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**SCIENTIFIC INFORMATION
REPORT**

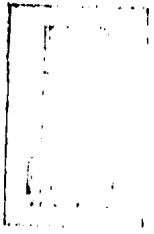
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CENTRAL INTELLIGENCE AGENCY

SCIENTIFIC INFORMATION REPORT



13 December 1959

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PLEASE NOTE

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

SCIENTIFIC INFORMATION REPORT

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I. CHEMISTRY

Analytical Chemistry

1. Papers Presented at Meetings of the Analytical Section of the Eighth Mendeleev Congress

"The Section of Analytical Chemistry at the Eighth Mendeleev Congress of General and Applied Chemistry," by G. N. Bilimovich; Moscow, Zhurnal Analiticheskoy Khimii, Vol 14, No 4, Jul/Aug 59,

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"In the work of the Section of Analytical Chemistry, Eighth Mendeleev Congress of General and Applied Chemistry, held on 16-23 March 1959, about 300 persons participated who came from a number of scientific research institutes, higher educational institutions, and industrial enterprises of the USSR. Scientists from China, Bulgaria, Czechoslovakia, Poland, Hungary, and Italy also participated. Approximately 70 reports were given.

"In the introductory address given by him, I. P. Alimarin reviewed progress in analytical chemistry and discussed present-day problems in this field.

"There was a significant number of reports in the following principal subdivisions of analytical chemistry: physical and physico-chemical methods of analysis, applications of new organic reagents, elemental organic micro-analysis, chromatographic analysis, and the application of tracer atoms in analytical chemistry.

"I. V. Tananayev reported on the application of physico-chemical analysis to heterogenous systems for the solution of a number of problems in analytical chemistry.

"A report on present-day trends in the application of organic reagents was given by V. I. Kuznetsov. Kuznetsov, in addition to outlining advances in this particular field, pointed out a number of shortcomings in work being done on the development and synthesis of reagents that are needed. With the example of halide and thiocyanate complexes, A. K. Babko showed that there is a correlation between the stability of complexes and the position of the central atoms of these complexes in the periodic system.

"The dependence of the stability of oxime derivatives of Cu, Co, and Ni on the structure of the oxime molecule was discussed by V. M. Peshkova and V. M. Bochkova. V. F. Toropova reported on the dual type of reactions which some compounds undergo when complexes are formed by them. Communications were made by Z. F. Shakhova and collaborators and by A. I. Kokorin and N. A. Polotebnova on some aspects of the application of heteropoly-acids in analytical chemistry.

"A great number of reports dealt with the application of new organic reagents in analysis. To give a few examples, dialkylthiosphoric and diarylthiophosphoric acids were used for the separation of a number of elements (A. I. Busev and M. I. Ivanyutin) and also arylarsonic and arylphosphinic acids (A. I. Portnov). R. N. Lastovskiy and collaborators reported on some properties of new sequestering agents ("complexons"). Reports by V. A. Nazarenko, G. G. Shitareva, and A. I. Kononenko concerning the photometric determination of a number of elements by methods involving the application of fluorone derivatives received a lot of attention. A. I. Cherkesov reported on the use made of halochromism phenomena in analytical chemistry.

"Definite interest was aroused by a report on the determination of tantalum by a differential spectrophotometry method (B. M. Dobkina and T. M. Malyutina). A report by Yu. V. Morachevskiy and I. A. Stolyarova on new highly sensitive methods of analysis with the use of a microscope employing ultraviolet light is worth noting.

"Several reports dealt with methods and theoretical problems in the field of spectral analysis (N. F. Zakhariya and G. A. Sheynin, E. Ye. Vaynshteyn and co-workers).

"Considerable progress was made in improving the methods of flame photometry (N. S. Poluektov and M. N. Nikonova).

"Several reports dealt with the determination of elements by polarographic methods (S. I. Sinyakova, Z. B. Rozhdestvenskaya and I. A. Yarovoy, Ya. V. Gokhshteyn). New data on the application of solid electrodes in polarography were reported by I. D. Panchenko, Yu. S. Lyalikov, and their co-workers. Kemula (Poland) gave a very interesting report on the polarographic determination of traces of metals by the suspended drop method. J. Semerano (Italy) described the application of polarography and spectrophotometry for clarification of the nature of Me-C bonds in organometallic compounds.

"E. Minczewski (Poland) discussed titration in nonaqueous solvents.

"A communication by N. I. Udal'tsova and P. N. Paley dealt with applications of the method of amperometric titration with two electrodes in the chemistry of uranium and thorium.

"Considerable attention was paid to investigations in the field of chromatography.

"M. M. Senyavin reported results demonstrating that it is possible to foretell conditions under which chromatographic separations of elements can be carried out by taking into consideration the position of these elements in the periodic system. P. A. Velyavskaya told about the application of ion-exchange methods in the investigation of the state in which substances are present in solutions.

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"Interesting reports were given on the chromatographic separation of a number of elements (A. S. Vernidub and V. I. Petrashen'), on problems involved in the control of properties of ion-exchange resins (N. G. Polyanskiy), on the chromatographic determination of sulfanilamides in body liquids (F. M. Shemyakin and others), and on the application of high-molecular polymers in chromatographic analysis (G. L. Starobinets and co-workers). Gas chromatography was discussed in two reports (one by A. A. Zhukhovitskiy and N. M. Turkel'taub and another by G. Sax of Hungary).

"Several papers discussed the application of radioactive isotopes in the chromatographic investigation of processes of complex-formation (E. I. Ryabchikov and coworkers), in the investigation of the mechanism of coprecipitation of ions of rare metals with sulfides (N. A. Rudnev), and in the determination of rare elements by the method of isotope dilution (I. P. Alimarin, G. N. Bilimovich).

"Among reports on elemental organic microanalysis, one may mention one by M. A. Korshun and N. E. Gel'man and one by V. A. Klimova et al. dealing with the development of rapid micromethods by which several elements can be determined simultaneously in the same sample of organic compounds containing boron, fluorine, and silicon.

"Among reports presented by foreign scientists, a communication by the Chinese professor Liu Ta-kang on the status of work on rare elements in the People's Republic of China was of particular interest. Liu Ta-kang presented a valuable collection of rare earths to the Soviet Union.

