemental analysis.

(2) Methods for functional organic analysis and identification of organic compounds.

(3) The application of physicochemical methods (electrochemical, optical, chromatographic, and others) for the analysis of organic substances.

(4) Mass spectral methods of investigating organic substances.

(5) Radiochemical methods of the analysis of organic compounds.

Special attention will be devoted to the problem of analyzing high molecular compounds, various organic polymers, and express methods of analysis.

The exact date of the conference will be announced later.

Electrochemistry

5. Some Aspects of Electrochemical Sources of Electric Power and of Fuel Cells

"Electrochemical Sources of Electric Current," by Prof P. D. Lukovtsev (Moscow); Moscow, Priroda, Vol 48, No 12, Dec 59, pp 22-28

Electrochemical sources of electric power are relatively insensitive to external effects due to the temperature, shocks, vibration, moisture, etc. For this reason, electrochemical sources of current can be used to supply electric power in connection with many applications for which other sources of power are unsuitable. This includes applications on artifical satellites and pilot balloons (p 22).

At present there is considerable interest in continuously operating cells in which electrochemically active substances or the electrolyte are fed uninterruptedly into the reaction zone. The advantages of these cells comprise a low polarizability of the electrode, high efficiency, and a long useful life. Two instances of such cells are the chlorine-sodium cell and the hydrogen-oxygen fuel cell.

At present, two types of the hydrogen-oxygen cell have reached a stage of development which warrants the conclusion that they will actually be applied on a practical scale before long. One of these types is the so-called Bacon cell, which operates at a high pressure (50 atmospheres) and requires a temperature of 200° at the boundary between the porous nickel electrodes and the alkaline electrolyte. Although this type of cell is capable of generating a current of a fairly high density (0.6 ampere per cm^2), problems connected with its construction and operation are rather difficult to solve.

Of considerable interest is a hydrogen-oxygen cell of another type, which operates at a low pressure (1-2 atmospheres) and a temperature below 100 degrees. The electrodes in this type of cell are made of carbon which is activated with platinum or some other metal. A solution of potassium hydroxide is used as the electrolyte. Continuous operation of the cell is assured by reason of the fact that the water formed as a result of the reaction between the hydrogen and the oxygen evaporates as rapidly as it is formed. Although cells of this type generate less power than Bacon cells, they are more convenient from the standpoint of practical application.

It may be assumed that the hydrogen-oxygen cells, which have an efficiency 2-3 times greater than that of internal combustion engines, will replace the latter, for instance in railroad transportation. Such cells can be used for storing electric power produced by windmills, solar-light power installations, etc.

The hydrogen and oxygen which are required for the operation of such cells are produced by electrolysis.

The prospects of further and more extensive application of hydrogen-oxygen cells depend on various aspects of the production, transportation, and storage of hydrogen. Hydrogen-oxygen cells operate on hydrogen of a relatively high degree of purity. Of great importance would be development of cells capable of operating on hydrogen produced by the cracking of natural gas and also by the interaction of coal with water. From this standpoint attention should be paid to research on high-temperature fuel cells with a solid electrolyte that operate at temperatures above 500° and are capable of utilizing not only hydrogen but also other combustible gases, such as carbon monoxide, hydrocarbons, etc. An important

problem to be solved in the future will be the development of a reliably operating fuel cell (primarily one operating on gaseous fuel) that would make it possible to utilize to a greater extent the energy contained in fuels, specifically in natural gas (pp 27-28).

Fuels and Propellants

6. Ways of Increasing Energy Content of Hydrocarbon Fuels

"Ways of Increasing the Energy Content of Hydrocarbon Fuels," by Ya. B. Chertkov; Moscow, Khimiya i Tekhnologiya Topliv i Masel, Vol 5, No 4, Apr 60, pp 1-4

The problem of increasing the energy content of fuels to be used in gas turbine engines is considered. It is suggested in the light of the data presented that it is expedient to estimate the energy of hydrocarbon fuels on the basis of the heat of combustion developed by a unit volume only (i e., not on the basis of the heat of combustion per unit weight). The conclusion is made that the most effective way of increasing the energy content of hydrocarbon fuels is inclusion into their composition of the maximum quantity of aromatic hydrocarbons with a high density. It is necessary to expand work on improving the combustion characteristics of aromatic hydrocarbons in engines. One way of improving these characteristics would be the use of suitable additives to the fuels (e.g., isopropylbenzene hydroperoxide, indium laurate, certain copper compounds). The conclusions made by the author are based on results obtained in investigating fractions of USSR crudes boiling in the range of 100-300°.

7. Effect of Temperature on Flash Back of Laminar Flames

"The Effect of Temperature Conditions on the Flash Back of Laminar Flames," by F. B. Moin and V. U. Shevchuk; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 4, Apr 60, pp 932-934

The effect of the temperatures of the mixture and of the tube wall on the flash-back velocity (mean velocity of the gas during the flash back) was investigated for methane-oxygen mixtures. It was established that at a constant temperature of the wall the flash-back velocity increases with increasing temperatures of the mixture both for mixtures rich in methane and those poor in methane. As far as the effect of the temperature of the wall is concerned, there is a pronounced difference between poor and rich mixtures: the extinguishing effect produced by the wall is much greater in the case of poor mixtures than that of rich mixtures. In the case of poor mixtures, the effect of the wall in extinguishing

the flame is due to heat conduction from the mixture into the wall. When the temperature of the wall increases, the flash-back velocity also increases. In the case of rich mixtures, the extinguishing effect of the wall is due to diffusion of radicals from the flame to the wall and destruction of these radicals at the wall. Because the rate of diffusion of radicals is independent of the temperature of the wall, the flash-back velocity is not affected by the wall temperature.

Investigation of the effects of temperatures of the mixture and wall on the flash-back velocity will be continued, using different combustible mixtures.

8. Predetonation Propagation of Flames in Rough Tubes

"The Mechanism of the Predetonation Propagation of Flames in Rough Tubes," by V. S. Babkin and L. S. Kozachenko, Institute of Chemical Kinetics and Combustion, Siberian Branch of the Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 131, No 3, 21 Mar 60, pp 591-592

The purpose of the investigation described was study of the combustion mechanism and of the structure of accelerating flames in the predetonation period in rough-walled tubes under conditions when the propagating detonation wave is accompanied by adiabatic ignition of the gas because of compression in the detonation wave. Three stages could be differentiated in the predetonation period: (1) brief propagation of a laminar flame after ignition of the mixture; (2) combustion in turbulent flow; (3) combination of a shock wave with a turbulent flame. In the third stage ignition of the mixture takes place at the rough walls in the vicinity of the wave front. The combustion process was investigated by the photographic method. It was established that the mechanism in question remains unchanged within a wide range of different degrees of roughness of the tube walls.

9. Measurement of Temperature of Detonation Front of Explosives

"Measurement of the Temperature of the Detonation Front of Explosives," by I. M. Voskoboynikov and A. Ya. Apin, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 130, No 4, 1 Feb 60, pp 804-806

By measuring the brightness of the light emitted by the detonation front of transparent liquid and semiopaque solid explosives (on the assumption that the emission characteristics of the detonation front correspond to those of a black or gray body), the temperatures of the

detonation front of a number of explosives were determined. The following detonation front temperatures were found: nitroglycerin -- 4000°K; nitroglycol -- 4400°K; methylnitrate -- 4500°K; nitromethane -- 3700°K; tetranitromethane -- 3100°; hexogen (RDX) -- 3700°K; ten (pentaerythritol tetranitrate) -- 4200°K; dina -- 3700°K.

10. Effects of Branching and Chain Breaking on Chain-Thermal Propagation of Flames

"On the Chain-Thermal Propagation of Flame; Part 4 -- The Effects of Branching and of the Breaking of Chains," by L. A. Lovachev, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR -- Otdeleniye Khimicheskikh Nauk, No 4, Apr 60, pp 645-650

Relationships have been derived for determining the velocity of flame propagation under consideration of the effects produced by the velocity of linear branching and the breaking of chains, the rate of quadratic breaking of chains, the rate of generation of chains, heat conductivity, and the coefficient of diffusion of the active center. It follows from the relationships derived that the influence of the quadratic breaking of chains on the velocity of flame propagation increases with lower combustion temperatures and lower values of the ratio of the product of heat capacity, density, and diffusion coefficient to the heat conductivity. When this ratio drops or the concentration of the active center is lowered at the combustion temperature, the effects of linear branching and chain breaking on the velocity of flame propagation increase, because there is a relative reduction of the number of active centers brought in by diffusion. By applying the relationships that have been formulated to two cases of hydrazine decomposition flames, calculations have been carried out which illustrate the effects of quadratic breaking and linear branching of chains on the velocity of flame propagation.

11. Temperature of Initial Foci of Heating Following Initiation of Explosion by Blow

"The Temperature of Initial Foci of Heating Following Initiation of an Explosion by a Blow," by V. K. Bobolev and L. G. Bolkhovitinov, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR -- Otdeleniye Khimicheskikh Nauk, No 4, Apr 60, pp 754-755

A method is proposed for calculating the initial temperature of foci of heating (hot centers) that form on initiation of an explosion by a blow. On the basis of experimental data, the initial temperatures of foci of

heating forming in connection with the initiation of explosions in ten (pentaerythritol tetranitrate), hexogen (RDX), and octogen were calculated and found to be 320°, 470°, and 500°, respectively.

12. Ignition in Flow

"Ignition in Flow," by S. A. Gol'denberg, Power Engineering Institute imeni G. M. Krzhizhanovskiy, Academy of Sciences USSR; Minsk, Inzhenerno-Fizicheskiy Zhurnal, No 3, Mar 60, pp 28-35

As a result of the analysis of the process of ignition in a flow, on the basis of the theory of a boundary layer, it is possible to make an approximate generalization of the solution of a number of problems and describe from a single point of view the process of ignition by incandescent bodies, stabilization of a flame by bodies of nonstreamlined form, and stabilization of a flame by a stream.

13. Combustion of Methane

"Combustion of Methane," by G. K. Sobolev, Power Engineering Institute imeni G. M. Krzhizhanovskiy, Academy of Sciences USSR; Minsk, Inzhenerno-Fizicheskiy Zhurnal, No 3, Mar 60, pp 129-131

The combustion of methane in weak CH_4 - O_2 - N_2 mixtures in an open Bunsen burner was investigated. The kinetic order of combustion of methane was established by the Zel'dovich-Biarskiy method according to oxygen. The energy of activation of the combustion process was found to be equal to 31,400 cal/mol.

14. Measurement of Velocity of Radiating Jet

"The Measurement of the Velocity of a Radiating Jet," by G. I. Strelkov and O. I. Yas'ko; Minsk, Inzhenerno-Fizicheskiy Zhurnal, No 5, May 60, pp 93-95

An application is described of the time magnifying glass "ZL-1" for the measurement of the velocity of a radiating stream by the photo scanning method. A formula for the determination of the jet velocity and data of measurements are given. The relationship between rate of flow and distance from the nozzle is plotted. Data are presented showing the average of 45 measurements for each section. The merits of the method include simplicity of apparatus and of analysis of measurement data; its shortcoming is that only velocity of unstable flows in which fluctuations of brightness are observed is measured.

15. Effect of Pulsations of Flow Rate on Evaporation of Drops of Fuel

"The Effect of Pulsations of Flow Rate on the Evaporation of Drops of Fuel," by R. S. Tyulpanov, Central Scientific Research Boiler and Turbine Institute imeni I. I. Polzunov (Leningrad); Minsk, Inzhenerno-Fizicheskiy Zhurnal, No 5, May 60, pp 119-123

The article considers the question of the effect of velocity pulsations on mass exchange between a stream and particles of fuel. An approximate theoretical solution is obtained for the rate of evaporation of drops of fuel in a gas flow. The accuracy of solution for large drops is completely satisfactory.

Herbicides

16. Synthesis of New Herbicides With High Yields

"Research in the Furan Series. Report V. Synthesis of Derivatives of the N-Trichloromethylmercaptoimide of 3,6-Endoxohexahydrophthalic Acid," by Yu. K. Yur'yev and N. S. Zefirov, Moscow State University; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 3, Mar 60, pp 855-859

Compounds containing the $>N-SCCl_3$ group, namely N-trichloromethylmercapto-imides, -oxazolidinediones, and -thiazolidinediones, are known to be effective as fungicides, insecticides, and germicides. It is also known that 3,6-endoxphexahydrophthalic anhydride and several of its derivatives are used as herbicides, insecticides, and especially as defoliants.

Since the activity of N-trichloromethylmercapto compounds depends on the presence of the $-S-CCl_3$ group, the authors became interested in obtaining compounds containing both this grouping and the 3,6-endoxocyclohexane group, and accordingly synthesized several N-trichloromethylmercaptoimides of 3,6-endoxohexahydrophthalic acid and related acids.

It is known from the American patent literature that N-trichloromethylmercaptoimides can be prepared by the reaction of perchloromethylmercaptan with salts on the imides in a neutral solvent or with an aqueous alkaline solution of the imides at a low temperature (0-30°C) to avoid hydrolysis of the imides.

Both variants of the synthesis were used. The authors established that the reaction between the perchloromethylmercaptan and the aqueous alkaline solution of the imide of 3,6-endoxohexahydrophthalic acid or its derivatives leads to the formation of the corresponding N-trichloromethylmercapto derivatives of this series with a high yield (80-90%). In this manner, the superfluous stage of the preparation of the imide salt is avoided.

Industrial Chemistry

17. USSR Conference on Nonchemical Methods of Water Treatment

"A Scientific-Technical Conference on Methods of Water Treatment Without the Use of Reagents," by M. S. Shkrob, Doctor of Technical Sciences, and I. F. Shapkin, Candidate of Technical Sciences; Moscow, Teploenergetika, Vol 7, No 1, Jan 60, pp 94-96

Nonchemical methods of water treatment, including the magnetic, electromagnetic, electrostatic, high-frequency, and ultrasound methods, are being applied to some extent outside the USSR. According to data published in the non-USSR technical press, the methods in question make it possible to reduce to a significant extent the formation of scale in boilers of low capacity and low pressure and also in different types of heat exchangers, internal combustion engines, turbine condensers, preheaters, and other equipment.

In the USSR, problems pertaining to the magnetic treatment of water are being studied at the All-Union Heat Technology Institute, the Khar'kov Engineering-Economic Institute, the Ministry of the River Fleet RSFSR, the Ural Power Engineering Trust for the Ferrous Metallurgy Industry (Uralenergochermet), the Chemical Service of the Donets Basin Regional Electric Power Administration (Donbass Energo), the Scientific Research Institute of Light Industry, and a number of other organizations. Work on ultrasound installations to prevent formation of scale is being done by the Leningrad Institute of Water Transportation, the All-Union Heat Technology Institute, and the Moscow Institute of Transportation Engineers. Problems pertaining to the treatment of water with high-frequency currents were included in work done at the Central Power Engineering Trust for the Ferrous Metallurgy Industry (Tsentroenergochermet). In research conducted in the USSR both foreign equipment and USSR equipment were employed. Comparison between USSR and foreign equipment and work conducted in this field in general involved both laboratory tests and tests under industrial conditions at operating installations.

A conference at which results of industrial applications of procedures that had been developed were discussed and lines to be followed in future research in the new field of nonchemical water treatment were considered was conducted by the Power Scientific Research Institute of the Academy of Sciences USSR and the Moscow Scientific and Technical Society of the Power Engineering Industry (MONITOEP). In papers presented at this conference, particular attention was paid to the magnetic and electromagnetic methods of water treatment. The ultrasound and high-frequency methods were discussed less extensively.

In one of the papers presented at the conference, Engr F. I. Belan (Central Power Engineering Trust for the Ferrous Metallurgy Industry) discussed the design of a type of equipment for the high-frequency treatment of water developed in the People's Republic of China. The effectiveness of water treatment in this equipment is being tested at present at an industrial establishment. Although equipment for the high-frequency treatment of water is being produced in China and applied under industrial conditions, good results were not obtained in all cases when this equipment was used.

It was decided by the conference that it is desirable to conduct work along the following lines:

a. Development of a design of magnetic equipment which makes it possible to change during operation the intensity of the magnetic field and to vary the rate of liquid flow. Experimental tests of the effectiveness of equipment of this type should be conducted by the Ural Affiliate of the Academy of Sciences USSR jointly with the Ural Power Engineering Trust for the Ferrous Metallurgy Industry.

b. Determination of the effectiveness of the magnetic method when applied in connection with the operation of boilers (this work should be conducted by the Ministry of the River Fleet).

c. Investigation of the effects exerted by the principal technological conditions on the efficiency of the application of the magnetic method in connection with the operation of steam turbine condensers.

d. Investigation of problems pertaining to the mechanism of the effect exerted by a magnetic field on electrolyte solutions (this work should be conducted by VTI -- the All-Union Heat Engineering Institute imeni F. Dzerzhinskiy).

The conference also recommended that VTI accelerate work on the designing of improved magnetic equipment and that the Moscow City Sovnarkhoz take care of the production of several units of the type of equipment designed by VTI.

It was proposed that scientific-technical conferences on research in the field of nonchemical water treatment be held regularly.

18. Synthesis of Polyglycol Ethers Suitable for Use as Lubricating Oils

"Synthesis of Lubricating Oils of the Polyglycol Ether Type," by V. I. Isagulyants, V. N. Tishkova, and I. A. Grushevenko, Moscow Institute of Petroleum Economy and the Gas Industry (MINKh i GP) imeni I. M. Gubkin; Moscow, Khimiya i Tekhnologiya Topliv i Masel, Vol 5, No 4, Apr 60, pp 8-13

A systematic investigation has been carried out of the condensation of propylene oxide with phenol, substituted phenols (butyl- and octylphenols), and the following alcohols: propyl, isopropyl, isoamyl, heptyl, and octyl alcohol and 2-ethylhexanol. Thirty-nine polyglycol ether lubricating oils were synthesized and tested for their low-temperature characteristics. It was established that polyglycol ethers prepared by the condensation of propylene oxide with alcohols have better low-temperature properties than those prepared by the condensation of propylene oxide with phenols. It was found that by varying the proportion of the starting materials (propylene oxide and alcohol), polyglycol ethers of different viscosities which exhibit good low-temperature characteristics can be obtained. It was established for the first time that by using readily available alcohols, e.g., isopropyl alcohol, polyglycol ethers with good low-temperature characteristics can be synthesized. It has been demonstrated that it is possible and feasible from the practical standpoint to produce synthetic polyglycol lubricating oils starting with alcohols which are being produced on an industrial scale.

Among the favorable characteristics of polyglycol ethers are a low congelation point (minus 60-minus 55°), advantageous viscosity-temperature properties, and a high viscosity index. Polyglycol ethers exhibit a higher mobility at low temperatures than petroleum oils having the same viscosity. At high temperatures they decompose in the engine with the formation of volatile products only; no resins, lacquer, or carbon are deposited.

Inorganic Chemistry

19. Deposition of Tungsten Oxide on Glass and Other Materials

"The Properties of Alcoholic Solutions of Tungsten Hexachloride and of the Films Obtained From Such Solutions," by Z. V. Shirokshina and N. V. Suykovskaya; Leningrad, Zhurnal Prikladnoy Khimii, Vol 33, No 5, May 60, pp 1001-1008

Investigation of the properties of alcoholic solutions of tungsten hexachloride established that these solutions form gels and can be used for the deposition of transparent, mechanically strong, and chemically

resistant thin films consisting of tungsten oxides which adhere to glass and other materials. The films deposited in this manner modify the optical properties of the glass.

20. Kinetics of Oxidation of Finely Dispersed Magnesium Powder at Elevated Temperatures

"Kinetics of the Oxidation of Finely Dispersed Magnesium Powder at Elevated Temperatures," by I. A. Makolkin, I. I. Vernidub, Yu. N. Zhvanko, V. T. Karpov, G. S. Razumovskaya, and A. A. Vol'khovskaya, Moscow Order of Labor Red Banner Institute of National Economy imeni G. V. Plekhanov; Leningrad, Zhurnal Prikladnoy Khimii, Vol 32, No 4, Apr 60, pp 824-831

In a communication about to be published in an issue of Nauchnyye Doklady Vysshey Shkoly, results obtained in work on the oxidation of the coarse magnesium powders M-1 and M-2 are described. The kinetics of the oxidation of the finely dispersed magnesium powders M-3 and M-4 in air, oxygen, and nitrogen have been investigated in this instance. Although processes of the oxidation of magnesium powders are being applied to an increasing extent in technology, the reactions involved have not yet been described in the literature.

Investigation of the kinetics of reactions which take place when the finely dispersed magnesium powders M-3 and M-4 are oxidized in air at temperatures in the range of 350-500°, in oxygen at 350-450°, and in nitrogen at 400-500° established that up to 450° both powders interact with air, oxygen, and nitrogen along curves with declining slopes. This indicates that the film consisting of oxides and nitrides of magnesium has protective characteristics up to 450°. Above this temperature, the film loses its protective properties and the kinetics of the process follow a straight-line law. The M-4 powder is more highly reactive than the M-3 powder. This is due to the greater specific surface of M-4 (3,500 cm^2 per gram), as compared with the specific surface of M-3, which is 616 cm^2 per gram. This finding is in agreement with the energies of activation, which were found to be lower for M-4 than for M-3 in air and nitrogen (the energy of activation in oxygen was higher for M-4 than M-3). On heating the powders in air at 500°, both MgO and Mg_3N_2 were formed. The reaction products consisted of three layers: white (predominantly MgO), gray (mainly Mg_3N_2), and yellow (mainly Mg_3N_2). Both powders reacted in nitrogen with the formation of Mg_3N_2.

Isotopes

21. Method for Separation of Highly Concentrated N^{15}

"A Method for the Separation of Highly Concentrated N^{15}," by I. G. Gverdtsiteli, Yu. V. Nikolayev, Ye. D. Oziashvili, V. A. Vlasenko, and R. V. Tishchenko, Physicotechnical Institute, Academy of Sciences Georgian SSR; Tbilisi, Soobshcheniya Akademii Nauk Gruzinskoy SSR, Vol 24, No 2, Feb 60, pp 153-156

N^{15} is used extensively as a tracer in physicochemical and biological research. Because of its low cross section of thermal neutron capture, N^{15} may also find application in nuclear technology. To separate highly concentrated N^{15}, exchange between NO and HNO_3 was applied. NO was generated continuously by reacting nitric acid with SO_2. Two packed columns were employed. The first column had a diameter of 26 mm and a height of 810 cm, the second a diameter of 9 mm and a height of 575 cm. During operation of the installation described, the NO depleted in N^{15} is oxidized and recovered in the form of nitric acid. The product enriched in N^{15} is taken from the bottom of the second column in the form of nitrogen oxides (N^{15} is concentrated in the nitric acid). Sulfuric acid formed by the oxidation of SO_2 is drained from both columns. The required amount of water is introduced into the system.

By using the installation described, the isotope separation factor could be raised to 17,000. With an outflow of 0.5 liter of NO per day and a flow of 15 cm^3/min in the first column and 1 cm^3/min in the second column, a concentration of N^{15} amounting to 98.5% was obtained.

At present the installation is being modified with the aim of making it more efficient. Furthermore, it is also being equipped with automatic controls.

The electronic flow meters for determining the flow of water and acid in the separation equipment were designed and constructed at the Institute of Electronics, Automatics, and Telemechanics, Academy of Sciences Georgian SSR, under the direction of G. N. Muskhelishvili.

22. Electrodiffusion in Dilute Metallic Potassium Solutions of Lead and Mercury

"Electrodiffusion in Dilute Metallic Potassium Solutions of Lead and Mercury," by S. I. Drakin, Yu. K. Golubkova, and E. P. Ushakova, Chemicotechnological Institute imeni D. I. Mendeleyev; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 4, Apr 60, pp 866-871

Electrodiffusion in dilute (0.4-0.6 at .%) solutions of lead and mercury in metallic potassium has been investigated with the aid of a previously developed method. The stationary distribution of dissolved metal due to this process has been found to obey an equation which is given. The electrodiffusion coefficients in the equation for the alloys K - Pb and K - Hg have been found to equal $2.6 \cdot 10^5$ and $1.2 \cdot 10^5$ deg/volt, respectively. A comparison of the data obtained with those for other systems showed that the maximum change in concentration of dissolved metal will be considerably greater at the same potential difference in the case of the K - Pb and K - Hg alloys than of all other systems studied up to the present time.

Increased attention has been paid to electrodiffusion processes since E. Haeffner succeeded for the first time in separating isotopes by a process of this type.

Nuclear Fuels and Reactor Construction Materials

23. Method for Separation of Neptunium-239 From Irradiated Uranium

"An Extraction Method for the Separation of Neptunium-239 From Irradiated Uranium," by Ye. S. Pal'shin and Yu. A. Zolotov; Leningrad, Radiokhimiya, Vol 1, No 4, Aug 59, pp 482-487

A rapid extraction method is proposed for the separation of radiochemically pure Np^{239} from irradiated uranium. Time required for the separation is 1-2 hours. The behavior of some splinter elements during the extraction of Np^{239} with diethyl ether is discussed. Neptunium-239 is of importance not only as an intermediate isotope in the production of plutonium, but also as a tracer in the investigation of the chemical properties of neptunium.

24. Formation of Complexes by Plutonium and Americium

"Investigation by the Methods of Solubility Determination and Ion Exchange of the Formation of Complexes by Plutonium and Americium (III) in Aqueous Solutions," by A. I. Moskvin; Leningrad, Radiokhimiya, Vol I, No 4, Aug 59, pp 430-434

The results of investigations of the formation of complexes by plutonium and americium in oxalate solutions are summarized. On the basis of data reported, it is concluded that the behavior of trivalent plutonium is analogous to that of trivalent americium. It is also concluded that the behavior of tetravalent, pentavalent, and hexavalent plutonium is analogous to the behavior of other actinides in the corresponding valency states.

25. Production of Calcium by Decomposition of Calcium Carbide

"Production of Calcium by the Decomposition of Calcium Carbide," by A. S. Mikulinskiy and S. S. Maron, Ural Scientific Research Chemical Institute; Leningrad, Zhurnal Prikladnoy Khimii, Vol 33, No 4, Apr 60, pp 835-841

The importance of calcium in the economy increases and has grown considerably during the last few years. Calcium is applied as a reducing agent in the production of a number of rare-earth elements, chromium, thorium, and uranium. It is also applied as an alloying component with lead, aluminum, magnesium, copper, and other metals as principal components. Furthermore, calcium serves as an initial material for the production of calcium hydride. If a method for producing calcium at a low cost is developed, metallic calcium will be applied to a still greater extent.

Experiments carried out in 1956 together with B. A. Borok, M. I. Rodnyy, V. I. Gavrilin, and B. P. Lobashov, workers at the Central Scientific Research Institute of Ferrous Metallurgy, indicated that it is possible to produce calcium by the decomposition of technical calcium carbide in a vacuum induction furnace.

Experiments carried out in this instance demonstrated that heating of calcium carbide at a temperature of 1,720-1770° and an initial pressure of 0.5-1 mm of mercury results in the production of compact metallic calcium containing 94.8-98.2% of Ca. The other product is graphite of high quality which contains 97% of C and has a low ash content. The yield of the products mentioned are 80% and 90%, respectively.

It was established that the decomposition of technical calcium carbide is preceded by interaction of the calcium oxide contained in it with the calcium carbide under formation of calcium vapor and carbon monoxide. This must be taken into consideration in scaling up the process and designing equipment in which it is to be carried out.

26. Extraction of Zirconium

"On the Mechanism of the Extraction of Zirconium With Amines From Nitrate-Oxalate Solutions," by V. M. Vdovenko, L. N. Lazarev, and Ya. S. Khvorostin; Leningrad, Radiokhimiya, Vol 1, No 4, Aug 59, pp 408-413

It was established that the nitrate of the amine used as an extracting agent is apparently present in a polymerized state in the organic phase when equilibrium conditions exist. The zirconium compound is apparently extracted by a finely dispersed phase formed by the amine nitrate. The coefficients of the distribution of zirconium depend on the concentration of the nitrate in the aqueous phase, because the extraction is of a competing ion-exchange type.

27. Extraction of Niobium and Tantalum With Tributylphosphate

"The Composition of Niobium and Tantalum Complexes Extracted With Tributylphosphate," by G. P. Giganov, V. D. Ponomarev, and O. A. Khan; Alma-Ata, Izvestiya Akademii Nauk Kazakhskoy SSR -- Seriya Metallurgii, Obogashcheniya, i Ogneuporov, No 3, (6), Apr 60, pp 73-78

The composition of tantalum, niobium, hydrofluoric acid, and sulfuric acid complexes extracted with tributylphosphate was determined. It was established that the highest distribution factors for tantalum are obtained when sulfuric acid is present in the initial solution and the concentration of hydrofluoric acid is at a minimum. The highest distribution factors for niobium are obtained when sulfuric acid is present in the solution and the concentration of HF is higher than 7%.

28. Concentration of Radioactive Elements From Large Volumes of Natural Water

"On the Problem of the Concentration of Radioelements From Large Volumes of Natural Water," by K. F. Lazarev and S. M. Grashchenko; Leningrad, Radiokhimiya, Vol 1, No 4, Aug 59, pp 493-496

Methods for the concentration of radioactive elements by coprecipitation with ferric hydroxide and barium sulfate are described on the basis of work done by the authors of the article.

29. Symposium on Solvent Extraction

"A Symposium on the Theory of Extraction," by I. V. Seryakova; Moscow, Atomnaya Energiya, Vol 8, No 3, Mar 60, pp 269-270

A symposium on the theory of extraction processes was held 3-4 December 1959 at the Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy. Five reports were given on the chemistry and thermodynamics of extraction equibria, the effects produced by extracting agents and salting-out agents, the composition of the compounds being extracted, and the interactions of these compounds with water and molecules of extracting agents.

In a report entitled "The Chemistry of Extraction Processes," V. I. Kuznetsov dealt with the chemical aspects of extraction processes. Kuznetsov pointed out that one of the principal prerequisites for good extractability of an element is the loss by it of hydrophilic properties. According to Kuznetsov, the facility with which ions are extracted increases with the decreasing density of their charge and consequent reduction of their tendency to form hydrates.

In a report entitled "Extraction Equilibria," V. V. Fomin considered processes of extraction from the standpoint of chemical reactions which the element being extracted undergoes in both phases. From this standpoint, extraction processes can be subdivided into two groups. The first group comprises processes of the extraction of metal cations which are based on exchange reactions introducing these cations into substances that react as weak acids (e.g., hydroxyquinoline, cupferron, and dithizon) and sometimes can be used as extracting agents (e.g., acetylacetone or butyric acid). The second type of processes involves extraction of inorganic anions with extracting agents that form cations on interacting with acids. The formation of the cations takes place prior to interaction with the inorganic anion being extracted. The cations may be amines or may belong to some other class of substances.

A report by A. V. Nikolayev, N. M. Sinitsyn, and S. M. Shubina, entitled "The Donor-Acceptor Properties of Extracting Agents," dealt with the effect of the nature of the organic solvent on the process of extraction. On the example of a single class of compounds containing phosphoryl oxygen, the dependence of the extracting capacity on the magnitude of the dipole moment (in this case the dipole moment of the P-O bond) was illustrated. The dipole moment changes depending on the constituents which have been introduced into the molecule of the extracting agent. According to the authors of the report, an increase in the magnitude of the dipole moment increases the capacity of the substance to extract elements.

O. Ya. Samoylov and V. I. Tikhomirov, who, on the basis of a statistical treatment of the thermal motion of water molecules attempted to explain differences in the action of salting-out agents with cations belonging to the principal subgroups (e.g., calcium or strontium) or secondary subgroups (e.g., zinc or cadmium) of the periodic system, emphasized in their report the dehydrating effect produced by salting-out cations and the dependence of this effect on the degree of covalency of the bonds formed by them.

A report by A. M. Rozen was concerned with the thermodynamics of extraction processes.

The symposium defined the principal directions along which subsequent research on the theory of extraction processes should proceed. The research program to be carried out in the future will emphasize work on problems pertaining to the selective solubility of inorganic and organic compounds in different solvents; more extensive investigation of the solvatation and hydration of ions and molecules; more extensive investigation of the chemistry and thermodynamics of extraction equilibria; and expansion of research pertaining to the composition and nature of extracting agents.

The symposium recommended the organization of a permanent seminar on the theory of extraction. A collection of papers presented at the symposium will be published by Atomizdat in 1960.

30. Application of Boron Carbide to Reduce Intensity of Gamma Radiation Generated in Steel

"The Effect of Layers With a Boron Content on the Secondary Gamma Radiation Yield," by D. L. Broder, A. P. Kondrashov, A. A. Kutuzov, and A. I. Lashuk; Moscow, Atomnaya Energiya, Vol 8, No 1, Jan 60, pp 49-51

The effect of a layer of boron carbide placed between steel and plexiglas (simulating water) on the intensity of generation of gamma quanta in steel irradiated with thermal neutrons and decelerated neutrons with relatively low energies was investigated. Steels of two grades, St-3 and stainless 1Kh18N9T, were used in the investigation.

31. Method for Determining Transfer of Uranium by Natural Waters

"A Field Method for the Determination of the State in Which Uranium Is Transferred by Natural Waters," by M. N. Yakovleva and M. A. Shurshalina; Leningrad, Radiokhimiya, Vol 1, No 4, Aug 59, pp 445-449

A new field method is proposed for the determination of the state in which uranium is transferred by natural waters. This method involves application of a dialysis procedure.

32. Crystal Constitution of Uraninites and Nasturans (Pitchblendes)

"Crystal Constitution of Uraninites and Nasturans (Pitchblendes)," by E. S. Makarov, I. M. Lipova, I. F. Dolmanova, and A. A. Melikyan, Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, Academy of Sciences USSR; Moscow, Geokhimiya, No 3, 1960, pp 193-213

For minerals of the uraninites-pitchblende series mineralographic investigation has been carried out; the chemical composition, density and lattice constants have been determined; numbers of atoms and formula units in the unit cell have been calculated; the crystal structure has been determined anew by the neutron diffraction method; and the manner of alteration of the structure owing to the degree of oxidation has been established. Uraninites and pitchblendes have been found to have a primitive cubic lattice related to the space group Th^6 - Pa3 in contrast to the face-centered lattice of the fluorite type assumed earlier. For all the studied specimens the number of atoms in the unit cell is lower than 12. This value is in line with the fluorite type of structure. Atom coordinates for the $UO_{2.33}$ pitchblende containing 3.15 formula units in the unit cell are listed.

According to the new structure the U^{6+} atoms in uraninites and pitchblendes form UO_2^{2+} (uranyl) groups and the uranium-oxygen distance is 1.90 Å.

Excess oxygen atoms occupy the interstices of the lattice 4 (a) and 4 (b) to compensate the charge of the uranyl groups. The amount of these atoms is equal to the number of the U^{6+} atoms [ions].

With the increase of the oxidation degree of uraninites and pitchblendes the numbers of uranyl groups and excess oxygen atoms in the structure are increasing while the number of atoms (N) and corresponding formula units (Z) in the cell are decreasing. It results from this that a decrease of the cell dimensions and of density takes place.

On the basis of the authors' own and reference data, the chemical composition of uraninites and pitchblendes is expressed by the formula $(U^{4+}, U^{6+}, Pb, Th, TR, Ca)O_{1.90-2.50}$.

33. Oxidation-Reduction Equilibrium in System Uranium-Iron in Carbonate Environment and Its Significance in Geochemistry

"Oxidation-Reduction Equilibrium in the System Uranium-Iron in a Carbonate Environment and Its Significance in Geochemistry," by G. B. Naumov and O. F. Mironova, Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, Academy of Sciences USSR; Moscow, Geokhimiya, No 3, 1960, pp 241-246

The experimental investigations that have been carried out show that the oxidation-reduction equilibrium in the system uranium-iron in a carbonate, neutral and weakly alkaline environment is almost completely shifted in the direction of uranium oxidation and iron reduction. Such equilibria may occur under natural conditions, particularly in hydrothermal uranium-bearing solutions.

34. Interphase Isotopic Exchange of Uranium-234 and Uranium-238

"On Interphase Isotopic Exchange of Uranium-234 and Uranium-238," by N. G. Syromyatnikov, Institute of Geological Sciences, Academy of Sciences Kazakh SSR, Alma-Ata; Moscow, Geokhimiya, No 3, 1960, pp 268-273

The change of the U^{234}/U^{238} ratio in liquid phase, after it reacted on the solid one, was examined, taking into account the amount of the dissolving uranium in this process and its isotopic composition. It has been established that isotopic exchange is mainly carried out by means of the reaction between the uranium in the liquid phase and the most soluble part of the uranium in the solid, the dependence between the isotopic exchange and the concentrations being approximately inversely proportional for the easily soluble uranium in the solid phase and directly proportional in the liquid phase.

35. Geochemical Peculiarities of Radioactive Rare-Earth Minerals

"On Some Geochemical Peculiarities of Radioactive Rare-Earth Minerals," by D. A. Mineyev, Institute of Mineralogy, Geochemistry and Crystal Chemistry of Rare Elements, Academy of Sciences USSR; Moscow, Geokhimiya, No 2, 1960, pp 131-138

As a result of considering the chemical composition of radioactive rare-earth minerals, the existence of a definite qualitative paragenetic correlation of Th with TR_{Ce} and of U with TR_Y has been established.

Some analogy in the evolution of the ratios

$$\frac{\Sigma\ TR_{Ce}}{\Sigma\ TR_Y} \quad \text{and} \quad \frac{Th}{U}$$

in the process of mineral formation is observed.

The dependence between the content of corresponding rare-earth and radioactive elements is quantitatively demonstrated in the example of the composition change of the individual minerals.

The practical value of the correlation of the above ratios in various mineralogical objects is noted.

36. Peculiarities of Rare-Earth Composition in Eudialytes and Loparites of Lovozero Massif

"Peculiarities of the Composition of Rare-Earth Elements in Eudialytes and Loparites of the Lovozero Massif," by Yu. A. Balashov and N. V. Turanskaya, Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, Academy of Sciences USSR; Moscow, Geokhimiya, No 2, Feb 60, pp 121-130

The investigation of the composition of rare-earth elements in the loparite and eudialyte of the Lovozero alkaline massif showed that their ratio in loparite does not essentially change and that in eudialyte there are considerable variations. In the vertical section of the exfoliated (second) complex a change with depth in the intensity of the total accumulation of rare-earth elements in the loparite and of the relative content of the yttric group of rare-earth elements in eudialyte is noted.