"The work of the section proceeded in a lively manner. Valuable suggestions and recommendations were made at meetings of the section."

2. Synthesis of New Organic Reagents for the Determination of Uranium, Thorium, and Rare-Earth Elements

"The Synthesis of 3,3'-Dinitrobenzidine and of the Analytical Reagents Arsenazo II, Thoron II, and Phenazo," by V. I. Kuznetsov and S. B. Savvin; Leningrad, Zhurnal Prikladnoy Khimii, Vol 32, No 10, Oct 59, pp 2329-2332

Biphenyl- 4,4' - diarsonic acid - 3,3' - bis [(-azo-2) - 1,6 - dihydroxynaphthalene - 3,6 - disulfonic acid] (arsenazo II) and biphenyl - 4,4' - diarsonic acid - 3,3' - bis [(azo - 1) - 2 - hydroxynaphthalene - 3,6 - disulfonic acid] (thoron II) were found to be good analytical reagents for uranium, thorium, rare-earth elements, and some other elements. 3,3' - Dinitrobiphenyl - 4,4' - bis [(azo - 4) phenol] (phenazo) was found to be a promising reagent for magnesium. 3,3' - Dinitrobenzidine is required for the synthesis of the three compounds mentioned and also for some others, e. g., diaminobenzidine, which is a good reagent for selenium.

To synthesize the three reagents mentioned in the title, 3,3' - dinitrobenzidine is first diazotized and arsonic acid groups are introduced into it in the 4 and 4' positions (Barth reaction). The nitro-groups are reduced to amino-groups, and bis-diazotation is carried out. The bis-diazotized 3,3' - diaminobiphenyl - 4,4' - diarsonic acid is coupled with chromotropic acid to prepare arsenazo II and with R-salt to prepare thoron II. Phenazo is synthesized by coupling bis-diazotized 3,3' - dinitrobenzidine with phenol.

In the work reported in the article, procedures for the synthesis of 3,3' - dinitrobenzidine have been improved. The syntheses of arsenazo II and thoron II are described for the first time.

3. V. I. Kuznetsov's Work on Solvent Extraction and the Development of Organic Reagents for Metals

"V. I. Kuznetsov (On the Occasion of His 50th Birthday)" (unsigned article); Moscow, Zhurnal Analiticheskoy Khimii, Vol 14, No 4, Jul/Aug 59, pp 509-510

Prof V. I. Kuznetsov, Doctor of Chemical Sciences, is one of the most prominent USSR analytical chemists. He is a specialist in the field of the application of organic reagents and author of more than 200 scientific publications.

Kuznetsov is a graduate of Tomsk State University. After graduating, he was active at the All-Union Institute of Mineral Raw Materials and at other scientific institutions. At present, he is Head of the Laboratory of Organic Reagents, Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, Academy of Sciences USSR.

Kuznetsov concentrated on the development and investigation of organic reagents for different applications in analytical chemistry. This includes reagents for color reactions and for extraction and coprecipitation. On the basis of work done by Kuznetsov, scores of analytical methods that are being applied in practice were developed in the USSR and abroad. Among the reagents developed by him, one may mention thoron, arsenazo (uranon), and their analogs -- anthrazo, phenazo, phensulfazo, "antrakhaz," stilbazo, etc. Kuznetsov has done outstanding work with regard to the formulation of theoretical relationships pertaining to the solvent extraction of elements. He was the first to introduce new concepts pertaining to different mechanisms of extraction and to propose a classification of a great number of extraction processes.

The review on the subject of extraction published by him enjoys a deserved popularity among those specializing in this field. Kuznetzov is doing extensive work on the development of new practically applicable methods for the extraction of elements. He proposed a number of low-melting solid extraction agents that are suitable for the extraction of elements in an extensive range of acidities.

Kuznetzov developed a new and very efficient method for the coprecipitation of ultrasmall quantities of more than 30 elements with the application of organic coprecipitants. Under Kuznetzov's direction, a new method of spectrophotometric analysis, i.e., thermospectrophotometry, is being developed. This method is of importance for the continuous automatic control of production processes.

Kuznetzov has done original work on organic synthesis with the utilization of chelates. The methods developed in this work make it possible to increase considerably the reactivity of the substances used and to accomplish syntheses which hitherto could not be carried out at all or could be carried out only with great difficulty as far as experimental execution was concerned.

Kuznetzov has formulated a theory which postulates similarity between the action of organic and inorganic reagents. On the basis of this theory, one may predict the characteristics of new reagents. Furthermore, Kuznetzov has worked on the coloration of reagents and of the complexes formed by them and has conducted investigations on characteristic atomic groupings, as well as the effect which the structure of inorganic reagents exerts on the strength of the coordination compounds formed by them. He proposed a new objective method for the evaluation of the relative strength of complexes.

At present, Kuznetzov is engaged in extensive work on the popularization of new scientific ideas and of methods of analytical chemistry with the purpose of the most rapid introduction of these methods into industrial application.

Fuels and Propellants

4. New Technique for the Investigation of the Rate of Combustion of Dispersed Liquid Fuel Under Conditions of Turbulent Flow

"Investigation of the Rate of Burning of Atomized Fuels in Turbulent Flow," by V. Ya. Basevich, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Zhurnal Fizicheskoy Khimii, Vol 33, No 5, May 59, pp 1080-1086

The diffusion constant k of the rate of combustion of droplets under conditions involving combustion of dispersed liquid fuel in turbulent flow has been determined by the following method. Using an arrangement described

earlier (cf. V. Ya. Basevich, Izvestiya Akademii Nauk SSSR -- Otdeleniye Tekhnicheskikh Nauk, No 2, Feb 58, p 26), a slanting **two-dimensional** flame in which dispersed fuel burned was stabilized by means of one of two hydrogen burners. The dispersion of fuel droplets according to size was determined on the basis of traces left on rods coated with a layer of carbon black and magnesium oxide. This determination was made at the entrance section of the combustion chamber. The currents in the zone of combustion were photographed directly. Photoresolution of the flame by means of a narrow slit made it possible to select a single trajectory for every measurement. The velocity of the flight of droplets along these trajectories was determined photographically. Local composition of the mixture ahead of the flame front at the entrance part of these trajectories was determined by measuring the quantity of deposited fuel in traps cooled with liquid nitrogen (a known quantity of the fuel-air mixture was removed by suction). The composition of the combustion products was determined in definite cross-sections located at a known distance from the entrance into the combustion chamber.

In determinations of the combustion time, the flame was stabilized by using both hydrogen burners, so that a two-dimensional flame was formed which was axially symmetric. The velocity of the gas in the flame was determined by photography of tracks made by luminescent particles formed by magnesium that was introduced for this purpose. Photographic resolution of the tracks was accomplished by employing a slit located on the flow axis. The length of the combustion zone was determined on the basis of the composition of the gases resulting from combustion or by photographing the zone of luminescence. Paraffinic kerosene with a specific weight of 0.82 gram per cubic centimeter was used. This kerosene boiled within the range of 140-300°C. To compare the time of combustion of dispersed liquid fuel with that of a homogeneous mixture, measurements were carried out on illuminating gas containing up to 75% of methane. The temperature of the flame was measured by the method of sodium D lines inversion.

In determining the constant k , the relationship

$$D_0^2 - D^2 = k \tau \quad (1)$$

was assumed to be valid, in which D_0 designates the initial diameter of the drop and D the diameter at the time of measurement. Mass transfer between trajectories was disregarded. On the basis of the size distribution of droplets, which gives direct information on the number of droplets in i groups of droplets with a definite initial diameter, dimensionless curves of the burning-out η , or completeness of combustion, were plotted for different values of the product $k \tau$. The actual values of η were determined on the basis of the relationship

$$\eta = \frac{[\text{CO}_2 + \text{CO}]}{[\text{CO}_2 + \text{CO}]_{\text{max}}}$$

where $[\text{CO}_2 + \text{CO}]$ is the total content of carbon dioxide and carbon monoxide determined by gas analysis and $[\text{CO}_2 + \text{CO}]_{\text{max}}$ the local maximum content of these gases calculated stoichiometrically. From the actual and calculated values of η , the product $k\tau$ was determined graphically. Finally, from the known length of the trajectory and the velocity of the flight of droplets, the time of combustion τ and the value of the constant $k = (k\tau) / \tau$ were obtained.

The results of the experiments did not enable one to draw conclusions in regard to the validity of the relationship (1). The value of the constant k determined in the experiments described was 1.5-2 times lower than the values obtained for single droplets under rather special conditions (k was found to be 0.0059 centimeter square per second in the work described). The results of the experiments conducted under conditions in which partial preliminary evaporation of the fuel took place confirmed that the zone of combustion of droplets is turbulent. The theoretical ratio between the rate of burning-up of drops and the rate of burning of the vapor phase of the fuel was checked in cases when the vapor phase forms a noncombustible mixture; the agreement between theoretical values and experimental results indicated that turbulent combustion takes place in the zone of the burning of droplets. The minimum critical diameter of droplets was established which under conditions of turbulent flow limit the diffusion region of combustion.

5. New Method for the Calculation of the Chain-Thermal Propagation of Flames

"The Chain-Thermal Propagation of Flames," by L. A. Lovachev, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR-Otdeleniye Khimicheskikh Nauk, No 10, Oct 59, pp 1750

A chain-thermal propagation of a thermal flame is defined as one in connection with which the reaction in the flame proceeds by a chain mechanism while there is an uninterrupted supply of heat and active centers from regions where high temperatures and a high concentration of active centers prevail. The velocity of the chemical conversion is determined essentially by diffusion of active centers from regions of the flame where the concentration of these centers is high rather than by the velocity of their generation in the fresh mixture. A system of equations for the chain-thermal propagation was integrated numerically by D. B. Spalding, Transactions of the Royal Society (London), Philosophical, Series A, Vol 249, N 957, 1, 1956, who applied for determination of the velocity of the flame the solution of a system of two equations, a method that is commonly used in thermodynamic theory and the use of which is well-founded as far as the solution of one equation is concerned. By applying the method mentioned, numerical results were obtained for the flame of hydrazine decomposition. However, the question in regard to the consistency of the simultaneous solution of two equations at the same value of the parameter had not been clarified.

In the present work, a new principle is proposed for the determination of the velocity of a flame on the basis of the highest probable velocity of heat evolution. Approximate formulas have been derived for the calculation of the flame velocity in chain-thermal propagation under consideration of the diffusion of active centers. The values obtained in the present work, for all practical purposes, coincide with the results of a numerical integration of the initial system of equations. Numerical calculations employing the formulas derived were carried out with regard to the propagation of the flame of hydrazine decomposition.

6. BR-1 Installations for the Production of Oxygen

"Results of Two Years of Experience in the Operation of BR-1 Installations and Prospects of the Production of Technical Oxygen," by Prof I. P. Usyukin, Doctor of Technical Sciences, Moscow Institute of Chemical Machine Building; Moscow, Kholodil'naya Tekhniki, Vol 36, No 4, Jul/Aug

59, p 63

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"Construction of installations for the production of technical oxygen was initiated in the USSR in 1935. Up to now, several types of installations have been released which produce from 300 cubic meters to 1,500 cubic meters of 99% oxygen per hour. The BR-1 installation, which has the highest capacity of those in operation, consists totally of new, highly efficient constructional parts, which assure complete and uninterrupted removal of carbon dioxide by using the heat that is inherently available in the system. The installation is reliably protected from the possibility that acetylene may enter into the separation equipment, so that safe operation is assured. Because of these characteristics, oxygen can be produced at a minimum cost. The problem of introducing oxygen blowing into metallurgical processes can be solved in an efficient and radical manner only by constructing powerful oxygen units which produce 12,000-30,000 cubic meters of oxygen per hour. For large metallurgical plants, central oxygen-producing units with an output of 50,000 cubic meters of oxygen per hour are necessary."

[SIR Note: This is an abstract of a paper presented at the All-Union Scientific Technical Conference on Refrigeration Engineering, Leningrad, 6-9 April 1959.]