37. Spectral Determination of Rare-Earth Elements in Minerals and Ores

"Spectral Determination of Rare-Earth Elements in Minerals and Ores," by A. N. Zaydel, E. N. Fafurina, P. P. Yakimova, and S. S. Yakovleva, Leningrad State University; Leningrad, Vestnik Leningradskogo Universiteta, Seriya Fiziki i Khimii, Vol 15 (No 4), No 1, Feb 60, pp 48-59

A method for the spectral determination of rare-earth elements in minerals and ores is described. A spectral analysis of the concentrate is made after chemical separation of the total rare earths and extraction of cerium. The precision of the method is characterized by a mean error of about 20 percent. The spectrograph "KSA-1" is used. The sample is excited by an a.c. arc burning in a CO_2 atmosphere. For the determination of the yttrium earths in some cerium minerals the rare-earth elements are separated into two fractions by means of ion-exchange resin. The method has been tested on a great number of minerals, the results of X-ray chromatographic, and spectral analysis being compared.

38. Character of Beta-Phase Transformation in Zirconium Alloys

"The Character of Beta-Phase Transformation in Zirconium Alloys," by Y. F. Bychkov, V. N. Maskalets, and A. N. Rozanov. Minsk, Inzhenerno-Fizicheskiy Zhurnal, No 4, 1960, pp 95-98

The kinetics of the transformation of the metastable beta phase in alloys of zirconium with 10% molybdenum and 15% niobium is investigated by measuring the physical properties of alloys during tempering. The connection between the stability of the beta phase and the concentration of outer electrons in the alloy is discussed.

Organic Chemistry

39. Probable Synthesis of Phosphorus-Containing Heterocyclic Compound Reported

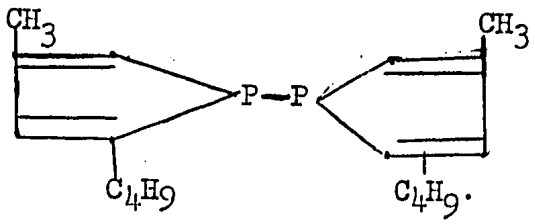
"The Interaction of Hydrogen Phosphide with α-Oxides of the Acetylene Series," by F. Ya. Perbeyev and K. Rikhter, Leningrad State University; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 3, Mar 60, pp 784-789

Earlier the authors had established the possibility of converting products of the condensation of α-acetylene oxides with various nucleophilic reagents into heterocyclic systems which contain the O, S, Se, or N atoms in

the ring. In continuing this research their purpose was now to study the interactions of hydrogen phosphide with α-acetylene oxides to obtain acetylenic hydroxyphosphines, to determine the manner in which the oxide ring opens up, and to evaluate the effect of the structural characteristics of the oxides on their reactivity. Synthesis and study of the chemical properties of hydroxyphosphines of the acetylene series appear to have as much practical as theoretical interest, since this class of compounds has never been described in the literature. The practical value of hydroxyphosphines consists in the possibility of using them as biologically active substances. In addition, it appeared possible to convert these compounds into phosphorus-containing heterocyclic compounds. The development of a suitable method to prepare 1-phosphocylcopentadienes would open extensive possibilities in expanding the chemistry of phosphorophenes.

Sodium dihydrophosphide was reacted with the following oxides: 2-methyl-1,2-oxydopentyne-3, 2-methyl-1,2-oxydooctyne-3, 2-methyl-1,2-oxydohexene-5-yne-3, and 2-methyl-1,2-oxydopentane. The following representatives of hydroxyphosphines were isolated and characterized: 2-methyl-2-oxy-yne-3-pentynylphosphine and 2-methyl-2-oxy-yne-3-octynylphosphine.

A product of the dehydration of hydroxyphosphine was prepared and characterized, which probably has the constitution of a dibutyl-(2,2')-dimethyl-(4,4')-P-diphospha-(1,1'_-dicyclopentadiene and is a (2,3-4,5)-bisbutyl-(2)-methyl-(4)-phosphorophene of the following structure:



The authors stated that they will continue work on establishing the structure of the dehydration products of hydroxyphosphines.

40. Drift of Particles in Sound Wave Investigated

"The Theory of the Drift of Aerosol Particles in a Standing Sound Wave," by S. S. Dukhin, Institute of General and Inorganic Chemistry, Academy of Sciences Ukrainian SSR; Moscow, Kolloidnyy Zhurnal, Vol 22, No 1, 1960, pp 128-130

The author proposes a new mechanism for the drift of aerosol particles in a standing sound wave, leading to their periodic distribution. A short theoretical discussion of the mechanism is presented in the article.

The value of the mean-square displacement during thermal movement, derived by Einstein's formula, indicates that for particles at least as large as 0.1 μ thermal movement cannot prevent the preferential concentration of particles in nodes.

41. Studies of Thermodynamic Properties of Liquid Metal Solutions; System Potassium -- Lead

"Studies of the Thermodynamic Properties of Liquid Metal Solutions. The System Potassium -- Lead," by M. F. Lantratov, Leningrad Electrical Engineering Institute imeni V. I. Ul'yanov-Lenin; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 4, Apr 60, pp 782-788

The values of the partial and integral thermodynamic values for the system K-Pb have been calculated over a large range of concentrations (0.05 to 0.9 N_K) and temperatures (500-600° C) from the emf's of the concentration cells potassium /glass/ potassium-lead alloy. Large negative deviations from the ideal values have been explained by the existence in liquid alloys of structural groups of metallic compounds. An approximately linear dependence of activity on temperature has been observed in the semilogarithmic coordinate system. The integral quantities possess extremal values at the composition $N_K = 0.5 - 0.6$. The formation of potassium-lead alloys is accompanied by a large exothermal effect. The maximum value of the heats of mixing equals 5.06 kcal/g. atom. The heats of mixing depend mainly on the value of the isobaric-isothermal potential. The negative values of the entropy of mixing observed over a wide range of concentrations are explained by the partial ionic character of the bond in the potassium-lead compound. The most stable compound has been shown to be KPb.

42. Measurement of Saturated Vapor Pressure of Solid Lithium Oxide

"Measurement of the Saturated Vapor Pressure of Solid Lithium Oxide," by An. N. Nesmeyanov and L. P. Belykh; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 4, Apr 60, pp 841-844

A new apparatus has been designed allowing the vapor pressure of substances to be measured by Knudsen's integral method without disturbing the vacuum in the zone of the substance undergoing investigation.

The vapor pressure of solid lithium oxide has been measured over the temperature range 1388-1506° K and the temperature relation of lg p has been found. The heat of sublimation has been calculated from the experimental data.

43. Application of Similarity Theory in Studies of Mass Transfer Processes

"Application of the Similarity Theory in Studies of Mass Transfer Processes," by A. G. Usmanov and A. N. Berezhnoy, Kazan' Chemico-technological Institute imeni S. M. Kirov; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 4, Apr 60, pp 907-920

A generalization of the experimental data on vapor diffusion and the thermal diffusion of gases has been made with the aid of similarity theory. The derived generalized formulas made it possible to determine over a wide range of temperatures and concentrations the vapor diffusion coefficients and the values for gas separation by thermal diffusion.

It has been shown that in the thermal diffusion of gases a simple linear relation exists between the relative separation values and the relative changes in entropy of the form:

$$\frac{\Delta\lambda}{\Delta\lambda_{\Delta S}} = 1.986\,\frac{S_1 - S_2}{R}$$

where $\Delta\lambda$ is the value for the separation of a mixture by thermal diffusion, $\Delta\lambda_{\Delta S}$ the scale factor for separation of the mixture on change in entropy $\Delta S = 1$, read off from a given value of S_1, S_1 and S_2 - entropy values of the hot and cold parts of the mixture in the steady state.

44. Decomposition of Nitrogen Oxides Under Action of Ionizing Radiation

"The Energy Yield of the Decomposition of Nitrogen Oxides Under the Action of Ionizing Radiation," by M. T. Dmitriyev, D. V. Saradzhev, and M. A. Miniovich; Leningrad, Zhurnal Prikladnoy Khimii, Vol 33, No 4, Apr 60, pp 809-814

Investigation of the dependence of the energy yields of the decomposition of N_2O, NO, and N O_2 under the action of ionizing radiation on the pressure (within the range of 0-1.5 atmospheres), the temperature (in the range of 0-400°), and the intensity of irradiation (up to 10^{17} ev/ cm^3. sec) established that the degree of stability of the oxides mentioned above to the action of ionizing radiation changes in an order inverse to that of the degree of their stability toward the action of high temperatures. It was also established that on irradiation of nitrogen-oxygen mixtures, the concentration of NO_2 that remains constant depends on the intensity of irradiation, reaching a level of approximately 15% at high intensities of irradiation. All three oxides can be used in gas dosimeters for the measurement of ionizing radiation. Under conditions when the temperature of the system being irradiated is not constant, the most convenient compound for dosimetry is NO.

The energy of the radiation-chemical decomposition of nitrogen oxides is of importance not only from the standpoint of application of these oxides in dosimetry, but also in connection with the development of industrial processes for the radiation-chemical oxidation of nitrogen to produce nitric acid industrially with the application of nuclear energy.

Advice given by S. Ya. Pshezhetskiy is acknowledged by the authors of the paper.

45. Radiation-Thermal Cracking of Hydrocarbons

"The Radiation-Thermal Cracking of Hydrocarbons," by Academician A. V. Topchieyev, L. S. Polak, N. Ya. Chernyak, V. Ye. Glushnev, I. V. Vereshchinskiy, and P. Ya. Glazunov, Institute of Petrochemical Synthesis, Academy of Sciences USSR, and Institute of Physical Chemistry, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 130, No 4, 1 Feb 60, pp 789-792

On the basis of the results reported, which pertain to the radiation-chemical cracking of normal paraffinic hydrocarbons, it is concluded that that cracking should be carried out in such a manner that centers from which the reaction starts are initiated by the radiation while the temperature is

elevated to a level which is high enough to bring about elimination of the activation barriers that prevent development of a chain reaction from these centers. Work done previously by the authors and results obtained by American investigators indicate that when radiolysis is carried out at room temperature (20°), no chains develop. The effect of chain formation at elevated temperatures is illustrated by the fact that radiation-thermal cracking of heptane at 400° proceeds with an over-all radiation-chemical yield of low-molecular hydrocarbons amounting to 2,000 molecules per 100 ev, which is approximately 10^3 higher than the yield of the same products obtained by the radiolysis of heptane vapor at 20°.

Furthermore, the quality of the products improves when radiation-thermal cracking is applied: hydrocarbons are formed predominantly, rather than hydrogen, which is the principal product of radiolysis at low temperatures. Preliminary experiments on the radiation-thermal cracking of naphthenic hydrocarbons and petroleum crudes have yielded results which support the conclusions made on the basis of work dealing with pure paraffinic hydrocarbons. On the basis of the results obtained, the method in question appears promising from the standpoint of practical applications. Equipment has been designed for subjecting to radiation-thermal cracking evaporated liquid hydrocarbons and hydrocarbon gases in a state of continuous flow. This equipment is now being tested.

46. Synthesis of Some Derivatives of Phosphonitrilic Chloride by Radiation Method

"Radiation Method of the Synthesis of Some Derivatives of Phosphonitrilic Chloride," by Academician V. I. Spitsyn, N. A. Afanas'yeva, A. K. Pikayev, I. D. Kolli, and P. Ya. Glazunov, Institute of Physical Chemistry, Academy of Sciences USSR, and Moscow State University; Moscow, Doklady Akademii Nauk SSSR, Vol 131, No 5, 11 Apr 60, pp 1106-1108

Among inorganic polymers, phosphonitrilic chloride $(PNCl_2)_n$ is of particular interest. However, the susceptibility of this heat-resistant polymer to hydrolysis prevents its practical application. The tendency toward hydrolysis exhibited by phosphonitrilic chloride can be reduced by introducing alkoxy groups into the molecule of the polymer. To react phosphonitrilic chloride with alcohols (e.g., n-butyl alcohol), high temperatures must be applied and the yields obtained are as a rule very low.

In the work reported in the article the possibility of synthesizing butyl phosphonitrilic ester by irradiating with high-energy electrons a mixture of phosphonitrilic chloride with n-butyl alcohol was investigated. Results obtained in a typical experiment involving irradiation of a 5% solution of the tetamer of phosphonitrilic chloride in n-butyl alcohol for 6-hours with electrons of an energy of 0.6 Mev at a current strength in the solution amounting to 3 μa are described. It is concluded on the basis results that the radiation method of preparing phosphonitrilic butyl ester is of advantage in comparison with the chemical method.

The action of ionizing radiation on a solution of phosphonitrilic chloride trimer in dioxane was also investigated. According to the analyses that have been carried out, the substance that forms in dioxane has composition corresponding to the formula $(PNClC_4H_8O_2)_x$, i.e., it is the product of the substitution of one chlorine atom with a dioxane molecule. The compound in question exhibits a considerable resistance to hydrolysis; it does not decompose even on boiling with an alcoholic solution of caustic alkali. The structure of the newly synthesized compound will be investigated.

47. Radiolysis and Radiation Oxidation of Diisopropyl Ether

"The Radiolysis and Radiation Oxidation of Diisopropyl Ether," by V. V. Sarayeva, B. Ya. Ladygin, and Nam Ch'ang-sung, Moscow State University; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 4, Apr 60, pp 759-761

The formation of carbonyl compounds and alcohols during the X-radiation of diisopropyl ether in the absence of oxygen has been investigated. The initial yield of carbonyl compounds has been found to depend to a great extent on the presence of impurities, in particular acetone, in the ether.

On irradiation of the ether in the presence of oxygen, the yield of carbonyl compounds and alcohols greatly increases and peroxides and acids appear.

It has been suggested that conversion of the ether takes place by a chain mechanism both in the presence and absence of oxygen.

48. Radiation Oxidation of Nitrogen

"Radiation Oxidation of Nitrogen, V. The Kinetics of Nitrogen Oxidation Induced by Gamma-Radiation and the Part Played by Ion Recombination," by M. T. Dmitriev and S. Ya. Pshezhetskiy, Physicochemical Institute imeni L. Ya. Karpov; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 4, Apr 60, pp 880-887

The oxidation of nitrogen induced by gamma-radiation has been investigated at pressures ranging from 1 mm Hg to 150 atm. The amount of NO_2 formed is proportional to the duration and intensity of the irradiation. The ratio of N_2O to NO_2 grows with the pressure. With increase in pressure from 1 mm to 1 atm the energy yield decreases. After 1 atm the yield grows, attaining a value of 5-6 molecules NO_2 at 150 atm. The N_2O yield at 30-50 atm and 150° is 2.5-3.5 molecules per 100 eV.

Up to 1 atm the dependence of the reaction rate on the gas composition is in line with second order kinetics. The dependence of the rate on the pressure deviates from the second order. This is mainly due to the increasing importance of the recombination of negative and positive ions, causing a fall in the reaction rate. This result is in agreement with the previously elucidated part played by the formation of nitrogen ions in the reaction. Quantitative correlations between the rate constant of the reactions and coefficient of recombination of the ions have been presented.

49. Structure and Properties of Carboxylated Rubber Vulcanizates Produced by Combined Action of Metal Oxides and High-Energy Radiation

"The Structure and Properties of Carboxylated Rubber Vulcanizates Produced by the Combined Action of Metal Oxides and High Energy Radiation," by Z. N. Tarasova, B. A. Dogadkin, M. I. Arkhangel'skaya, and S. B. Petrova, Scientific Research Institute of the Tire Industry; Moscow, Kolloidnyy Zhurnal, Vol 22, No 2, 1960, pp 253-256

The heating of carboxylated rubbers with metal oxides leads to the formation of vulcanizates of high strength, but low thermal stability. The rate constant of stress relaxation of the vulcanizates at 100° is about 100 times that of the vulcanizates with polysulfide bonds. The number of cross links does not change on relaxation. The osmotic molecular weight of the dissolved vulcanizate determined after relaxation to zero also does not noticeably change. All this points to the fact that relaxation of the vulcanizates obtained on heating with metal oxides takes place through exchange rearrangement of the salt bonds. Irradiation of the carboxylated rubbers by a Co^{60} source leads to additional formation of cross links of the salt type and stable chemical bonds. Vulcanizates obtained in this way containing not more than 10^{19} ml^{-1} chemical bonds are of considerable strength and of high stability.

Radiochemistry

50. USSR Work on Vitreous Semiconductors and Action of Radiation on Glass

"The Third All-Union Conference on the Vitreous State," by Z. M. Syritskaya; Moscow, Steklo i Keramika, Vol 17, No 3, Mar 60, pp 43-46

The third All-Union Conference on the Vitreous State, which was held at the end of 1959 in Leningrad, summarized the most important scientific research on glass that had been conducted during the past 5-6 years in the USSR. The conference was organized by the Institute of Silicate Chemistry of the Academy of Sciences USSR, the All-Union Chemical Society imeni D. I. Mendeleyev, and the State Optical Institute imeni S. I. Vavilov.

More than 100 reports were presented at the conference. These reports dealt with methods for the investigation of the vitreous state, the mechanism of vitrefication, and the physicochemical and technical characteristics of glasses.

The seventh session of the conference dealt with results obtained in the investigation of semiconductor glasses (six reports), the coloration of glass and the effects of radiation on glass (nine reports), and also the technical characteristics of glass (four reports). V. A. Ioffe and G. I. Khvostenko presented a paper entitled "The Electrical Properties of Some Semiconductor Glasses." B. T. Kolomiyets, N. A. Goryunova, and V. P. Shilo reported on methods for the preparation of chalcogenide glasses, some properties which they have in common, and the limits within which vitrefication takes place in the systems Tl_2Se-As_2Se_3, Tl_2Se-Sb_2Se_3, Sb_2Se_3-As_2Se_3, and Tl-As-Se.

B. T. Kolomiyets and B. V. Pavlov gave a paper dealing with the investigation of optical absorption by a number of binary chalcogenide systems. B. T. Kolomiyets, T. N. Mamontova, and G. F. Nazarova reported a finding to the effect that chalcogenide glasses exhibit a purely electronic conductivity (amounting to 10^{-14}-10^{-3} ohms^{-1} . cm^{-1}), which is preserved in melts after the softening period.

A. A. Vaypolin and Ye. A. Poray-Koshits, in a report entitled "X-Ray Investigation of the Structure of Vitreous Chalcogenides of Arsenic," pointed out that the diffraction diagrams of glasses having the composition As_2Se_3 [As_2S_3] and those formed in the system As_2Se_3-As_2Te_3, in which the conductivity increases with increased substitution of sulfur with selenium and then with tellurium, exhibit similarities in the course of regular changes of the composition, indicating that all of the glasses in question have a similar structure.

V. V. Tarasov and V. A. Romanovskiy reported that by using calorimetric measurements, they were able to establish that the vitreous arsenic trisulfide As_2S_3 has a chain structure.

In a report entitled "The Effects of Radiation on Glass and Absorption Spectra of Glass," I. N. Berezhnaya gave results of determinations of the light absorption coefficient in the visible region of the spectrum after irradiation of glass with ultraviolet light, X rays, and gamma rays. S. M. Brekhovskikh in a paper presented by him gave the composition of a number of types of glass which exert effective protection against gamma radiation and neutrons.

V. P. Danilov and N. V. Berbash reported on changes in the spectral absorption of glasses of simple composition as a result of exposure to gamma rays. All sodium borosilicate glasses exhibit negative absorption in the region of the spectrum corresponding to the wave length of about 280 millimicrons, i.e., their transparency increases under the action of gamma rays.

An analogous phenomenon is observed in sodium silicate and sodium borate glasses after irradiation with gamma and X rays and also as a result of exposing the glasses to the action of short-wave ultraviolet radiation. A characteristic property of phosphate glasses is an absorption band with a maximum at 500-520 millimicrons. This absorption band is due to the presence of phosphorus ions in the glass.

G. O. Karapetyan reported on the effect which the structure of glasses has on the spectral and chemical properties of cerium ions. The absorption and luminescence spectra as well as the quantum yield and thermoluminescence of borate, phosphate, silicate, and borosilicate glasses containing cerium were investigated as they are affected by the composition, cerium concentration, conditions under which the glass was made, and irradiation with ionizing radiation. The results obtained by Karapetyan indicated that cerium contained in glass forms not only luminescence centers, but also centers of capture.

N. F. Orlov discussed the effects of impurities and of the regularity of the structure of the crystal lattice on the coloration of quartz glass as a result of exposure to gamma rays. He pointed out that the particularly intense absorption bands that form as a result of irradiation, specifically bands in the visible part of the spectrum, arise as a result of the introduction of oxides of alkali metals and aluminum oxide into the quartz glass. On remelting of the glass, the dimensions of the crystalline particles and also the intensity of the absorption bands diminished.

At the eighth session of the conference, which was concerned with research results in the fields of the physical chemistry of glass and mechanical properties of glass, S. M. Brekhovskikh and V. N. Sesorova reported on the preparation of hafnium silicate glasses and described results obtained in the investigation of these glasses.

III. ELECTRONICS

Acoustics and Audio Frequencies

51. Instruments For Plotting Refracted Waves

"On Instruments For Plotting Refracted Waves," by O. P. Galkin and V. S. Grigor'yev, Acoustics Institute of the Academy of Sciences USSR, Moscow; Moscow, Akusticheskiy Zhurnal, Vol 6, No 1, 1960, pp 23-29

The basic principles of design are considered for direct-acting automatic instruments which plot the aggregate sound-wave combination in a complex nonhomogeneous medium on the basis of a given law of the propagation of sound (or a gradient of the speed of sound) along a vertical coordinate. Of the many possible variant designs for such instruments, this article considers primarily those which produce an exact solution. It is assumed that electronic instruments with reflected beam on an electron-beam indicator are more suitable for high-speed presentation of relatively low accuracy, whereas electromechanical integrators which present the beam system in the form of a graphic are more suitable for low-speed presentation with higher accuracy.

[For additional information on acoustics, audio frequencies, and ultrasonics, see Physics, Acoustics.]

Communications

52. Methods for Improving the Performance of Panoramic Receiver

"Appraisal of the Efficiency of Various Methods to Improve the Dynamic Range of a Panoramic Radio Receiver," by N. I. Svetlov; Moscow, Radiotekhnika, No 5, May 60, pp 29-32

The dynamic range of a panoramic radio receiver is determined primarily by the magnitude of cross distortion formed in different stages of the wide-band channel. Such distortions can be minimized by introduction of negative feedback, retuning filters, or a combination of the two.

A comparative evaluation of the effectiveness of methods to improve the dynamic range of the panoramic radio receiver is presented. Experiments conducted at the Leningrad Radio Receiving Center of the Ministry of Communications have revealed that on certain overloaded sections frequency detuning between the operating stations varied from 5 to 20 kc. For the experimental

determination of the magnitude of cross distortions, simulation of interfering stations was carried out by feeding to the input of automatically retuning filters a signal from the high-frequency GSSS-6 oscillator. A two-circuit band-pass filter with two reactance tubes having a pass-band of 20 kc was used. The maximum dynamic range in all examined cases in the presence of two signals and 10 kc detuning was about 60 decibels.

This experiment has comfirmed the effectiveness of retuning filters in reducing cross distortions and other nonlinear disturbances.

53. New Czechoslovak Television Tower

"Competition for the Petrin Observation Tower" (unsigned article); Prague, Vecerni Prague, 3 Jun 60, p 1

According to a brief announcement, accompanied by a photograph of three dish-type antennae, the Strahov television relay tower in Prague is replacing the relay facility formerly located atop the Petrin Observation Tower in the city. The new tower is 50 meters tall and located at a higher elevation than Petrin. Since 7 May, it has been transmitting audio and video signals to western Bohemia and is scheduled to begin transmission in the northern direction soon. The article mentions that the tower at Strahov is part of the eight-tower complex of the Prague-Bratislava relay network and that the equipment atop the tower is wired for automatic switching in case of malfunction.

Components

54. Permanent Magnets

"Permanent Magnets and Their Magnetic Characteristics," by V. M. Chernov; Moscow, Standartizatsiya, No 3, Mar 60, pp 18-19

The permanent magnets in the USSR are manufactured in accordance with the State Standard (GOST) 4402-48 entitled "Permanent Cast Magnets for Aviation Magnetoes and Instruments." However, this standard does not cover all of the alloys for pemanent magnets which are widely used in industry. This standard permits lowering of the prescribed magnetic characteristics to the extent of 10 to 15% depending on the complexity of magnet configuration. Neither standard instruments nor methods for magnetic measurements have yet been developed, which makes it necessary for industrial enterprises to develop their own measuring instruments, which often lack the required accuracy.

The All-Union Scientific-Research Institute for Electricl Measuring Instruments (Leningrad), at the request of the Committee on Standards, Measures and Measuring Instruments, and Gosplan USSR are now working on new standard specifications for permanent magnets.

55. Miniature Cold-Cathode Tubes

"Billions Saved by a Small Tube," by A. Presnyakov; Moscow, Ekonomicheskaya Gazeta, 2 Jun 60

The article contains the following passages:

A most wonderful and simple device was invented in the Soviet Union; it is the cold-cathode tube. These tubes were known for many years and were used only as a light-signal source. Their second birth took place in 1947 at the Physics Institute imeni P. N. Levedev, Academy of Sciences USSR, even prior to the advent of transistors. Experimental Engineer L. N. Korablev has discovered in these tubes a number of valuable properties, hitherto not known.

"Here, before us is such a miniature tube. Its glass bulb is of the size of a sunflower seed, and it is filled with rarefied xenon. Inside the bulb are two tiny stubs and a cylinder activated with cesium compounds. These tubes weigh less than one gram. The energy consumption is only a fraction of one percent of that of a conventional electron tube. In some pulsed radio circuits one cold-cathode tube replaces several of the conventional tubes.

"The universal Soviet-made cold-cathode tube MTKh-90 contains only six parts, while a conventional electron tube has 50-70 parts. From one ton of glass and nickel, it is possible to manufacture up to one million of these tubes. The service life of such tubes is about 100,000 hours, which is about 100 times greater than the guaranteed service life of an electron tube.

"Cold-cathode tubes can be used for generation or amplification of electric pulses.

"While investigating and discovering the new properties of these tubes, Soviet physicists developed about 150 radio circuits applicable to various fields of engineering. It is difficult to find a branch of engineering where these miniature tubes could not be utilized to greater advantage. More than 200 industrial enterprises and research institutes are now designing instruments incorporating these new tubes.

"The annual demand for these tubes is 10 million pieces. To manufacture 10 million tubes per year, it would be necessary to improve the equipment of the existing shop and also to build a new manufacturing plant. Realization of this is quite possible because the production of reliable and inexpensive cold-cathode tubes does not require special buildings nor special equipment for a new plant. Notwithstanding all of this, the construction of the new plant has not yet been started.

"Doesn't it look to you, comrades from the State Committee for Radioelectronics, that you are chasing nickels while overlooking the rubles?"

56. Dynamics of Transients in Miniature Electric Drives

"On the Dynamics of Transient Processes in Microelectric Drives," by L. I. Stolov; Moscow, Izvestiya Vysshikh Uchebnykh Zavedeniy, Elektromekhanika, No 3, 1960, pp 80-84

The study presented here is based on the assumption that, although the dynamics of transient processes in electric drives with variable moment of inertia has been studied, the friction in the step-down, which plays a particularly important role in the case of microelectric drives, has not been taken into account. Furthermore, for a drive with variable mass, the coefficient of friction of the contacting elements has been considered constant. In this article, both the reduced moment of inertia and the reduced static moment are considered variable, and it is assumed that the system contains a reduction gear which is very small; thus the moment of friction is relatively large. It is further assumed that the mass of the servomechanism is concentrated in a point, but the moment of friction in the reduction gear between the drive and the servo is linearly dependent on the output moment of the reduction gear.

57. Synchro Generator Built With Semiconductor Components

"Television Synchro Generator Built With Ferrite and Semiconductor Components," by Z. A. Demin, L. A. Chinenkov, and B. P. Shcherbakov; Moscow, Tekhnika Kino i Televideniya, No 3, Mar 60, pp 53-57

A synchro-pulse generator for a television broadcasting system supplies several pulse signals, some of which are composite in nature and consist of a pulse train of varied duration, having a multiple repetition rate. The performance of frequency division and pulse shaping units can be considerably improved if some of the electronic tubes are replaced by ferrite cores with rectangular hysteresis loop and certain other semiconductor devices.

At the Scientific-Research Laboratory No 2 of the Novosibirsk Electrical Engineering Institute of Communications, a television synchro generator was designed in which the frequency division and pulse shaping units were built, for the first time, entirely with rectangular-loop ferrite cores and transistors. This synchro generator was built with 2 type 6N1P twin triodes, 56 ferrite cores, and 40 transistors. A laboratory test of this prototype synchro generator has shown that the frequency division and pulse shaping units performed with a high degree of stability even when the supply voltage was fluctuating in a range of ± 10% and the temperature fluctuation ranged from +10°C to +60°C.

58. Fluctuations of Synchronization in Sound-Recording Equipment

"Investigation of the Fluctuations of Synchronization in a Magnetic Tape Recorder With the Aid of Electromechanical Analogies," by W. Wolf, Institute of Electrical and Room Acoustics, Dresden Technische Hochschule, Industrial Laboratory for Radio and Television, Berlin-Adlershof; Leipzig, Hochfrequenztechnik und Elektroakustik, Vol 69, No 2, Apr 60, pp 41-52

The effect of the longitudinal oscillations of a recording tape, resulting from the elasticity of the tape and the inertial masses of the rotating components, is studied with the aid of analogies and measurements with an equivalent circuit. To provide dimensions for this analog electrical circuit, relationships were devised which make it possible to convert mechanical into electrical values. The determination of the mechanical flexibility of the tape required an exact study of its modulus of elasticity. The friction between the magnetic tape and the revolving head was determined without difficulty by means of an equivalent circuit. The analogy approach was also used to study the dynamic properties of the synchronous motor used for the tape drive and for the determination of the longitudinal oscillations of the tape between spools.

Computers and Automation

59. Logarithmic Frequency Characteristics of Pulsed Automatic Control System

"A Method of Constructing the Logarithmic Frequency Characteristics of a Pulsed System of Automatic Control," by I. N. Pechorina; Moscow, Izvestiya Vysshikh Uchebnykh Zavedeniy, Elektromekhanika, No 3, 1960, pp 75-79

This article presents a method of constructing the logarithmic frequency characteristics of pulsed automatic control systems for the case in which the continuous portion of the control system is represented by a low-frequency filter with a pulse-spacing factor considerably less than unity.

60. Semiconductors in Decoding Circuits

"Decoding Circuits with Semiconductor Components," by E. Oehme, Institute of High-Frequency Engineering and Electron Tubes, Dresden Technische Hochschule; Leipzig, Hochfrequenztechnik und Elektroakustik, Vol 69, No 2, Apr 60, pp 52-61

The principles of decoding circuits are developed for the case of binary coding. The decoding process consists of two parts, synthesis and analysis. For the case of codes with groups of unequal length (Shannon-Fanocodes), there

is an interaction between synthesis and analysis. For binary codes with groups of equal length, details are given for decoding circuits which also relate to the use of transistors and germanium diodes.

High-Frequency Heating

61. Improvements Made in High-Frequency Generator LGZ-10

"Broadening the Limits of Applicability of the LGZ-10 High-Frequency Generator," by V. M. Azhazha, V. S. Gumenyuk, and B. Ye. Popov, Physico-Technical Institute of the Academy of Sciences Ukrainian SSR; Moscow, Pribory i Tekhnika Eksperimenta, No 1, Jan/Feb 60, pp 102-103

Certain alterations are proposed for the LGZ-10 generator, designed for tempering small steel parts, which would expand its capabilities and allow it to operate with inductors of different sizes.

The changes consist of replacing the secondary turn and heating induction coil with a multiturn coil and tuned load circuit. A plate capacitor, having two systems of stationary Dural plates, serves as the balancing capacitor in the load circuit. The capacitor is designed to operate at a capacitance of 43 millimicrofarads with air dielectrics and 90 millimicrofarads with oil dielectrics.

Instruments and Equipment

62. New Flash Tube Operates on A-C Supply

"New Electronic Flash Tube IFK15-1 With Capacitorless Source," by V. P. Ivanov and I. S. Marshak; Moscow, Pribory i Tekhnika Eksperimenta, No 1, Jan/Feb 60, pp 92-94

This recently developed flash tube is an electric vacuum device combining the properties of a flash tube and the basic element of a device for providing a synchronizing pulse with a capacitorless discharge supply from an a-c network. The lamp automatically synchronizes the firing with the operation of a camera shutter and the phase of the a-c supply (127 or 220 volts).

Duration of flashes is 6 milliseconds, the smallest interval between flashes under continuous operating conditions is 10 seconds for a 127-volt supply and 20 seconds for a 220-volt supply, and the average life of the tube is 2000 flashes.

63. Circuit for Synchronization of Short-Duration Processes

"Electronic Delayed-Pulse Oscillator for Pulse Roentgenography," by N. A. Bekeshko, Artillery Engineering Academy; Moscow, Pribory i Tekhnika Eksperimenta, No 1, Jan/Feb 60, pp 67-68

The circuit of a low-voltage delay line and delayed-pulse oscillator for time delays of one to 250 milliseconds is described. The circuit is used for synchronizing the cut-in moment of high-voltage X-ray apparatus with the phase of the high-speed process being examined. A phantastron is used to obtain the necessary delay.

Deviation from delay linearity in the circuit is 0.1%, and voltage changes from an unstable power supply of ± 10% cause changes in the maximum duration of delay of only 0.1%.

The circuit may also be used in other cases in which the duration of the process is very small, such as in spark photography, shock wave studdies, etc.

64. Circuit for Sequential Recording of Time Markers and Process

"Control of the Electron-Beam Tube of an Oscilloscope With Mechanical Scanning," by V. M. Vyrodov and T. V. Pogorelova; Moscow, Pribory i Tekhnika Eksperimenta, No 1, Jan/Feb 60, pp 65-66

A circuit is described which may be used for the sequential recording of a studied process and time markers by one and the same beam of an oscilloscope with mechanical scanning. The method eliminates the faults associated with point-marking discharge tubes usually found in such oscilloscopes.

The circuit provides two triggering operations for the tube: first, for recording the phenomenon and, second, for recording the group of time markers by applying positive pulses from monostable multivibrators to the modulating electrode of the tube.

65. Current Generator Using Cable Discharge Developed

"High-Power Current Pulse Generator," by V. M. Kul'gavchuk and N. A. Protopopov; Moscow, Pribory i Tekhnika Eksperimenta, No 1, Jan/Feb 60, pp 85-89

A current pulse generator is described which is based on the use of coaxial cable discharge. To obtain a low characteristic impedance, the generator has a unit consisting of 400 sections of parallel-connected

RK-3 coaxial cable, which was used at voltages up to 100 kv. Current pulses up to 250 ka with a duration of up to 0.3 microsecond at a maximum pulse rise of $3 \cdot 10^{12}$ a/sec are possible.

The generator was used to study electrical explosions of conductors, but may also be used to study the initial stages of a spark discharge, discharges in gases, etc.

66. Method for Measuring the Intensity of Inhomogeneous Magnetic Fields

"Measurement of Intensity and Gradient of Inhomogeneous Magnetic Fields With Nuclear Magnetometers," by Yu. N. Denisov, Joint Institute for Nuclear Research; Moscow, Pribory i Tekhnika Eksperimenta, No 1, Jan/Feb 60, pp 82-84

Nuclear magnetometers with the described pickups may be used to measure the intensity and gradient of extremely inhomogeneous magnetic fields with a high degree of accuracy. Permissible inhomogeneity of the magnetic field is 1000-1200 oersteds/cm. Accuracy in measuring the absolute value of magnetic field intensity is 0.01%, and accuracy in measuring the gradient is 0.5-1%. The proposed method may be used to determine, not only the value, but also the direction of the gradient in a magnetic field of arbitrary configuration.

67. New Device for Studying the Semiconductor Properties

"Electron Mirror," by V. Bezuglyy; Moscow, Izvestiya, 1 Jun 60

The Electrophysical Laboratory of the Institute of Metallurgy imeni A. A. Baykov developed an instrument called the "electron mirror," which can examine the electrical properties of semiconductors at their surface and slightly below it.

The device operates as follows: An electron gun ejects a dense electron beam at a glancing angle to the surface of the examined semiconductor, the latter being subjected to a high potential. The electrons, so to speak, feel the surface of the semiconductor or, to be more precise, their electric field envelops the crystal as if with a "jacket." Like the rays of light reflected from a mirror, the electrons, after touching the electric field, are reflected back. The reflected electrons pass through an electron-optical system and are admitted to a small television screen on which a clearly visible pattern of the electric field at the surface of the semiconductor is displayed. Such a pattern will change with the change of magnitude of electric field passing through the semiconductor.

D. Kormilitsin, junior scientific associate of the Electrophysical Laboratory, one of the co-inventors of this device, said: "I believe that the "electron mirror" will become as important to all engaged in the study of electrical phenomena as the metallographic microscope is now to the metallurgists."

Materials

68. Heat of Formation and Physical Properties of Intermetallic Semiconductors

"The Heat of Formation and Physical Properties of Intermetallic Semiconductors," by P. P. Otopkov and A. M. Yevsyev, Moscow State University; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 4, Apr 60, pp 815-818

It was established that the atomization energy of intermetallic semiconductors has an optimum in its dependence upon the width of the forbidden semiconductor zone within the limits of a single structural group characterized by near order.