7. Automation of Equipment for the Production of Oxygen

"Status of and Trends in Work on the Automation of Oxygen Machines," by A. I. Moroz, Candidate of Technical Sciences, and Engr B. V. Denisshchuk, All-Union Scientific Research Institute of Oxygen Machine Building; Moscow, Kholodil'naya Tekhnika, Vol 76, No 4, Jul/Aug 59, p 64

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"Work on the automation of the operation of air separation equipment has been initiated by the All-Union Scientific Research Institute of Oxygen Machine Building in 1950. As an object for the study and development of an automatic control system to be applied in this process, the largest Soviet installation of this type, namely, the BR-1 oxygen installation, was selected. A technological automation system has been developed which involves installation in the separation section of 3 temperature controllers, 2 level controllers, 2 controllers of the concentration, and one controller of the ratio of gas flow. The sensing units and the control appliances for this purpose are being produced by the industry on a continuous [series production] basis. Control units with electric connections have been designed and produced. The equipment in question was assembled at an experimental installation run by the All-Union Scientific Research Institute of Oxygen Machine Building. The tests conducted showed that all automatic controllers work in a satisfactory manner. On the basis of decisions, automatic control is being introduced into practical application in the oxygen industry. The decisions in question must be considered when low-pressure installations are being designed."

SIR Note: This is an abstract of a paper presented at the All-Union Scientific-Technical Conference on Refrigeration Engineering, Leningrad, 6-9 April 1959.]

8. Gasification of Mazut in the USSR

"For the Gasification of Mazut," TASS dispatch; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Vol 4, No 126 (581), 25 Oct 59, p 3

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"At the Chirchik Electrochemical Combine, a special installation has been erected for the gasification of mazut to produce technical gas that will be employed in the production of nitrogen fertilizers. Experiments conducted demonstrated that mazut and other wastes of the petroleum industry will soon replace expensive coke and coal, which, at present, are used to produce gas for the manufacture of ammonia. The gas derived from mazut will have superior characteristics. It contains up to 93% of carbon monoxide and hydrogen, i.e., 20% more of these constituents than gas derived from coke or coal. A plant department for the production of gas from mazut will have considerably smaller dimensions than gas generator installations [for the gasification of coke or coal]."

Industrial Chemistry

9. Low-Temperature Vulcanization of Organosilicon Elastomers

"Low-Temperature Vulcanization of Rubber," by Prof. A. Berlin;
Moscow, Promyshlenno-Ekonomicheskaya Gazeta, No 87 (542),
26 Jul 59, p 4

Organosilicon elastomers retain their elasticity within an extensive range of temperatures, i.e., from minus 100° to plus 300°. The demand for products of this type increases constantly.

However, vulcanization of organosilicon elastomers is rather difficult. It is carried out in two stages. The elastomers are, first, vulcanized in pressure molds at a temperature of 150° and then aged at more elevated temperatures which are held at a constant level.

Workers at Moscow scientific research institutes have developed a new method which makes it possible to transform unvulcanized silicone elastomers into mechanically strong and thermally stable products. By using the method which has been developed, silicone elastomers can be vulcanized at room temperature. By varying the quality of catalyst which has been introduced into the crude elastomer mixtures containing fillers, one can control the velocity of the process, i.e., complete the vulcanization during the period of time required by production conditions. This time may amount to several minutes or several hours. Organosilicon elastomers produced by the method of cold vulcanization have the same thermal stability as elastomers produced by vulcanization at elevated temperatures. However, their mechanical strength is greater by 50%.

This method of vulcanization brings about radical changes in the technology of the production of silicone elastomer products. By conducting the vulcanization in an appropriate manner, one may manufacture directly finished machine parts, e.g., fittings, pipes, diaphragms, and gaskets. The technology of impregnating fabrics with silicone elastomers is considerably simplified.

The new and highly efficient method of cold vulcanization has been subjected to extensive tests. The present task consists in rapid introduction of the new method into industrial application. To achieve this, one must, first of all, organize the production of catalysts. The production of catalysts can be organized most expeditiously at one of the enterprises of the Moscow Oblast' Sovnarkhoz.

The new method should be introduced rapidly into the industrial application for the production of thermally stable organosilicon foam elastomers.

Nuclear Fuels and Reactor Construction Materials

10. Uranium Molybdate Minerals

"On Molybdates of Uranium -- Moluranite and Iriginite," by G. Yu. Epshteyn; Leningrad, Zapiski Vsesoyuznogo Mineralogicheskogo Obshchestva, Vol 88, No 5, Sep/Oct 59, pp 564-570

The properties of the uranium molybdate minerals moluranite and iriginite, which were discovered by the author of the article and Ye. A. Osmolovskaya in 1951, are described.

11. USSR Review of Methods for the Production of Heavy Water

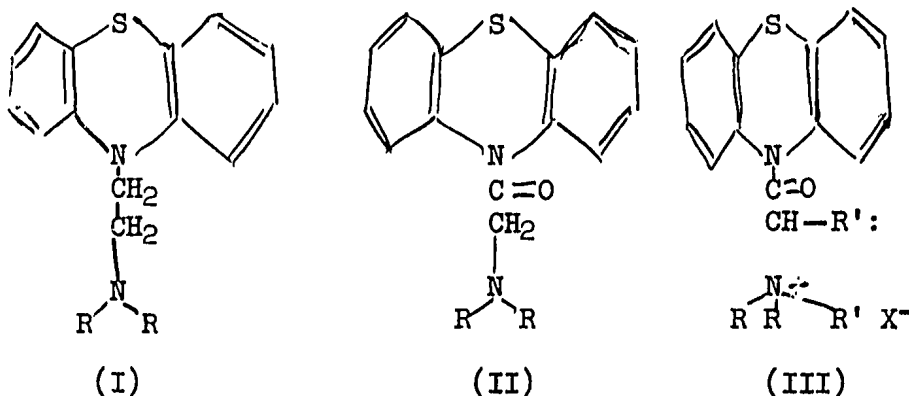
"Present-Day Methods for the Production of Heavy Water," by Y. M. Varshavskiy, Doctor of Chemical Sciences, and S. E. Vaysberg, Candidate of Chemical Sciences; Moscow, Khimicheskaya Nauka i Promyshlennost', Vol 4, No 4, Aug 59, pp 498-509

Electrolysis of water in combination with isotope exchange between water and hydrogen, distillation of water, distillation of liquid hydrogen, and two-temperature exchange as methods for the separation of hydrogen isotopes are discussed in considerable detail. Information is given on the industrial production of deuterium in the USSR by the distillation of hydrogen. On the basis of a comparison made in the article between different methods, the conclusion is reached that the most expedient method for the industrial production of heavy water is two-temperature water--hydrogen sulfide exchange. According to the author, only the low-temperature distillation of liquid hydrogen can compete with this method from the standpoint of cost. However, application of the latter depends on the possibilities of using ordinary hydrogen. If there is no demand for hydrogen for purposes other than the production of deuterium, the possibilities of applying this method are limited.

Organic Chemistry12. New Cholinolytic Compounds Synthesized

"Synthesis of Several Acyl Derivatives of Phenothiazine. I. Derivatives of Glycine and α -Alanine Containing Quaternary Atoms of Nitrogen," by N. V. Khromov-Borisov and A. M. Yanovitskaya, First Leningrad Medical Institute imeni I. P. Pavlov; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 8, Aug 59, pp 2663-2667

Considerable attention has been paid over the last several years to phenothiazine derivatives which contain various substitutes at the nitrogen of the thiazine ring. Special interest has been evinced toward phenothiazine derivatives of the types (I) and (II) which exhibit strong cholinolytic activity.



The authors now describe methods of preparation and properties of several new compounds of the type (III), which are quaternary ammonium salts.

All of the synthesized quaternary ammonium derivatives, and also the corresponding salts of tertiary amines were tested pharmacologically by M. Ya. Mikhel'son. They are all strong cholinolytics; whereas the quaternary derivatives manifest their action principally on the periphery, the tertiary derivatives also penetrate into the brain and hence exert a central cholinolytic action.

The 10-diethylaminoacetylphenothiazine and 10-(α -diethylaminopropionyl)-phenothiazine were synthesized. Their hydrochlorides and quaternary ammonium salts were obtained and characterized. The hydrochloride of 10-diethylaminoacetylphenothiazine, known as "diphazine," has been employed in medical practice. The methylsulfomethylate of 10-diethylaminoacetylphenothiazine, under the name of "mephazine," is successfully undergoing clinical testing.

13. Research on Organophosphorus Compounds Continued

"Syntheses Based on the Ethyl Ester of Hydroxymethylphosphinic Acid," by B. A. Arbuzov and N. P. Bogonostseva, Scientific Research Chemical Institute of the Kazan State University; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 8, Aug 59, pp 2617-2622

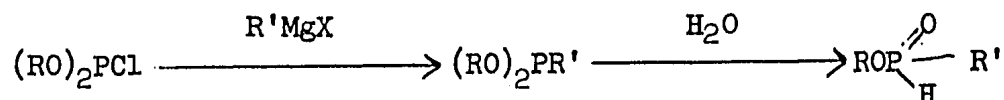
The authors state that the sodium derivative of the ethyl ester of hydroxymethylphosphinic acid, $(C_2H_5O)_2POCH_2ONa$, is a very convenient starting material for syntheses since it is readily available. They studied the reactions of this compound with the acid chloride of diethylphosphoric acid, with the ethyl esters of chloroacetic and of chloro-carbonic acids, with the chlorohydrin of ethylene glycol, and with silicon tetrachloride, phosphorus trichloride, phosgene, and thionyl chloride.

The following six new esters were prepared by these reactions and characterized: the diethylphosphoric ester of the ethyl ester of hydroxymethylphosphinic acid, the α -diethylphosphon- α' -carboxydimethyl ester the carboxyester of the ethyl ester of hydroxymethylphosphinic acid, the acetate of the ethyl ester of hydroxymethylphosphinic acid, the mixed ethyl (diethylphosphon) methyl ester of hydroxymethylphosphinic acid, and the 1,4-dioxo-2,5-diethoxy-2,5-diphosphorinane.

14. Acid Esters of Alkyl- and Aryl-phosphinous Acids Obtained by the Hydrolysis of Corresponding Complete Esters in a Nitrogen Atmosphere

"Method of Synthesizing Acid Esters of Phosphinous Acids," Academician M. I. Kabachnik, Ye. I. Tsvetkov, and Chang Jung-yu, Institute of Organoelemental Compounds of the Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 125, No 6, 1959, pp 1260-1263

The authors describe a general method of synthesizing acid esters of alkyl- and aryl-phosphinous acids by hydrolyzing the corresponding complete esters, which are easily obtained from dialkylchlorophosphites and organomagnesium compounds by a method developed earlier. The process can be performed without separating the corresponding complete esters of phosphinous acids in the pure state, namely, by the action of water on the reaction mixture which was formed by the interaction of dialkylchlorophosphite and an organomagnesium derivative:



All of the operations are conducted in an atmosphere of pure nitrogen. The yields, constants, and analytical data pertaining to the eight compounds synthesized are presented in the form of a table.

15. New Method of Preparing Carbylamino-fluorides

"Carbylamino-halides. III. New Method of Preparing Carbylamino-fluorides," by K. A. Petrov and A. A. Neymysheva; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 8, Aug 59, pp 2695-2698

The authors have conducted a search of the literature on the synthesis of carbylamino-fluorides. They state that the Haszeldine method for synthesizing these compounds is applicable to a very limited extent. All of the known carbylamino-fluorides are listed in a table.

They describe a method they developed for synthesizing carbylamino-fluorides by the dehydrofluorination of secondary amines containing a CF₃ group with the aid of KF at 140-150°. By this method, they were able to obtain phenyl- and trifluoromethylcarbylamino-fluorides with a 70% yield.

16. New Highly Active Local Anesthetics Synthesized

"Synthesis of Several Acyl Derivatives of Phenothiazine. II. Derivatives of β -Dialkylaminoisobutyric Acid," by N. V. Khromov-Borisov and A. M. Yanovitskaya, First Leningrad Medical Institute imeni I. P. Pavlov; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 8, 1959, pp 2667-2671

The authors describe the synthesis and properties of phenothiazine derivatives which contain the complex acyl radicals β -diethylaminoisobutyryl and β -(N-piperidino)-isobutyryl and are analogs of dicarpol and Phenergan [Promethazine], which possess valuable pharmacological properties.

A method was developed for preparing β -dialkylaminoisobutyryl-10-phenothiazine by the interaction of metacrylyl-10-phenothiazine (which was especially synthesized) with secondary amines.

Thirteen previously unknown derivatives of β -diethylamino- and β -piperidinoisobutyryl-10-phenothiazines were obtained.