69. Investigation of the Conditions for the Silicon-Thermic Production of Lanthanum Silicide and Some Properties of This Compound

"Investigation of the Conditions for the Silicon-Thermic Production of Lanthanum Silicide and Some Properties of This Compound," by V. S. Neshpor and G. V. Samsonov; Leningrad, Zhurnal Prikladnoy Khimii, Vol 33, No 5, May 60, pp 993-1001

Formation of the Lanthanum disilicide $LaSi_2$ after silicon-thermic reduction of lanthanum oxide in vacuum proceeds in two stages. At lower temperatures, formation of the monosilicide LaSi predominates. The monosilicide reacts with an excess of silicon and is partially converted into $LaSi_2$. At higher temperatures, La_2O_3 is reduced directly to the disilicide. Lanthanum disilicide is obtained in the form of a practically monophasic product at 1500° and an initial evacuation in the furnace corresponding to 10^{-3} millimeters of mercury. The approximate heats of formation of lanthanum monosilicide and lanthanum disilicide are 64 and 52 kilocalories per mol, respectively, the latter value being close to the heat of formation of $CeSi_2$. The microhardness of lanthanum silicide amounts to 324 kilograms per square millimeter and is considerably lower than the microhardness of the disilicides of transitional metals of the III-IV groups of the periodic system. It is also lower than the microhardness of pure silicon. The latter circumstance is due to the loosening effect of lanthanum atoms which are located in the

empty spaces of the three-dimensional lattice formed by the silicon atoms bound to each other. In the range of 20-500°, lanthanum disilicide is a metallic conductor of the n-type. At temperatures higher than 500°, it is apparently a semiconductor of the p-type.

70. Saturated Vapor Tensions of Solid Indium Antimonide

"Saturated Vapor Tensions of Solid Indium Antomonide," by A. N. Nesmeyanov, B. Z. Iofa, and A. S. Polyakov; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 2, Feb 60, pp 246-248

The vapor pressures of indium antimonide in the temperature range of 636-720° K were determined. The radioactive isotopes Sb^{124} and In^{114} were used in the work described. It was established that in the temperature range in question, there is partial dissociation of indium antimonide in the solid phase into antimony and indium.

71. Regularities Underlying the Process of Grinding Certain Crystalline Materials

"The Laws of the Process of Grinding Certain Crystalline Materials," by N. N. Kachalov, and L. F. Grigor'yeva, Institute of Silicate Chemistry, Academy of Sciences USSR; Minsk, Inzhenerno-Fizicheskiy Zhurnal, No 1, 1960, pp 35-40

It is shown that the character of the process of polishing investigated crystalline materials is basically analogous to the known process of grinding glass. This indicates that the mechanism of brittle disintegration of the superficial layer as acted upon by abrasive grains, in the grinding of these materials, is basically the same as in the grinding of glass.

The relationships obtained quantitatively determine the effect of basic technological factors on the coefficients of the grinding process and can be used in the rationalization of basic production processes in the machining of corundum, quartz, germanium, and silicon.

[For additional information on electronics materials, see Chemistry, Radiochemistry.]

Wave Propagation

72. Geometrical Optics Applied to Wave-Duct Propagation

"Application of Geometrical Optics Methods for Calculation of Field in the Presence of Near Water-Surface Ducts or Elevated Ducts and for Conditions of High Elevation of One of the Communication Points," by N. N. Komarov, I. Ye. Ostrovskiy, B. D. Zamaroyev, and A. D. Razenberg, Institute of Radiophysics and Electronics, Academy of Sciences Ukrainian SSR; Gor'kiy, Izvestiya Vysshikh Uchebnykh Zavedeniy, Radiofizika, No 1, 1960, pp 39-49

The formulas determining the attenuation factor and the range of the "horizon" for conditions of wave-duct propagation when the ground conductivity is ideal and one of the transmitting stations is located at considerable elevation were initially derived in the work by V. A. Fok, L. A. Vaynshteyn, and M. G. Belkina (Radiotekhnika i Elektronika, No 1, 1956).

The aim of this research was to determine the extent of the zone in which the electromagnetic wave propagation constant is large enough for the concept of ray-propagation to be applied to the nonhomogeneous media, especially in the presence of the wave-ducts. The limiting conditions for the application of geometrical optics to the case of wave-duct propagation were determined. The conditions for formation of "radio pits" in the case of slanting inversions were also determined.

73. Determination of Boundary Conditions for Electromagnetic Field

"Boundary Conditions for the Mean Electromagnetic Field Over a Surface With Random Irregularities and Impedance Fluctuations," by F. G. Bass, Institute of Radiophysics and Electronics, Academy of Sciences Ukrainian SSR; Gor'kiy, Izvestiya Vysshikh Uchebnykh Zavedeniy, Radiofizika, No 1, 1960, pp 72-78

The problem of electromagnetic wave propagation over a surface with random irregularities was discussed by Ye. L. Feynberg for the case of a vertical dipole located over a certain plane surface with randomly distributed irregularities. It was shown by Feynberg that the distribution of a mean electromagnetic wave over the surface with the random irregularities is equivalent to propagation of an electromagnetic wave over a flat surface with a certain effective complex dielectric constant, the value of which depends on the statistical characteristics of the random irregularities.

In the present work, the boundary conditions were derived for a mean electromagnetic field over a somewhat irregular surface having certain random irregularities and electric inhomogeneities. The discussion was limited to well-conducting surfaces which would satisfy the boundary conditions as set by Leontovich.

The author thanks Ye. L. Feynberg and E. A. Kaner for their valuable assistance.

IV. ENGINEERING

Electrical Engineering

74. Effect of Radioactive Irradiation on Insulating Materials

"Electrical and Physical Properties of Industrial Electrical Insulating Materials Subjected to Radioactive Irradiation," by K. A. Vodop'yanov, B. I. Vorozhtsov, G. I. Potakhov, and N. I. Ol'shanskaya, Siberian Physicotechnical Institute, Tomsk State University; Moscow, Elektrichestvo, No 5, May 60, pp 60-66

The technical literature contains very little information on the effect of radioactive irradiation on the electrical and physical properties of insulating materials. However, the expanding use of atomic power calls for a clear understanding of the resistance of insulating material to radioactive irradiation.

The effects of gamma irradiation on the electrical and physical properties of high-polymer, silicon-organic, and phenol-formaldehyde insulating materials were studied with the aid of a 15 Mev-betatron of Tomsk Polytechnic Institute design. The samples were irradiated with intensities of 300 to 1,200 roentgen per minute at temperatures of -60°, +20°, and +60°C and under the condition of 98% relative humidity. Measurements were taken of the dielectric strength, the loss angle, and permittivity of the insulating materials prior to and after radioactive irradiation. It was found that gamma irradiation up to 10^6 roentgen intensity did not affect the dielectric losses or polarization of the high-polymer insulating materials.

75. New Kiev Hydroelectric Power Plant

"Kiev Hydroelectric Station" (unsigned article); Moscow, Sovetskaya Aviatsiya, 9 Jun 60

The design of the new Kiev hydroelectric station has now been completed. The construction of this station will be carried out in a rather unconventional manner; the main station structure and the locks will be built with prefabricated reinforced-concrete elements, which will be manufactured at Kremenchug and shipped by water to the construction site. Horizontal-type water turbines which do not require any elaborate turbine-generator room will be installed.

For the first time in USSR practice, the Kiev Station will utilize an auxiliary reservoir, completely separated from the river and located on an elevated spot. During periods of low power demand, the water will be pumped from the lower basin into the auxiliary reservoir, and during peak hours, the water will be drawn from the reservoir to drive the turbines.

76. Accuracy of Measurement of Temperature With Thermistors

"The Accuracy of Measurement of Temperature With Thermistors," A. G. Shashkov, Power Engineering Institute, Academy of Sciences Belorussian SSR (Minsk); Minsk, Inzhenerno-Fizicheskiy Zhurnal, No 3, Mar 60, pp 123-125

A concept is introduced and an expression deduced for the error in temperature measurement caused by the change of state of a medium. It is shown that with an increase in measurement precision, the indicated error becomes commeasurable with the basic error caused by the measured current.

77. Validity of the Equation: rot rot v = grad div v - Δ v

"The Range of Validity of the Equation rot rot v = grad div v - Δ v," by F. Mueller, Leipzig, Hochfrequenztechnik und Elektroakustik, Vol 69, No 2, Apr 60, pp 62-67

It is often stated in the literature that the equation rot rot v = grad div v - Δ v applies only for rectangular Cartesian coordinates and the straight-line components of curve-line systems. Sometimes the statement is found that this equation should be used with caution, but no further information is given to tell why the caution is necessary. The question of the validity or invalidity of the equation is, in the last analysis, a matter of defining the vector operations. Whereas these definitions are quite clear in the Cartesian coordinate system, the concept of the components of a vector in other coordinate systems can be defined in various ways.

This article attempts to prove that, assuming proper definitions (which must naturally be reduced to the known definitions of the Cartesian system), the above equation is valid for all coordinate systems with vanishing curvature tensor.

The solution begins with a generally valid formulation of all coordinate systems, the symbolism of Riemann geometry. Since it has been applied only very sparingly in electrical engineering, however, an insertion is made on the basis of work done by Lagally (Vorlesungen ueber Vektorrechnung /Lectures on Vector Calculus/, 5th edition, Leipzig, 1956), but only to the extent necessary for an understanding of the problem treated here.

Mechanical Engineering

78. Combination Test Stand for Plastic Materials

"Apparatus for Testing Plastic Materials Under Complex Loading Conditions," by Ya. M. Pavlov and N. T. Smotrin, Nauchno-tekhnicheskiy Informatsionnyy Byulleten'. Leningradskiy Politekhnicheskiy Institut (Scientific-Technical Information Bulletin. Leningrad Polytechnic Institute), No 4, 1959, pp 63-65 (from Referativnyy Zhurnal -- Mekhanika, No 5, May 60, Abstract No 6779)

A report is given of the design of an attachment to the IM-12A testing machine. The use of the attachment affords the possibility of testing tubular specimens subjected to both internal and external pressure (up to 1,000 atmospheres) simultaneously.

Photogrammetry

79. Effects of Refraction and Curvature of the Earth on Air Photogrammetry

"The Effects of Refraction and Curvature of the Earth on Air Photogrammetry," by K. Szangolies, VEB Carl Zeiss, Jena; Berlin, Vermessungstechnik, No 4, Apr 60, pp. 99-102

A few examples are given of a graphical representation of the errors caused by refraction, curvature of the earth, and a combination of both in aerial photogrammetry for the case of the "normal atmosphere" established by the International Commission for Air Navigation. The errors are shown to have the same character as lens distortions, except that they depend on the particular recording conditions, which means that they can be compensated only at relatively great expense, generally with such aids as the compensation plate. All three values can be handled together in mathematical pointwise interpretation of stereophotographs taken from the air, but even in the graphic (line) method of interpretation, there are possibilities of automatic compensation. Depending on the radial distance between the measurement marks and the main image point, the camera constant can be changed so that refraction, earth-curvature, and distortion are eliminated. This solution is practically provided in the Model IV stereocartograph of Galileo-Santoni.

Photography

80. Spark Schlieren Photography in the Investigation of Streamlining of Bodies in a Supersonic Wind Tunnel

"Spark Schlieren Photography in the Investigation of Streamlining of Bodies in a Supersonic Wind Tunnel," by M. G. Morozov, Power Engineering Institute imeni G. M. Krzhizhanovskiy, Academy of Sciences USSR; Minsk, Inzhenerno-Fizicheskiy Zhurnal, No 3, Mar 60, pp 126-128

A spark unit is described for obtaining individual schlieren photographs with an exposure of less than 10^{-6} sec, as well as a method of using it in investigations in a supersonic wind tunnel. Samples of photographs obtained are presented.

81. Optimum Angle of Slope of a Drum Camera in the Measurement of Combustion Rate

"The Optimum Angle of Slope of a Drum Camera in the Measurements of Combustion Rate," by N. N. Bakhman, Institute of Chemical Physics, Academy of Sciences USSR; Minsk, Inzhenerno-Fizicheskiy Zhurnal, No 1, 1960, pp 94-97

It is shown that in the measurement of rate of combustion with a drum camera, the optimum angle of slope of the camera to the direction of movement of the film, at which errors in measurement are at a minimum, can be considerably less than 45°. Actually, in many cases it should be taken at not more than $15\text{-}20^{\circ}$.

Miscellaneous

82. Development Tendencies of Modern Operator Calculus

"Development Tendencies of Modern Operator Calculus," by F. H. Lange, Rostock, Leipzig, Hochfrequenztechnik und Elektroakustik, Vol 69, No 2, Apr 60, pp 67-75

The analysis of processes in linear systems involves, to a considerable extent, the use of the Laplace transformation, which is considered a fundamental mathematical tool which was missing in the heuristic operator calculus of Heaviside. The characteristic difference between the present-day concept

and the original Heaviside concept is in the mapping of the time process in the spectral range of the image, an approach first introduced by K. W. Wagner and Doetsch (Anleitung zum praktischen Gebrauch der Laplace-Transformation /Guide to the Practical Use of the Laplace Transformation/, Munich 1956), and which had long been considered absolutely necessary for the unequivocal transformation of differential equations into algebraic equations. Mathematicians, primarily Mikusinski (Operatorenrechnung /Operator Calculus/, Deutscher Verlag der Wissenschaften, Berlin, 1957), have, in the past decade, successfully established an operator calculus which makes no use of the transformation of functions and operates in the same field of numbers. It is based on the convolution theorem. A similar function algebra has recently been made known by Rajewski (Wissenschaftliche Zeitschrift der Hochschule fuer Elektrotechnik Ilmenau, Vol 4, No 2, 1958, pp 142-165); it is based on the Duhamel integral. Since there is also a variant of the Laplace transformation, mapping by means of the Carson-Laplace integral, the engineer is faced with four different symbolic methods, the relationships of which are expounded in this article.

It took more than two decades for the engineers engaged in filter and control work to become fully aware of the advantages of the spectral representation of the linear transmission process in the form of analytical functions of the complex argument, namely, through the use of the classical theory of functions; the new function algebra will likewise meet its decisive test in the area of filter design and stability theory in regard to closed control circuits before it is generally accepted, since the analysis and synthesis of linear networks on the spectral basis have been extensively developed. The new development tendencies of operator calculus are, nevertheless, important, since they regard the behavior of the system itself with respect to time. However, the main interest today is in nonlinear, rather than linear, systems, and, since the convolution theorem and the Duhamel integral employ the principle of superposition, function algebra is not applicable to nonlinear systems. On the other hand, there are still controlled systems, i.e., systems whose differential equation contains coefficients which are (mostly periodically) independent of time. For them, the Laplace transformation is inapplicable, since it does not lead to algebraic equations. Whether or not the new methods will find a way out in this direction has not yet been investigated. The future development of operator calculus in the direction of circuitry problems in control systems would be desirable.

V. MATHEMATICS

Control and Stability

83. Calculation of the Optimum in Linear Control System

"On an Approximate Calculation of an Optimum Control by the Direct Method," by N. N. Krasovskiy, Sverdlovsk; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 2, Mar/Apr 60, pp 271-276

A description is given of an approximation method of calculating the optimum, with respect to a fast-action trajectory, in a linear control system. The optimum problem is substituted by an auxiliary "smoothed" problem, which is investigated by the usual procedure of the variational calculation.

84. Theory of Pulsed Servo Systems

"On the Theory of Pulsed Servo Systems," by Ya. N. Roytenberg, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 2, Mar/Apr 60, pp 309-315

The equations of motion are given for a pulsed servo system in which the control signal dies out between pulses and for which the values of the time constant of the control circuit are small. First, the problem is considered of a choice of a "rule of change with time" of a function expressing an auxiliary signal fed at the input of the servo system to accelerate its conformance, and an expression is derived with which this "rule of change with time" can be determined. A graphic solution is given as an example of the application of the theory to the treatment of a servo system for which the four main parameters have known numerical values.

85. Limited Conversion in Solution of Optimum Control Problem

"On the Limited Conversion in the Solution of One Problem of Optimum Control," by F. M. Kirillova, Sverdlovsk; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 2, Mar/Apr 60, pp 277-282

An optimum problem for linear systems of differential equations is considered for the case in which the integrals of the powers of p ($p > 1$) of the modulus are control functions.

86. Stability of the Equilibrium Position in Discontinuous Systems

"On the Stability of the Equilibrium Position in Discontinuous Systems," by M. A. Ayzerman and F. R. Gantmakher, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 2, Mar/Apr 60, pp 283-293

Two systems of differential equations

$$\frac{dx}{dt} = f_{-}^{+}(x) \qquad (1_{-}^{+}) \qquad (1)$$

are considered, which describe the motion in a phase space "above" (+) and "below" (-), respectively, a given surface

$$F(x) = 0, \qquad (2)$$

where x denotes the n-dimensional vector with coordinates $x_1, \ldots, f_{-}^{+}(x)$ the vector functions, and F(x) the scalar function of x.

It is assumed that both the "upper" (1^+) and the "lower" (1^-) systems of equations satisfy the usual conditions which guarantee the existence and the uniqueness of the solutions under given initial conditions and have no specific points on the surface of discontinuity. Consequently, systems (1_{-}^{+}) do not determine the conditions of transition through the surface of discontinuity nor the motion along it, which should be recalculated. Under these conditions, a position of equilibrium can exist on the surface of discontinuity.

In individual cases, the question of the stability of these positions of equilibrium is calculated directly, beginning with new equations which are introduced during the recalculation of the problem and which specify the presence of equilibrium. In other cases, which are considerably more complex, although the equilibrium is stipulated by the new equations, the question of its stability is solved in the basic equations (1).

This article is devoted to the investigation of the stability of equilibriums which emerge on a surface of discontinuity.

This problem was considered, appropo a system of the second order, by Yu. I. Solntsev ("On the Stability According to Lyapunov of the Position of Equilibrium of a System of Two Differential Equations in the Case of Right Sides," MGU, Uchennyye Zapiski Matematika /Moscow State University. Scientific Notes. Mathematics/, Vol 4, No 148, 1951). The general case considered in this earlier work is of further interest here, since the vectors of the field f_{-}^{+} concerning the surface of discontinuity in the point

considered were not taken into account. For the case of the arbitrary order n, a similar problem was posed and studied only for relay systems

$$\frac{dx}{dt} = Ax + \lambda \frac{x_1}{x_1} \qquad (3)$$

where A is the constant square matrix, and λ is the constant vector, i.e., for systems which differ from linear systems with constant coefficients by the presence of one nonlinear function of the relay type. This article considers this problem for differential equations of the type $(1 \pm)$ with arbitrary right sides.

87. Stability of Motion of Solid Body Around Immobile Point

"On the Stability of a Motion of a Heavy Solid Body Around an Immobile Point in One Partial Case," by Yu. A. Arkhangel'skiy, Moscow; Prikladnaya Matematika i Mekhanika, Vol 24, No 2, Mar/Apr 60, pp 294-302

The stability is first considered, in the first approximation, of a motion determined by relationships which can be expressed by Jacob; functions for the case in which a parameter k (modulus of the particular ellipcical integral) has a low value.

It is shown that a sixth order system of perturbation equations, in the first approximation, is broken down into two independent linear third-order systems with periodic coefficients, whereby the product of the roots of the characteristic equation of each independent system is equal to unity. The stability condition is determined for these two third order systems.

The limits of the areas of instability are determined by a method given by I. G. Malkin (Teoriya Ustoychivosti Dvizheniya /Theory of the Stability of Motion/, Gostekhizdat, Moscow, 1952).

Differential Equations

88. Mixed Problem for Almost Linear Hyperbolic Systems of Differential Equations on a Plane Generalized

"The Mixed Problem for an Almost Linear Hyperbolic System on a Plane," by V. E. Abolinya and A. D. Myshkis; Moscow, Matematicheskiy Sbornik, Vol 50 (92), No 4, Apr 60, pp 423-442

The mixed problem of a sufficiently general form is considered for an almost linear (with weak nonlinearity) hyperbolic system of equations having partial derivatives of the first order with respect to two independent variables; thus, both in the equations and the boundary conditions

there may exist integral or functional terms which take the secondary action into account. Under the specified assumptions, the existence, uniqueness, and continuity of the dependence on the nonhomogeneous terms of the summed or continuous general solution, as well as of the smoothness (i.e., the continuous differentiability) of the classical solution of the problem, are proved. The nonhomogeneous boundary conditions are considered immediately without conversion to the homogeneous. This provides the possibility to encompass the most general form of nonhomogeneous forms. The structure of the set of discontinuities of the summed general solution (the discontinuities may also be obtained during solution of applied problems, for example, when the initial conditions, as often occurs, do not agree with the boundaries) is investigated.

A series of works is devoted to a mixed problem for linear hyperbolic systems of equations. Thus, M. I. Vishik and O. A. Ladyshenskaya ("Boundary Value Problems for Equations in Partial Derivatives and Several Classes of Operator Equations," Uspekhi matem. nauk, Vol 11, No 6 (72), 1956, pp 41-97, and A. A. Dezin, "Mixed Problems for Several Symmetrical Hyperbolic Systems," DAN SSSR, Vol 107, No 1, 1956, pp 13-16) studied systems in the n-dimensional space.

In addition, other methods have been investigated for several classes of systems of a less general form for the case n = 2. A smooth solution of the linear mixed problem of general form for n = 2 was constructed in the work of L. Campbell and A. Robinson ("Mixed Problems for Hyperbolic Partial Differential Equations," Proc. London Math. Soc., Vol 3, No 5, 1955, pp 129-147). Not one of the mentioned or other works embrace the fundamental results of the present work.

The above-mentioned work generalizes in several directions the results of the dissertation by V. E. Abolinya ("Concerning the Mixed Problem for Linear Hyperbolic Systems of Differential Equations Having Partial Derivatives on a Plane," Kandidatskaya Dissertatsiya, Riga, 1954).

89. Sturm-Liouville Equation Investigated

"Several Problems Concerning the Theory of the Sturm-Liouville Equation," by B. M. Levitan and I. S. Sargeyan; Moscow, Uspekhi Matematicheskikh Nauk, Vol 15, No 1(91), Jan/Feb 60, pp 3-98

The paper was divided into four parts which were subdivided as follows:

Part 1. Solution of the Cauchy problem for a homogeneous wave equation.

a. Application of the method of successive approximations.

b. Reduction to the Goursat problem.

c. Solution of the mixed problem on a half line.

d. Solution of the mixed problem on a finite segment.

Part 2. Expansion in terms of eigen functions.

a. Derivation of auxiliary formulas.

b. Preliminary estimate of the spectral function. The case of an entire straight line.

c. Asymptotic behavior of the spectral function. The case of an entire straight line.

d. Asymptotic behavior of the spectral function. The case of a half line.

e. Summation of the spectral function according to Riesz.

f. Proof of a uniform convergence theorem.

g. Convergence and summability of an expansion in terms of eigen functions.

Part 3. Differentiation of eigen function expansions.

a. Preliminary estimation of the derivatives of the spectral function.

b. Asymptotic behavior of the derivatives of the spectral function.

c. Uniform summability of the differential expansions in terms of eigen functions.

d. Summability of differential expansions in the ordinary and generalized Fourier integral.

e. Convergence of a differential expansion in terms of eigen functions.

f. Justification of the Fourier method for a uniform wave equation.

Part 4. Eigen function expansion for an unbounded rising potential.

a. Derivation of auxiliary identities.

b. Several estimates for a Green function.

c. Asymptotic behavior of the trace of a Green function.

d. Asymptotic distribution of the eigen values.

e. Summability of the expansions and of the differential expansions in terms of eigen functions.

f. Convergence of expansions and differential expansions in terms of eigen functions.

g. Examples.

90. Integral Curves of One Differential Equation Studied

"Concerning the Behavior of Integral Curves of One Differential Equation," by A. N. Berlinskiy, Stalinabad Pedagogical Institute imeni T. G. Shevchenko; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Matematika, Vol 2, Mar/Apr 60, pp 3-17

The equation

$$\frac{dy}{dx} = \frac{P(x, y)}{Q(x, y)}$$

is considered where P and Q are relatively prime ploynomials of the second degree having real coefficients.

Several methods for distinguishing the type of singular point are indicated in section 2. Section 4 is devoted to the proof of a theorem saying that the number of singular points of the second group, i.e., of focuses or centers, do not exceed two. In the case of four singular points, a certain relation between the nature of these points and their mutual distribution is established in section 3. The relationship is made more precise in section 5. The Poincare indexes are employed in a series of cases whose definition and separate properties are presented in section 1.

The results presented in the present work were published previously in the following works of the author:

1, "One Theorem Concerning the Behavior of Integral Curves of One Differential Equation," Uch. zap. Stalinab. ped. in-ta, Vol 20, No 3, 1958, pp 3-8.

2. "Concerning the Number of Singular Points of the Second Group," Uch. zap. Stalinab. ped. in-ta, Vol 20, No 3, 1958, pp 9-31.

3. "Concerning the Behavior of Integral Curves of One Differential Equation in a Neighborhood of a Singular Point," Uch. zap. Stalinab, ped. in-ta, Vol 20, No 3, 1958, pp 41-51.

91. Almost Periodic Solutions of Systems of Differential Equations

"Concerning Almost Periodic Solutions of Systems of Differential Equations," by V. I. Zubov; Leningrad, Vestnik Leningradskogo Universiteta, Seriya Matematiki, Mekhaniki i Astronomii, No 1, Jan 60, pp 104-106

The conditions for the existence and stability of almost periodic solutions of systems of differential equations are examined.

The system of n differential equations in vector form

$$\frac{dX}{dt} = F(X, t)$$

where $X = (x_1, \ldots, x_n)$; $F(X,t) = f_1(X, t), \ldots, f_n(X, t)$

is considered. In addition, the right sides of the system are assumed to satisfy the conditions:

1. For all finite real values of its arguments, the functions $f_s(X, t)$ are given real and continuous.

2. The functions $f_s(X, t)$ are almost periodic relative to t for any fixed values of the remaining arguments.

3. The functions $f_s(X, t)$ are uniformly continuous relative to t in any finite region of the variables $x_1, \ldots, x_n$.

4. The functions $f_s(X, t)$ satisfy the lipschitz condition with an invariable constant relative to the variables $x_1, \ldots, x_n$.

The problem concerning the qualitative behavior of integral curves of a system of n equations in the presence of asymptotic stability in the whole of an almost periodic solution is solved.

Also determined was the sufficient criterion for the existence of almost periodic solutions.

92. Successive Reduction of Order of Systems of Ordinary Differential Equations

"Substantiation of the Method of Successive Reduction of the Order of Systems of Ordinary Differential Equations," by E. M. Kozlov; Kiev, Doklady Akademii Nauk Ukrainskoy SSR, No 12, Dec 59, pp 1295-1299

In the present paper, which is the logical conclusion of the work by E. M. Kozlov, DAN URSR, No 813, 1958, the author outlines a substantiation of the method of successive reduction of the order. It is shown that a solution obtained by the method of successive reduction of the order may be made more precise by the algorithm of successive approximations, which, in the case involved, rapidly leads to an exact solution of the system and is relatively simple in practice.

93. Integral Curves Investigated

"Concerning Integral Curves With Zero or Infinite Measures of Curvature," by A. F. Andreyev; Leningrad, Vestnik Leningradskogo Universiteta seriya Matematiki, Mekhaniki i Astronomii, No 1, Jan 60, pp 5-13

The equation

$$\frac{dy}{dx} = \frac{P(x, y)}{Q(x, y)} \qquad (1)$$

is considered where P and Q are polynomials having terms of whole number degrees of x and y converging in a certain neighborhood of the point (0, 0) and vanishing at that point.

The existence of integral curves of equation (1) which approach the singular point (0, 0) with an order of curvature $0 < \nu < +\infty$ with zero or infinite measures of curvature is investigated.

Information Theory

94. Limit of a Sequence of Pairs of Random Variables and Their Associated Information

"Passage to the Limit Under the Symbols of Information and Entropy," by R. L. Dobrushin; Moscow, Teoriya Veroyatnostey i yeye Primeneniya, Vol 5, No 1, Jan-Mar 60, pp 29-37

The principle result of this paper is equivalent to the following statement: If a sequence of pairs of random variables (ξ_n, η_n) is given and the sequence converges to the pair of random variables (ξ, η), then

$\lim_{n\to\infty} I(\xi_n, \eta_n) = I(\xi, \eta)$ if and only if the sequence of corresponding information densities is uniformly integrable, where $I(\xi, \eta)$ is the information of the pair (ξ, η). A similar result is proven for entropies and for a new concept in information within a probability E of events. Conditions are found for the convergence of these quantities.

Numerical Analysis

95. Different Methods for Solving an Equation of the Parabolic Type

"Several Difference Schemes for the Numerical Solution of a Differential Equation of the Parabolic Type," by Yüan Chao-ting; Moscow, Matematicheskiy Sbornik, Vol 50(92), No 4, Apr 60, pp 391-422

In the present work, several different schemes for the numerical solution of the following problem were considered:

To find a solution $u(t, x) = u(t, x_1, \ldots, x_m)$ of the equation

$$\frac{\partial u}{\partial t} = Lu + f(t, x), \quad (t, x) \in R,$$

satisfying the boundary condition

$$u(t, x) = \psi(t, x), \quad (t, x) \in S,$$

and the initial condition

$$u(0, x) = \varphi(x), \quad x \in Q,$$

where Lu is an m-dimensional, linear, differential, self-conjugate, elliptic operator, the coefficients of which may depend on t and x; $R = [0 < t \leq T] \times Q$ is an m-dimensional region in the hyperplane t = 0 with boundaries Γ; S is an m-dimensional surface; f, ψ, and φ are given functions. It was assumed that the problem had a unique solution of the required smoothness.

Probability Theory

96. Markov Processes Employed to Find More General Results

"On Several Limit Theorems in Probability Theory," by K. V. Maslov; Teoriya Veroyatnostey i yeye Primeneniya, Vol 5, No 1, Jan-Mar 60, pp 54-83

The following problem is considered in the paper. Let

$$\xi_{n,1};\ \xi_{n,2};\ \ldots\ \xi_{n,k_n} \quad (n = 1, 2, \ldots)$$

be a sequence of series of independent random variables where $\varphi(x, y)$ is any function of two variables and the random variables $\zeta_{n,k}$ are determined recurrently by the following:

$$\zeta_{n,1} = \xi_{n,1}; \quad \zeta_{n,k+1} = \varphi(\zeta_{n,k};\ \xi_{n,k+1}) \quad (k = 1, 2, \ldots k_{n-1}).$$

Sufficient conditions for the existence of a limit distribution of the random variable ζ_{n,k_n} $(n \to \infty)$ and the form of this distribution are to be found. If $\varphi(x, y) = x + y$, we have the well-known problems for sums of independent random variables.

The method employed for solution of the formulated problems is different from the methods generally used in analogous studies (for example, from S. N. Bernstein's methods, which were developed in his book Teoriya veroyatnostey [Probability Theory], 6th edition, Moscow-Leningrad, 1946) for a similar problem.

The theory of partial differential equations and the theory of Markov processes were employed to find more general distributions than those found by Bernstein.

97. Measures Corresponding to Random Processes

"Concerning the Differentiability of Measures Corresponding to Random Processes," by A. V. Skorokhod; Moscow, Teoriya Veroyatnostey i yeye Primeneniya, Vol 5, No 1, Jan-Mar 60, pp 45-53

The present work immediately borders on the work presented by the same author and published in Teoriya veroyat. i yeye primen., Vol 2, No 4, 1957, in which the problem concerning differentiability of measures corresponding to processes with independent increments was investigated.

In the present work, sufficient conditions are found under which measures corresponding to two Markov processes defined by stocastic differential equations are absolutely continuous, one to the other.

The density of one measure with respect to the other was calculated.

Statistical Mechanics

98. Problem of Body Bound by a Finite Number of Ellipsoids of Rotation

"The Solution of the Dirichlet Problem for a Body Bound by a Finite Number of Ellipsoids of Rotation," by I. P. Matskevich, Smolensk Pedogogical Institute imeni Karl Marx; Minsk, Doklady Akademii Nauk BSSR, Vol 4, No 5, May 60, pp 190-193

A method presented in an earlier work of the author (Inzhenerno-Fizicheskiy Zhurnal, Vol 11, No 4, 1959, p 116) can be used to solve the Dirichlet problem for regions of the considered space which are bounded or unbounded and the limits of which are a finite number of ellipsoids of rotation without common points. The solution of the problem leads to the solution of an infinite system of linear algebraic equations. This article considers the case in which the region is an ellipsoid of rotation with p ellipsoidal elements. Additional considerations show that this method can also be used for other boundary problems of potential theory: the Neumann problem, the problem of mixed equations, and the determination of potential in a space with dielectrics in the form of ellipsoids of rotation.

VI. MEDICINE

Aerospace Medicine

99. Survival in Space

"Before a Man Can Take Off Into Outer Space," by Candidate of Medical Sciences V. Malkin, member of a Bureau of the Astronautics Section; Moscow, Meditsinskiy Rabotnik, 24 May 60, p 2

This article states that solving the problem of man's survival in solar space will require the close cooperation of scientists of many specialties.

Medical personnel have been playing such an active and important role in attempts to devise a method to protect and sustain human life in interplanetary space that it has become necessary to create a new science: space medicine.

A human being cannot perform any function in a space-vehicle system unless his physiological integrity is assured; this is a very complicated problem which calls for extensive and intensive effort in medicobiological research. Solving the problem of man's survival in interplanetary space is difficult because the environment in outer space cannot sustain the life of human beings and higher animals even for a relatively short time.

I. M. Sechenov, the father of Russian physiology, pointed out that to understand physiology, the environment of a living organism must be considered. It can be readily seen why physiologists and physicians doing research in astronautics look on interplanetary space as a biological environment. This is why any detailed knowledge that can be acquired about the various physical properties of cosmic space is of great value not only to astrophysicists, but also to physicians and biologists.

The Soviet space vehicle-satellite supplied the necessary step toward man's penetration into interplanetary space. The vehicle was large enough to accommodate a man. It showed that Soviet scientists on earth can control a satellite's flight via radio, detach the hermetic cabin by remote control, and order the vehicle to begin its descent. It was found that the hermetic cabin is of paramount importance; it can supply sufficient protection to its human occupant.

Working independently, a Russian chemist D. I. Mendeleyev and a Frenchman Paul Ber suggested that a hermetic cabin be used by people who are going up to high altitudes. Pressure equivalent to atmospheric pressure can be maintained in the hermetic cabin. K. E. Tsiolokovskiy -

developed the idea of a cabin which can be used for protection against rarefied atmosphere. He thought that a definite temperature could be maintained in a hermetic cabin, and astronauts could take along a supply of oxygen to last for a short time. He thought that chemicals could be used to absorb carbon dioxide. For long flights, however, Tsiolkovskiy suggested a hermetic cabin which could be transformed into a greenhouse.

Air regenerating equipment can maintain the necessary oxygen pressure in the air in the hermetic cabin and can remove excess carbon dioxide and humidity.

Ventilation-type hermetic cabins have been found most practical and have been used in modern airplanes which fly at high altitudes. The necessary pressure is maintained by compressed air supplied by a blower, and the proper air composition is restored.

Consideration must be given to other important physiological and hygienic questions. These include the maintenance of a temperature between 18°C and 20°C, protection from noise, comfortable chairs, proper lighting, etc. Technically it would not be feasible to use a hermetic cabin of the ventilating type in flights to outer space. It is evident that a hermetic cabin used in rockets and other vehicles flying at very great altitudes must be of the air-regenerating type such as the cabin in which the dog Layka made its flight in the artificial earth satellite.

Many articles devoted to the best oxygen-regenerating methods, the proper chemical composition of gases in the air of a hermetic rocket cabin, and the pressure which must be maintained in the cabin have been published. The pressure in the hermetic cabin of a space vehicle must be lower than that of the atmosphere because (1) this lower pressure could reduce the effect of a drop in pressure on the human occupant if the cabin suddenly becomes dehermetized; and (2) it could eliminate the escape of gas from the cabin. The danger of decompression sickness is present when the pressure in the cabin becomes very low, usually at an altitude of 7,000-8,000 meters. Decompression sickness causes sharp pain in the joints and muscles. A cabin filled with pure oxygen is a fire hazard. The air in the cabin must contain other gases. In creating an artificial atmosphere in the cabin, such properties as heat conductivity, the capacity to form isotopes, and spontaneous combustion must be taken into consideration.

It is very difficult for space medicine to find a way to maintain a temperature that can be tolerated by a human being in the hermetic cabin. Solar radiation is the main source of heat during flights through interplanetary space. The source of heat inside the cabin would be the human astronauts themselves, electronic equipment, lights, etc. Special automatic equipment must be installed in the cabin to prevent superheating.

The first Soviet space vehicle is rotating around the earth. Separation of the hermetic cabin from the vehicle of the satellite was controlled by a crew of specialists on earth. Data transmitted to earth by instruments indicate that the conditioning and thermoregulating systems of the vehicle operated normally. The progressive segment of the world's population looks with satisfaction at the great contribution that the USSR is making to the peaceful mastery of interplanetary space.

100. Restoration of Equilibrium in White Mice

"Effect of Carlina Bierbersteinii Bernh. on the Endurance of White Mice in Relation to Radial Acceleration," by A. A. Denova, A. M. Zakharov, and V. Ye. Kolla, Perm' Pharmaceutical Institute; Moscow, Farmakologiya i Toksikologiya, Vol 23, No 2, Mar/Apr 60, p 177

The effect of one and 10 percent aqueous infusions of the seeds of Carlina Biebersteinii Bernh on the endurance of white mice in relation to radial acceleration was studied. Two mice of equal weight, one control and one experimental, were rotated in a centrifuge at a speed of 1,000 revolutions a minute for periods of 5-10 seconds. One hour before being placed in the centrifuge, the experimental mouse received 0.1 milliliter of a one-percent infusion of the seeds of the plant per each 10 grams of weight; the control mouse received 0.1 milliliter of physiological salt solution per each 10 grams of weight. After being taken out from the centrifuge, the mice were placed on a table where they continued to rotate around a longitudinal axis for some time before regaining their normal position and being able to run in a straight line. It was found, however, that the experimental animal regained its equilibrium in a considerably shorter time than the control mouse. The resistance of the animal to radial acceleration was greater as the concentration and dose of the preparation were increased.