Several of the synthesized compounds exhibited local anesthetic activity and also cholinolytic properties.

17. Improved Synthesis of Hexachlorophene Described

"Interaction of 2,4,5-Trichlorophenol With Formaldehyde," by I. S. Ioffe and M. Z. Zal'manovich, Military-Medical Academy imeni S. M. Kirov; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 8, Aug 59, pp 2685-2689

2,4,5-Trichlorophenol condenses with formaldehyde only upon heating in the presence of concentrated sulfuric acid. 2,4,5-trichlorosaligenin forms as an intermediate product. This intermediate further condenses either with an excess of formaldehyde or with an excess of 2,4,5-trichlorophenol, with the formation in the first case of the cyclic methylene ether of 2,4,5-trichlorosaligenin and, in the second case, 2,2'-dihydroxy-3,5,6,3',5',6'-hexachlorodiphenylmethane (hexachlorophene).

Hexachlorophene was studied because of its strong disinfectant properties. The monosodium salt and the diacetyl and dibenzoyl derivatives of hexachlorophene were prepared in the course of this study.

18. Military Medical Academy Research on Disinfection Agents

"N-Substituted Amides of Salicylic Acid and Its Derivatives. I. Arylides of 3,5-Dichlorosalicylic and 5-Nitrosalicylic Acids," by I. S. Ioffe and M. Z. Zal'manovich, Military-Medical Academy imeni S. M. Kirov; Leningrad, Zhurnal Obschey Khimii, Vol 29, No 8, Aug 59, pp 2682-2685

Several arylides (aryl amides) of salicylic acid possess a high activity as disinfectants. Thus, 5,3'-trichlorosalicylanilide arrests the growth of *Staphylococcus aureus* in a dilution of 1:8,600,000.

The authors compared the various methods in the literature of obtaining arylides of salicylic acid and decided that the most convenient method was the direct fusion of salol and amines. This method also appeared suitable for preparing arylides of 3,5-dichlorosalicylic and 5-nitrosalicylic acids.

Radio Chemistry

19. New USSR Rules for the Shipping of Radioactive Isotopes

"New Rules for the Shipping of Radioactive Substances," by A. Shtan' and N. Leshchinskiy; Moscow, Atomnaya Energiya, Vol 7, No 4, Oct 59, p 399

The Main Administration for the Utilization of Nuclear Energy of the Council of Ministers USSR and the State Sanitary Inspection of the USSR approved new rules for the shipping of radioactive substances. These rules have been published under the title Vremennyye Sanitarnyye Pravila Transportirovaniya Radioaktivnykh Veshchestv (Temporary Sanitary Rules for the Shipping of Radioactive Substances), Moscow, Medgiz, 1959. The rules in question are outlined in some detail in the present article. Under these rules, radioactive substances are subdivided into three groups: (1) substances which emit gamma-quanta in addition to alpha and beta particles, (2) substances which emit neutron radiation or both neutrons and gamma-radiation, and (3) substances which emit alpha or beta particles. Depending on the intensity of the gamma radiation at the surface of the package in which the radioactive substances are shipped and the intensity of gamma-radiation at a distance of one meter from the package, the substances are divided into four shipping classes: (1) those with an intensity of the dose of gamma-radiation at the surface of the package not exceeding 0.1 microcurie per second, (2) those with an intensity of the dose of gamma radiation on the surface of the package not exceeding 3 microcuries per second and an intensity of the dose of gamma-radiation at a distance of one meter from the package not exceeding 0.1 microcurie per second, (3) those with an intensity of the dose of gamma radiation on the surface of the package not exceeding 55 microcuries per second and an intensity of

the dose of gamma radiation at a distance of one meter from the package not exceeding 2.5 microcuries per second, and (4) radioactive substances which, because of the excessive weight of the containers or other reasons, cannot be transported together with other freight or packages. Containers with radioactive substances of the fourth category can be transported in special railroad cars, automotive vehicles, planes, or in the hold of ships in special locations provided for this purpose and disposed in such a manner that the container is located at a considerable distance from photosensitive materials and areas constantly occupied by human beings.

20. New USSR Container for Shipping Large Quantities of Radioactive Isotopes

"A New Container for Radiation Sources of High Activity," by V. Sinitsyn, N. Leshchinskiy, and A. Gusev; Moscow, Atomnaya Energiya, Vol 7, No 4, Oct 59, pp 399-400

In connection with the extensive application of powerful isotope installations, the necessity arose for shipping large quantities of radioactive isotopes to be used as radiation sources of high activity. It also became necessary to charge irradiation units directly from shipping containers. The containers used hitherto were designed for the transportation of radio-active isotopes with an activity up to 400 gram equivalents of radium. Charging of irradiation units from these containers could be carried out only in special water pools. A new type of container has now been developed which is designed for the shipment of radiation sources of high activity and can be used for the direct charging of irradiation units. In containers of this type, one can ship simultaneously up to four standard cobalt radiation sources with a nominal activity of 700 gram equivalents of radium each. The design of containers of this type is described in detail.

21. Use of Radioactive Tracers to Determine the Age of Writing With Ink or Pencil

"The Autoradiographic Method for the Investigation of Ink and Pencil Tracings on Documents," by Ye. Gordon and V. K. Lisichenko; Moscow, Atomnaya Energiya, Vol 7, No 4, Oct 59, pp 384-385.

The method of determining the age of writing with ink by measuring the migration of chloride ions is often unsatisfactory; in cases when this method cannot be used, the autoradiographic determination of the age of writings or tracings still yields good results. Furthermore, the autoradiographic method does not depend on the diffusion of chloride ions because the reagent containing the radioactive tracer is adsorbed on the ink or pencil line itself. The more recent the writing, the greater is the adsorption of the radioactive tracer. By observing the relative darkness of lines on the autoradiogram, alterations made at a later date can

be distinguished in criminalological work. Examples of applications of the autoradiographic method are treatment of methylviolet ink writing with a solution of silver nitrate containing Ag^{110} ; treatment of methylene blue ink with a solution of $K_4 Fe (CN)_6$ containing Cl^{36} as a tracer; and development of basic dyestuffs contained in pencil tracings by the adsorption of cations containing radioactive tracers. By using this method, one may, in some cases, prepare legible photoprints of illegible originals and detect additions made by writing with another type of ink or pencil.