Contagious Diseases

101. Nerve Cell Morphology Altered by Tick-Borne Encephalitis and Related Diseases

"A Study of the Morphology of Nerve Cells Affected by the Viruses of Tick-Borne Encephalitis and Diseases Similar to It," by A. A. Avakyan, Ye. N. Levkovich and M. M. Bychyuk, Institute of Virology imeni D. I. Ivanovskiy and Institute for the Study of Poliomyelitis; Moscow, Voprosy Virusologii, Vol 5, No 2, Mar/Apr 60, pp 208-216

This report deals with a comparative study of pathological-morphological changes in white mice experimentally infected with the tick-borne encephalitis, two-wave fever, and Omsk hemorrhagic fever viruses. The following conclusions are based on the results of morphological and histological observations, which are discussed in detail.

1. Inflammatory and necrotic changes characteristic for encephalitis were observed after the infection of mice with different strains of the tick-borne encephalitis virus (F, L-3 and Sof'in) in the cerebrum, spinal cord, and cerebellum; these changes were less pronounced after infection with a strain which had been passed through tissue culture.

2. The pathological changes observed in animals infected with a strain of two-wave meningoencephalitis virus were very similar to those observed after infection with the tick-borne encephalitis virus. In both cases, inflammatory processes were noted in the brain membranes, a pronounced vascular reaction and necrotic changes of the nerve cells were seen in the brain tissue itself.

3. Necrotic changes as well as inflammatory processes were weakly expressed after infection with Omsk hemorrhagic fever virus. The vascular reaction, on the other hand (severe congestion of the vessels, diapedesis of the blood elements and hemorrhage into the brain tissue) was more sharply manifested than in mice infected with the viruses of tick-borne encephalitis and two-wave meningoencephalitis.

4. The use of histochemical methods of research did not afford the possibility of differentiating Omsk hemorrhagic fever, two-wave fever, and tick-borne encephalitis.

Epidemiology

102. Circulation of B. tularense in Kazakh SSR

"Pattern of Circulation of the Tularemia Pathogen in Different Types of Foci in Taldy-Kurganskaya Oblast, Kazakh SSR," by M. A. Aykimbayev, Tr. Sredneaz. N.-I. Protivochumn. In-ta (Works of the Central Asian Scientific Research Antiplague Institute), No 4, 58, pp 139-144 (from Referativnyy Zhurnal -- Geografiya, No 3, Mar 60, Abstract No 6360, by O. V. Ravdonikas)

"The incidence of tularemia in Taldy-Kurganskaya Oblast, was conditioned by the existence of two types of natural foci of this disease. In natural foci of the submountain-stream type, favorable conditions help to maintain the numbers of water rats and Dermacentor marginatus ticks, which support the existence of the focus. Two basic routes are suggested for the circulation of the tularemia pathogen: from diseased rats to healthy rats via the larvae and nymphs of Ixodes ticks with the transmission of infection to hares by imaginal forms, and infection of healthy animals from steam water infected by diseased water rats. In river-stream tularemia foci, besides this, numerous blood-sucking insects, especially mosquitoes, take part in the circulation of the pathogen. The isolation of the pathogen was reported primarily from susliks and water scorpions."

103. Tularemia Outbreak Attributed to Contaminated Food

"Tularemia Cases Connected With the Use of Food Products," by M. F. Shmuter, Ya. L. Svitsent, Tr. Sredneaz. N.-I Protivochumn. In-ta (Works of the Central Asian Scientific Research Antiplague Institute), No 4, 58, pp 135-137 (from Referativnyy Zhurnal -- Geografiya, No 3, Mar 60, Abstract No 6358)

"An outbreak of tularemia in Khar'kov in 1948 is described; the outbreak was connected with the delivery of milk and sugar from a village in which a tularemia epizootic was occurring among mouselike rodents at this time. Within a week, 24 persons in 6 families contracted tularemia (17 with the anginous-bubonic form and 7 with localization of the affection in the internal organs). All the diseased had ingested milk and sugar obtained from the same stall in a market."

104. Tularemia in Muskrats

"Tularemia in the Muskrat Regions of the Buryatskaya ASSR," by Ye. S. Cherkasskiy and S. Ye. Sorina, Tr. Vses. N.-I. In-ta Zhivotn. Syr'ya i Pushniny (Works of the All-Union Scientific Research Institute of Animal Raw Materials and Furs), No 17, 58, pp 123-133 (from Referativnyy Zhurnal -- Geografiya, No 3, Mar 60, Abstract No 6363)

"Muskrats were brought into the Buryatskaya ASSR in 1932 from the Solovetskiy Islands. Tularemia epizootics among them were first noted in 1940-1941 in Kabanskiy Rayon in 1951 and in Severo-Baykal'skiy and Baykalo-Kudarinskiy rayons in 1954-1955. Disease among hunters was also reported during these years. Microtus ungurensis Kastschenko, which substituted for Microtus arvalis here, played a significant epizootiological role. Tularemia apparently occurred in a latent form in the interepizootic period."

105. Q Fever Among Animals in a Human Focus

"A Study of Q Fever Among Agricultural Animals in a Focus of Disease Among Humans," (from Voronezhskaya Scientific Research Veterinary Station and Oblast Veterinary Bacteriological Station), by V. V. Krasnoshchekova and K. A. Shitov; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 31, No 5, May 60, pp 115-116

"The objective of the research was a study of the distribution of Q fever among animals and the determination of their role in the epidemiology of this disease. For this purpose, the following sera were investigated with the aid of the complement fixation reaction with Q antigen: cattle (1466), sheep and goat (39), and swine (20) from 15 populated points in 8 rayons in 4 of which individual cases were reported, and in one of which an outbreak was observed in 1957-1958.

"In active foci, a positive reaction was obtained from 66 out of 1,326 animals (4.97%), and a doubtful reaction, from 104 (7.84%); in favorable populated points, 20 animals out of 140 (14.29%) reacted positively, and 19 (13.57%) reacted doubtfully. Analogous results were obtained on investigation of the sera of the remaining species of animals.

"Thus, the presence of positive serological reactions in animals did not always correspond with the presence and the extent of distribution of Q fever among humans. The titer of the complement fixation reaction performed repeatedly at one-month intervals fluctuated from high to low, and remained stable only in individual animals.

"Clear symptoms of Q fever were not observed in clinical examination of animals with positive and doubtful complement fixation reactions."

106. Natural Focus of Anthrax

"The Epidemiology of Anthrax (from Ivanovskaya Oblast Sanitary-Epidemiological Station)," by B. P. Novikov; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 31, No 5, May 60, p 119

"An experience in controlling anthrax in a focus is described in this article.

"Extensive epizootics of anthrax and a high incidence among humans were reported daily in this oblast in prerevolutionary times. Systematic antianthrax measures directed toward eradicating the conditions favorable to pathogen preservation led to the transformation of the epidemic form into sporadic cases. However, an extensive outbreak of anthrax occurred in 1952; on the basis of this outbreak, the author draws his own conclusions regarding the rational control of this disease.

"The author states that obligatory incineration of corpses of animals which have died of anthrax, prohibition of access of agricultural animals to old cattle burial grounds, and closing of pastures (with perennial grass) which become freshly infected with the anthrax pathogen are fundamental among these measures."

107. Control of Foot-and-Mouth Disease in Ukrainian SSR

"Modern Measures of Control of Foot-and-Mouth Disease," by S. R. Didovets, chief, Veterinary Administration; Kiev, Visnyk Sil's'kohospodars'koy Nauky, Vol 3, No 2, Feb 60, pp 43-47

"Epizootics of foot-and-mouth disease which encompassed large territories and affected many cattle have occurred repeatedly in the Ukraine during the past 10 years.

"Mortality among cattle, even with the benign form of foot-and-mouth disease, reached 5% of the convalescing animals in some areas, and among animals with the malignant form, 40% or more.

"During the last two epizootics, the disease was caused by types A and O viruses; affection with type O produced more severe forms of the disease.

"The same types of virus which caused the benign form of foot-and-mouth disease also caused the malignant form in the Ukraine.

"A broad complex of veterinary-sanitary measures can guarantee the prevention of foot-and-mouth disease and its eradication in primary foci.

"Animals should be vaccinated not only in threatened farms and a danger area, but also in threatened herds.

"The method of vaccination in the tunica submucosa of the upper jaw by a dose of one ml of VIEV vaccine makes it possible to use the vaccine more economically than with subcutaneous introduction without diminishing its effectiveness.

"The use of anti-foot-and-mouth disease vaccine made from rabbit-adapted foot-and-mouth virus under conditions found in the Ukrainian SSR demonstrated its high immunogenic properties with a duration of 2-5 months' immunity in cattle. The simplicity of the preparation of this vaccine makes it possible to use it in unlimited quantities for the prophylaxis and control of foot-and-mouth disease, without decreasing the quality of the measures carried out, which we could not do with the other vaccines used during the past few years."

108. Plague Epizootics Among Marmots

"The Problem of the Course of Plague Epizootics in the Marmota caudata Geoffroy Population," by L. N. Klassovskiy, Ye. A. Shvarts, and E. L. Berendyayeva, Tr. Sredneaz. N.-I. Protivochumn. In-ta (Works of the Central Asian Scientific Research Antiplague Institute), No 4, 58, pp 75-79 (from Referativnyy Zhurnal -- Geografiya, No 3, Mar 60, Abstract No 6352, by Yu. M. Rall')

"Plague epizootics among Marmota caudata Geoffroy have not been extensively studied. They have been observed only in the subalpine and alpine zones of Alayskaya Valley in areas with a relatively high concentration of marmots (up to four per hectare). Here, marmots are found with three species of fleas, the total numbers of which are low (Ceratophilus lebedewi predominated). In addition, lice and ticks (one species) are found on the marmots. The highest point of the epizootics occurs at the end of May-June, then they are sharply extinguished. The finding of corpses of marmots which have died of plague is extremely rare. The epidemic significance of foci of plague in these marmots is not great, since trading is carried on at the end of the year when there are almost no epizootics."

109. Detection of Plague Foci Among Gerbillinae

"Methodological Principles of Determining Epizootics and Microfoci of Plague in Habitats of Gerbillinae According to External Signs of the Condition of the Colonies," by S. N. Varshavskiy, Ye. V. Rotshil'd, and M. N. Shilov, Tr. Sredneaz. N.-I. Protivochumn. In-ta (Works of the Central Asian Scientific Research Antiplague Institute) No 4, 58, pp 43-54 (from Referativnyy Zhurnal -- Geografiya, No 3, Mar 60, Abstract No 6351, by Yu. M. Rall')

"The mass discovery of rodent skeletons in colonies of Rhombomys opimus Lichtenstein (1823) can indicate the presence of plague microfoci of long duration. Along the Northern Aral Coast the authors detected 68 epizootic points, of which 49 contained abundant skeletal remnants. These data are presented on a chart. The bones belonged to 20-30 species of small animals, primarly rodents. Among the latter, the most numerous were Rhombomys opimus L. (21-64%), Citellus pygmaeus Pallas (15-29%), and Citellus fulvus Lichtenstein (7-20%). A table of plague epizootics among Gerbillinae according to external signs (characteristics of colonization, the behavior of the animals, the presence of bones and corpses) is presented."

110. Book on Disinfection

"Manual for Disinfectors," by V. I. Vashkov and B. I. Gandel'sman, M., 1959 339 pp (from Meditsinskiy Referativnyy Zhurnal, Section 3, No 5, May 60, Abstract No 1819, by Ye. P. Klimenko)

"The book consists of nine chapters. Chapter 1 deals with the problems of general epidemiology as a science; discusses in brief the characteristics of the causative agents of diseases; and provides information of infections, the infectious processes, the epidemiological process, and measures for the control of contagious diseases. Chapter 2 discusses the problems of special epidemiology and briefly characterizes intestinal and blood infections, as well as infections of the respiratory organs. Chapters 3, 5, and 8 deal with the problems of disinfection, disinfestation, and deratization, as well as with disinfection chambers. The problem of the disinfection service in the USSR is dealt with in Chapter 9."

Hematology

111. Amylase Sorption by Erythrocytes

"On the Sorption of Enzymes by Erythrocytes (Sorption of Amylase)," by G. P. Borodina; Tr. Blagoveshch. Med. In-ta, (Works of the Blagoveshchensk Medical Institute), No 3, 1957, pp 143-147 (from Referativnyy Zhurnal Khimiya -- Biologicheskaya Khimiya, No 8, 25 Apr 60, Abstract No 10451, by S. K.)

"Determinations of amylase activity in whole blood, plasma, and erythrocytes of rabbits were made. It was shown that amylase is distributed between the erythrocytes and the plasma, but the major part (75.4%) is found in the plasma. Amylase activity rises during hemolysis. The author determined that pancreatic amylase was sorbed by the erythrocytes under experimental conditions. The increased activity of the hemolysate is explained by the release of amylase from the structural elements of the erythrocytes."

112. Factor T Discovered in Healthy Blood and Duodenal Juice

"The Problem of Treating Thrombocytopenic Purpura," by Prof. Yu. A. Kotikov, Clinic of Hospital Pediatrics, Leningrad Pediatric Medical Institute; Moscow, Problemy Gematologii i Perelivaniya Krovi, Vol 5, No 4, Apr 60, pp 28-29

The author of this article discusses the source and physiology of a thrombopoietic factor T. The therapeutic effect of factor T is substantiated by several experiments and also from clinical practice.

A 4-year-old child suffering from hemorrhages of various sites was unsuccessfully treated with vitamin K, calcium chloride, ascorbic acid, and "antianemia"; but a daily dose of 80-100 ml of fresh bovine blood produced improvement: the number of thrombocytes increased, and hemorrhages disappeared.

Duodenal juice taken from healthy people was administered to rabbits and caused a rise in the number of thrombocytes; but duodenal juice taken from patients suffering from thrombocytopenia did not have such an effect. The duodenal juice of healthy people administered (through a catheter) to patients suffering from thrombocytopenia had favorable results.

The author concludes that the presence of a thrombopoietic factor, T, has been established in the duodenal juice and in the blood of healthy people and animals, and that when it is used in treating thrombocytopenic purpura against a background of the usual symptomatic therapy it induces rapid and stable therapeutic results.

Immunology and Therapy

113. Therapy of Experimental Plague With Antibiotics

"Therapeutic Effect of Oxytetracycline, Tetracycline, and Their Combinations With Other Antibiotics in Experimental Plague," by L. N. Makarovskaya, I. S. Tanker, and Ye. N. Aleshina, Rostov-na-Donu State Scientific Research Institute, Ministry of Health USSR; Moscow, Antibiotiki, Vol 5, No 2, Mar/Apr 60, pp 63-67

Experiments were conducted in vitro to determine the effectiveness of oxytetracycline and tetracycline when used separately or in combination with other antibiotics in the therapy of experimental plague. Bacterium pestis 773 in concentrations of 5 million microbes were used in the experiments. Oxytetracycline and tetracycline were applied in concentrations of 50, 100, 250, 500, and 1,000 gamma per milliliter. Seeded cultures served as controls. The experiments established that both antibiotics have a bactericidal and bacteriostatic effect on plague microbes: in concentrations of 50 gamma per milliliter they possess bacteriostatic properties, and in concentrations of 100-1,000 gamma per milliliter they are bactericidal to the microbes; oxytetracycline and tetracycline have a definite therapeutic effect on experimental plague; the therapeutic effectiveness is greater when they are administered subcutaneously than when administered per os; the combination of these two antibiotics with mycerin has a definite effect in the therapy of experimental plague.

114. Diagnosis of Tick-Borne Encephalitis

"The Problem of Preparing a Diagnosticum for the Complement Fixation Reaction in Tick-Borne Encephalitis," by M. K. Tyushnyakova, M. S. Zagromova, and Yu. V. Fedorov, Tomsk Institute of Vaccines and Sera; Moscow, Voprosy Virusologii, Vol 5, No 2, Mar/Apr 60, pp 204-208

This article is devoted to a study of different methods of culturing, purifying, and inactivating the tick-borne encephalitis virus for the preparation of a diagnosticum. The Kargasokskiy strain, isolated from Ixodes persulcatus ticks in the Tomsk focus in 1951, was used in all experiments.

Brain suspensions from intracerebrally infected mice were purified by extraction, thermolysis, and the subsequent action of benzene, ether, and chloroform. For further purification tests, the specific substrate was precipitated in the thermolysed suspension by methyl alcohol according to

V. I. Tovarnitskiy's method. The virus was inactivated by ultraviolet irradiation from a BUV-15 lamp, the photodynamic action of methylene blue, and formalinization. Complete inactivation was achieved by 40% formalin in a dilution of 1:1,000; this method also afforded the smallest decrease in specific antigen activity.

The following methodology was developed on the basis of the results obtained in these tests: a 10% suspension of the brains of white mice sacrified when the disease was clinically most apparent was prepared; the virus titer was 10^{-8} to 10^{-9}. The suspension was agitated and kept at 4° C for 24 hours, and then centrifuged, after which it was subjected to thermolysis and freezing (five times) with liquid nitrogen or oxygen. It was then thawed in a water bath at 37°. Flocs were precipitated by additional centrifugation for 30 minutes. The specific substrate was precipitated by the addition of methyl alcohol at -20° C in the amount of 45 ml per 100 ml of purified brain suspension, then kept at 4° C for 18-24 hours. After a 30-minute centrifugation, the precipitate without its supernatant fluid was dissolved in a phosphate buffer (pH 7.2-7.4), and methyl alcohol was added. The dissolved precipitate also served as specific antigen.

The results of the subsequent testing of the diagnosticum are discussed and tabulated. The following conclusions are given:

1. With the aid of thermolysis, purification with methyl alcohol and formalinization, tick-borne encephalitis antigen which was harmless and active in the complement fixation reaction was prepared from a virus-containing suspension of mouse brain.

2. The tick-borne encephalitis virus antigen, dried by the lyophylization method with the use of 20% sucrose and 2% gelatin (pH 7.4) as a supplement, maintains sufficient specific activity up to one year when it is kept at 4° C.

3. Testing of the diagnosticum in the complement fixation reaction with sera from tick-borne encephalitis patients demonstrated its specific activity, which makes it possible to detect the presence of complement-fixing antibody during the first day of the disease in titers of 1:4 to 1:128.

115. Chinese Army Medical Researchers Isolated Adenovirus in 1958

"Isolation of Adenovirus and Serologic Survey for Adenovirus Infections," by Yu Chung-hou (于 忠厚), Wu-Shu-ch'un (吳 樹 椿), and Chang Hsueh-te (張 学 德), People's Liberation Army Academy of Military Medical Sciences; and Lo Hui-yuan (羅 會 元), Infectious Disease Section of the Medical Department, Peking Union Hospital of the Chinese Academy of Medical Sciences; Peiping, Chung hua Nei k'o Tsa chih (Chinese Journal of Internal Medicine), Vol 8, No 1, Jan 60, pp 10-16

This paper reports the details concerning materials and methods used in the spring and again in the fall of 1958 to isolate adenovirus from the throat washings of patients with acute respiratory infections. From a total of 69 specimens, three strains of virus were isolated by HeLa cell tissue culture. The HeLa cells reportedly were obtained from Poland and had been preserved in the author(s)' laboratory for at least 1 1/2 years. The cytopathogenic effects of these three strains were found to be similar to those of adenoviruses described in the literature. Two strains were positively identified as type 3. The other strain was not neutralized by type 3 or type 7 antiserum, but was classified with certainty as a member of the adenovirus group because, besides other characteristics, it was found to share a common complement-fixing antigen with adenovirus types 3 and 7. The authors had only types 3 and 7 antisera to work with in their typing tests. These they prepared from adenovirus strains which were obtained from the Department of Microbiology of the Chinese Academy of Medical Sciences and had been passed serially through HeLa cells in the authors' laboratory for a year.

In the fall of 1958, type 3 adenovirus complement-fixing antibodies reportedly were demonstrated in 14 ont of 119 serum specimens from patients (ages from birth to 60) who did not have respiratory infections. The percentage of positives was low in all age groups.

The foreign literature on previous research is reviewed. The role of adenovirus in absenteeism among US military personnel and reports of effective preventive inoculation with formaldehyde-killed adenovirus vaccine are pointed out. The authors note the urgent need for conducting a survey of adenovirus infection among Chinese recruits to determine whether or not preventive inoculation is warranted.

Oncology

116. Discrepancies in RNA and DNA Contents in Normal and Tumor Cells During Mitotic Processes

"Changes in Nucleic Acids During the Process of Cell Division in Normal and Tumor Cells," by N. V. Krasil'nikova, Tr. Stud. Nauchn. O-va Khabarovskogo Med. In-ta (Works of the Students' Scientific Society of the Khabarovsk Medical Institute), No 2, 1959, pp 21-23 (from Referativnyy Zhurnal Khimiya -- Biologicheskaya Khimiya, No 8, 25 Apr 60, Abstract No 11159, by M. Piotrovskiy)

Changes occurring in nucleic acids during the process of mitosis in normal and tumor cells were studied by histochemical methods. The intestinal and tongue epithelium of normal, full-grown white mice, and cells of Crocker sarcoma were studied. It was shown that whereas the RNA noted in the normal cells during the metaphase and anaphase stages was at its minimum, the amount of RNA remained unchanged during all the stages of cell division in the tumor cells. Changes in DNA content during the processes of mitosis in tumor cells were similar to those in normal cells, although the shifts in DNA content during the division of tumor cells were very weakly expressed."

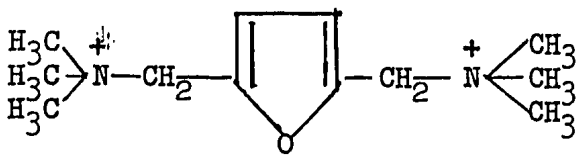
Pharmacology and Toxicology

117. New Ganglioblocking Preparations

"Concerning the Ganglioblocking Action of Certain New Bis-Ammonium Bases," by Ya. Shuster; Riga, Izvestiya Akademii Nauk Latviyskoy SSR, No 2, 1960, pp 179-183

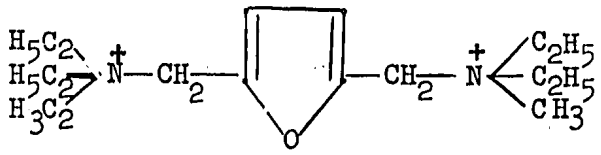
Pharmacological investigations were conducted of new bis-ammonium bases synthesized by Yu. K. Yur'yev, K. Yu. Novitskiy, and V. N. Zhingareva of the Chair of Organic Chemistry, Chemical Faculty of the Moscow State University imeni M. V. Lomonosov. The structural formulas of the new compounds are as follows:

YuNZh-1

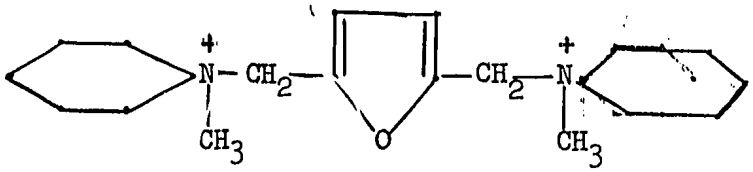


2 I-

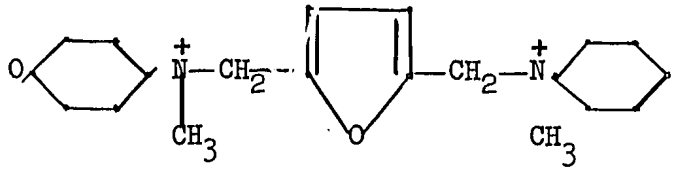
YuNZh-2



YuNZh-3



YuNZh-4



All these substances are white-yellow tinted powders, readily soluble in water. The pharmacological action of the compounds was compared with that of hexonium. Cats were used in the experiments. It was found that all the four compounds possess ganglioblocking and hypotensive properties; YunZh-3 and YunZh-4 are highly effective when administered into the upper cervical sympathetic ganglion; YunZh-4 is effective also for the cardiac ganglion of the vagus nerve; the preparations are somewhat less active than hexonium.

118. Effect of Ganglioblocking Substances on Nervous System

"Effect of Ganglioblocking Drugs on the Rapidity With Which Nervous Excitation Is Transmitted in Sympathetic Ganglia," by D. A. Kharkevich, Laboratory of Special Pharmacology, Institute of Pharmacology and Chemotherapy, Academy of Medical Sciences USSR, and Chair of Pharmacology First Moscow Order of Lenin Medical Institute imeni I. M. Sechenov; Moscow, Bulleten' Eksperimental'noy Biologii i Meditsiny, Vol 49, No 3, Mar 60, pp 61-64

The results of experiments conducted to determine the effect of ganglioblocking substances on the rapidity with which stimuli are transmitted in the sympathetic ganglia are reported. Cats anesthesized with urethan were used in the experiments. The ganglioblocking substances tested were tetraethyl ammonium, hexonium, pentamin, and mecamine. For comparison, tests were also carried out with novacain and barbamil. The drugs were injected into the vena femoralis. Supramaximal electric stimuli were used to excite the preganglionic fibers. Bipolar platinum electrodes were used to record the discharges from the postganglionic fibers. The experiments established that all ganglioblocking substances inhibit the transmission of stimuli in the sympathetic ganglia, regardless of the

mechanism of their depressing action. Experiments in which novocain and barbamil were used determined that these substances, like the ganglioblocking preparations, also depress the transmission of stimuli in the ganglia.

119. Effect of Ganglioblocking Substances on Resynthesis of Adenosine Triphosphate

"Effect of Ganglioblocking Substances on the Glycolytic Processes in the Upper Cervical Ganglion," by N. B. Vysotskaya, Laboratory of Special Pharmacology, Institute of Pharmacology and Chemotherapy, Academy of Medical Sciences USSR; Moscow, Farmakologiya i Toksikologiya, Vol 23, No 2, Mar/Apr 60, pp 155-158

The effect of nicotine, hexonium, pentamin, tetraethyl ammonium, and pachycarpine on the resynthesis of adenosine triphosphate in the upper cervical ganglion of cats anesthesized by urethan was studied. The investigations revealed that with the exception of hexonium, the ganglioblocking substances tested disturbed the glycolytic resynthesis of adenosine triphosphate causing a decrease in the ganglion content of adenosine triphosphate. Another reason for the decrease in the content of adenosine triphosphate was an increase in the activity of adenosinetriphosphotase. Hexonium had no essential effect on the glycolytic processes in the upper cervical ganglion.

120. Measuring Serum Cholinesterase Activity

"A Simple and Accelerated Colorimetric Method of Measuring the Activity of Serum Cholinesterase," by G. David, L. Gyarmati, and I. Fanczi; Budapest, Kiserletes Orvostudomany, Vol 11, No 2, 1960, pp 201-206

"A simple and accelerated colorimetric micromethod for measuring the activity of serum cholinesterase was developed by the authors. With the help of this method it is possible to determine the activity of serum cholinesterase in 20-25 minutes. The basis of this method is the fact that cholinesterase separates the red 2-azobenzene-1-naphthol from the yellow 2-azobenzene-1-naphthyl acetate. On the basis of this method they were able to define the unit; observations conducted on 20 healthy persons made it possible to determine the activity of the cholinesterase at 1.57 ± 0.30."

121. Effect of Cholinolytics on Certain Centers

"Effect of Central Cholinolytics on the Respiratory and Vasomotor Centers," by A. Ye. Aleksandova, Chair of Pharmacology, Leningrad Sanitary-Hygienic Medical Institute; Moscow, Farmakologiya i Toksikologiya, Vol 23, No 2, Mar/Apr 60, pp 109-113

Cats anesthesized by urethan, hexenal, or thiopental were used in experiments conducted to determine the effect of spasmolytin, pentaphen, and diazil on the respiratory and vasomotor centers. The drugs were administered to the animals either intracisternally or into the vertebral artery, in doses of 0.25-0.5 milligrams per kilogram of body weight. In doses of 0.25 milligram per kilogram of body weight, the drugs depressed the amplitude and rate of respiration. In doses of 0.5 milligram per kilogram of body weight they sometimes stopped respiration. The assumption is that the respiratory and vasomotor centers contain cholinoreactive systems which are sensitive to the cholinolytics.

122. Condensation of α-Nitroketones With Nitroolefins

"Synthesis of α, γ -Dinitroketones", by V. V. Perekalin and K. Bayer, Leningrad State Pedagogical Institute imeni Gertsen; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 3, Mar 60, pp 943-945

Nitroketones and their derivatives have been used successfully as starting materials for the synthesis of various pharmacologically active substances: analogs of quinacrine, adrenalin, chloromycetin, and miosmin.

The attention of the authors was attracted to α-nitroketones in the methylene groups of which considerable mobility of the hydrogen atoms should be expected due to the pi,sigma-conjugation with the electrophilic nitro- and carbonyl-groups.

In addition, up to the present there have not been any attempts to bring α-nitroketones into a reaction with compounds possessing active double bonds, in particular, with unsaturated nitro compounds which readily react with substances that contain mobile hydrogen atoms in methylene and methine groups.

The authors sought to develop a general method for synthesizing, α, γ -dinitroketones and for the subsequent heterocyclization of products of the reduction of these compounds. Several fatty-aromatic α-nitroketones, viz., ω -nitroacetophenone, p-methyl-, p-methoxy-, and m, p-methylenedioxy-ω -nitroacetophenones were reacted with unsaturated nitro compounds of the aromatic and heterocyclic series, namely β -nitrostyrene, p-methoxy-, p-nitro- β -nitrostyrenes, 1,4 -bis (β -nitrovinyl)- benzene, 2-furyl- and 2-thienyl-nitroethylene.

1,4 -Bis (β-nitrovinyl) benzene reacted with two mols of ω-nitroacetophenone and p-methoxy- ω-nitroacetophenone, which were added to both multiple bonds of the dinitroolefin.

123. Doubling of Molecules Leads to Intensified Pharmacological Action in Experiment

"Bis-dialkylaminoacetyl Derivatives of the Benzidine and 4,4'-Diaminodiphenylethane Series," by N. I. Kudryashova and N. V. Khromov-Borisov, Institute of Experimental Medicine of Academy of Medical Sciences USSR; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 3, Mar 60, pp 902-906

In this work, the authors searched for new local anesthetics and investigated the relationships between the chemical structure of the substances synthesized and their pharmacological activity. They synthesized a number of bis-dialkylaminoacetyl derivatives of the benzidine and 4,4 -diaminodiphenylethane series. These compounds are doubled analogs of compounds of the Xycaine series which the authors prepared in previous work [Xycaine is ω-diethylamino-2,6 -dimethylacetanilide]. "Doubling" of the molecules leads to an intensification of the pharmacological action, according to the authors.

The pharmacological observations, conducted by P. Ye. Motovilov and O. G. Plets, indicated that the duration of local anesthetic effect of the hydrochlorides of the prepared compounds of the benzidine series was greater than of the corresponding compounds of the xycaine series while the duration of the local anesthetic effect of compounds of the diphenylethane series did not differ from the duration of that produced by ω-dialkylamino-4-methylacetanilide. The authors observed that the hydrochloride salts of the synthesized derivatives of benzidine enhibited considerably less toxicity than the corresponding salts of aniline derivatives. The diiodomethylates of "doubled" compounds, on the other hand, were considerably more toxic than the iodomethylates of the corresponding derivatives of aniline.

124. Complex Compounds of Amines With Halo-Phenols Tested for Bactericidal Action

"Formation of Complexes by Amines With Various Organic Compounds. I. Complexes of Benzidine and Naphthylamines With Some Halophenols," by B. V. Tronov, I. M. Bortovoy, and L. I. Potekhina, Tomsk State University; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 3, Mar 60, pp 982-985

In the literature, a large number of complex compounds of amines with phenols have been described. These complexes form because formation of a hydrogen bond between the hydrogen of the phenolic hydroxyl group and the

nitrogen of the amine takes place. In many systems of this type the complex compounds have not been isolated but an interaction between the components was observed by various methods of physicochemical analysis.

The authors in this work have studied formation of complexes of benzidine, α-naphthylamine, and β-naphthylamine with several halo-substituted phenols. In nearly all cases, the complexes were obtained by mixing solutions of the components in a suitable solvent, most frequently benzene; occasionally the complex compounds were recrystallized. The complex compounds were analyzed for nitrogen and in some cases for halogen.

The synthesized compounds were tested for their bactericidal activity. Several of them gave positive results on several it could be shown that the action of the complex compound was different from the individual actions of the amine and the phenol. The bactericidal activity was determined by sowing B. coli in a beef-peptone broth. The phenol-resistance of the strain lasted for 20 minutes in a 1:90 phenol solution. The phenol coefficient was not determined but rather the active concentration and the time of action. The results of the tests are presented in a table.

In all, nine complex compounds of amines with halo-phenols were prepared which had not been previously described.

125. Effect of Vitamins on Analeptic Drugs

"Effect of C and B Complex Vitamins on the Sensitivity to Some Analeptics in Deep Hexenal Anesthesia," by T. V. Ivanovskaya, V sb.: Eksperim. Issled. po Fiziol. Biokhimii i Farmakol. Vyp 1, (Collection of Works of Experimental Investigations in Physiological Biochemistry and Pharmacology, No 1), Perm', 1959, 141-144 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 9, 10 May 60, Abstract No 13004, by I. El'man)

"The preliminary administration intravenously of vitamins B_2 (in doses of 0.4 milligram per kilogram of body weight) and PP (in doses of 5 milligrams per kilogram of body weight) increased the sensitivity of the respiratory center to cordiamin, when respiration stopped during deep hexenal anesthesia, securing greater dependence on the action of the analeptic drug. When respiration was again halted by the additional administration of hexenal, the application of cordiamin on a background of the vitamins again restored respiration in four cases out of seven. The combination of vitamins B_2 plus PP plus C was less effective."

126. Effect of Platyphylline on Depressants

"Effect of Platyphylline on the Action of Certain Substances Which Depress the Central Nervous System," by R. G. Dianova, Chair of Pharmacology, Astrakhan State Medical Institute and Chair of Pharmacology, Kalinin State Medical Institute; Moscow, Farmakologiya i Toksikologiya, Vol 23, No 2, Mar/Apr 60, pp 106-109

Rabbits and albino mice were used in the experiments which were conducted to determine the effect of platyphylline, an alkaloid which has an atropinelike action, on the action of magnesium sulfate, luminal, nembutal, and chloroform. A solution of platyphylline was subcutaneously administered to the animals in a dose of 40 milligrams per kilogram of body weight about 15 minutes before the administration of the substances to be tested. Magnesium sulfate in doses of 750 milligrams and 1.25 grams per kilogram of body weight and nembutal in doses of 9-30 milligrams per kilogram of body weight were subcutaneously administered to the animals; luminal in a dose of 60 milligrams per kilogram of body weight was injected into the vein of the rabbit's ear. The control animals received Locke's solution instead of platyphylline. The results were as follows.

1. Platyphylline in combination with magnesium sulfate, nembutal, and luminal potentiated the anesthesizing action of the latter drugs.

2. Platyphylline when used in combination with chloroform intensified and prolonged the side effects produced by the latter.

127. Effect of Some Drugs on Terramycin

"Investigations in vitro of the Antagonism to Terramycin," by Irma Togodi and Laszlo Feuer, Biol. Kozl. (Hungary), 1959, 7, No 1-2, 107-111 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 9, 10 May 60, Abstract No 12218, by S. Shapovalova)

"One of the derivatives of terramycin which has no antibiotic properties is capable of depressing the antibiotic action of terramycin. Caffeine, theophylline, and barbiturates also diminish the activity of terramycin. Vitamin C and rutin do not modify the antibiotic properties of terramycin."

128. Effect of Antithyroid Preparations on Blood

"Effect of Methylthiouracil and Potassium Perchlorate, Antithyroid Preparations, on the Nonprotein Nitrogen and Cholesterol in the Blood of Rabbits," by Ya. A. Dergousova and T. V. Goldobina, V sb.: Eksperim. Issl. po Fiziol., Biokhimii i Farmakol. (Collection of Works on Experimental Physiological Biochemistry and Pharmacology), No 1, Perm', 1959, 86-92 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 9, 10 May 60, Abstract No 12047, by R. Chapnitskaya)

"It was found that the administration of methylthiouracil (I) in doses of 100 milligrams in 24 hours for a period of 60 days to rabbits weighing 1,200-2,000 grams caused a considerably greater decrease in the blood content of nonprotein nitrogen (II) than the administration of a similar dose of potassium perchlorate (III) for the same period of time. When the dose of (III) was increased to 200 milligrams in 24 hours, it produced an increase in the level of (II) which approximately equaled that caused by the administration of 200 milligrams of (I) in 24 hours. The effect of (I) when its dose was raised to 200 milligrams in 24 hours was insignificant; (I) and (III) administered in doses of 200 milligrams in 24 hours caused a decrease in the blood content of Urea (IV), by 22.4 and 18.2 percent, respectively. Within 15 days after the administration of (I) and (III) was stopped, the blood content of (II) and (IV) in the animals was restored to their normal levels. The blood content of cholesterol (V) 30-40 days after the administration of (I) and (III) was begun, increased, but began to recede during the succeeding days and at the end of the experiment was restored to its normal level. (I) and (III) when administered in doses of 200 milligrams in 24 hours produced considerably greater changes in the concentration of (V) than they do in doses of 100 milligrams per 24 hours; (III) had a greater effect on the blood content of cholesterol than (I)."

129. Hypotensive Preparation

"A Substance Obtained From the Fruit of Carum carvi Possessing Hypotensive Action," by B. Avramova, Tr. N.-i. In-t Farmatsii (Works of the Scientific Research Institute of Pharmacy, Bulgaria), 1959, 2, 65-67 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 9, 10 May 60, Abstract No 13161, by B. Barun)

"A crystalline substance (melting point 239-240 degrees), possessing an expressed hypotensive action and only slightly toxic, has been isolated from the fruits of Carum carvi. The substance does not manifest any

glycoside or alkaloid properties and is not a cumarine derivative. Certain of its physical and chemical properties permit the assumption that it belongs to the group of amino acids."

130. Therapy of Carbon Tetrachloride Intoxication

"On the Therapeutic Effect of Intravenous Administrations of Sodium Lactate to Animals Intoxicated With Carbon Tetrachloride," by I. I. Fedorov, Ye. L. Neygauz, and S. S. Vavrinyuk, V sb.: Fiziol. Mekhanizmy Kompensatorn. Reaktsii i Vosstanovit. Protsessov (Collection of Works on the Mechanisms of the Compensatory Reaction and Restorative Processes), Part 2, L'vov, 1958, 25-91 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 9, 10 May 60, Abstract No 13177)

"Experiments carried out on dogs with isolated ureters (and in a number of cases with gall bladder fistulas) revealed that the intravenous administration of sodium lactate produced a diuretic and choleretic effect. Carbon tetrachloride intoxication causes a decrease in diuresis and bile formation, the appearance of bilirubinuria, albuminuria, an increase in the amount of indican in the urine, and a decrease in the excretion of chlorides. The administration of a 10-percent solution of sodium lactate had a considerable therapeutic effect and regulated metabolism."

131. Effect of Triethylamine Vapors on the Organism

"Concerning the Toxicology of Triethylamine," by V. V. Kustov, A. A. Denisenko, and O. S. Shemyakin; Moscow, Farmakologiya i Toksikologiya, Vol 23, No 2, Mar/Apr 60, pp 174-176

Studies were conducted to determine the effect of triethylamine, a substance widely used in the chemical industry, on the organism. White male mice were used in the experiments. Intoxication by triethylamine vapors was carried out by exposing the animals to the action of the vapors in a special chamber. The experiments established that the lethal concentrations of triethylamine for mice are as follows: LC_{100}, 3.54 milligrams per liter; LC_{50}, 1.9 milligrams per liter; the threshold concentration of triethlamine after a 2-hour exposure is 0.18 milligram per liter, as established by olfactory conditioned reflexes. The preparation is also toxic locally, causing chemical burns on contact with the skin.

132. Effect of 6270, an Antibiotic, on the Organism

"Pharmacological Investigation of the Antibiotic 6270," by L. Ye. Gol'dberg, Institute for the Search of New Antibiotics, Academy of Medical Sciences USSR; Moscow, Antibiotiki, Vol 5, No 2, Mar/Apr 60, pp 50-55

An account is given of the results of the experiments which were carried out on white mice, rats, rabbits, and dogs to determine the pharmacological properties of 6270, an antibiotic isolated from the mycelium and cultural fluid of Actinomyces flavochromogenes, and found to be effective against tumors, especially lymphosarcoma L-10-1. The experiments revealed that the antibiotic 6270 is highly toxic and possesses cumulative properties; it is less toxic for mice than for dogs and rabbits; in maximally tolerated doses, it does not affect the level of total nitrogen in the blood, and the level of the glycogen and fat content in the liver. The antibiotic increases the permeability of the vessels, causes a decrease in the number of thrombocytes, and increases the prothrombin time. The toxicity of the antibiotic can be reduced by the administrations of vitamins C, P, and K_3.

133. Effect of Imanin on the Organism

"On the Effect of Imanin When Administered Subcutaneously," by M. M. Smyk and T. I. Ivanova, Chair of Pathological Physiology, Lugansk Medical Institute; Moscow, Antibiotiki, Vol 5, No 2, Mar/Apr 60, pp 103-104

Rabbits were used in experiments in which it was sought to determine the effect of imanin on the organism. Imanin [an antibacterial preparation for external application obtained from Hypericum perforatum L., by M. D. Mashkovskiy, Moscow, 1957, pp 602-607] is an antibiotic used in the therapy of burns and other skin injuries when administered subcutaneously to animals. The experiments established that: when subcutaneously administered to healthy rabbits, imanin decreased the blood content of polynucleates; when administered to rabbits infected with staphylococci, it considerably increased the number of polynucleates in the blood; anemia and polynuclear leukocytosis were less pronounced in the rabbits which received imanin than they were in the control animals.

134. Simplified Method of Titanium Determination by Spectral Analysis

"Spectral Determination of Small Quantities of Titanium in Dust," by M. V. Nifontova, Institute of Sanitation and Hygiene imeni F. F. Erisman; Moscow, Gigiyena Truda i Professional'nyye Zabolevaniya, No 1, Jan 60, pp 51-53

Since the current methods for determining small amounts of titanium are lengthy and cumbersome, the purpose of the research described was to develop a spectrographic method for such determinations and to introduce this method into the practice of sanitation and industrial chemistry. The spectrographic method makes it possible to determine titanium in the presence of various other elements without having to dissolve it.

The author describes the various factors and conditions for an accurate determination. The two tables presented are entitled "Results of the Quantitative Spectral Determination of Titanium in Fluid Solutions" and "The Determination of Titanium in Artificial Mixtures."

The following conclusions are presented:

1. The method developed for the spectral determination of small amounts of titanium requires small volumes of fluid (from 0.1 to 0.15 ml), and small samples of the dry substance (0.02 g and less).

2. The accuracy of determination by the above-mentioned method is approximately $\pm 5.1\%$, and the sensitivity is 0.0002 mg titanium.

3. Selecting ammonium citrate as the medium increases the intensity of the blackening of the spectral lines by a factor of 10.

135. Review of Book on Antibiotics

"Methods of Search for New Antibiotics," by G. F. Gauze, Reviewed by K. N. Kashkin; Moscow, Mikrobiologiya, Vol 29, No 2, Mar/Apr 60, pp 305-307

The article is a critical review of the monograph on antibiotics written by G. F. Gauze. The book consists of an introductory chapter, and five textual chapters. In the introductory chapter the author states the purpose of the book and briefly reviews the literary data on the subject of antibiotics already available. The distribution of fungi, spore bacteria, actinomycetes, and the soils from which these are obtained is the topic of discussion in the first chapter. The importance of the proper selection of soils for the production of antibiotics is stressed. It is the author's opinion that northern soils are preferable to southern soils in this respect.

Chapter 2 of the book deals with the problem of the classification of the substances which form antibiotics. Considerable space is given to actinomycetes. Problems bearing on the methods and ways of discovering new antibiotics are discussed in Chapter 3. Several methods for isolating antibiotics are suggested, and a comparative evaluation of these methods is made. Chapter 3 and 4 are devoted to the problems of the search for antivirus and antitumor antibiotics. Gauze stresses the importance of the cooperative efforts of microbiologists, biochemists, and chemotherapeutists for the successful solution of the problem of the discovery of new antibiotics.

The reviewer is somewhat critical of the book claiming that (1) too much attention is given to reports on research work done by the author himself without sufficient attention given to literary data already available on the subject in domestic and foreign literature; (2) the problem of the classification of actinomycetes is inadequately treated; (3) insufficient information on preparations which are capable of suppressing the vital activities of the bacteria which are resistant to bacteria is provided; and (4) the use of ion exchange resins for the isolation of antibiotics should have been treated in greater detail.

Physiology

136. Effects of Oxygen Intoxication

"Morphological Changes in the Central and Certain Portions of the Peripheral Nervous Systems of Animals in Hyperoxemia," by Yu. M. Zagorskiy, Chair of Physiology of Military Labor of Military Medical Academy imeni S. M. Kirov, and Neurohistological Laboratory of Scientific Research Neurosurgical Institute imeni A. L. Polenov; Moscow, Arkhiv Patalogii, Vol 22, No 3, 1960, pp 27-34

The author describes experiments in which oxygen intoxication was produced in four cats and one dog by the administration of oxygen under pressure. It was noted that distinct morphological changes in the central and peripheral nervous systems accompany such intoxication. The most pronounced changes observed were in the optic thalami, the cerebellum, and in the caudal spinal cord sections. Results of investigations of the peripheral nervous system portions showed that the most pronounced changes took place in the sensory neurons of the spinal and cranial sensory ganglia.

The nature of these changes confirms the view of some physiologists that tissue hypoxia is one cause of oxygen intoxication.

137. Audio Signal Frequency Discrimination

"On the Accuracy of 'Absolute' Discrimination of the Frequency of Audio Signals in Man," by Ye. Ya. Voytinskiy, Institute of Physiology imeni I. P. Pavlov, Academy of Sciences USSR; Moscow Voprosy Psikhologii, No 2, Mar/Apr 60, pp 74-83

This article discusses the results of experiments conducted on 15 people with normal hearing and describes the method for determining differential thresholds from the results of "absolute" discrimination. The "absolute" discrimination of a number of audio signals of different frequencies was investigated by this method. It was found that the broader the range of frequency, the less the accuracy of differentiation (the thresholds increase) and vice versa. With narrow frequency ranges, the accuracy of differentiation approaches that of "relative" discrimination.

138. Conditioning of Verbal Stimuli

"Conditioned Responses to Verbal Stimuli," by L. A. Shvarts, Institute of Psychology, Academy of Pedagogical Sciences RSFSR; Moscow, Voprosy Psikhologii, No 1, Jan/Feb 60, pp 86-98

The author of this article states that 429 experiments on the replacement of conditioned verbal stimuli with words similar to them in pronunciation but different in meaning, or similar in meaning but different in pronunciation (synonyms), were conducted on 13 adults. The results of the experiments indicated that a broad generalization takes the place of conditioned verbal stimuli. It was demonstrated that conditioned connections between verbal stimuli which are similar only in pronunciation are extinguished. At the same time, it was observed that conditioned connections between synonyms did not disappear.

The administration of a cortical soporific (chloral hydrate) resulted in a weakening of the conditioned response to the verbal stimulus synonyms, and in the disinhibition of the already extinguished conditioned response to words similar to the verbal stimulus in pronunciation.

139. Ability Formation Discussed

"The Formation of Abilities," by A. N. Leont'yev, Chair of Psychology of Moscow University; Moscow, Voprosy Psikhologii, No 1, Jan/Feb 60, pp 7-17

This article was read at the First Congress of the Society of Psychologists held in Moscow from 29 June to 4 July, 1959. The author states that it is necessary to identify two types of abilities in a human being: the natural abilities and the specifically human abilities. The former are directly related to innate, anatomic, and physiological properties. They are natural abilities to form and to differentiate conditioned associations rapidly, abilities to withstand the effects of negative stimuli, and abilities to analyze. The specifically human abilities are built on the foundation developed by natural abilities. These specifically human abilities have an ontogenetic origin, are the result of the process through which the individual learns (or acquires) the social and historical achievements of mankind, and are embodied not in biological factors, but in the objective products of material and spiritual culture. These abilities have as their material basis the functional "physiological organs" of the brain, formed during a lifetime.

The above statements are based on the results of experiments performed on 100 adults in the author's laboratory. The investigations began with a study of the development of the ability to analyze sounds of various frequencies.

140. Space Perception Experiments Reported

"News in the Study of Space Perception," by B. G. Anan'yev, Leningrad Scientific Research Institute of Pedagogy, Academy of Pedagogical Sciences RSFSR, and Chair of Psychology of University of Leningrad; Moscow, Voprosy Psikhologii, No 1, Jan/Feb 60, pp 18-28

This article is a reprint of the paper read at the First Congress of the Society of Psychologists, held in Moscow from 29 June to 4 July 1959. The author discusses the recent experimental studies on space perception conducted from psychological, physiological, and pedagogical standpoints which were reported at a special scientific conference on space perception held in May 1959 in Leningrad. This conference was called by the Leningrad Branch of the Society of Psychologists and the Leningrad Scientific Research Institute of Pedagogy, Academy of Pedagogical Sciences RSFSR.

The article says that space perception is a complex, intermodal association; it is an important tool of human orientation within the world he inhabits. Like perception in general, it has as its basis a complicated conditioned response to a complex stimulus. The mechanism of space perception is characterized by some specific features, such as variation in the structure of intermodal associations according to the objective nature of space signals, unification of the brain terminals of various analysors, binary functioning of receptors, and functional asymmetry in the paired work of the brain and its principal analysors.

The article presents data on the development of space perception and its role in man's working activity.

141. Vibration Sickness and Its Countermeasures

"Vibration Caused by Drilling With Electric Drills," by V. I. Yelgazin, Chair of General Electrical Technology, Tomsk Polytechnic Institute; Moscow, Gigivena i Sanitariya, No 4, Apr 60, pp 108-110

To date, the consequences of vibration have not attracted serious attention, and they have been considered harmless. According to the research conducted by the author, this is not so, since vibrations produced while drilling with electric drills, especially with hand drills, are harmful to the whole organism; they produce symptoms of vibration sickness, characterized by a sensation of pain in the hands and in the vertebral region, decreased tactile sensation of the fingers, and decreased vision during the drilling operations.

To counteract vibration consequences, certain measures and improvements in the designs of instruments are sketched and explained, and close cooperation between the designers and the hygienists is recommended.

142. Fluctuation of Phospholipid Metabolism in C. N. S. During Excitation and Inhibition

"The Metabolism of Phospholipids in the Brain Against a Background of Excitation and Inhibition," by A. V. Tyazhkaya and V. A. Lyashenko, Tr. Stud. Nauchn. O-va Khaba-Khabarovskogo Med. In-ta (Works of the Students' Scientific Society of Khabarovsk Medical Institute), No 2, pp 31-33, 1958 (from Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 8, 25 Apr 60, Abstract No 11040, by T. Nevskaya)

"The use of P^{32} in experiments on mice indicated that during excitation of the central nervous system by caffeine, the specific activity of lipid phosphorus is increased as compared with that of the controls, but that during the inhibition of the central nervous system by hexenal, the specific activity is decreased. During central nervous system inhibition by hexenal a certain tendency toward the accumulation of lipid phosphorus is observed."

143. Effect of Anaphylactic Shock on Proteins

"Modifications of the Protein Composition of the Blood of Rabbits in Anaphylactic Shock During the Early Period of Resusciation After Clinical Death," by M. G. Kolpakov, V sb.: Materialy Vtorovo Plenuma Sibirsk. Fil. O-va Patofiziolov (Collection of Reports of the Second Plenum of the Siberian Branch of the Society of Pathophysiologists), Chita, 1958, 77-79 (from Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 6, 25 Mar 60, Abstract No 7769)

"The peculiarities of the response reaction of a resuscitated organism to the administration of a sensitizing dose of a heterogenic protein was studied in 40 rabbits. The rabbits, depending on the sex, reacted differently to a sensitizing injection of horse serum. This may be explained by the peculiarities of the hormonal regulation of the animals. The increase in the blood serum content of beta and gamma globulins in the course of the anaphylaxis which takes place during the early period of resuscitation is greater in males than in females. In addition, the albumin content is decreased in the females. In control experiments (without resuscitation) the content of alpha, beta, and gamma globulins, as well as of albumins, is decreased in the males; in the females, the gamma globulin contents is considerably increased, and that of albumins is decreased."

144. Portable Electrocardiograph Invented

"Portable Electrocardiograph," by N. Koshelev; Moscow, Izvestiya, 15 May 60, p 4

The author of this article states that physicians will soon be able to perform electrocardiography in a patient's home with the aid of a portable electrocardiograph. A graphic picture of the condition of a patient's heart can be obtained quickly and without any difficulty with the aid of this mechanism, which is presently undergoing testing.

This device was invented by Yu. Sakharov, engineer of the Kuybyshev bearing plant; P. Gorbarenko, docent of the Kuybyshev Medical Institute; and radiotechnicians V. Isayev, N. Kudashev, and A. Yul'skiy. This portable electrocardiograph is simple and inexpensive. Its dimensions are 35 x 25 x 25 centimeters.

145. Physiological Idealism Criticized

"V. I. Lenin's Criticism of Physiological Idealism and Its Role in the Interpretation of the History of Psychophysiology," by M. G. Yaroshevskiy; Moscow Voprosy Psikhologii, No 2, Mar/Apr 60, pp 47-60

The author of this article states that V. I. Lenin's criticism of "physiological idealism" is a splendid example of a concrete historical analysis of the evolution of natural science which strives to penetrate the world of mental phenomena. V. I. Lenin was convinced that estimates of the idealistic school on the history of science were wrong. He believed that all fragments of idealism will be smashed against the immovable pillars of natural historical materialism. By throwing light on the evolution of science, V. I. Lenin supplied a cue for drawing a true picture of the formation of ideas involving the mechanisms of sensory learning. It is the aim of the author of this article to develop this picture in the light of V. I. Lenin's analysis of I. Mueller's doctrine.

Public Health, Hygiene, and Sanitation

146. Improving Medical Service

"On Measures for the Further Improvement of Medical Service to and for the Preservation of Health of the People of the USSR" (unsigned article); Moscow, Gigiyena Truda i Professional'nyye Zabolevaniya, Vol 4, No 4, Apr 60, pp 3-6

The article stresses the necessity for further improvement of medical services to the people and the adoption of measures for the preservation of the people's health. The great strides which are being made by Soviet industry, particularly in connection with the production of polymers, and the application of energy from new sources, such as nuclear energy, electromagnetic oscillations, various vibration techniques, and others, are creating new occupational and production factors which require thorough study in relation to their unfavorable effect on the organism. While a number of institutes have already begun studies of this subject, comparatively little has been done to develop prophylactic measures which would protect the organism from the effects of radioactivity, excessive noise, vibrations, and other harmful factors. Nor is there yet a sufficient number of personnel or adequate facilities which make it possible to efficiently cope with this problem. There need be no doubt, the article states in conclusion, that the workers in the fields of hygiene and occupational pathology will do all possible to correct the situation.

147. Conference on Physical Training

"Fourth All-Russian Scientific-Practical Conference of Chairs of Physical Training, Therapeutic Physical Culture, and Medical Supervision Over Medical Institutes," by V. V. Bulychev; Moscow, Zdravookhraneniye Rossiyskoy Federatsii, No 5, May 60, pp 46-47

This article reports on the fourth All-Russian Scientific-Practical Conference of Chairs of Physical Training, Therapeutic Physical Culture, and Medical Supervision Over Medical Institutes, held in January 1960 in Leningrad. Some 120 representatives of chairs of 45 medical institutes of the RSFSR attended the conference. Representatives of the Ukrainian, Belorussian, Lithuanian, Kazakh, and Armenian SSRS were also present at the conference, which was sponsored by the Ministry of Health RSFSR.

Those present at the conference discussed the program of physical training for students of medical institutes. The program was drawn up by the Main Administration of Schools of the Ministry of Health RSFSR in 1959 and sent out to all medical institutes of the RSFSR for preliminary appraisal.

The delegates to the conference elected a commission to edit the program on physical training of students in medical institutes.

It was noted at the conference that the chairs of physical training, therapeutic physical culture, and medical supervision of medical vuzes (higher educational institutions) of the RSFSR have considerably expanded the volume of scientific research within the past few years.

148. Reduction of Disease Morbidity and Mortality Rates

"Achievements and Prospects in the Fight Against Communicable Diseases," by L. A. Sakvarelidze, deputy chief of the State Sanitation Inspection, Ministry of Health USSR; Moscow, Meditsinskaya Sestra, No 4, Apr 60, pp 3-6

The author of this article states that immense economic and cultural changes, better living conditions, and improved health service and medical science in the USSR made possible the elimination of many factors which form the basis of the incidence of communicable diseases. Favorable conditions exist now in the USSR for a determined effort to control and to reduce the incidence of many communicable diseases. Such diseases as cholera, plague, black smallpox, parasitogenic typhus infections, and parasitic worms have been completely eradicated. Such diseases as malaria and tularemia have almost completely disappeared. Morbidity and mortality rates of other diseases have been reduced considerably.

Further expansion of the national economy and cultural development in the USSR, projected for 1959-1965 by the 21st Congress of the CPSU and by the decree of the Council of Ministers USSR, offer greater possibilities for further decreasing the morbidity rate.

Malaria must be completely eradicated in 1960. By 1965, diphtheria, rabies, ancylostomiasis, Taeniarhynchus infestation, and trachoma must be reduced to the point of sporadic occurrence. Health agencies must also strive to reduce, by 1965, the incidence of typhoid fever, poliomyelitis, whooping cough, tetanus, brucellosis, and other infections.

An all-union conference held in January 1960 in Moscow discussed various methods of reducing and eradicating communicable diseases. The conference was called by the Ministry of Health USSR, the Academy of Medical Sciences USSR, and the Ministry of Health RSFSR. Those attending the conference noted that the ministries of health of the union republics and the local health agencies have improved their work considerably. This proves that agencies of the Soviet health service are familiar with epidemic control measures and have sufficient material resources at their disposal to cope with the problem of communicable diseases. It was also noted

that vaccination, finding sources of infections, and medical and epidemiological surveillance over the foci of infections can be improved in some cities of union republics and autonomous republics.

Sanitary-epidemiological service personnel must be increased, and well-equipped laboratories and motor transportation must be placed at their disposal. The work in pediatric sections of medical districts must be improved. None of city pediatric districts should have more than 1,000 children within their territories.

The majority of delegates to the conference voted in favor of the proposal of the Ministry of Health USSR that special rooms be set aside in outpatient clinics for the vaccination of children only.

Greater attention must be given to the training of medical personnel of a subprofessional level in immunization. Medical personnel of a subprofessional level who are to be assigned to duty in rural medical district hospitals or to independent duty at feldsher-midwife posts must undergo training in immunization.

The Academy of Medical Sciences USSR, scientific research institutes of the Ministry of Health USSR, and of the ministries of health of the union Republics are not conducting scientific research that is extensive enough to bring about the discovery of methods accelerating the diagnosis of communicable diseases and to aid in developing associated vaccines.

Scientific research institutes of epidemiology, microbiology, and hygiene, and of vaccines and sera must assist health agencies every day. Institutes of pediatrics and for the protection of mothers and children, chairs of epidemiology, communicable diseases, and pediatrics of medical institutes, and institutes for the advanced training of physicians must also assist health agencies in their work.

More attention must be given to training physicians and medical workers of a subprofessional level in sanitation and epidemic control. The methods of teaching in sanitation and hygiene faculties must be changed, and the program of specialization and advanced training of physicians in sanitation and epidemic control must be re-examined.

149. Conference Held on Outpatient Service

"An All-Union Conference on Outpatient-Polyclinical Service to the Population" (unsigned article); Moscow, Sovetskoye Zdravookhraneniye, No 4, 1960, pp 23-38

This article is a report on a conference held in Moscow on 8 and 9 January 1960 on the subject of outpatient-polyclinical service to the population. The following officials took part in the work of the conference: ministers of health of union and autonomous republics, heads of oblast, kray, and city departments of health, chief physicians of hospitals, polyclinics, and sanitation units, heads of polyclinics, chief specialists of departments of health, staff physicians of medical districts and of industrial plants, and workers of scientific research institutes.

S. V. Kurashov, Minister of Health USSR, read a report in which he analyzed the outpatient-polyclinical service in cities and indicated what action must be taken to improve this service further. N. N. Grigor'yeva, Deputy Minister of Health RSFSR, noted in her report that better living conditions, and improved preventive medical measures and therapeutic service have contributed to a decrease in child morbidity and mortality, and have created a better climate for the physical development of children. P. L. Shupik, Minister of Health Ukrainian SSR, reported on the organization of outpatient-polyclinical service to workers in industries. Ye. D. Ashurkov, director of the Institute for the Organization of Public Health and the History of Medicine imeni N. A. Semashko, discussed scientific research in the field of the organization of outpatient-polyclinical service to the population.

Yu. Ye. Danilov, Minister of Health Kirgiz SSR, stated that the absence of an independent department of health within the framework of the State Planning Committee (Gosplan) of the Council of Ministers USSR and of the Council of Ministers of the union republics is responsible, to some extent, for poor public health planning.

150. Lenin's Approach to Public Health

"V. I. Lenin and Soviet Public Health" (unsigned article; Minsk, Zdravookhraneniye Belorussii, No 4, Apr 60, pp 5-9

This article commemorates the 90th anniversary of the birth of V. I. Lenin (22 April 1960). The welfare of workers and the vigorous expansion of the national economy, projected by the Seven-Year Plan, are ideas of the Communist Party and V. I. Lenin.

The organization of public health service is one of the most outstanding achievements of the Soviet government. The distinctive features of the Soviet health service are: preventive medical measures, free, comprehensive, and qualified medical aid which is accessible to all, close cooperation between medical practitioners and scientific medical establishments, and having as many organizations as possible interested in sanitation.

One of the first decrees signed by Lenin (December 1917) dealt with the protection of mothers and children.

The Council of People's Commissars decreed, 11 July 1918, the establishment of a Commissariat of Health RSFSR. Sanitary inspection of houses was decreed on 18 July 1919. A decree of 8 November 1919 ordered the formation of a special All-Russian Commission for improving sanitary conditions, throughout the republic.

Lenin always promoted the health of workers, the builders of a Communist society. The Eighth Congress of the CPSU (1919) consequently adopted the following program of V. I. Lenin: protection of the health of the population, improvement of housing facilities for the working masses, improvement of working conditions, and social insurance.

A code of labor laws was approved in 1922 at the Fourth session of the All-Union Central Executive Committee (VTsIK).

New health problems arose as the country became industrialized. The Council of People's Commissars RSFSR approved, in October 1927, a decree establishing sanitation agencies.

Before the October Revolution there were 15 medical faculties in different universities of the country. These faculties graduated a very insignificant number of physicians each year. There was only one scientific research medical institute in Russia before the revolution, the Institute of Experimental Medicine in Petrograd.

At present there are 273 scientific research institutes and 79 medical universities, which utilize the services of 30,000 scientific workers. The Soviet Union has 380,000 physicians and 1.3 million feldshers, midwives, pharmacists, and nurses. The hospital bed capacity is increasing every year. Highly specialized medical aid is becoming more and more accessible to the population.

The general mortality rate now is only about one fourth as great as it was before the revolution; child mortality is almost one seventh as great. The life expectancy in the USSR has risen from 32 years to 68 in 1957 and 1958. Cholera, plague, smallpox, and typhus have been

completely eradicated in the USSR. The incidence of diphtheria has been sharply reduced. A 6- or 7-hour workday is expected to be introduced during 1960 with no reduction in take-home pay. The workday is expected to be reduced further within the next few years.

It was reported at the 24th Congress of the Communist Party of Belorussia that 4.5 billion rubles was spent during the past 4 years to further improve health service in Belorussia. The number of physicians has increased by 2,500 or by 30%, since 1955. The number of hospital beds, during the same 4-year period, increased by 25%.

A decree of the Central Committee CPSU and the Council of Ministers USSR dealt with further improvement of medical service to the population of the USSR. It was pointed out in this decree that the preservation of health of the Soviet people is one of the most important obligations of everyone: the Communist Party, the government, komsomol organizations, trade unions, and other organizations.

Radiology

151. Cleansing Skin Contaminated With Radioactive Substances

"Skin Contaminated With Radioactive Substances and the Comparative Efficacy of Certain Methods of Cleansing," by L. A. Il'in; Moscow, Gigiyena Truda i Professional'nyye Zabolevaniya, No 3, Mar 60, pp 28-32

The research described is based on 23 experiments dealing with the following methods of cleansing skin which has been contaminated with radioactive phosphorus and yttrium: (1) washing the skin with tap water plus 40% household soap and scrubbing; (2) washing with 5% $Na_2 HPO_4$ and scrubbing (in experiments dealing with P^{32} contamination); (3) washing with dilute acids (3% citric acid and 2% hydrochloric acid) and scrubbing; (4) treating the skin with pumice in powdered form, then washing with water; (5) wiping the skin with a dry rag; and (6) treating the skin with a cation exchange resin "vophavit" (in experiments dealing with Y^{91} contamination).

In this study, the author defines three layers of skin contamination which can result from mechanical deposition, physicochemical adsorption, and ion exchange processes. The harmfulness of skin contamination by radioactive substances is discussed with regard to the concentration and time of contact of the radioactive substances as factors, and the efficacy of the various deactivation methods used is compared.

For most practical purposes, the method most highly recommended for hands contaminated with radioactive P^{32} and Y^{91} consists of washing the hands in tap water containing 40% household soap, scrubbing for 4-5 minutes, and subsequent scrubbing in a jet of 2% HCl for 3 minutes (preferably with a different brush). After dosimetric examination, the hands are rinsed with water and dried with a rag.

152. Ionizing Radiation Effects on Unirradiated Parabionts

"On Humoral Mechanisms in Hemopoietic Changes During Acute Radiation Sickness," by N. A. Fedorov, A. M. Namyatysheva, M. G. Kakhetelidze, N. S. Rozanova, and N. A. Zhizhina, Central Order of Lenin Institute of Hematology and Blood Transfusion, Ministry of Health USSR; Moscow, Problemy Gematologii i Perelivaniya Krovi, Vol 5, No 4, Apr 60, pp 13-19

The authors studied the humoral mechanisms in the processes of disruption and restoration of hemopoiesis under the effect of ionizing radiations. Changes in the morphological composition of peripheral blood and bone marrow in parabiotic rats after the irradiation of one of the parabionts by 600, 700, 800, 900, and 1,000 r from X rays served as indexes for this study. Results indicated the following.

After the irradiation of one of the parabionts, decreased indexes for white and red blood cells were observed in both partners.

Leukocyte changes were more marked in the irradiated parabionts, but these changes were less marked than when the irradiated animals were single, which indicates the moderating effect of the unirradiated parabiont on the injurious effects of ionizing radiation on the other.

A picture of radiation injury was observed in the bone marrow of the irradiated rats, both single and parabiotic; but the bone marrow of the unirradiated parabionts retained the appearance of well-functioning tissue.

Marked activation of proliferating processes in the bone marrow of unirradiated parabionts which preceded the regeneration of bone marrow in the irradiated parabionts merits special attention.

Various myelograms of single and parabiotic rats at 3, 5, 7, 9, and 12 days after their irradiation by 600 and 700 r are presented and explained by different theories.

153. Constant Dynamic "Radioactive" Equilibrium of Man

"Natural Radioactivity and Leukoses," by V. A. Leonov; Minsk, Doklady Akademii Nauk BSSR, Vol 4, No 2, Feb 60, pp 86-88

In a previous report entitled "Bone and Skeleton as a Whole as the Organ of Hemopoiesis" (see Zdravookhraneniye Belorussii, No 4, 1959), the author discussed in detail the concept proposed by P. A. Korzhuyev, which postulates that the organ of hemopoiesis is not the bone marrow, but the bone itself, and consequently the skeleton as a whole. In the previous report it was concluded that "the disruption of the metabolism of natural radioactive elements as the energy source of hemopoiesis should be considered the fundamental link in the pathogenesis of leukoses."

The present report is a further study of the various aspects of the above-mentioned concept.

The author recounts a very long list of the various natural radioactive macro-, micro-, and ultramicro-elements which are found in the human body, and which he divides into three categories. The first category includes elements the majority of which emanate beta radiation. The second category of natural radioactive elements consists of three families forming the principle radioactive decay series. The third category consists of radioactive carbon, tritium, and radioactive beryllium (Be^7); all of these inorganic substances are constantly being formed in the atmosphere under the effect of cosmic radiations. One should also bear in mind that the atmosphere constantly contains emanations of radium, thorium, actinium--radon, thoron, and actinon.

In his analysis of the subject, the author refers to the distribution of various natural radioactive elements in air, soil, plants, and animals. The author emphasizes the selective concentration of uranium, radium, Ca^{40}, Nd^{150}, Sm^{147}, Lu^{176}, Zr^{96}, uranium, and thorium in the bones; of all the remaining natural radioactive substances, some are equally distributed in all of the organs and tissues, some are concentrated in the liver, spleen, and other organs, and some are concentrated in the bones. Reference is also made to the results of certain very significant experiments: the saturation of bones with uranium disturbs the metabolism of calcium and potassium, but a rickets-producing diet induces the elimination of uranium from the bones. The presence of uranium in human embryos is also mentioned.

The bone and the skeleton as a whole are considered the "central laboratory" for the metabolism of inorganic substances; if one considers that the blood contains 25 trillion erythrocytes and 40 million leucocytes,

and that the average life of the erythrocytes is 30 days, and that of the leucocytes is 3-9 days, it follows that this gigantic force of mitotic activity and hemopoiesis must be accomplished in an organism by large amounts of radioactive energy from natural atomic decay. Furthermore, the great concentration of natural radioactive substances in the bones is not accidental; it supplies the energy of atomic decay for the generation of the formed elements of blood and explains the special sensitivity of the hemopoietic organs to the effect of artificial radiation which disrupts the normal dynamic "radioactive" equilibrium of an organism.

Hence, on the basis of these studies, and data from literature, the author concludes that the following are important studies to be pursued:

1. The study of the metabolism of the natural radioactive macro-, micro-, and ultramicro-elements, the physiological role of each of them, and their over-all biological effects.

2. The study of the disturbances of the metabolism of the natural radioactive substances during blood diseases in general, and during leukoses in particular.

3. The study of the natural radioactive background in different territories and regions, i.e., to conduct a bio-geochemical study of the provinces of natural radiation.

4. To discover therapeutic preparations intended to normalize the metabolism of natural radioactive elements.

154. Early and Differential Diagnosis of Cancer by Polarographic Method

"Polarographic and Clinical Studies of Cancer Patients Under X-Ray Therapy," by I. P. Mitev, N. Kh. Kryshkov, M. S. Kharizanova, and T. N. Marovski, Tr. Vissh. Med. In-t Plovdiv (Works of the Higher Medical Institute, Plovdiv), No 12, (1958-1959 pp 55-65 (from Referativnyy Zhurnal Khimiya--Biologicheskaya Khimiya, No 8, 25 Apr 60, Abstract No 11445, by M. Maslova)

"Polarographic studies were conducted on the blood serum of 30 healthy people, 52 cancer patients, and 13 patients with pulmonary tuberculosis. The average height of the second wave of the filtrate and its index were respectively: in healthy people, 26.2 and 1.0; in patients with cancer of the mammary gland, 26.7 and 1.02; in lung caner patients, 52.8 and 2.02; in sarcoma patients, 18.4 and 0.7; and in patients with pulmonary tuberculosis, 23.8 and 0.9. After X-ray treatment, depending on the condition and improvement of the patient,

the height of the second wave of the filtrate approached in value that of the healthy people. The same ratio was established between the height of the second wave of the filtrate and the number of leukocytes in the blood. During the development of radiation sickness, the height of the second wave of the filtrate rises, and the index increases. In cases of relapses and metastases, these values are greatly increased, a fact which is of great significance for their early diagnosis. This method can also be used in the differential diagnosis of cancer and pulmonary tuberculosis."

155. Radiation Toxicity Explained by Fat Oxidation and Acid Formation

"On the Specificity of Radiation Effects During the Process of the Formation of Toxic Substances in Fats," by Ye. B. Burlakova, B. G. Dzantiyev, G. B. Sergeyev, and N. M. Emanuel', Chair of Chemical Kinetics, Moscow State University imeni M. V. Lomonosov; Moscow, Nauchnyye Doklady Vysshey Shkoly --Biologicheskiye Nauki, No 1, 1960, pp 145-147

Various experiments which demonstrate that the formation of toxic products is due to fat oxidation and to the formation of acids are described.

Tests to determine radiation toxicity were performed on hydra and the roots of white lupine.

The data obtained indicate that unoxidized fats, both irradiated and unirradiated, do not exert any toxic effects on the hydra or on the roots of white lupine, while oxidized fats, both irradiated and unirradiated, do exert acute toxic effects on the hydra and on the lupine roots. Furthermore, there is no difference in the toxicity of irradiated and unirradiated fats oxidized to the same degree.

These simple tests, the authors suggest, make it possible to infer that the toxicity of oxidized fats is due to the formation of acids. A growth curve of wetted white lupine roots indicates that even an insignificant amount of acid leads to retardation of the growth of the roots, i.e., to the appearance of toxicity. This growth inhibition is intensified with an increase in the acid number. The mechanism are further explained.

156. Chinese Researchers Discuss Chemical Protection Against Ionizing Radiation

"Drugs for Chemical Protection Against Ionizing Radiation," by Yuan Ch'i-hsin (袁启新) and Hsu Tao-hui (徐道辉); Peiping, K'o-hsueh-T'ung-pao (Scientia), No 4, 26 Feb 60, pp 97-108

This article reviews world literature on research achievements in drugs which provide lower animals and mammals protection against radiation injury. Four important applications of such drugs are mentioned in the introduction: They are auxiliaries in radiation therapy, protect in case of accidential injury in the atomic energy industry, ensure the safety of the military and civilian population in time of nuclear attack, and provide a basis for further research on protection against cosmic radiation during space flight.

About three fourths of the article is devoted to discussion of chemical protection against gamma radiation. Specific compounds are classified under nine categories and discussed with respect to the relation between their chemical structures, properties, and mechanisms of protective action, as reported in the literature. The categories are: amino acids containing sulfur; mercapto alkyl amines; isothiocarbamides and mercapto alkyl guanidines; thiols, amino acids, and amines without the sulfhydryl group; substances which induce hypoxia; chelates; vitamins, enzymes, and hormones; and alkaloids and higher nervous stimulants. The common characteristics and weaknesses of these drugs and the current research trends are also discussed.

Some of the article treats of chemical protectants, specifically, chelate compounds, which aid the removal of alpha- and beta-ray emitters from the body. The basic requisites of chelates which can be used in this respect, the principles governing their design, and the relation between chemical structure and chelating capacity are noted.

The information is carefully documented against a list of 130 references. Although no Chinese work is included in their bibliography, the authors indicate by the following statement that they have at least worked with cysteine: "It is reported in the literature that cysteine can be air-dried, but according to our experience, it is very unstable in air and decomposes even after recrystallization and filtering. The best way to purify it is by sublimation at reduced pressure. It can then be preserved in vacuum bottles."

Confidence in the success of an "all-out" research effort is expressed in the following closing remarks: "The search for effective protection against external radiation and removal of internal emitters requires extensive and complicated research. Nevertheless, it is theoretically possible to solve these problems. If we would go all out to strengthen cooperation between the various disciplines, taking advantage of the opportunities offered in a socialist system, these research tasks, which have theoretical significance as well as practical value, will find solution in our hands."

Miscellaneous

157. Wider Dissemination of Biological Propaganda Advocated

"V. I. Lenin on Natural-Scientific Propaganda," by S. S. Gurvich, Chair of Dialectical and Historical Materialism, Kiev, Medical Institute; Kiev, Vrachebnoye Delo, No 4, Apr 60, pp 347-350

The author says that the decree issued by the Central Committee CPSU entitled "Tasks of Party Propaganda Under Modern Conditions" contained an outline of the course which the party should pursue during the period of building Communism. The purpose of the decree is to prepare workers for new tasks which are arising as a result of the economic and political progress of the country. The mastery of Marxist philosophy and dialectical materialism and the comprehension of the actual processes of modern social life, particularly the transition from socialism to Communism, are of ever-increasing importance. The decree places great stress on having everyone trained in the materialistic world outlook.