22. Investigation of the α - Spectrum of the Natural Mixture of Samarium Isotopes

"The α - Spectrum of the Natural Mixture of Samarium Isotopes," by A. A. Vorob'yev, A. P. Komar, V. A. Korolev, and G. Ye. Solyakin, Leningrad Physico-Technical Institute; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 2(8), Aug 59, pp 546-548

By using a pulse ionization chamber, the α - spectrum of Sm^{147} was determined. The energy of α - particles emitted by Sm^{147} was measured. The maximum content of Sm^{146} in the natural mixture of samarium isotopes was estimated.

Radiation Chemistry

23. Radiation Chemistry of Aqueous Solutions of Inorganic Compounds

"The Action of Ionizing Radiation on Aqueous Solutions of Inorganic Compounds," by P. I. Dolin, Doctor of Chemical Sciences; Moscow, Khimicheskaya Nauka i Promyshlennost', Vol 4, No 4, Aug 59, pp 516-521.

The subject is reviewed predominantly on the basis of non-USSR publications. It is pointed out that research in this field is of importance from the standpoint of nuclear technology. Investigations of the effect of ionizing radiation on aqueous solutions were induced by the necessity of solving problems arising because of the radiolysis of water in nuclear reactors, problems connected with the selection of efficient methods for the chemical conversion of products of nuclear reactions, the necessity of clarifying the mechanism of the corrosion of materials in contact with water when exposed to the effects of irradiation, etc.

The subject of radiation sensitization due to the presence of organic compounds is discussed on the basis of USSR work. The effect of radiation on electrochemical systems consisting of the solution of an electrolyte and a metal electrode is reviewed briefly on the basis of publications by USSR scientists. It is stated in conclusion that results obtained in the investigation of aqueous solutions of inorganic compounds should be utilized more extensively in interpreting the action of radiation on aqueous solutions of organic compounds and also on solutions in nonaqueous solvents. The view is expressed that one of the components of a nonaqueous system may function as a solvent and absorb the principal portion of the radiation energy that passes through it; the radicals that are formed and other active particles will represent products of radiolysis. One of the tasks of research of radiation-chemical transformations in such a system would be identification of products of this type, determination of their yields, and investigation of their reactions with other components.

24. Automatic Control of the Production of Potassium Fertilizers by Utilizing the Radioactivity of This Element

"For Chemical Production" (unsigned item); Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Vol 4, No 16 (571), 2 Oct 59, p 3

Because the output of inorganic fertilizers will be increased almost by a factor of 3 during the current Seven-Year Plan, automatic control of the production of fertilizers becomes of great importance. To facilitate the automatic control of the production of potassium fertilizers, the Tallin Experimental Indicator and Controller Plant developed the first gamma-radiation device for the control of the concentration of potassium. This device utilizes the natural radioactivity of potassium for the automatic control of a production process.

Application of the new device makes it possible to increase by 10-20% the efficiency of the production equipment used and also to reduce the losses connected with the process applied. Furthermore, the necessity of conducting monthly chemical analyses is eliminated. The device for measuring the concentration of potassium on the basis of gamma-radiation emitted by this element makes it possible to determine the content of potassium, not only in solutions, but also in sludge and in the initial raw material ("ore"). The intention exists of releasing 20 devices of the type mentioned during 1959.

Miscellaneous

25. Synthesis of Fluoroacetylene

"Syntheses of Vinyl Monomers. Fluoroacetylene -- Its Preparation and Properties," by A. Ya. Yakubovich, K. M. Smirnov, and S. S. Dubov, Khimicheskaya Nauka i Promyshlennost', Vol 4, No 4, Aug 59, pp 551-552

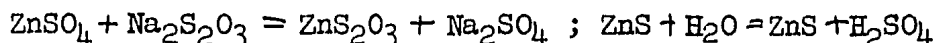
Fluoroacetylene was synthesized by reacting 1,1-difluoro-2-bromoethylene with magnesium metal in dry tetrahydrofuran. From the mixture of gaseous substances that formed, monofluoroacetylene and vinylidene fluoride were isolated. The properties of fluoroacetylene (including its chemical behavior) and of polyfluoroacetylene were investigated. These properties are described.

The work in question was done prior to the publication of the paper on fluoroacetylene by W. Middleton and W. Sharkey in the Journal of the American Chemical Society, Vol 81, 1959, p 803. The American investigators synthesized fluoroacetylene by another method.

26. Preparation of Zinc Sulfide Phosphor

"Investigation of the Preparation of Zinc Sulfide Phosphor by the Reaction Between Sodium Thiosulfate and Zinc Sulfide," by M. I. Tombak and A. A. Bundel', State Institute of Roentgenology and Radiology; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 7, Jul 59, pp 1568-1576

It was established that at 100° the following second-order reaction takes place in a mixture of solutions of sodium thiosulfate and zinc sulfate:



This reaction leads to the formation of zinc monosulfide. Because of the formation of sulfuric acid, the following reaction takes place:



This reaction brings about contamination of the precipitate with elemental sulfur. The SO₂ which forms reacts with the thiosulfate, leading to the formation of a mixture of polythionates, which subsequently, decompose, forming sulfuric acid, elemental sulfur, and S²⁻. The ZnS prepared in

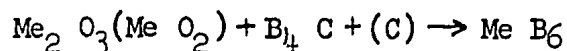
this manner is contaminated with oxygen-containing compounds. As a result, the phosphor is activated with oxygen, and a green band corresponding to oxygen appears in the spectrum of the phosphor. By selecting suitable conditions for the washing of the zinc sulfide, the content of oxygen-containing admixtures in it can be lowered considerably, so that the sulfide becomes suitable for application as a phosphor. As distinguished from the adjacent copper band, the green oxygen band rapidly decreases in brightness when the phosphor is heated.

27. Hexaborides of Rare-Earth Elements

"An Investigation of the Hexaborides of Rare-Earth Elements and of Yttrium," by N. N. Tvorogov, Institute of Radio Engineering and Electronics, Academy of Sciences USSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 9, Sep 59, pp 1961-1966

The hexaborides of Y, La, Ce, Pr, Nd, Sm, Gd, Tb, Eu, Ho, Er, Tu, and Yb were prepared and investigated by subjecting them to X-ray diffraction analysis. The densities of the hexaborides prepared were determined. Compounds of Tb and Tu with boron were synthesized for the first time. The lattice constants of the tetraborides of Gd, Ho, and Gd were calculated.