Lenin though that the propagation of natural scientific learning must be coordinated with the natural scientific knowledge of the materialistic world outlook and atheism. Lenin stated as long ago as 1905 that the reactionary bourgeois policy which seeks to disrupt the forces of the proletariat must be counteracted by "encouraging solidarity of the proletariat and a scientific world outlook." In his work, Materialism and Empiriocriticism, Lenin showed in a convincing manner that science and religion are incompatible. In the chapter "On the Relationship Between the Workers Party and Religion," Lenin explained that natural-scientific, atheistic propaganda must be associated with the practical struggle of the working class and the party representing it. He said that the struggle must be subordinated to its fundamental task, the task of intensifying the class struggle between the exploited masses and their exploiters.

In the early days of the revolution, Lenin wrote that the Communist Party Program must be based on a scientific and materialistic world outlook. "The elucidation of our problem," he said, "must necessarily include a revelation of the historical and economic roots of the fog of religion. Our program must necessarily include antheistic propaganda and the publication of suitable literature...."

In his speech before the delegates of the Second All-Russian Congress of Medical and Sanitation Workers, held 1 March 1920, Lenin appealed for cooperation between representatives of science and the proletariat. "Only such cooperation," he said, "will help to obliterate poverty, disease, and filth. This will be done. Representatives of science, the proletariat, and technology will not permit any force of darkness."

Natural scientific propaganda broadens man's horizon, increases his self-reliance, and reveals the possibility of mastering the laws of the evolution of the world around him. Lenin said that this is an integral part of the Communist training of workers. Old museums must be utilized and new museums must be built: this is one of many forms of the propagation of natural scientific knowledge.

The Kiev Medical Institute showed what can be done with this form of propaganda. The administration of this institute, of which V. D. Bratus' is the director, set up a unique museum which displays the emergence of a human being, the evolutionary development of a human organism on earth from the simplest form of life. Docent V. D. Bratus' did this at the suggestion of a number of scientists: Prof N. I. Zazybina, Corresponding Member of the Academy of Medical Sciences USSR, Head of the Chair of Histology; Prof K. Yu. Kostyukova, Head of the Chair of Biology; Prof M. S. Spirova, Head of the Chair of Normal Anatomy, and Honored Scientist; and others.

Such a museum, open to a broad population, group, can be a mighty instrument for natural-scientific propaganda, can be of cultural value, and can perform important work in spreading atheism.

A visitor to the Department of Biology will be able to visualize the evolution of a living organism from lower forms to higher forms of life with ease. The attention of visitors will be attracted by transitory forms between one species and another, which will alledgedly show that no supernatural force is responsible for their creation.

Displays at the museum have demonstrated very convincingly the materialistic idea of natural evolution of the organic world from the simplest to the most complex forms of life, various forms of adaptation of animals to various conditions of existence, inheritance, and natural selection. This can be demonstrated by a special film on the origin of species on earth.

The histology department of the museum has sufficient equipment to show the embryological and microscopic structure and development of the bodies of animals and humans.

In the anatomical department of the museum, a visitor can become acquainted with the adaptability of separate parts of the human body to natural and social environmental conditions. Physiology, biochemistry, and pathophysiology departments can be added later.

In the decree of 10 November 1954 dealing with errors committed in carrying on scientific-atheistic propaganda, the Central Committee CPSU noted that scientific-atheistic propaganda of the most important phenomena, such as the structure of the universe, the origin of life and of the human being on earth, astronomy, biology, physiology, physics, chemistry, and other sciences, must be presented in a popular form. The presentation of the development of nature and society must conform to the materialistic viewpoint. N. S. Khrushchev said that "there is no room in popular education, in the dissemination of scientific knowledge, or in the study of the laws of nature for belief in God."

According to this article, the influence and popularity of Marxist-Leninist philosophy is gathering momentum throughout the world. Soviet natural-scientific propaganda, an integral part of Communist training, is contributing greatly to the popularity of Marxist-Leninist philosophy. Lenin continuously stressed the importance of such propaganda.

158. Coordination of Research on Philosophical Problems of Natural Science

"Philosophical Questions in Natural Science" (unsigned article); Moscow, Pravda, 28 May 60, p 4

"A scientific council has been organized whose mission is to coordinate the research on [illegible] philosophical problems of natural science being conducted by Soviet scientific establishments and vuzes. The council membership consists of 35 academicians and corresponding members of the Academy of Sciences USSR, 26 academicians and corresponding members of academies of sciences of the union republics, and doctors and candidates of science who are working in various fields of natural science and philosophy.

"The scientific council held its first session 26 May with P. N. Fedoseyev, Corresponding Member of the Academy of Sciences USSR, presiding. Two papers were read and discussed. One paper by Kh. S. Koshtoyants, the Corresponding Member of the Academy of Sciences USSR, was entitled 'Philosophical Problems in the Physiology of the Nervous System.' He expects to present this paper at the coming All-Union Conference on Philosophical Theories of Higher Nervous Activity. The other paper, by Academician

M. E. Omel'yanovskiy, of the Academy of Sciences Ukrainian SSR, was entitled 'Concerning a Prospective Research Plan on the Problem of Dialectical Materialism and Modern Natural Science.'

"The following members of the council took part in the discussion: Academician N. N. Semenov, Academician A. A. Grigor'yev, and Academician N. S. Shatskiy; V. L. Ryzhkov and G. V. Nikol'skiy, Corresponding Members of the Academy of Sciences USSR; P. I. Valeskaln, Academician of the Academy of Sciences Latvian SSR; Professors V. N. Kolbanovskiy, B. M. Kedrov, and A. S. Prangishvili; and natural scientists and philosophers of various scientific establishments and vuzes who were invited to attend the session."

159. Medical Sciences In Moldavia

"Some Data Concerning the Development of Medical Science in Moldavia," by Ye. V. Batalova; Kishinev, Zdravookhraneniye, No 1, Jan/Feb 60, pp 10-14

According to this article, one of the most important moves made by the Soviet government has been the establishment of numerous seats of learning. Previously, all scientific thought was concentrated mainly in the nation's capital and in a few of the largest cities. The Moldavian SSR has become one of many local seats of learning.

Scientific medical research in Moldavia is being conducted by personnel of two establishments: the Kishinev Medical Insitute and the Moldavian Institute of Epidemiology, Microbiology, and Hygiene. The Soviet government has spent 11,790,000 rubles during the period 1947-1959 to maintain the Moldavian Institute of Epidemiology, Microbiology, and Hygiene.

F. Ye. Ageychenko is the director of the Chair of Pathological Anatomy of the Kishinev Medical Institute. Prof V. F. Parfent'yeva is director of the Chair of Topographic Anatomy and Operative Surgery. Prof V. I. Zakharov is director of the Chair of Biology. Prof M. S. Mikhlin is director of the Chair of Biochemistry. Seventeen native Moldavians have received the degree of Candidate of Medical Sciences since World War II.

Two balneological sanatoriums have been established in Moldavia; one in Ryshkany and the other in Kalarash. Workers from all over the Soviet Union come to these sanatoriums for treatment.

The interest that the Communist Party and the Soviet government have shown in the Moldavian SSR has been extensive. The Moldavian scientists have responded with valuable contributions to medical science.

The decree of the Central Committee CPSU dealing with the improvement of medical service to the population of the Soviet Union makes it necessary for Moldavian scientists to make a still greater effort. It is of paramount importance that the infant morbidity and mortality rates be decreased. The incidence of communicable diseases and other diseases such as epidemic hepatitis, influenza, acute gastrointestinal disorders, diseases of the cardiovascular system, and malignant neoplasm, be reduced. Greater stress must be placed on the utilization of new discoveries made abroad and in the Soviet Union. The number of scientific research institutes in the Moldaviah SSR must be increased during the Seven-Year Plan. Enormous sums of money are being spent for research and for training young Moldavian scientists.

Medical practitioners must be armed with drugs to prevent and treat various diseases and to improve the health and prolong the life of the Soviet population.

160. Progress Report on China's Medical Science Achievements

"Summary of Communist China's Achievements in the Medical Sciences in the Past Decade," by Ch'ien Hsin-chung (錢信忠), Peiping, Jen-min Pao-chien (People's Health), No 12, 1959, pp 1092-1099

This article begins with a brief review of the organization of medical research facilities in China under the Communist regime and then presents a more detailed summary of research achievements in the medical sciences and related fields. The achievements are discussed under the following subheadings:

1. Achievements in the eradication and prevention of important diseases. (including parasitic diseases, social diseases, occupational diseases, and infectious diseases such as infectious hepatitis, B encephalitis, forest encephalitis, epidemic hemorrhagic fever, brucellosis, tuberculosis, poliomyelitis, dysentery, influenza, and others).

2. Research achievements in Chinese traditional medicine.

3. Achievements in cardiovascular surgery, extracorporeal circulation, hypertension, oncology, blood transfusion and hematology, and medical use of radioisotopes.

4. Research on antibiotics, other drugs, and medical apparatus.

5. Achievements in morphology, physiology, biochemistry, and medical microbiology.

161. Hungarian Scientific Academy Now Linked With All Bloc Academies

"Organized Contacts With Socialist Academies," by Lajos Janossy, Academician, academy secretary; Budapest, Magyar Tudomany, Apr 60, pp 225-228

The article states that as of 1960, the Hungarian Academy of Sciences has direct scientific cooperation agreements with all socialist academies or with the corresponding supreme scientific organs where there is no academy. The agreements cover periods of several years, usually 5, and they are supplemented each year by work plans containing concrete tasks. Constant features of these agreements are: a statement pertaining to cooperation, joint research, publications exchange, and a mutual information service; regulations governing study trip exchanges; and financial regulations.

Study trip exchanges available for 1960 are as follows, in calendar weeks: with the Academy of Sciences USSR, 140 weeks; with the Academy of Medical Sciences USSR, 40 weeks; with the Academy of Sciences, Ukrainian SSR, 20 weeks; with the Academia Sinica, 100 weeks; with Tirana State University, 14 weeks; with the Bulgarian Academy of Sciences, 40 weeks; with the Czechoslovak Academy of Sciences 90 weeks; with the Slovak Academy of Sciences, 48 weeks; with the Korean Academy of Sciences, 4 weeks; with the Polish Academy of Sciences, 80 weeks; with the Mongolian Scientific and Higher Education Committee, 8 weeks; with the German Academy of Sciences, 90 weeks; with the Academy of the Rumanian Republic, 70 weeks (plus 40 weeks for joint historical research); and with the Vietnam National Scientific Committee, 4 weeks.

The author adds: "Additional study trips are ensured by that part of the Technical-Scientific Cooperation Agreement which affects the academy and by agronomy agreements concluded jointly with the Ministry of Agriculture, with the Soviet, German, and Czechoslovak Academies of Agricultural Sciences. The trips within the above frameworks (with the exception of the German Democratic Republic) will be realized on the basis of mutual visits without the use of foreign exchange."

Apparently the "Technical-Scientific Cooperation Agreement" referred to above is an agreement between states; the several academies then have their own agreements which are separate from the state agreements.

The 1960 plans designate responsible institutes to carry out specific joint research themes. The numbers of joint research themes are as follows: with the Academy of Sciences USSR, 30; with the Academy of Medical Sciences USSR, 12; with the Academia Sinica, 9; with the Bulgarian Academy of Sciences, 20; with the Czechoslovak Academy of Sciences, 21; with the Polish Academy of Sciences, 34; with the German Academy of Sciences, 27; and with the Academy of the Rumanian Republic, 32.

Corrosion

162. New Cathodic Protector for Ships and Pipelines

"Enemies and Friends of Subterranean Arteries," by L. Agayan; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Vol 5, No 58, (666), 15 May 60, p 3, columns 3-7

Work on the protection of pipelines against corrosion is being done at the Scientific Research Institute of Powder Metallurgy and Special Alloys of the Academy of Sciences Ukrainian SSR. This work is being conducted by a group of scientists headed by the director of the institute, I. N. Frantsevich, Corresponding Member of the Academy of Sciences Ukrainian SSR. At one of the laboratories of this institute work is being done on the development of cathodic protectors. A new protector consisting of an alloy of aluminum with calcium has been developed in the work in question. A new method for producing this alloy has been proposed by workers at the laboratory: the calcium is recovered from calcium chloride, which forms a waste product of the soda industry. The protectors in question were originally designed for use on seagoing ships. Corrosion by seawater is less harmful than that produced by the action of saline soils, however.

The new aluminum-calcium protectors were tested on ships that navigated in all seas and oceans of the world in waters with different salt concentrations. The new cathodic protectors were found to be very effective in these tests. It was established that their life is greater than that of magnesium protectors.

Quite recently aluminum-calcium protectors were tested for the protection of subterranean metal constructions in saline soils, where corrosion is particularly severe. It was found that the new protectors are very effective under these conditions as well. They protect metals, including metals used for the construction of pipelines, under conditions when magnesium protectors are completely ineffective.

Ore Concentration

162. Jigging of Titanium-Zirconium From Sea-Placer Sands

"Jigging Tests on Fine-Grain Titanium-Zirconium Sands From Sea-Placer," by D. I. Nedogovorov and L. S. Kuznetsova, Trudy Tsentral'nogo Nauchno-Issledovatel'nogo Gornorazvedochnogo Instituta (Works of the Central Scientific Research Institute of Mining Prospecting), No 28, 1959, pp 102-108 (from Referativnyy Zhurnal -- Metallurgiya, No 2, Feb 60, Abstract No 2577)

Results are given on laboratory experiments on the jigging of fine-grain (0.15-0.05 millimeter) titanium-zirconium sands. One step necessary for a successful jigging is a previous desliming. Satisfactory results

were obtained under the following conditions: 3-1-millimeter bed granulation; 250-400 strokes; 4-millimeter [pump] diaphragm stroke; 70-80-millimeter bed height. The product in the first chamber under the screen represents a heavy fraction of 35 percent; from it are extracted 74.7-97.7 percent of the valuable minerals. The material in the second chamber is reworked. The tests confirmed the reliability of the jigging process for the initial concentration of fine-grain titanium-zirconium sands.

Physical Metallurgy

164. Three-Year Creep Test of LA1 and EI257 Steels

"Extended (10,000-30,000 Hours) Creep Tests and Investigation of the Stability of the Structure and Properties of Austenitic Steels LA1 and EI257," by M. I. Solonouts, Struktura i Svoystva Zharoprochnykh Materialov. TsNIITMASh, Kniga 93 (Structure and Properties of Heat-Resistant Materials. TsNIITMASh Book 93), Moscow 1959, pp 161-174 (from Referativnyy Zhurnal--Mekhanika, No 4, Apr 60, Abstract No 5401)

Results are given of creep and fatigue tests on austenitic steels LA1 and EI257 at 585-590 deg C and lasting 10,000-30,000 hours, as well as the changes of the microstructure, of composition of the carbide phase and the mechanical properties in the process of age-hardening during these periods.

Results are also given of a study of the changes of microstructure and mechanical properties of a control section of a high-pressure steam pipe made of EI257 steel, worked for 14,000 hours at 550 deg C.

165. Electron Emission Properties of Metallic Borides

"Borides of Transition Metals and Their Electron Emission Properties," by G. A. Kudintseva, B. M. Tsarev, and V. A. Epel'baum, Bor. Trudy Konferentsii po Khimii Bora i Yevo Soyedineniy (Boron. Works of the Conference On the Chemistry of Boron and Its Compounds), Moscow, Goskhimizdat, 1958, pp 106-111 (from Referativnyy Zhurnal -- Metallurgiya, No 2, Feb 60, Abstract No 2759)

A method involving the simultaneous reduction of metallic and boron oxides with carbon, using double excess B_2O_3 to compensate any possible losses during evaporation, was used for the production of borides on a semi-industrial scale. The obtained borides, containing 1-2 percent free carbon, were then concentrated by heat treatment in vacuum at 2,000-2,200

degrees centigrade. Diborides of titanium, zirconium, chromium, vanadium, niobium, tantalum, and manganese obtained by this method were studied with respect to their emission properties. Factors determined included the emission factor ε_λ, the work function ψ, and the electron emission constant A, as well as the saturation current during continuous and pulsed operation. CrB_2, which can be used as material for thermal cathodes, has the lowest work function (3.36 electron volts). The secondary emission factor of all diborides is less than unity; for this reason, they can be used as antithermionic (suppressor-grid) coatings.

166. 1Kh18N12T and EI724 Steels for Boiler Tubes

"Study of Steel 1Kh18N12t and EI724 for the Tubes of Boilers," by G. P. Fedortsov-Lutikov and T. S. Griboyedova, Struktura i Svoystva Zharoprochnykh Materialov. TsNIITMash Kniga 93 (Structure and Properties of Heat-Resistant Materials. TsNIITMash Book 93), Moscow, 1959, pp 128-148 (from Referativnyy Zhurnal -- Metallurgiya, No 4, Apr 60, Abstract No 8721)

A study was made of the mechanical properties (σ_b, $\sigma_{0.2}$, δ, ψ) at temperatures of 20, 600, 650, and 700 deg C, the physical properties (E, λ, ρ, α) at temperatures of 20-900 deg C, fatigue strength at 600-700 deg C, for 10^5 hours, yield strength at 600 deg C, the relaxation properties at 500-650 deg C, and the change of the mechanical properties and structure during age-hardening under loading and without loading at temperatures of 600-700 deg C and soaking up to 10,000 hours for steels 1Kh18N9T, 1Kh18N12T and EI724 (same composition, but with niobium in place of the titanium). It was found that steel 1Kh18N12T has $\sigma^{600}_{10^5}$ = 13.5 kilograms per square millimeter, $\sigma^{650}_{10^5}$ = 8 kilograms per square millimeter, $\sigma^{700}_{10^5}$ = 5 kilograms per square millimeter, whereas the save values for steel EI724 (less than 0.1 percent carbon) are, respectively, 13.5, 9, and 4 kilograms per square millimeter. The structure and mechanical properties of these steels, including a_k, undergo almost no change at all during an extended (10,000 hours) age-hardening at 600-700 deg C.

167. Influence of Predeformation on Materials Worked at High Temperatures

"Influence of a Previous Deformation on the Behavior of Materials During Subsequent Working at Elevated Temperatures," by I. I. Trunin, Struktura i Svoystva Zharoprochnykh Materialov. TsNIITMASh Kniga 93 (Structure and Properties of Heat-Resistant Materials. TsNIITMASh Book 93), Moscow 1959, pp 99-127 (from Referativnyy Zhurnal -- Mekhanika, No 5, May 60, Abstract No 6714)

A study was made of the influence of cold hardening by twisting on the characteristics of the strength and ductility of certain grades of steel under prolonged temperature effects.

The results of the studies obtained by psysicochemical methods were compared with data obtained in endurance tests.

It is shown that a previous cold deformation has a negative influence on the properties of a metal during subsequent prolonged effects of temperature and loading. For other materials, this influence varies with the particular material. In individual alloys, a previous cold hardening has an insignificant effect on the endurance limits, but considerably reduces the ductility; in other metals an opposite influence was observed.

168. Properties of EI757 Chromium-Steel

"Study of the Properties of Chromium-Steel EI757," by G. P. Fedortsov-Lutikov and M. F. Sheshenev, Struktura i Svoystva Zharoprochnykh Materialov. TsNIITMASh Kniga 93 (Structure and Properties of Heat-Resistant Materials. TsNIITMASh Book 93), Moscow, 1959, pp 208-216 (from Referativnyy Zhurnal -- Mekhanika, No 5, May 60, Abstract No 6718)

As a result of an investigation of the influence of the alloying elements on the structure and properties of 12-percent chromium-steel, it is recommended that a new chromium stainless steel, EI757, be used for the blades of stationary steam turbines.

On the basis of a study of the static mechanical characteristics, impact strength, endurance, creep, and fatigue, as well as certain physical properties, the high-temperature properties of EI757 steel (up to 600 deg C) are not exceeded by any austenitic steel.

169. "Superductility" of Alloys

"On the Question of the 'Superductility' of Alloys," by A. A. Presnyakov and V. V. Chervyakova, Trudy Instituta Yadernoy Fiziki AN KazSSR (Works of the Institute of Nuclear Physics, Academy of Sciences Kazakh SSR), Vol 2, 1959, pp 30-40 (from Referativnyy Zhurnal -- Mekhanika, No 5, May 60, Abstract No 6726)

In a cast eutectic aluminum alloy containing 33 percent copper, a superductility effect was discovered at temperatures of 500 deg C and above, but no such effect was observed when the same alloy was homogenized and cold-hardened. When subjected to a dynamic load, the alloy, in all cases, underwent brittle fracture all the way down to the melting point.

Aluminum alloys containing 70-88 percent zinc, and particularly an alloy with 80 percent zinc at 275 degrees C (elongation 648 percent), exhibited superductility. The alloys deformed without hardening and with

very low forces. Superductility appears only in metastable alloys of aluminum with copper and zinc when the deformation occurs at a rate commensurable with the rate of breakdown of the solid solution, which occurs at temperatures which are high enough to produce the necessary mobility of the atoms.

170. Vacuum Rolling Effects on IMP-1 Titanium

"Change of Structure and Properties of a Powdered Titanium During Vacuum Rolling," by A. K. Butylenko, V. N. Gridnev, and V. I. Trefilov, Sbornik Nauchnykh Rabot Instituta Metallofiziki AN USSR (Collection of Scientific Works of the Institute of the Physics of Metals, Academy of Sciences Ukrainian SSR), No 9, 1959, pp 89-97 (from Referativnyy Zhurnal -- Mekhanika, No 5, May 60, Abstract No 6744)

A study was made of IPM-1, a powdered titanium alloy prepared (calcium hydride method) by the Institute of Metallurgical Problems of the Central Scientific Research Institute of Ferrous Metallurgy. In the rolling on the laboratory vacuum stand (4×10^{-5} to 6×10^{-5} millimeters of mercury), the specimens were subjected to various types of deformation. After rolling, the specimens were held for one, 4, and 8 hours in vacuum at a temperature of 1,160-1,200 deg C; they were then cooled in a vacuum chamber.

The prepared specimens were subjected to microstructural and X-ray analysis, and mechanical tests at room temperature.

It was found that the structure and properties of this titanium alloy are strongly influenced by the temperature during rolling. The optimum properties were obtained by vacuum rolling at 1,000 deg C.

An attempt is made, on the basis of theory, to explain the change of ductility and strength with a change of grain size and structure.

171. Welding Properties of Titanium Alloys

"Investigation of the Welding Properties of Certain Titanium Alloys," by A. P. Goryachev and S. M. Yegorov, Svarka 1. (Welding), Leningrad, 1958, pp 166-174 (from Referativnyy Zhurnal -- Metallurgiya, No 2, Feb 60, Abstract No 3174)

An investigation was made of the structure and properties of the zone of thermal influence and the metal of the welded joint for:

(1) Two alpha-alloys of titanium, Ti-4Al and Ti-5.4Al2.3Sn

(2) Two (alpha plus beta) alloys of titanium, Ti-6.5Al-3V

(3) A Ti-2.8 Mn-complex (1.5Fe + 0.94 Cr + 1.0 V + 1.0 Mo)

The mechanical properties of the zone of thermal influence were determined on standard round specimens and impact specimens cut from blocks 11 x 11 x 80 millimeters in size, which were heated by electric current to simulate the thermal cycle of welding. For the two alpha-alloys after heating up to 1,500 degrees centigrade at a rate of 250-300 degrees per second, and cooling in air, the factors α_b, α_k, δ, and ψ in the zone of thermal influence changed only slightly by comparison with the original condition, and in the case of quenching in water, the indexes were only inappreciably higher. For the Ti-Mn complex (3), δ and ψ were considerably reduced by quenching in air, and α_b, δ, and ψ dropped to zero following quenching in water. After a quenching in both air and in water, the plastic properties of the two alpha + beta alloys (2) decreased, but less abruptly than those of the Ti-Mn complex under equal conditions.

A brief annealing (20 seconds) following quenching in water increased the ductility only of the Ti-Mn complex, and only at a temperature of 850 degrees centigrade. With technical titanium, a noticeable reduction of the mechanical properties was observed following heating above 900 degrees and quenching in air. Manual argon-arc welding of the Ti-5Al alloy, 7 millimeters thick, with a filler rod of degassed technical titanium guarantees high mechanical properties of the metal of the welded joint, but when the welding is done with a filler rod of ordinary metal, the ductility of the metal of the welded joint is low. The alpha + beta alloy (2) has welding properties which are barely adequate, whereas the Ti-2.8Mn-complex (3) has poor welding properties, since the α_k in the zone of thermal influence in welded sheets 12 millimeters thick amounts to 0.5-0.6 kilogram-meter per square centimeter.

172. Obtaining Anhydrous Chromium Chloride

"Obtaining Anhydrous Chromium Chloride," by S. N. Basmanova, Gidroelektrometallurgiya Khroma (Hydroelectrometallurgy of Chromium), Tbilisi, Academy of Sciences Georgian SSR, 1959, pp 99-105 (from Referativnyy Zhurnal -- Metallurgiya, No 2, Feb 60, Abstract No 2686)

One of the methods of obtaining anhydrous chromium chloride was studied with respect to its further use as a raw material for the production of pure chromium. Into a 750-milliliter quartz distillation flask were added 20 grams of hydrated chromium chloride containing 19.02 percent chromium, 0.22 percent iron, and the remainder water of crystallization. Carbon tetrachloride vapors were admitted into the quartz flask. At temperatures above 300 degrees centigrade anhydrous chromium chloride is

formed. The iron chloride is completely distilled off in the process of dehydration and condenses on the inside walls of the cooler. The optimum conditions for the process were a temperature of 650-700 degrees centigrade and a rate of passage of the CCl_4 of 0.2-0.3 milliliters per minute. The CCl_4 expenditure amounted to one gram per gram of chromium chloride. In addition to the direct chlorination of Fe-Cr, anhydrous chromium chloride may be obtained also by dissolving Fe-Cr in HCl and then dehydrating with CCl_4. Optimum conditions were determined, and a technological plan was devised for obtaining anhydrous chromium chloride, using Fe-Cr as the initial raw material.

173. Influence of Metallic Additives on Mechanical Properties of Tin Bronze

"Study of the Mechanical Properties of Tin Bronze With Additions of Zinc, Phosphorus, Lead, and Nickel," by A. A. Presnyakov and A. V. Novikov, Trudy Instituta Yadernoy Fiziki AN KazSSR (Works of the Institute of Nuclear Physics, Academy of Sciences Kazakh SSR), No 2, 1959, pp 41-73 (from Referativnyy Zhurnal -- Metallurgiya, No 3, Mar 60, Abstract No 6435)

A study was made of the properties of alloys combined with the copper corner of the systems Cu-Sn, Cu-Sn-P, with a radio of Sn:P = 10 percent and 30 percent, of the systems Cu-Sn-Zn with radios of Sn:Zn = 0.5, 1 and 2 percent, the system Cu-Sn-Pb with 1 and 4 percent lead, the systems Cu-Sn-P-Ni and Cu-Sn-P with Sn:P = 30 and additions of 0.1 and 0.3 percent nickel, and the systems Cu-Sn-Pb and Cu-Sn-Zn with Sn:-Zn = 1 percent and additions of 1 and 4 percent lead. Microscopic examinations were made; the microhardness, ductility, and strength were determined, and the age-hardening of OF-6.5-0.15 bronze and OTsS 4-4-2.5 bronze was studied. The alloys were studied in the cast and "equilibrium" (deformed and annealed) states.

All the alloys were hardened during casting into metal forms, and a decomposition of the solid solution took place within them during further heat and mechanical treatment, which, in a number of cases, led to an abrupt reduction of ductility and a cracking of the ingots and bars. The kinetics of the decomposition of the solid solution is connected with the composition and degree of hardening during casting. The addition of phosphorus to the Cu-Sn system causes a considerable acceleration of the decomposition of the solid solution; the addition of zinc and a combination of zinc and lead reduces the rate of decomposition of the solid solution even below that of the binary alloys of the Cu-Sn system themselves. The addition of nickel to the Cu-Zn-P-bronze increases the stability of the solid solution and inhibits age-hardening. The homogeneity of the alloys is reduced during the decomposition of the solid solution.

The alloys of the Cu-Sn system show, in comparison with the other systems, the peculiarity of a change of ductility; their collapse of ductility extends in the direction of high temperatures up to the solidus; there is no increase of ductility at high temperatures. An exception is the system Cu-Sn-P, but the increase of ductility in these alloys is very slight. The strength of these alloys also varies somewhat anomalously by comparison with the other systems: up to 200-300 degrees centigrade, the change of strength is small, whereas at higher temperatures its decrease is more intense. In the majority of alloys, a local effect of the reduction of strength, connected apparently with the decomposition of the solid solution, is observed at temperatures of 100-200 degrees centigrade.

174. Structure of Zinc Base Alloys

"The Structure of Zinc Base Alloys," by A. A. Presnyakov and N. S. Sakharova, Trudy Instituta Yadernoy Fiziki AN KazSSR (Works of the Institute of Nuclear Physics, Academy of Sciences Kazakh SSR). No 2, 1959, pp 146-150 (from Referativnyy Zhurnal -- Metallurgiya, No 3, Mar 60, Abstract No 6460)

An investigation was made of the microstructure of cast and homogenized zinc and its alloys with aluminum (up to 2 percent), with copper (up to 3 percent), with lead (up to 0.2 percent), and with cadmium (up to 10 percent), prepared with grade TsO-zinc. The etching was done with a 5-percent alcohol solution of HCl. When the content of the second component was low, and when pure nickel was used, acicular (martensite) grain structure was observed. The needles crossed at angles of about 30, 60, and 120 degrees. In the cast state, the size of the needles decreased with increased content of the second component. In the case of all the alloys, no distinct pattern of regularity for the appearance of the needles was observed following homogenization. The acicular structure cannot be explained by twinning. With increased concentration of the added components, the dendritic structure of cast alloys becomes finer. No Zn-Pb alloys were found with dendritic structure. In cast alloys of Zn-Al, Zn-Cd, and Zn-Cu, the second phase was located along the grain boundaries, whereas in the homogenized alloys it was located inside the grain boundaries.

175. Diffusion of Boron, Carbon, and Silicon in Transition Metals

"Activation Energy Involved in the Diffusion of Boron, Carbon Nitrogen, and Silicon in High Melting Transition Metals," by G. V. Samsonov, Bor. Trudy Konferentsii po Khimii Bora i Yevo Soyedineniy (Boron. Works of the Conference on the Chemistry of Boron and Its Compounds), Moscow, 1958, pp 74-89 (from Referativnyy Zhurnal -- Metallurgiya, No 3, Mar 60, Abstract No 5999)

The metallographic method was employed to investigate the reactive diffusion of boron in Ti, Nb, Ta, Cr, Mo, W, Fe, Co and St-3 steel; the diffusion of carbon in Ti, Zr, Nb, Ta, Cr, Mo, and W; and the diffusion

of cobalt and silicon in titanium. X rays during the diffusion phase revealed the formation of the following: TaB_2, NbB_2, TiB_2, CrB_2, Mo_2B, W_2B, FeB, CoB $TiSi_2$, TiC, ZrC, Ta_2C Nb_2C, Cr_2C_2, Mo_2C, W_2C, and Co_3C_2. The parameter values obtained for the diffusion of carbon and boron in the corresponding compounds are given in a table. It is shown that the activation energy of the diffusion of boron, carbon, and silicon in the indicated transition metals is connected with the magnitude of the ionization potential of boron, carbon, and silicon and the degree of deficiency of the d-level of these transition metals.

176. Properties of AlSb-CdSb System

"Some Data on the Ternary System, Al-Sb-Cd," by S. I. Radaytsan, Uchenyye Zapiski Kishinevskogo Universiteta (Scientific Notes of Kishinev University), Vol 39, 1959, pp 69-72 (from Referativnyy Zhurnal -- Metallurgiya, No 3, Mar 60, Abstract No 6136)

A study was made of the alloys of the AlSb-CdSb cross section of the system Al-Cd-Sb containing 10, 20, 30, and 40 percent AlSb. Specimens of the alloys were synthesized in graphite crucibles or quartz ampules under vacuum. The initial materials consisted of Sb and Cd (distilled two to four times in vacuum) and grade AB-000 aluminum. The synthesized specimens were annealed at 350 degrees centigrade for 100 hours. Through microstructure analysis methods and measurements of the microhardness and electrical resistance, it was established that the system AlSb-CdSb represents a mechanical mixture of the two binary components. To a limited degree, AlSb is dissolved in CdSb, but a dissolving of CdSb in AlSb was not observed. Above 100 degrees centigrade, the investigated alloys reveal the conductivity behavior of semiconductors. A linear increase of $\triangle$ E was observed with increased AlSb content.

177. Mechanical Properties of Aluminum-Tin Alloys in Solid-Liquid State

"Mechanical Properties of Aluminum-Tin Alloys in the Solid-Liquid State," by I. I. Novikov and K. T. Chernousova, Trudy Instituta Yadernoy Fiziki, AN KazSSR (Works of the Institute of Nuclear Physics, Academy of Sciences Kazakh SSR). No 2, 1959, pp 109-111 (from Referativnyy Zhurnal -- Metallurgiya, No 3, Mar 60, Abstract No 6402)

A study was made of cast aluminum alloys containing 5, 10, 20, 30, and 50 percent tin at 150-600 degrees centigrade. Tensile tests showed that in alloys with 50 percent tin, the tensile strength drops to zero at the eutectic temperature. In alloys containing 20 and 30 percent tin the compressive strength drops abruptly near the eutectic temperature,

then remains practically unchanged, and reaches the zero value only at 500 degrees centigrade. The abrupt drop of ductility near the eutectic point is explained by the fusing along the grain boundaries and, in connection with it, the change from ductile to brittle failure. Above the solidus, the liquid phase is disposed as an isolated enclosure, and the ductility of the alloy is determined by the ductility of the solid crystals which make up the framework. In the case of such a liquid-solid alloy structure, therefore, a temperature increase leads to an increased ductility of the crystals, because of slip and parting, and thus to increased ductility of the alloy. At a certain temperature, the cohesion between dendrites disappears, which leads to decreased ductility. It was shown that increased ductility in the upper portion of the temperature interval of the solid-liquid alloy should contribute to greater resistance on the part of the alloy to the formation of hot cracks.

178. Liquation in Bronze Ingots

"On the Question of the Liquation Phenomena in Ingots of OtsS-4-4-2.5 Bronze," by A. V. Novikov, M. I. Tsypin, and L. P. Fridman, Trudy Instituta Yadernoy Fiziki AN KazSSR (Works of the Institute of Nuclear Physics, Academy of Sciences Kazakh SSR), No 2, 1959, pp 151-152 (from Referativnyy Zhurnal -- Metallurgiya, No 3, Mar 60, Abstract No 6434)

The liquation of alloying components along a section of flat ingots of bronze OTsS 4-4-2.5, 40 x 220 x 750 millimeters in size, was determined by means of chemical analysis. To determine the influence of the rate of cooling on liquation, the ingots were cast in cast-iron, copper, and water-cooled pans. It was found that liquation intensifies with decreased rate of cooling; the curves which show the deviation of composition of tin and led from the average composition according to the thickness of the ingot have the same form, whereas the liquation curves for zinc differ sharply from them, which suggests a combined liquation of tin and lead. It is presumed that lead does not manifest an indifferent phase with respect to the solid solution in copper base alloys, but rather interacts with it.

179. Relaxation Tests on High-Temperature Materials

"Analysis of the Results of Relaxation Tests by Various Methods," by T. I. Volkova, Struktura i Svoystva Zharoprochnykh Materialov. TsNIITMASh, Kniga 93 (Structure and Properties of Heat-Resistant Materials. TsNIITMASh Book 93, Moscow, 1959, pp 225-236 (from Referativnyy Zhurnal -- Mekhanika, No 4, Apr 60, Abstract No 5405)

An analysis is made of the results of relaxation tests on steel EI723 at 500-550 deg C, up to 4,000 hours, by two methods:

(1) By the ring method, in which a detached ring is tested, the working part of which has the form of a beam of equal strength.

(2) By the flat spring method, in which the spring, resting on two bearings, is loaded in the middle, and the loading along the surface varies from zero at the supporting bearing to a maximum at the point where the load is applied.

It is shown that relaxation tests on ring specimens and flat plates do not guarantee qualitatively uniform characteristics of relaxation strength.

As a rule, the relaxation strengths obtained in the first stage of the method used for the flat springs are higher than, and those obtained in the second stage are lower than, those obtained by the ring method. The total relaxation strength obtained in the testing of the flat springs can be either higher or lower than that obtained for the rings, depending on the relative intensities of the relaxation processes in the first and second stages.

180. Intermetallic Compounds (Laves Phases) in Fe-Cr-Ni-Base Alloys

"Intermetallic Compounds -- Laves Phases -- in Fe-Cr-Ni-Base Alloys With Varying Content of Tungsten and Niobium," by S. A. Yuganova, N. A. Duel', and M. D. Nesterova, Struktura i Svoystva Zharoprochnykh Materialov. TsNIITMASh Kniga 93 (Structure and Properties of Heat-Resistant Materials. TsNIITMASh Book 93), Moscow, 1959, pp 70-98 (from Referativnyy Zhurnal -- Metallurgiya, No 4, Apr 60, Abstract No 8488)

Through the X-ray analysis of electrolytically deposited coatings, a study was made of the phase composition of cast Fe-Cr-Ni alloys (16 percent Cr and 32 percent Ni) alloyed with 2.85-9.65 percent tungsten, 2.82-3.47 percent molybdenum, 0.24-2.39 percent niobium, 0.38-2.47 percent titanium, and 0.48-9.91 percent aluminum after hardening at 1,200 deg C, followed by age-hardening at 700-950 deg C for 10-3,000 hours. It was found that in these alloys, during age-hardening, an intermetallic Laves-type phase, $M_A(M_B)_2$, is precipitated together with the carbides, the dominant role being played by the tungsten and the niobium. When the tungsten content is 3 percent, the precipitated Laves phase (W, Mo, Nb) $(Fe, Cr, Ni)_2$ is unstable and is redissolved during an extended period of age-hardening. When the tungsten content is 6 percent, the Laves phase is stable. Two Laves phases were observed: one which does not dissolve at the hardening temperature of 1,200 deg C $(Nb_{18}W_6Mo_6)(Fe_{15}Cr_{10}Ni_5)_2$, and the one which precipitates at 700-850 deg C $(W, Mo, Nb)(Fe, Cr, Ni)_2$. The alpha-phase is precipitated during age-hardening at 700 deg C for 100 hours or more, when aluminum content is 0.9 percent.

181. Change of State in EI755 and EI757 Steels During Hot Working

"Change in Phase State of Steels EI755 and EI757 Depending on the Conditions of Hot Working," by S. A. Yuganova and M. D. Nesterova, Struktura i Svoystva Zharoprochnykh Materialov. TsNIITMash Kniga 93 (Structure and Properties of Heat-Resistant Materials. TsNIITMash Book 93), Moscow, 1959, pp 217-224 (from Referativnyy Zhurnal -- Metallurgiya, No 4, Apr 60, Abstract No 8489)

The change of phase state was studied during age-hardening at 600-700 deg C of EI755 steel (0.13 percent carbon, 2.05 percent tungsten, 10.85 percent chromium, 0.09 percent vanadium, 0.73 percent molybdenum, 0.37 percent niobium) and EI757 steel (0.14 percent carbon, 3.92 percent tungsten, 10.85 percent chromium, 0.11 percent vanadium, 0.74 percent molybdenum). The phases were precipitated electrically in an aqueous solution containing 300 grams per liter of KCl, 30 grams per liter of citric acid, and 30 grams per liter of HCl. The ferrite was precipitated electrolytically in an aqueous solution containing 20 grams per liter of $CuSO_4$, 10 grams per liter of ammonium citrate, and 5 grams per liter of H_2SO_4. X-ray and chemical analyses were made, and the lattice spacing of the solid alpha solution and the R_B value were determined.

It was found that, during age-hardening of the two steels, at first a transitional carbide $(Cr, Fe, W, Mo)_{23}C_6$ is precipitated; during a later stage of age-hardening the intermetallic Laves phase $(W, Mo)(FeCr)_2$ is precipitated. In EI757 steel, which contains more tungsten, the intermetallic compound is precipitated earlier (in 100-10 hours, rather than 1,000-25 hours for EI755, at 600-700 deg C) and in greater quantities. When age-hardening at 700 deg C was extended, a ferrite was precipitated, presumably the eutectoid, which, after soaking for 1,000 and for 3,000 hours, contained (in Steel EI757) 5 and about one percent chromium, respectively. At all age-hardening temperatures, a more varied lattice spacing of the solid alpha solution and R_B value were observed in EI757 steel. The softening of the solid alpha solution in both steels was most intense during isothermal soaking at 700 degrees C and with periods of age-hardening of 1,000-3,000 hours.

182. Problems Regarding Strength of Cermets Materials on Silicon Carbide Base

"Certain Problems Regarding the Strength of Cermets Materials on a Silicon Carbide Base," by V. T. Troshchenko, Institute of Powder Metallurgy and Special Alloys, Academy of Sciences Ukrainian SSR; Minsk, Inzhenerno-Fizicheskiy Zhurnal, No 1, 1960, pp 103-107

The application of statistical theories of strength to the calculation of brittle cermet materials is discussed with relation to silicon carbide.

It is shown that there is good agreement between formulas from W. Weibull's statistical theory of strength and experimental data obtained on the effect of size, type of stressed state, and concentration of stresses on strength.

183. Chemical Resistance of Beryllium Borides Toward Oxygen, Nitrogen, and Carbon at Elevated Temperatures

"The Chemical Resistance of Beryllium Boride Toward the Action of Oxygen, Nitrogen, and Carbon at Elevated Temperatures," by G. S. Markevich and L. Ya. Martovskiy, State Institute of Applied Chemistry; Leningrad, Zhurnal Prikladnoy Khimii, Vol 33, No 5, May 60, pp 1008-1012

The data obtained indicate that there are significant differences in the resistance of different beryllium borides toward the action of oxygen, nitrogen, and carbon. The most stable borides are those containing a large quantity of boron (Be B_2, Be B_4, and Be B_6), while the least resistant are phases with large content of beryllium (Be_5 B and Be_2B). It may be assumed that the beryllium borides which are rich in boron contain three-dimensional boron structures which are responsible for the high stability of the borides in question. However, even the most stable beryllium borides have a lower chemical resistance than the borides of other metals. In the work described the resistance to scale formation of berylium borides is compared with that of zirconium boride, titanium boride, zirconium boride containing silicon, molybdenum silicide, boron carbide, and boron carbide containing silicon. An investigation of the stability of beryllium borides toward the action of carbon indicated that these borides form Be_2C in the temperature range of 900-1300°, whereas the borides of transitional metals do not form carbides even at 2000°.

104. Silicide W_3 Si

"Concerning the Existence of the Silicide W_3 Si," by N. N. Matyushenko, L. N. Yefimenko, and D. P. Solopikhin, Physico-technical Institute, Academy of Sciences Ukrainian SSR; Sverdlovsk, Fizika Metallov i Metalovedeniye, Vol 8, No 6, Dec 59, pp 878-880

On the basis of the results described, it is concluded that the existence of a silicide having a composition W_3 Si has been experimentally proven. The dimensions of the unit cell of this compound have been determined.

Production Metallurgy

185. Hot Rolling of Titanium Tubing

"Hot Rolling of Tubes of Titanium," by S. M. Shul'kin, Metallurgiya (Metallurgy), Leningrad, Sudpromgiz, 1958, pp 153-166 (from Referativnyy Zhurnal -- Metallurgiya, No 2, Feb 60, Abstract No 3022)

A description is given of the manner in which technology was devised for the hot rolling of tubes of technically pure titanium. Some data are also given on the characteristic properties of an experimental batch of hot rolled titanium tubes.

186. Vacuum Reduction Process for Production of Titanium Boride

"Some Characteristics of the Vacuum-Thermic Method for the Production of Titanium Boride," by V. F. Funke, S. I. Yudkovskiy, and G. V. Samsonov, All-Union Scientific Research Institute of Hard Alloys; Leningrad, Zhurnal Prikladnoy Khimii, Vol 33, No 4, Apr 60, pp 831-835

Investigation of a method for the production of titanium boride by the vacuum-thermic method according to the reaction $2\ Ti\ O_2 + B_4\ C + 3\ C \longrightarrow 2\ Ti\ B_2 + 4\ CO$ indicated that it is possible to produce pure boride with a negligible content of impurities from technical boron carbide and titanium dioxide. In the experiments described, charges of 100-200 grams were used and the process was carried out in a TVV-2 furnace.

187. Magnesium-Thermic Reduction of Titanium Tetrachloride

"Concerning the Problem of the Mechanism of the Interaction Between Titanium Tetrachloride and Magnesium Under Optimum Temperature Conditions of Carrying Out the Reduction Process," by R. A. Sandler, All-Union Aluminum-Magnesium Institute; Leningrad, Zhurnal Prikladnoy Khimii, Vol 33, No 5, May 60 pp 1013-1019

It was established that the reduction of titanium tetrachloride with magnesium takes place stepwise over the intermediate stages of the formation of $Ti\ Cl_3$ and $Ti\ Cl_2$. Whether the interaction takes place predominantly in the gas phase or in the condensed phase depends on the rate at which $Ti\ Cl_4$ is supplied to the reactor and on the partial pressure of the inert gas. One must regard 930-940 as the optimum temperature range for the reduction of titanium tetrachloride, because at lower temperatures crystallization of $Ti\ Cl_2$ from the melt is possible and there may be decomposition of titanium dichloride with the formation of volatile $Ti\ Cl_3$.

188. Recovery of Rhenium From Tungsten-Rhenium Alloys

"Recovery of Rhenium From Tungsten-Rhenium Alloys," by A. I. Lazerev, Akmolinsk Agricultural Institute; Leningrad, Zhurnal Prikladnoy Khimii, Vol 33, No 2, Feb 60, pp 468-469

Alloys of rhenium with tungsten are heat-resistant. The are applied in electrical engineering and in the radio industry. Because of the great shortage of rhenium supplies and the high cost of tungsten, a method is required for the recovery and separation of these metals. Development of such a method was the subject of the present investigation. One of the procedures developed involves dissolution of the alloy in perhydrol [highly concentrated hydrogen peroxide]. Addition of nitric acid to the perhydrol expedites the process of solution. The solution finally obtained contains rhenic [perrhenic?] acid, pertungstic acid, and hydrogen peroxide. Boiling of the solution converts to pertungstic acid into tungstic acid. The latter separates in the form of a precipitate and can be filtered off. Another variant of the separation procedure involves neutralization of the solution with calcium hydroxide. The filtrate from the neutralized solution which has been boiled contains Ca^{2+} and ReO_4^- ions. This solution is passed through an ion-exchange column. The ReO_4^- ion passes through the column while the calcium cation is absorbed. The recovery of rhenium by the methods proposed exceeds 99%.

189. Adhesion of Nickel Plating to Base Metals and Alloys

"The Cohesion of a Nickel Plating With Steel-2, Nickel, Chromium, Steel 1Kh18N9T, and a Chromium-Nickel Alloy," by M. I. Morkhov. and K. N. Kharlamonva, Trudy Chetvertogo Soveshchaniya Po Elektrokhimii 1956 (Works on the Fourth Conference on Electrochemistry, 1956), Moscow Academy of Sciences USSR, 1959, pp 482-485 (from Referativnyy Zhurnal -- Metallurgiya, No 3, Mar 60, Abstract No 6692)

The organic and oxide films which form on the surface of a metal during polishing prevent the cohesion of the metal to electrolytic coatings. It was found that the most complete removal of these films and the most firm adhesion of a nickel coating to polished nickel and St-2 steel is achieved if, before the nickel plating, the metal is washed with gasoline, electrically degreased in an alkali solution, and chemically etched in 2N. HCl. The nickel plating is done in a bath containing 280 grams per liter of $NiSO_4 \cdot 7H_2O$, 30 grams per liter of H_3BO_3, 10 grams per liter of NaCl at 25 and 60 degrees centigrade, approximately pH 5, D_k = 1-4 a/dm^2. In the case of steel 1Kh18N9T, following the preparatory scouring of the surface, the plating is done in a bath containing 240 grams per liter of $NiCl_2 \cdot 6H_2O$, 50 grams per liter of HCl, at 60 degrees centigrade, D_k = 4 a/dm^2. For chromium, it is recommended that a bath be used containing 280 grams per liter of $NiSO_4 \cdot 7H_2O$, 72 grams per liter of H_2SO_4, at 60 degrees centigrade, D_k = 4 a/dm^2.

From these baths, the output of nickel per unit of current amounts to 100, 50, and 10 percent, respectively. A good adherence of a nickel coating to a chromium-nickel alloy is achieved by substituting an anodic treatment in 20 N H_2SO_4 for the chemical etching. This alloy was nickel plated in the same bath used for the 1Kh18N9T steel.

190. Alloying of Borides With High-Melting Transition Metals

"Some Properties of Alloys of Borides of High-Melting Transition Metals," by G. A. Meyerson, G. V. Samsonov, R. B. Kotel'nikov, M. S. Voynova, I. P. Yevteyeva, and S. D. Krasnenkova, Bor. Trudy Konferentsii po Khimii Bora i Yego Soyedineniy (Boron, Works of the Conference on the Chemistry of Boron and Its Compounds), Moscow, 1958, pp 58-73 (from Referativnyy Zhurnal -- Metallurgiya, No 2, Feb 60, Abstract No 2781)

A description is given of the technology for producing, and of the results of an investigation of the phase condition and structure of, products resulting from the diffuse interaction of borides of the systems TiB_2-CrB_2, TiB_2-W_2B_5, and ZrB_2-CrB_2. Studies were made also of the microhardness of the phases, the thermal stability of the alloys, and the structure of the scales of various consistencies.

191. Electroplating of Molybdenum and Tungsten Alloys With Metals of Iron Group

"Comparative Characteristics of the Processes of Electroplating of Molybdenum and Tungsten Alloys With Metals of the Iron Group," by T. V. Frantsevich-Zabludovskaya and A. I. Zayats, Trudy Chetvertogo Soveshchaniya Po Elektrokhimii 1956 (Works of the Fourth Conference on Electrochemistry, 1956), Moscow, 1959, pp 524-529 (from Referativnyy Zhurnal -- Metallurgiya, No 2, Feb 60, Abstract No 4292)

Comparative data are given on the electroplating of molybdenum and tungsten, as components of alloys, with metals of the iron group, primarily with nickel. It is shown that, with increased concentration of the ratio Ni:Mo (W) in the solution, the content of molybdenum and tungsten in the alloy first drops abruptly and then negligibly. Changing the temperature of the electrolyt has almost no influence on the deposition of molybdenum alloys, whereas in the deposition of tungsten alloys the content of tungsten in the alloy and the current efficiency increase with increased temperature. The tungsten content in the alloy and the current efficiency neither depend on D_k nor increase with it, as the molybdenum content decreases with increased D_k, but during the depositing of molybdenum alloys, the current efficiency reaches a maximum with increased D_k. The mechanism of electrodeposition of molybdenum and tungsten alloys is described. It is found that the mechanisms are the same for both alloys.

192. Electrolytic Deposition of Coatings on Titanium

"Electrolytic Deposition of Coatings on Titanium," by S. M. Burtina and A. G. Samartsev; Leningrad, Zhurnal Prikladnoy Khimii, Vol 33, No 5, May 60, pp 1141-1146

It has been established that it is possible to deposit chromium, copper, and nickel coatings on titanium. Of importance is the treatment of the surface of the metal before electrolytic deposition of the coating. Procedures for treating the surface are proposed. It was shown that heat treatment in vacuum of samples coated with chromium, copper, or nickel at a thickness of the coating amounting to 8-10 microns results in improved adhesion of the coating. Subsequently to this treatment, it is possible to deposit a second layer of greater thickness (80-150 microns).

Miscellaneous

193. USSR Work on Application of Gas Jets for Disintegration of Materials

"A Rocket on a Leash -- Disintegration in Gas Jets," by N. Rogozhinskaya, Candidate of Technical Sciences; Moscow, Tekhnika-Molodezhi, Vol 28, No 3, Mar 60, pp 5-6

The technology of the disintegration of materials (including those applied in the metallurgical, fuels, chemical, foodstuffs, and construction materials industries) is undergoing a change which may be referred to as a veritable revolution. USSR metallurgical scientists, headed by the late Academician I. P. Bardin, and physical chemists and technologists, working under the direction of Academician P. A. Rebinder, Doctor of Technical Sciences N. V. Mikhaylov, and their associates, have developed the fundamentals of physicochemical mechanics, a borderline science which deals with the optimum conditions for the disintegration of materials and the application of finely subdivided materials in different technological processes.

Because of the increasing trend toward the use of more finely dispersed materials, it may be expected, if the methods in current use are applied, that close to 50% of the total quantity of electric power produced in the USSR will be spend on the grinding and disintegration of materials before long. Furthermore, more than a million tons of high-grade steel used to construct mechanical mills for grinding and disintegration will be wasted annually because of the wear of mills. At present, there is a tendency both in the US and the USSR to eliminate the use of metal grinding mills and to disintegrate materials by employing jets of compressed air or of superheated steam. Although jet appliances for disintegration by this

method are being developed in the US, very little is published on the subject there. In the USSR both the theory and practical designing of jet mills of this type are being advanced. Work on the subject has been conducted since 1955, under the direction of Engr V. I. Akunov, by the staff of the Laboratory of Jet Mills, All-Union Scientific Research Institute of New Construction Materials, Academy of Construction and Architecture of the USSR. Jet appliances operating on this principle are much more efficient and economical than ball mills.

However, even this type of disintegrator has been practically superseded at the present stage. In the future, combustion jet mills will be applied. In 1958, Engr V. I. Akunov, Doctor of Technical Sciences M. G. Dubinskiy, and Engr B. K. Tel'nov proposed a design of a gas jet disintegrator which operates by employing the energy of combustion products derived from different types of fuel rather than energy supplied by the compressed air or superheated steam. A combustion jet (a reaction engine) is very promising from the standpoint of applications for the fine disintegration of materials. The temperature in the combustion chamber of a jet engine reaches 3,000°, while the rate of flow of combustion gases is equal to 900-1,000 meters per second. The energy potential of an engine of this type is approximately 7,000 kw per ton, i. e., almost 900 times higher than that of a ball mill.

A hypothetical application of a jet disintegrator in connection with a process for the direct reduction of metals contained in ores can be visualized as follows. After being subjected to preliminary grinding, the ore is fed by means of a conveyer from a storage bin (bunker) into a pipe leading to a disintegration chamber. In this chamber, the ore comes into contact with a gas stream which is emitted with a great velocity from the combustion chamber. The ore is carried by the stream of gas at a velocity of 500-1,000 meters per second in a direction opposite to that of another gas stream which meets head on the stream carrying the ore. As a result of the turbulence produced by the impingement of the two gas streams, the ore particles collide with each other and disintegrate. The two opposed gas streams are joined together after being diverted in a direction perpendicular to that of the original flow and carry the particles of material into a central disintegration chamber, where these particles undergo additional disintegration.

At the same time, under the action of high temperature, which may reach 2,500°, and of the reducing agent present in the gas, metal in a finely subdivided form is separated chemically from the ore and together with the extraneous dust (slag) is conducted into the dust separator, where classification of particles according to size takes place. The large particles fall down, are carried away by the gas, and are recirculated into the disintegration stage. The small particle fraction containing the metal particles is conducted into a chamber where the total solids of this fraction settle down and fall into a special storage bin. The gas is purified and the heat contained in it is utilized.

The finely subdivided mass consisting of metal and slag is separated by means of a special separator. The metal may be fed into an open-hearth furnace, where it is converted into steel, while the slag may be used for the production of cement. If the process described is applied, treatment of iron ore in a blast furnace can be dispensed with.

VIII. PHYSICS

Acoustics

194. Scattering Sound Waves Over Corrugated Surface of Elastic Body

"Scattering of Sound Waves on the Uneven Surface of an Elastic Body," by D. S. Grasyuk, Acoustics Institute of the Academy of Sciences USSR, Moscow; Moscow, Akusticheskiy Zhurnal, Vol 6, No 1, 1960, pp 30-33

The solution is given of the problem of the distribution of sound over the uneven boundary of separation between a liquid and a solid body. The unevenness is assumed to be periodic with respect to amplitude and small by comparison with the length of the incident wave. The Rayleigh method is used to approximate the amplitude of the waves which glance along the surface and the waves which are displaced through the solid body. At low angles of incidence (up to 12 degrees), the displacement waves can be neglected.

195. Propagation of Low-Frequency Sound in Shallow Water

"Study of the Propagation of Sound of Low-Frequency in Shallow Water," by V. S. Grigor'yev and F. I. Kryazhev, Acoustics Institute of the Academy of Sciences USSR, Moscow; Moscow, Akusticheskiy Zhurnal, Vol 6, No 1, 1960, pp 34-42

An experimental procedure is described for investigating the propagation of low-frequency sound in shallow water. The experimental data obtained characterize certain peculiarities of the waveduct transmission of sound under conditions prevailing in fresh water reservoirs and shallow seas.

196. Determining Width of Sawtooth Acoustic Wave Front

"On One Method of Determining the Width of the Front of an Acoustic Wave, Close in Form to a Saw-Tooth," by L. K. Zarembo, Acoustics Institute of the Academy of Sciences USSR, Moscow; Moscow, Akusticheskiy Zhurnal, Vol 6, No 1, 1960, pp 43-46

A method is presented for determining the width of the front of a periodic saw-tooth wave according to measurements of its spectral components. The width of the front may be estimated approximately on the

basis of the absorption. Data given in the literature on the spectral analysis of saw-tooth waves in water are considered here from the viewpoint of this special width determination.

197. Propagation of Ultrasonic Waves in Liquid

"On the Problem of the Rate of Propagation of Ultrasonic Waves of Finite Amplitude in a Liquid," by L. K. Zarembo, and V. V. Shklovskaya-Kordi; Moscow, Akusticheskiy Zhurnal, Vol 6, No 1, 1960, pp 47-51

In a solution of methyl alcohol and water with a temperature coefficient of velocity of approximately 10^{-5} deg $^{-1}$, the phase method was used to determine the velocity variation of the zero wave with finite amplitude, when the voltage fed to a quartz oscillator was amplified from 100 volts to 1.5 kilovolts at a frequency of 1.5 megacycles. The maximum accuracy in the determination of the change of velocity was 0.003 percent. Measurements taken with a constant excess pressure (about one atmosphere), when the formation of cavitation is difficult, show that, with an accuracy of about 0.007 percent, the velocity of the zero wave of finite amplitude with acoustic Reynolds numbers around 10 and Mach numbers about 10^{-4} remains constant. During the development of cavitation in the water and in the solution of water and methyl alcohol, a considerable, but intermittent, increase in velocity was observed on a certain portion of the wave propagation.

198. Transient Emission of Sound From a Piston

"Transient Emission of Sound From a Piston," by A. A. Kaspar'yants, Odessa State University Moscow; Akusticheskiy Zhurnal, Vol 6, No 1, 1960, pp 52-56

A study is made of the transient field of short sound waves produced by a flat piston emitter, the action of which is initiated in a fundamentally motionless gas. During the establishment of the steady state condition, a motion is found which has the character of an impulse and the form of which is closely related to the form of the emitter; the intensity, however, depends on the phase at the moment the emitter is first switched on.

199. Normal Waves During Bending Oscillations of a Plate

"Concerning the Normal Waves During Bending Oscillations of a Plate," by Yu. K. Konenkov, Acoustics Institute of the Academy of Sciences USSR, Moscow; Moscow, Akusticheskiy Zhurnal, Vol 6, No 1, 1960, pp 57-64

The propagation of bending oscillations along an infinite elastic strip is considered for cases in which the edges of the strip are free, fixed, and hinged. The corresponding dispersion equations are derived and solved, and a study is made of the properties of the normal first-number waves.

Experiments (based on a method described by N. S. Ageyeva at the 3d All-Union Acoustics Conference in 1957 [Otchety Akusticheskiogo Instituta AN SSSR, 1955] were conducted in order to excite one of the many normal waves in an elastic strip with free edges and to confirm the propagation of the disturbance across the width of the strip for this normal wave. The strip was excited monochromatically with a piezoelectric vibrator. The test specimen used was an aluminum strip with density of material = 2.65 cm^3; modulus of elasticity = 7.05×10^{11} dyn/cm^2; thickness = 0.3 cm; and width = 5.0 cm. The vibration frequency used was 12 kilocycles. The experimental findings were in good agreement with theory.

200. Acoustic Field of the First Normal Wave in a Sheet of Water

"The Sonic Field of the First Normal Wave in a Sheet of Water," by F. I. Kryazhev, Acoustics Institute of the Academy of Sciences USSR, Moscow; Moscow, Akusticheskiy Zhurnal, Vol 6, No 1, 1960, pp 65-76

The article considers the field of the first normal wave in a plane-paralled layer of water lying on a bottom without slip elasticity. Results are given of experiments in which the properties of the first normal wave were studied during the propagation of sound in shallow water under real conditions, as well as the determination, on the basis of its characteristic, of the properties of the underwater bottom. The experimental results are in comparative agreement with theory.

201. Surface Resonance on a Sinusoidal Surface

"On the Problem of the Surface Resonance on a Sinusoidal Surface," by Yu. P. Lysanov, Acoustics Institute of the Academy of Sciences USSR, Moscow; Moscow, Akusticheskiy Zhurnal, Vol 6, No 1, 1960, pp 77-80

A modified Rayleigh method is used to investigate the influence of a low-amplitude surface resonance on a shallow sinusoidal surface.

202. Propagation of a Wave Through a Medium Containing Inhomogeneities

"On the Limits of Applicability of the Method of 'Smooth' Perturbations in the Problem of the Propagation of an Emission Through a Medium With Inhomogeneities," by V. V. Pisareva, Gor'kiy State University; Moscow, Akusticheskiy Zhurnal, Vol 6, No 1, 1960, pp 87-91

The question of the limits of applicability of the method of "smooth perturbations" in the solution of the problem of the propagation of an emission through a medium with inhomogeneities is considered on the basis of results obtained by Obukhov (Izvestiya AN SSSR, Seriya Geofizicheskaya, No 2, 1953, pp 155-165), Chernov (Akusticheskiy Zhurnal, Vol 1, No 1, 1955, pp 89-95), and Scheffler (Astronomische Nachrichten, Vol 284, No 1, 1957, pp 21-23) for the mean square values of the fluctuations of phase and amplitude and the correlation function of amplitude. Those conditions are defined at which the influence of a layer with inhomogeneities on the transient radiation may be replaced by the perturbation effect of an equivalent phase "shield."

203. Streaming of Sound in Water

"Experimental Investigation of Acoustic Flows In Water," by Ye. V. Romanenko, Acoustics Institute of the Academy of Sciences USSR, Moscow; Moscow, Akusticheskiy Zhurnal, Vol 6, No 1, 1960, pp 92-95

The dependence of the velocity in water of acoustic flows caused by waves of finite amplitude on the amplitude of the sonic pressure and the form of the wave are investigated by experiment. The dependence has a quadratic character whenever the wave is sinusoidal or saw-tooth. During the transformation of a sinusoidal wave into a saw-tooth wave, an anomalous increase in the rate of the acoustic flows with increased amplitude of the wave is observed. Although the dependence stated above was found to be somewhat more abrupt than quadratic by Naugol'nykh (Doklady AN SSSR,

Vol 123, No 6, 1958, pp 1003-1006), the experimental conditions here were so different from those in Naugol'nykh's work, agreement of results cannot be expected.

204. Sound Field in the Focal Plane of Convergent Spherical Beams

"The Sound Field in the Focal Plane of Convergent Spherical Beams," by B. D. Tartakovskiy, Acoustics Institute of the Academy of Sciences USSR, Moscow; Moscow, Akusticheskiy Zhurnal, Vol 6, No 1, 1960, pp 96-100

An investigation is made of the distribution of the sonic velocity and pressure in the focal plane of spherical sound beams with a finite aperture angle, which are characterized by a nonuniform distribution of amplitude along the wave front. It is assumed that the essential change of amplitude along a wave front of the order of magnitude of the amplitude itself occurs at distances not less than λ/π .. As in the calculation of the amplification factor, the distribution function of amplitude along the front is expressed by a polynomial, the integration of which provides a solution in the form of special functions.

205. Diffraction of Sonic Wave by Infinite Cylindrical Cavity in an Elastic Medium

"The Diffraction of a Two-Dimensional Sound Wave at an Infinite Cylindrical Cavity in an Elastic Medium at an Arbitrary Angle of Incidence," by V. V. Tyutenkin, Acoustics Institute of the Academy of Sciences USSR, Moscow; Moscow, Akusticheskiy Zhurnal, Vol 6, No 1, 1960, pp 101-106

The case is considered for the diffraction of a plane sonic wave at an infinite cylindrical cavity when the angle of incidence of the wave in relation to the axis of the cavity is arbitrary. The solution obtained for the scalar and vector potentials is obtained in the form of a superpositioning of cylindrical waves of different orders. The dependence of the amplitude of the zero wave on angle of incidence and frequency is also investigated.

206. Absorption of Ultrasound in Electrolytes

"On the Question of the Absorption of Ultrasound in Electrolytes," by M. I. Shlomis, Perm State University; Moscow, Akusticheskiy Zhurnal, Vol 6, No 1, 1960, pp 116-119

Two mechanisms involved in the absorption of sound in electrolytes are considered, one of which is connected with the electro-acoustic effect, and the other, conditioned by the relative motion of the ions and solvent during the propagation of sound in the solution. A formula expressing the coefficient of absorption and a numerical estimate of the considered effects are given.

207. Tests Conducted on Underwater Cylindrical Focusing Sound Radiator

"Experimental Testing of Cylindrical Focusing Systems, by I. N. Kanevskiy, Acoustics Institute of the Academy of Sciences USSR, Moscow; Moscow, Akusticheskiy Zhurnal, Vol 6, No 1, 1960, pp 123-124

This article gives the results of experiments on cylindrical focusing radiators made of barium titanate. An earlier work by the author, together with L. D. Rozenberg, discusses the theoretical aspects of the field of such cylindrical systems. (Akusticheskiy Zhurnal, Vol 3, No 1, 1957, pp 46-61).

The distribution of the field was measured with a miniature hydrophone 0.02 millimeter in diameter (Ye. V. Romanenko, Akusticheskiy Zhurnal, Vol 3, No 4, 1957, pp 342-347), and a precision coordinate device capable of shifting the receiver automatically with an accuracy of position not less than 0.01 millimeter. The initial tests with the radiator at angles of 30, 60, and 90 degrees and a frequency range of 600-900 kilocycles showed a sharp difference between the experimental results and theory. The measured amplification factor was 30-60 percent lower than the theoretical, and the propagation pattern was considerably distorted. It was found that the amplitude of the oscillations distributed along the surface of the radiator was periodic, but not uniform. When the wave front was plotted during a test of the radiator in both air and water, the distortion pattern was much like that of a plane radiator (I. N. Kanevskiy, Doklady AN SSSR, Vol 129, No 4, 1959, pp 766-768). The nonuniform periodic distribution of amplitude was equivalent to the presence on the surface of the radiator of two waves which met and produced a radiation at angles to the normal of the oscillating surface; this radiation distorted the field and reduced the amplification factor of the transducer. The distortion was reduced by selecting a frequency for which

the oscillations producing the parasitic radiation have minimum amplitude. The plotted curve of the potential distribution in the focal region of a semicylindrical radiator with a resonance frequency of 830 kilocycles, but operated at 764 kilocycles, was in satisfactory agreement with theory. This method, however, can be used only when high intensity is not required. A coaxially positioned dural filter brought the amplification factor to within 23 percent of the theoretical during operation at resonant frequency.

208. Ultrasonics in Communist China

"Works on Ultrasonics in the Chinese People's Republic, by I. G. Mikhaylov; Moscow, Akusticheskiy Zhurnal, Vol 6, No 1, 1960, pp 139-141

During the first half of 1959, the author spent 3 1/2 months in Communist China lecturing on molecular acoustics and acting as consultant for the organization of scientific-research work at the Chair of Acoustics of Nanking University. This university, which is the center of acoustics training in Communist China, prepares specialists in architectural acoustics, acoustics of speech, and ultrasonics. During Mikhaylov's visit, two new special fields were initiated -- molecular acoustics and hydro-acoustics. In the ultrasonics laboratory, the training and research includes work on barium titanate transducers, the coagulation of aerosols, and methods of measuring ultrasonic intensities. During the visit, adjustments were being made on a newly erected semiautomatic optical device for measuring the absorption of ultrasonic waves in liquids at frequencies of 3-30 megacycles. New equipment being tested at the time included an ultrasonic interferometer, a pulsed device for measuring sound absorption, and an instrument for measuring the absolute intensity of ultrasonic oscillations. Among the instructors at the Chair of Acoustics are assistants Tu K'ung-hua and K'ung Hsiu-feng and aspirant Jang Su-i.

There is also a large ultrasonics laboratory (headed by Prof Ying T'ung-fu) in the institute of "Radioelectrics" of the Academia Sinica, where research is conducted on the energy effect of ultrasound and certain problems involved in the excitation and measurement of ultrasonic fields. This institute works together with a number of industrial establishments, particularly with Peking textile mills, on problems of dyeing fabrics.

The Shanghai Polytechnic Institute is conducting research on the sterilization of water with ultrasonics.

Interesting work on the coagulation of aersols is being done at a chemical plant in the city of P'u-k'ou with the use of an electrodynamic vibrator (about 10 kilocycles). The author witnessed a very effective demonstration of a practically complete coagulation of ammonium chloride vapors. This research is done in cooperation with the Chair of Acoustics of Nanking University. Other research on the coagulation of aerosols is being done at Shanghai Polytechnic Institute.

The Shanghai Institute of Materials and the Central Metallurgical Laboratory in Shanghai are conducting research on the alteration of the mechanical properties of molten steel by ultrasonci irradiation. The Central Metallurgical Laboratory uses a 50-kilowatt magnetostriction generator and treats up to 130 kilograms of molten steel in a single operation. The Institute of Materials also does research on the use of ultrasonics in the electropolishing of metals. Experiments have been conducted at a frequency of 0.8 megacylce, and the polishing process has been simplified and accelerated by the use of ultrasonics.

Ultrasonic defectoscopy is widely used, for example, at the Ch'iang-Nan Shipyard in Shanghai, at the Ultrasonic Equipment Plant in Wu-hsi, and the Peking Electrical Instruments Plant, all of which use defectoscopes produced by the Leningrad Electrical Engineering Institute.

The Nanking Radio Tube Factory uses ultrasonics exclusively in the cleaning and decreasing of the cathodes of its tubes. Several places are doing work on the design and improvement of ultrasonic equipment.

Atomic Engineering

209. Investigation of Processes of Heat Transfer in Fuel Elements of Nuclear Reactors by the Hydraulic Analog Method

"An Investigation of Processes of Heat Transfer in Fuel Elements of Nuclear Reactors by the Hydraulic Analog Method," by O. I. Yaroshevich; Power Engineering Institute, Academy of Sciences Belorussian SSR; Minsk, Inzhenerno-Fizicheskiy Zhurnal, No 5, May 60, pp 81-85

The one-dimensional problem is considered of the distribution of a temperature field with inner heat sources applicable to fuel elements of water-moderated, water-cooled reactors. In the solution, boundary conditions of the fourth type are used on contact boundaries of separate layers of fuel elements, and conditions of the third type, on inner surfaces. In the solution, the dependence of the coefficient of heat conductivity on temperature in the formula $\lambda = 1000 (t + 273)^{-0.86}$ is applied. The problem is solved by the hydraulic analog method on the hydrointegrator of V. S. Lukyanov. The results are represented in the form of graphs.

210. Nonstationary Temperature Field in Heating Elements of a Reactor

"The Nonstationary Temperature Field in Heating Elements of a Reactor," V. S. Yermakov, Power Engineering Institute, Academy of Sciences Belorussian SSR (Minsk); Minsk, Inzhenerno-Fizicheskiy Zhurnal, No 4, 1960, pp 127-131

An analytical solution is given of the differential equation of heat conductivity for the determination of the distribution of temperature along a fuel element rod of a nucelar reactor in nonstationary conditions of reactor operation. If the reactor is supercritical with relation to the prompt neutrons, the solution is described by a formula. Taking into account delayed neutrons, the solution may be written in a different form.

211. Temperature Field in a Finite Cylinder With Inner Sources

"The Temperature Field in a Finite Cylinder With Inner Sources," by T. L. Perel'man, Power Engineering Institute, Academy of Sciences Belorussian SSR; Minsk, Inznenerno-Fizicheskiy Zhurnal, No 5, May 60, pp 138-144

By the integral transform method with finite limits, a solution is obtained of the problem of the temperature in a finite cylinder with volume sources of heat for various limiting conditions at the ends of the cylinder and convection heat exchange on the side surface. The result is of interest for the study of heat transfer in nuclear reactors.

212. Methods for Measuring Radioactivity Applied in the USSR

"Methods for the Metrology of Radioactivity Applied in the USSR," by K. K. Aglintsev, V. V. Bochkarev, V. N. Grablevskiy, and F. M. Karavayev; Moscow, Atomnaya Energiya, Vol 8, No 4, Apr 60, pp 354-359

This article reviews the present-day status of the standardization of radioactivity sources and of methods for measuring radiation emitted by radioactive substances. General principles are expounded of the organization of a system of radiometric measurements based on the application of a single system of units, standard methods, and standard installations. Methods for relative measurements by using standard sources are discussed. A system is proposed for checking sources of ionizing radiation standardized according to a scale subdivided into units of activity. This system of checking is based on a standard method of reproducing the Curie unit. The characteristics of standard radioactive sources of ionizing radiation and sources used for control purposes are briefly described.

213. Investigation of Heat Exchange During the Turbulent Flow of Heavy Liquid Metals

"Investigation of Heat Exchange During the Turbulent Flow of Heavy Liquid Metals in Tubes," by M. Kh. Ibragimov, V. I. Subbotin, and P. A. Ushakov; Moscow, Atomnaya Energiya, Vol 8, No 1, Jan 60, pp 54-56

Heat transfer during turbulent flow through tubes was investigated in experiments with mercury, lead, and lead-bismuth eutectic.

214. Aircraft Radiometer-Analyzer

"An Aircraft Radiometer-Analyzer," by V. V. Matveyev and A. D. Sokolov; Moscow, Atomnaya Energiya, Vol 8, No 1, Jan 60, pp 70-72

A highly sensitive scintillation aircraft threshold gamma-spectrometer is described which is designed for the determination of the intensity and relative hardness of gamma-radiation emitted from the earth's surface. A liquid scintillator is used in the equipment described. Tests carried out in 1956 and actual application of the radiometer in 1957 indicated that it is superior to instruments of older designs and that it will be useful in aeroradiometric prospecting for minerals.

Low Temperature Physics

215. Physicotechnical Institute of Low Temperatures To Be Organized at the Academy of Sciences Ukrainian SSR

"For Research on Low-Temperature Physics" (unsigned item); Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Vol 5, No 63 (671), 27 May 60, p 4

The Presidium of the Academy of Sciences Ukrainian SSR has decided to open a Physicotechnical Institute of Low Temperatures The staff of the institute will do research on low-temperature electronics, magnetism, resonance phenomena in solids, electrical conductivity and superconductivity, plasticity and strength of solid materials, the thermodynamic properties of liquid gases and other subjects.

216. Limits of Flat Motions of a Rocket In a Void

"On Two Classes of Flat Extremal Motions of a Rocket in a Void," by Yu. A. Gorelov, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 2, Mar/Apr 60, pp 303-308

This article considers the conditions which guarantee an extremal (with respect to time and mass expenditure) motion of a rocket along a curvilinear trajectory.

The rocket is considered an ideally directed body, i.e., it can instantaneously assume a required angle of orientation in space by turning on its longitudinal or transverse axis which passes through the center of gravity. This assumption makes possible the formulation of the problem, which is based solely on the equations of motion, assuming the equation expressing the moments is always satisfied.

Motion is considered on the active portion of the trajectory, i.e., the mass of the rocket is considered to be variable with time.

Within the framework of the indicated assumptions, the author sets up a variation problem for the determination of the characteristic of an extremal (with respect to time) turn of the rocket at a given agle under given initial and terminal velocities and initial and terminal weight of the rocket. A solution of the problem is sought for flat motions separately in the horizontal and vertical planes, assuming the absence of influences resulting from aerodynamic forces.

217. Hypersonic Flow Around Thin Bodies at Large Angles of Attack

"Three-Dimensional Hypersonic Flows of a Gas Around Thin Bodies at Large Angles of Attack," by V. V. Sychev, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 2, Mar/Apr 60, pp 205-212

The smallness of the parameters which characterize the relative thickness of the bodies affords the possibility of an approximate presentation of the problem of flow around such bodies in a form which generalizes the similarity of hypersonic flows with small perturbations for the case of an arbitrary angle of attack. The obtained approximate formulas for the calculation of the aerodynamic characteristics of the thin bodies at large angles of attack contain as unknowns only certain constants which depend on the form of the cross section of the body.

218. Motions of Gas Produced by Point and Peripheral Explosions

"On the Motion of a Piston in an Ideal Gas," by N. N. Kochina and N. S. Mel'nikova, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 2, Mar/Apr 60, pp 213-218

This article considers a nonself-modeling problem ($p_1 \neq 0$) of the motion of a gas caused by a piston moving with a velocity of $v_n = ct^m$. These motions may be represented as emanating from the point of an explosion with a divergent shock wave or from a peripheral detonation with convergent shock wave, taking into account the displacement of the gas by the explosion products.

219. Shock Wave From a Slightly Curved Piston

"Shock Wave From a Slightly Curved Piston," by R. M. Zaydel', Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 2, Mar/Apr 60, pp 219-227

A method is given for solving a problem considered earlier by Freeman (Proc.Roy.Soc. A228, 1955, p 341). The method given here does not require the construction of "conical solutions" and affords the possibility of solving other problems which lead to a hyperbolic system of equations with boundary conditions having variable limits.

220. Determination of the Thickness of a Stationary Shock Wave

"The Determination of the Thickness of a Stationary Shock Wave," by V. S. Pushkin, Power Engineering Institute imeni G. M. Krzhizhanovskiy, Academy of Sciences USSR; Minsk, Inzhenerno-Fizicheskiy Zhurnal, No 3, Mar 60, pp 36-40

A new method is given for the evaluation of the thickness of shock waves by which this thickness can be estimated with any degree of accuracy permitted by the formulation of the problem. This method is based only on that part of the solution which produces a noticeable change of physical values (for example, velocity) with a change in the argument; branches of the solution extending to $\pm \infty$, on which physical values change little with a change in the argument, are neglected.

221. Approximation Method for a Two-Dimensional Eddy Flow of a Gas

"Approximation Method of Solving Problems of a Two-Dimensional Eddy Flow of a Gas," by Yu. S. Zav'yalov, Tomsk; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 2, Mar/Apr 60, pp 228-236

This article provides, on the basis of an example of an adiabatic motion, proof of an argument presented in an earlier work of the author ("On One Class of Plane-Parallel Steady Vortical Motions of a Gas," Doklady Akademii Nauk SSSR, Vol 116, No 3, 1957). In addition, the author presents here, for use in the investigation of potential flows, an approximation method for a supersonic eddy flow. An approximate general solution is provided, which is analogous to the solution given by S. A. Khristianovich ("Approximate Integration of the Equations of a Supersonic Motion of a Gas," Prikladnaya Matematika i Mekhanika, Vol 11, No 2, 1947), except that the solution here contains three, rather than two, arbitary functions. A solution is given of the main boundary problems for flows without abrupt changes of density and of certain problems of flow with abrupt changes of density.

222. Return Flow and Turbulent Boundary Layer Separation

"On the Study of Return Flows in the Area of Separation of a Turbulent Boundary Layer," by Yu. A. Dem'yanov and V. N. Shmanenkov, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 2, Mar/Apr 60, pp 237-239

The idea of free turbulence is used for a solution of the problem of flow in the vicinity of turbulent boundary layer separation. The presence of return flows in the retarded zones is taken into account. The cases treated are those of a supersonic flow around a step-shape (two-dimensional problem) and around a blunt-nosed body with a spike attached in front (axisymmetrical problem).

223. Waves Produced by Shock Waves at Surface of Incompressible Liquid

"On the Waves Produced by a Shock Wave on the Surface of an Incompressible Liquid," by B. N. Rumyantsev, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 2, Mar/Apr 60, pp 240-248

The article considers the two-dimensional and three-dimensional problem of the motion of a liquid as a result of a pressure applied to its surface, disregarding the influence of gravity. A number of self-modeling solutions are derived.

A certain time after an explosion has occurred above the surface of a liquid, the shock wave reaches the liquid and interacts with it. To determine the motion of the liquid and gas, it is necessary to solve the problem jointly for both media. If the density relationship of the two media is taken into account, it is possible to show, in the first approximation, that the movements of the liquid have no effect on the motion of the gas, which is assumed to be known. This approach leads to the problem of determining the motion of the liquid under the influence of a pressure applied at the surface and changing in accordance with a given law. An analogous linear problem has been treated for compressible liquids (Bagdoyev, A. G., Vestnik Moskovskogo Universiteta, No 3, 1957); here, the liquid is considered incompressible, which is applicable for the case of air and water, with pressures behind the shock wave not greater than 22 kilograms per square centimeter.

224. Stability of Plane-Parallel Flows of Nonhomogeneous Liquid

"On the Stability of Plane-Parellel Flows of a Nonhomogeneous Liquid," by L. A. Dikiy, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 2, Mar/Apr 60, pp 249-257

It is assumed that, even if the Reynolds number is rather high, the introduction of viscosity into the study of the stability of a nonhomogeneous liquid affords no particular advantage; the viscosity is considered to be equal to zero. It is pointed out that breaking down solutions into wave solutions and investigating the natural frequencies is not an end in itself, but only a tool for investigating the Cauchy problem for partial derivative equations. If such wave solutions are not provided, however, then the Cauchy problem regarding the development of arbitrary initial perturbations must be solved by some other method. A motion is assumed here to be stable if the arbitrary intial perturbation, which originates in a finite region of space, becomes limited in the course of time; otherwise, the motion is unstable. This article shows that, in individual examples at least, such an investigation can be conducted to the end, especially in cases in which wave solutions are not available.

225. Impact of Elliptical Surface Against Incompressible Liquid

"Horizontal Impact of a Floating Ellipse Against an Incompressible Liquid," by N. A. Kudryavtseva, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, No 2, Mar/Apr 60, pp 258-261

An analytic solution is given of the problem of the horizontal impact imparted to the liquid by a semi-immersed ellipse. The experiments confirmed the general theoretical assumption of a separation of the liquid from the surface of the ellipse. The correct solution of the problem of the horizontal impact of the ellipse shows that an approximation of the point of separation and the forces of momentum on the basis of an impact of the ellipse without separation (Semenov Tyan-Shanskiy, V. V., "On the Problem of the Impact of an Ellipse," Trudy Leningradskogo Korabel'nogo Instituta [Works of the Leningrad Shipbuilding Institute], Vol 13, 1954) leads to a large error.

226. Statistical Problems in Elasticity Theory

"On Conditions of Finiteness in the Mechanics of Complex Media. The Statistical Problems of the Theory of Elasticity," by G. I. Barenblatt, Moscow; Moscow, Prikladnaya Matematika i Makhanika, Vol 24, No 2, Mar/Apr 60, pp 316-322

In many cases of the treatment of complex media in mechanics, when the solution of the general differential equations does not lead to a unique solution, supplementary conditions are introduced, often in the form of new independent hypotheses. It is shown that it is possible to set up a general form of supplementary conditions which will yield a unique solution under such conditions. These conditions, particularly such supplementary conditions as the finiteness of velocity or of pressure, are not independent physical hypotheses. They are derived from the fundamental integral principles of mechanics just like the general differential equations and the boundary conditions. This article investigates the application of such supplementary conditions to statistical problems of the theory of elasticity.

227. Heat Transfer by Rarefied Gas Flowing Round a Wall

"Heat Transfer by Rarefied Gas Flowing Round a Wall," by A. A. Pomerantsev, Moscow State University; Minsk, Inzhenerno-Fizicheskiy Zhurnal, No 5, May 60, pp 3-11

The Blazius-Rubezin method is generalized for the case of supersonic movement of a body in a rarefied gas in the presence of slippage. A solution is obtained for the flow of gas round a wall. A conclusion is deduced for hydrodynamic and thermal boundary conditions corresponding to the problem formulated.

228. Calculation of Combined Heat Interaction of Solids and Liquids

"The Calculation of Combined Heat Interaction of Solids and Liquids," by E. A. Sidorov, Institute of Thermal Physics, Siberian Branch of the Academy of Sciences USSR; Minsk, Inzhenerno-Fizicheskiy Zhurnal, No 5, May 60, pp 106-110

The paper proposes a simple approximate method of solution of quasi-stationary problems of convective and conductive heat transfer in the presence of radiation. The method is based on linearization according to a formula given of a nonlinear boundary condition calculated in accordance with the radiation of bodies and on the presentation in the form of a balance formula of the resulting heat transfer equation.

As a concrete example, the problem is solved of combined heat transfer of a semilimited body where the density of the incident radiant flow is constant.

229. Stress and Strain of Thick-Walled Cylinders Calculated by Computers

"Investigation of the Stressed and Strained State of Short Thick-Walled Cylinders Subjected to Axisymmetrical Loading With the Help of Computers in the Case of Arbitrary Axial Loading," by A. L. Kvitka, Kiev Polytechnic Institute; Kiev, Doklady Akademii Nauk Ukrainskoy SSR, No 12, Dec 59, pp 1300-1305

A method is described for solving an axisymmetric problem which allows compiling tables for calculation of short, thick-walled cylinders subjected to arbitrary axial loading.

230. Attraction of Antiprotons

"Influence of Coulomb Attraction on the Cross Section of Absorption of Antiprotons by Nuclei," by P. E. Nemirovskiy and Yu. D. Fivelskiy; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 5, May 60, pp 1486-1488

The influence of Coulomb attraction of the nucleus on the cross section for absorption of antiprotons whose energy is small compared with the Coulomb energy at the nuclear boundary is investigated. Interaction between the antiprotons and nuclei is treated on basis of the optical model. Calculations are presented for C, Cu, and Pb nuclei for nuclear attraction, as well as repulsion potentials. It is shown that due to Coulomb attraction, the cross section for antiproton absorption at energies below the Coulomb energy is 4-10 times greater than the cross section for antineutrons of the same energy.

231. Alpha Decay of U-236

"Investigation of α-Decay of U-236," by A. P. Komar, G. A. Korolyov, and G. Ye. Kocharov, Leningrad Physico-technical Institute, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 5, May 60, pp 1436-1438

An ionization chamber with a grid was employed to investigate the α-spectrum of U^{236}. After introduction of corrections to account for ionization, imperfect grid shielding, and rise time of the pulse, the energy of the fundamental α-particle group was found to be (4.488 ± 0.003) MeV. The energies and intensities of transitions of the 2^+ and 4^+ levels of the daughter nucleus have also been determined.

232. Deuteron Stripping by Protons

"Investigation of the Spectra of Neutrons Emitted in the Disintegration of Deuterons by Protons," by V. V. Komarov and A. M. Popova, Institute of Nuclear Physics, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 5, May 60, pp 1559-1563

The energy spectra of neutrons emitted at angles of 0° and 180° in the c.m.s. from the $p + d \rightarrow p + p' + n$ reaction are calculated for a total energy of the reaction of $\sim$ 4 MeV, pair interaction of nucleons in the final state being taken into account.

Application of this method for calculation of the energy distribution of reaction products when several particles are emitted is considered from the standpoint of its possible application for ascertaining the role of particle interactions in the final states.

233. Strange Particles

"New Strange Particles," by B. Pontecorvo, Joint Institute for Nuclear Research; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 5, May 60, pp 1654-1656

The possibility of existence of a particle D^+ ($T=0$, $S=+2$, $N=0$) (according to M. Gell-Mann, Suppl. Nuovo Cim., 4, 848 (1956) is discussed. Wang Kan-Ch'ang reported at the Conference of Physics of High Energy Particles in Kiev, 1959, (at press) on interaction of π-mesons in a bubble chamber which can be interpreted by assuming the existence of a new particle D at 750 Mev energy and decaying according to

$$D^+ \rightarrow K + \pi \begin{cases} K^\circ + \pi^+ \\ K^+ + \pi^\circ \end{cases}$$

The lifetime of the particle is evaluated to be of the order of 10^{-10} sec, and its detection is discussed theoretically by means of the emitted K particles.

234. Superheavy Hydrogen and Helium

"Superheavy Isotopes of Hydrogen and Helium," by V. I. Gol'danskiy, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 5, May 60, pp 1637-1639

For evaluating the stability of several isotopes (H^5, H^7, He^8) with respect to their neutron emission, data on neutron energy coupling were established and analyzed. The stability condition for He^8 depends on the condition that the decay energy $He^7 \rightarrow He^6 + n$ be below 1.4 Mev, and the condition becomes sufficient if this energy is not over 0.8 Mev. The isotope H^5 is found unstable.

235. New Tellurium Isotope

"A New Isotope Te-115," by I. P. Selinov, N. A. Vartanov, D. Ye. Khulelidze, Yu. A. Bliodze, N. G. Zaytsova, and V. A. Khalkin; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 5, May 60, p 1654

By analyzing the periodic chart of half-lives, it was assumed that the unknown Te-115 isotope decays in 7 minutes, transmuting into the recently discovered Sb-115 (T = 32 min). The Te isotope was observed from the reaction Sn-112 (α, n) Te-115, and its half-life was found to be 6.0 $\pm$ 0.5 minutes.

236. Motion in a Linear Betatron

"Theory of Electron Motion in a Linear Betatron," by Ts. I. Gutsunayev and Ya. P. Terletskiy, Physics Faculty of Moscow State University, Chair of Statistical Physics and Mechanics; Moscow, Zhurnal Tekhnicheskoy Fiziki, Vol 30, No 5, May 60, pp 491-496

The linear betatron, a new type of electron accelerator, was first suggested and analyzed by M. Ya. Konyukov and Ya. P. Terletskiy (ZhETF, 34, 1003 (1958); Nuovo Cimento, 9, 930 (1958). The solution of a particular problem, not yet clarified, concerning the relativistic motion of an electron in an axially symmetric magnetic field, moving nonuniformly along the axis of symmetry, was found. The law of energy increase of the accelerated particle was established. The stability of motion and the radiation of the accelerated electron were analyzed.

237. Computation of Strong Focusing

"A New Method for Computing High-Order Focusing Magnetic Fields" by V. R. Saulit; Leningrad, Vestnik Leningradskovo Universiteta, Seriya Fiziki i Khimii No 1, Vol 15, No 4, 1960, pp 33-40

A magnetic field with mirror symmetry is computed for strong focusing in beta and gamma spectroscopy. The problem is solved in the form of polynomials for an inhomogeneous field depending on one coordinate. The obtained magnetic field has continuous derivatives. The electron or ion beams may be obtained in a desirable form. As an example, a magnetic field giving seventh-order focusing is computed.

238. Computation of Atom Charge

"Computation of Atom Charge in Molecules From X-Ray K-Absorption Spectra," by R. L. Barinskiy and Ye. G. Nadzhakov, Institute of Rare Elements, Academy of Sciences USSR, and Physics Institute of the Bulgarian Academy of Sciences; Moscow Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 24, No 4, Apr 60, pp 407-414

A method previously described by the authors (DAN, 129, 1279 (1959) was applied to the computation of X-ray, of K-absorption spectra in atoms, molecules, and crystals. The effective atom charges were found and tabulated and showed good agreement in cases in which they could be compared with previously obtained results. It is shown that the charge of the central atom in a complex is influenced by the character of its surroundings.

239. Nuclear X-Ray Generator

"A Nuclear Generator of X-Rays for Fluorescent Spectral Analysis," by K. I. Narbutt, R. L. Barinskiy, and I. S. Smirnova, IGEM Academy of Sciences USSR, IMGRY Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk, Seriya Fizicheskikh Nauk, Vol 24, No 4, Apr 60, pp 354-361

Excitation of K X-rays on lead and tin by betas emitted by S-35 (170 keV) and P-32 (1700 keV) were studied. Gamma and X-radiation emitted by a Tu-170 source for fluorescent excitation of K-radiation in elements from Zn-30 to U-92 were tested. It was found that the Tu-170 source decays by beta (968 keV and 88 keV) and gamma (84 keV) emission. Data

characterizing the relation to Z of the excitation efficiency of K-radiation of elements Z = 30 to Z = 92 by X and gamma radiation emitted by Tu-170 were presented in a graph. It showed that the nuclear generator exhibits its highest efficiency for Z = 47 to Z = 64 elements.

240. Instability of Plasma

"Instability of the Inductive Pinch," by I. F. Kvartskhava, K. N. Kervalidze, and Yu. S. Gvaladze; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 5, May 60, pp 1641-1643

As was reported at the Sixth International Conference on Ionization Phenomena in Gases at Upsala, 1959, a new form of instability was observed at pulsed compression of plasma in linear and inductive pinches. The present communication discusses results of further experiments involving photography of a discharge with a SFR-2M high-speed camera, in the process of which exposure time per frame was 0.5 microsec, with a 2-microsec interval between frames. A page of photographs is included.

241. Diffusive Losses of Charged Particles

"Relation Between Oscillations and Velocity of Losses of Charged Particles in a Cylindrical Low Pressure Plasma in a Longitudinal Magnetic Field," by A. A. Zaytsev and M. Ya. Vasil'yeva, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 5, May 60, pp 1639-1640

Plasma oscillations in a positive column and in a constant longitudinal magnetic field were investigated. The magnetic field increased the background noise and introduced oscillations up to 7-10 volts in amplitude. The velocity of diffusive losses of the charged particles increased. These phenomena may be interpreted as a result of a macroscopic shift of the plasma pinch in the magnetic field.

242. Plasma Bremsstrahlung

"Magnetic Bremsstrahlung of a Restricted Plasma," by K. N. Stepanov and V. I. Pakhomov, Physico-technical Institute, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 5, May 60, pp 1564-1568

Magnetic Bremstrahlung of a restricted plasma is examined under the condition that the magnetic pressure p_H is considerably higher than the pressure of the electron gas p_e. The condition $p_H \gg p_e + p_i$ (p_i -- the ion gas pressure) is required for the creation of balanced plasma configurations and for securing their stability (plasma torus stabilized by a strong magnetic field, a stellator, or other means).

243. Capture of a Magnetic Field of Plasma

"Some Properties of Inductive Gas Discharge," by E. D. Andryukhina, S. Ye. Grebenshchikov, M. S. Rabinovich, M. D. Rayzer, A. Ya. Safronov, and I. S. Shpinel, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Tekhnicheskoy Fiziki, Vol 30, No 5, May 60, pp 429-538

Some phenomena affecting plasma dynamics, such as the capture of the magnetic field by the plasma, the skin effect, and shock wave propagation, were studied experimentally by means of high-speed photography. The observed change of current sign of the oscillograph proved the presence of a reversed current which should indicate the "capture" of the magnetic field by the plasma compressed toward the axis or escaping the magnetic mirror. The pressure of the captured magnetic field produced a broadening of the plasma by preventing it from compressing radially. A cylindrical shock wave is formed at discharge in a range of $5 \cdot 10^{-1}$ to 10^{-2}, mm Hg pressure compressed toward the axis of the system. The conducting region expands during the shock wave propagation, and the currents produced may, in the presence of skin effect, compensate the external magnetic field in the chamber.

244. Plasma Stability

"Stability of a Plasma Cylinder in a High Frequency Magnetic Field," by T. F. Volkov; Moscow, Zhurnal Tekhnicheskoy Fiziki, Vol 30, No 5, May 60, pp 497-503

The problem is solved in hydrodynamic approximation showing that a quasistationary high frequency magnetic field of sufficiently high amplitude traveling along the axis may secure the stability of the plasma cylinder with respect to arbitrary small perturbations. A high frequency magnetic field rotating around the azimuth does not create stability.

245. Plasma Oscillations

"Detection of Ion Oscillations in a Plasma," by M. D. Gabovich, L. L. Pasechnik, and V. G. Yazeva; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 5, May 60, pp 1430-1433

Ion oscillations have been detected against the noise background of a discharge plasma (charge concentration $10^{10} cm^{-3}$). The results obtained can be explained by assuming that the probe selectively indicates oscillations with a wave length which is approximately equal to the radius of the ionic layer surrounding the probe.

246. Waves Moving in Plasma

"Build-Up of Electromagnetic Waves in a Plasma Moving in a Nondispersive Medium in the Presence of a Constant Magnetic Field," by G. G. Getmantsev and V. O. Rapoport, Radiophysics Institute, Gor'kiy State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 4, Apr 60, pp 1205-1211

A dispersion equation has been obtained which describes the propagation of plane electromagnetic waves in a plasma beam moving in a fixed plasma along the lines of force of a constant and homongeneous magnetic field. The damping (or build-up) coefficients of the waves as a function of time have been found for a rarefied plasma moving along the magnetic field through a nondispersive dielectric.

247. First Czechoslovak Cyclotron

"New Items -- Czechoslovakia" (unsigned item); Moscow, Atomnaya Energiya, Vol 8, No 4, Apr 60, p 397

The first cyclotron in the country was made ready for use on 19 February 1960. The equipment for the cyclotron was supplied by the USSR. The USSR also rendered aid in assembling and setting up the cyclotron. The cyclotron will be used to conduct research in nuclear physics and to produce artificial radioactive isotopes.

248. Dose Characteristics of Ionization Chambers and of a Large Scintillation Crystal

"Dose Characteristics of Ionization Chambers and a Large Scintillation Crystal," V. I. Kukhtevich, E. S. Matusevich, B. P. Shemtenko, and L. A. Trykov; Minsk, Inzhenerno-Fizicheskiy Zhurnal, No 4, 1960, pp 125-126

Dose characteristics were determined of an ionization chamber, the dimensions of which are comparable with the range in air of secondary electrons formed by primary gamma rays and scintillating primary gamma rays, and of a scintillating organic crystal, for which the absorption of primary radiation is essential. The region of energies of primary gamma radiation from 0.08 Mev to 2 Mev is considered. Results are shown graphically.

249. Radio Frequency Mass Spectrometer

"Line Shape of Mass Spectrum and the Role of a Pulse Ion Source in a Radio Frequency Mass Spectrometer," by Ye. M. Kuchkov, Leningrad Electrotechnical Institute imeni Ul'yanov; Moscow, Zhurnal Tekhnicheskoy Fiziki, Vol 30, No 5, May 60, pp 568-572

The equations of a radio frequency mass spectrometer are reduced to a form convenient for the analysis of its operation. Equations for the mass spectrometer lines in the absence of velocity scattering were derived. The limits of application of radio frequency instruments are outlined, including those operating with a pulse ion source.

250. Preliminary Experiments to Thermonuclear Reactions

"Investigations of Fast Electrons in Powerful Pulsed Discharges," by N. G. Koval'skiy, I. M. Podgornyy, and M. M. Stepanenko, Institute of Nuclear Physics, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 5, May 60, pp 1439-1445

During experiments devoted to attempts at realization of controlled thermonuclear reactions in powerful gas discharges in 1952, hard X-rays were revealed, as well as a neutron emission at powerful pulsed discharges in deuterium. Thus, strong electric fields were created, facilitating the acceleration of charged particles in an axial direction. The formation of an unbalanced group of fast particles in the plasma may also clarify the nature of surges of cosmic radiation.

In the present work, which describes results of investigations of fast electrons in a powerful pulsed discharge, the existence of two groups of unbalanced electrons was assumed by analyzing the relation of the electron spectrum to the strength of the external magnetic field and the initial pressure. The first group of fast electrons at energies up to 100 kev is probably accelerated in electric fields appearing during redistribution of the current during the pinching process of the plasma. The second group of fast electrons probably is accelerated up to 300 kev in local electric fields formed during the instability state of the "overloaded" plasma pinch. Assuming that the mechanism of successive particle acceleration is due to several "overloads," a discrete structure of the fast electron spectrum should be expected, but cannot be observed.

251. Research on Neutron Physics Planned in Bulgaria

"New Items -- Bulgaria" (unsigned item); Moscow, Atomnaya Energiya, Vol 8, No 4, Apr 60, p 397.

The Academy of Sciences is creating a research center which will have a nuclear reactor of the IRT type. This reactor will be constructed with the aid of the Soviet Union. It will be used to conduct research on neutron physics.

252. Elasticity of Quartz Filaments

"Variations of the Elasticity Modulus of Quartz Filaments in Response to Gammas From Cobalt -60," by S. V. Starodubtsov, L. P. Khiznichenko, and I. A. Domoryad, Institute of Nuclear Physics, Academy of Sciences Uzbek SSR; Moscow, Doklady Akademii Nauk SSSR, Vol 132, No 5, Jun 60, pp 803-805

The effect of Co-60 gammas on the elasticity modulus of fused quartz filaments was studied by special measuring equipment using torsional oscillations. It was found that the elasticity modulus of fused quartz increases by 0.16 ± 0.02%. It may be tentatively explained by the appearance of ordered regions in the structure of fused quartz because the elasticity modulus of crystalline quartz is higher than that of the fused.

253. "Spot Fields" of Cathodes

"Electron Optical Observations of 'Spot Fields' on Emitting Surfaces," by G. V. Spivak, I. A. Pryamkova, and V. N. Lepeshinskaya, Moscow State University imeni Lomonosov; Moscow, Doklady Akademii Nauk SSSR, Vol 130, No 4, Feb 60, pp 751-754

A direct observation of spot fields in an electron mirror was carried out for establishing the shape and distribution of spots and their relation to the crystalline structure and temperature of the emitter. The parallel behavior of delay curves and the spot picture with respect to temperature, as well as the similarity of this picture with the optically detected structure of the lining, proved that the spots should be interpreted as a "deficiency" of electrons.

254. Electron Exchange in Metals

"Exchange Interaction of Inner and Outer Electrons in Transition Metals," by S. V. Vonsovskiy, A. A. Berdyshev, Yu. A. Izyumov, B. V. Karpenko, and Yu. Ya. Polyak, Institute of Physics of Metals, Academy of Sciences USSR, and Ural State University imeni Gor'kiy; Moscow, Doklady Akademii Nauk SSSR, Vol 132, No 4, Jun 60, pp 797-800

For studying the properties of an electron system in transition metals, the method of lagging and leading statistical Green functions, developed by N. N. Bogolyubov and S. V. Tyablikov (DAN, 126, 53 (1959)),

was applied. The resulting computation facilitated a general conclusion showing that the interaction between inner and outer electrons of transition metals leads to the appearance of an effective exchange bond between the inner electrons, exhibiting a ferromagnetic nature.

255. Neutron Irradiated Silicon Iron

"The Effect of Neutron Bombardment on the Magnetization Curve of Silicon Iron Single Crystals," by V. V. Klyushin, Institute of Physics of Metals, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 132, No 1, 1960, pp 102-103

An investigation of the effect of neutron irradiation of single crystal silicon iron was carried out to clarify the behavior of shifting processes of boundaries of ferromagnetic regions and the rotation of their magnetization. The tentative data obtained indicate a possibility that at high temperatures the observed changes of magnetic properties are bound to the appearance of "shift zones." It is expected that further research may provide knowledge on the mechanism of dislocation in the crystal lattice provoked by irradiation by heavy particles.

256. Exciton Absorption in Cu_2O

"Optical Anisotropy of Cubic Crystals Produced by Dispersion in Space. Quadrupole Excitonic Absorption of Light in Cuprous Oxide," by Ye. F. Gross and A. A. Kaplyanskiy, Physicotechnical Institute, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk USSR, Vol 132, No 1, May 60, pp 98-101

On the long-wave edge of the Cu_2O absorption spectrum, two hydrogen-like absorption series were observed. The line 6125 Å was particularly investigated because of its deviation from the series position, tentatively ascribed to the small radius of its exciton excitation for n=1. Experiments revealed a quadrupole transition in this excitonic line, requiring additional explanations. The quadrupolarity of the line concurs well with R. S. Elliot's conclusions (Phys. Rev., 108, 1384 (1957), but the hydrogen model he uses does not satisfy the small exciton radius for n=1. However, the model by A. G. Zhilich (Vestn. LGU, No 4 (1957) provides an excitation value in accordance with experimental data.

257. Study of n-InSb

Galvanomagnetic Phenomena in n-InSb in Magnetic Pulse Fields," by Kh. Amirkhanov, R. I. Bashirov, and Yu. E. Zakiev, Dagestan Affiliate, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 132, No 4, Jun 60, pp 793-796

Conclusions of the quantum theory concerning galvanomagnetic phenomena in n-InSb were tested experimentally on five samples by measuring the effects of magnetic fields and temperature. Discrepancies found between theory and experimental data were explained by the existence of two different scattering mechanisms, lattice and ion diffusion, while the theory considers only one mechanism.

258. Photoelectromotive Force of CdSe-Se

"Problem of the Photoelectromotive Force on the CdSe-Se Junction," by K. K. Valatska and P. P. Brazdzhyunas, Institute of Physics and Mathematics, Academy of Sciences Lithuanian SSR; Vil'nyus, Trudy Akademii Nauk Litovskoy SSR, Seriya B, 4 (20), 1959, pp 45-54

Results are presented of investigations concerning the conditions of production and spectral distribution of photo emf in systems Al-CdSe-Se-Au, Au-CdSe-Se-Au, Al-CdSe-Au, Au-CdSe-Al, Al-Se-Au, and Al-Se-Al under illumination by visible light. The spot of the appearance of photo emf in systems Al-CdSe-Se-Au and Au-CdSe-Se-Au was established. The role of contact of Se and CdSe with the metallic electrodes was clarified. The connection of the spectral distribution of the photo emf of the systems Al-CdSe-Se-Au, Al-CdSe-Au, and Al-Se-Au with the band of intrinsic light absorption in Se and CdSe was established. The zone scheme clarifying the formation of a photo emf in the system Al-CdSe-Se-Au at illumination is presented.

259. Photoconductivity of Sb_2Se_3

"Temperature Dependence of Optical Properties of Layers of Sb_2Se_3," by A. Yu. Shileyka and P. P. Brazdzhyunas, Institute of Physics and Mathematics, Academy of Sciences Lithuanian SSR; Vil'nyus Trudy Akademii Nauk Litovskoy SSR, Seriya B, No 4, (20), 1959, pp 31-43

The results of studies of optical properties of layers of Sb_2Se_3 in the spectral range of 400-1200 mmc in a temperature range from +140 to +240°C are reported. The width of the forbidden zone is determined from

the position of the long-wave absorption band edge, which equals, for finely dispersed layers, 1.5 ev, and for polycrystalline 1.25 ev at 290°K; the temperature coefficient of variation is, respectively, $-5.7 \cdot 10^{-4}$ and $-3.1 \cdot 10^{-4}$ ev/degree. Computed from the value of temperature shift of interference extrema, the temperature coefficient of the refraction index of finely dispersed layers equals: $\Delta n / \Delta T = 6.3 \cdot 10^{-4}$ degree^{-1} at λ = 1000 mmc, where n = 3.8. The data indicate that in the investigated temperature range from -140 to +160°C, $\lambda \sim n^4$ for the absorption band edge of finely dispersed layers. The difference between the "surface" and the "volume" refraction indexes was established. The reasons for the temperature shift of the absorption band edge longwise at rising temperature was ascribed to narrowing of the width of the forbidden zone.

Spectroscopy and Optics

260. Luminescence Quenching

"Theory of Luminescence Quenching in Liquid Solutions," by Yu. A. Kurskiy and A. S. Selivanenko; Leningrad, Optika i Spektroskopiya, Vol 8, No 5, May 60, pp 643-650

Equations are derived, expressing the quenching of luminescence of solutions. Extinction laws with allowance for Brownian movement of molecules and resonance extinction are derived.

261. Depolarization of Phosphorescence

"Concentration of Depolarization of Phosphorescence of Organoluminophors," by P. I. Kudryashov and B. Ya. Sveshnikov; Leningrad, Optika i Spektroskopiya, Vol 8, No 5, May 60, pp 651-656

Concentrated depolarization of total glowing and phosphorescence of boron-glycerin luminophors, activated by fluorescein at 20 to -186°C, was investigated. It was shown that, first, the depolarization degree of a narrow spectral section of phosphorescence does not vary during extinction of after-glow; second, at room temperature, the concentration-depolarization of the total glowing is less than the concentration depolarization of phosphorescence; and, third, at low temperature, the concentration depolarization of the phosphorescence is less than the concentration depolarization of fluorescence.

It was concluded that the transfer of excitation energy from a metastable molecule to a molecule in normal state is impossible at the distances at which concentration depolarization of fluorescence is observed. Experimental results at low temperatures are contradictory to modern concepts on the mechanism of transition of a molecule into a phosphorescent state and the mechanism of concentration depolarization of fluorescence, while experimental results at room temperature are in agreement with these concepts.

262. Luminescence of Hydrocarbons

"Peculiarities of the Luminescence of Ortho-disubstituted Aromatic Hydrocarbons. III. Fluorescence and Absorption Spectra of Some Carboxylic Acids," by Yu. V. Naboykin, B. A. Zadorozhnyy, and Ye. N. Pavlova; Leningrad, Optika i Spektroskopiya, Vol 8, No 5, May 60, pp 657-662

The effect of ionization, intermolecular hydrogen bonds, and the formation of dimers on the electronic absorption spectra and fluorescence of some substituted carboxylic acids was studied. Differences in luminescence of 2.3- and 1.4-derivatives of naphthalene were noticed. It was shown that the variability of fluorescent bands is connected to structural peculiarities of the studied substances.

263. Thermal Luminescence of Phosphors

"Thermal Luminescence and Localized Levels of ZnS-Mn Phosphors," by V. L. Levshin and V. F. Tunitskaya; Leningrad, Optika i Spektroskopiya, Vol 8, No 5, May 60, pp 663-671

The structure, the filling, and the thermal emptying of trapping levels of the cubic modification of ZnS-Mn phosphors were studied. The variation of the level spectrum at increasing manganese concentration and the relation of filling of the levels to the wave length of the exciting light were investigated.

264. Luminescence of CsI Crystals

"Luminescence of Nonactivated CsI Crystals," by Z. L. Morgenshtern; Leningrad, Optika i Spektroskopiya, Vol 8, No 5, May 60, pp 672-678

Luminescence of nonactivated and activated CsI crystals excited by gamma radiation was studied at room temperature and at the temperature of boiling liquid nitrogen. It was shown that in the luminescence spectra three types of emission are observed: ultraviolet, blue, and long-wave (activating), pertaining to various glowing centers. The spectral characteristics of the luminescence of these crystals in all indicated bands and, in particular, the dependence of luminescence yield on temperature were studied. The problem of the origin of various bands in the luminescence spectra of the studied crystals is analyzed.

265. Determination of Relaxation Time

"Development of the Method for Determination of the Relaxation Time With the Use of a Spectrophone. II. Elimination of Phase Shift by the Instrument," by P. V. Slobodskaya and Ye. S. Gasilevich; Leningrad, Optika i Spektroskopiya, Vol 8, No 5, May 60, pp 678-685

The sources of systematic errors occurring in the determination of relaxation time with a spectrophone are investigated. Various methods of their elimination permitting the obtaining of absolute values of relaxation time are described.

266. Scattering of Light

"Comparison of the Functions of Light Scattering by Spherical Particles," by Yu. V. Maltsev; Leningrad, Optika i Spektroskopiya, Vol 8, No 5, May 60, pp 686-691

The accuracy and limits of applications of various generalized parameters are analyzed for a kind of graphic representation of the scattering function in which the positions of the corresponding basic extrema of various functions coincide. A new generalized parameter is suggested, the application of which for the computation of the position of the extrema in the case of the usual construction of the function does not require any knowledge of these functions. The functions of scattering, constructed in relation to the new parameter, have an aspect convenient for comparison.

267. Light Guides

"Passage of Light Through Light Guides," by A. R. Daytch, Yu. A. Tsirlin, and L. E. Pargamanik; Leningrad, Optika i Spektroskopiya, Vol 8, No 5, May 60, pp 713-721

The passing of light through cylindrical light guides with mirror walls is analyzed in geometric optics approximation. Transparency coefficients for light guides with total reflection and with a reflecting cover were computed. Light absorption in the raw material of the light guide was taken under consideration. The relation of the transparency coefficient to the dimensions of the light guide and the reflecting conditions was clarified. Light guides of various types were compared.

268. Samples for Infrared Spectrometry

"Pressed Samples for Infrared Spectrometry," by V. S. Akselrod; Leningrad, Optika i Spektroskopiya, Vol 8, No 5, May 60, pp 721-722

A method was devised for obtaining high quality pressed samples for infrared spectrometry with a minimum absorption coefficient and minimum scattering of the infrared beam. A vacuum press-form for compressing powders into pellets, which improve the conditions for spectrometry in infrared, is described.

269. Gas Behind a Shock Wave

"Spectral Investigation of the State of a Gas Behind a Shock Wave. II.," by F. S. Fayzullov, N. N. Sobolev, and Ye. M. Kudryavtsev; Leningrad, Optika i Spektroskopiya, Vol 8, No 5, May 60, pp 585-593

A photoelectric method for measuring the gas temperature behind a shock wave was devised. The method is based on measurements of intensities of emission and absorption of spectral lines. The accuracy of the method is discussed. The velocity of the shock wave was measured by ionization and schlieren methods.

270. K-Spectrum in Ni-Al Alloys

"Investigation of the Basic K Absorption Edge of Nickel in Alloys of the Ni-Al Type," by S. A. Nemnogov and M. F. Sorokina, Institute of Physics of Metals, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 24, No 4, Apr 60, pp 455-460

The work is a part of series of investigations concerning X-ray analysis of alloys of first transition period metals with Al, Si, and some other elements for the purpose of revealing the electron interaction in them in relation to the defect in the 3d-shell of the transition element and the vacancies of the second element. The comparison of results obtained for the K-edge of Ni absorption in Ni-Al alloys with results of the K-edge of the transition metal in systems Fe-Al, Fe-Si, and Cr-Si showed in all cases that with an increasing amount of the second element, a similar variation of structure of the K-edge occurs, pointing to some common atom interaction of the transition metal with Al or Si atoms of these systems.

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