The hexaborides were prepared by the following reaction:



The initial substances were heated in vacuum to bring about the reaction.

II. EARTH SCIENCES

28. Hungarian Geophysicists Train Chinese Researchers

"Hungarians in Chinese Oil Prospecting Expedition" (unsigned article); Budapest; Nepszabadsag, 24 Oct 59, p 6

An oil prospecting expedition has been working in China for more than 3 years. Several hundred Chinese experts and some Hungarian geophysicists are in the expedition. After one group of Hungarian researchers returned home, Lorand Sedy of the [Hungarian] Geophysical Institute had the following to say about their experiences.

CPYRGHT

"Forty five Hungarian researchers took part in the expedition. We did our prospecting in the northern part of China over an area three times the size of Hungary. We were looking for oil. As a result of our prospecting they have already begun to drill wells in some places. We used Hungarian equipment for our research. As we worked we trained Chinese experts who are now taking over the direction of the work from us."

29. Accuracy of Electron-Optical Range Finders

"Accuracy of an Electron-Optical Range Finder With Visual Phase Comparison," by B. Delong, Scientific Research Institute of Geodesy, Prague; Prague, Studia Geophysica et Geodaetica, No 3, 1959, pp 213-226

It is shown that in the use of electron-optical range finders with visual observations, the adjustment of the maximal illumination of the field of vision of the ocular is more exact than the adjustment of the minimal illumination. The same applies to electron-optical modulators (Kerr modulators and quartz modulators), with and without polarizing potential.

An equation is derived which expresses the accuracy of the electron-optical range finder; the phase difference of the emitted and reflected modulated waves is determined visually by an adjustment of the maximum illumination of the field of vision of the ocular. According to this equation, the error in ranges measured only once is within the decimeter range, and the resultant error is practically independent of the measured range. The indicated accuracy can be improved through repetition, but is satisfactory for many purposes even without repetition. The validity of the equation was confirmed by field tests with the Soviet electron-optical range finder SVV-I.

30. Common Catalog System Suggested for Calculating Astronomical-Geodetic Nets

"Systematic Differences in Fundamental Catalogs and the Method of Equal Altitudes," by Georgij Karsky, Institute of Geodesy and Topography, Prague; Prague, Studia Geophysica et Geodaetica, No 3, 1959, pp 227-231

In connection with observations in which the method of equal altitudes was used to determine a certain number of Laplace points in Czechoslovakia, a study was made of the systematic differences in various fundamental catalogs. Expressions are given for determining the deviations of the absolute values of terms in the observational equations, which occur because of the systematic differences of values taken from tables of different catalogs or obtained by direct comparison of the observed stars. Both numerical and graphical transformations of the Laplace points are given. One table gives approximate maxima for the possible changes of geographical coordinates which occur when the circumzenithal is applied within the latitudes of Czechoslovakia. A second table gives the results of experimental transformations of two Laplace points and shows that transformations of the coordinates from three catalog systems to a fourth system can cause deviations which, though slight, should not be neglected.

It is suggested that all Laplace points used in the calculation of an astronomical-geodetic net be related to a common fundamental catalog system.

III. ELECTRONICS

Communications

31. Low Wave-Impedance Antenna

"Wide-Band Mast Antenna With Low Wave Impedance," by Ye. A. Anfilov; Moscow, Elektrosvyaz', No 10, Oct 59, pp 30-37

A mast type antenna suggested by G. Z. Ayzenberg is about 260 meters high and provides satisfactory operation in a wave-length range of 200 to 2,000 meters. Low wave impedance in this type of antenna is attained with the aid of guy wires attached in four parallel rows to a three-sided mast. The lower one third portion of the antenna mast is encircled with a screen (shield). The mast and the screen thus form a sort of coaxial feeder. The unshielded portion of the antenna mast acts as an unloaded radiator and the outer surface of the screen acts as a radiator with its current loop at the bottom. The screen is made of eight conductors placed in a circle around the mast. The low wave impedance of the unscreened portion of antenna mast was secured by certain arrangement and interconnection of guy wires. The characteristics of such an antenna are: wide band-pass, low voltages at the antenna and improved matching between antenna and transmission line. Such an antenna displays satisfactory directivity of the radiation pattern.

32. Geometric Construction of Reliable Codes

"Geometric Construction of Optimal Codes," by B. M. Pushnoy; Moscow, Elektrosvyaz', No 10, Oct 59, pp 3-12

The problems related to the construction of codes immune to noises are discussed in the article. An investigation was conducted utilizing the principles of geometric representation of code combinations in form of dots distributed in space at the vertices of certain regular polyhedrons. It was shown that the signal dots for optimum codes coincide with the vertices of certain regular multidimensional polyhedrons. For the three-dimensional space only tetrahedron, octahedron and icosahedron are "optimal." A number of multidimensional irregular polyhedrons with their vertices representing the signal dots were examined.

The author concludes that the geometric method is very effective in analysis of the theory of coding. Such an analysis is highly descriptive and permits a qualitative appraisal of results. All the possibilities of geometric method of construction of high efficiency codes have not yet been fully utilized.

The author thanks Prof A. A. Kharkevich for his assistance.

33. Calculation of Transients at FM

"Calculation of Transients at FM," D. Ye. Vakman; Moscow, Radio-tekhnika, 1 Elektronika, No 10, Oct 59, pp 1617-1627

An asymptotic method, based on the principle of stationary phase, for calculation of transient processes in systems with FM is suggested. The general formulas for wide band-pass and narrow band-pass circuits are derived and the physical interpretation of the method is given. The main advantage of the asymptotic method is the ease of obtaining the solution at high percentage of modulation and for random changes of the frequency.

34. Recent Soviet Patents in the Field of Communications

"Authorship Certificates," (unsigned article); Moscow, Elektrosvyaz', No 10, Oct 59, pp 77-78

Class 21a, 30₃₀, No 115921; R. S. Medvedev; Device for Measuring Small DC Current of Control Electrode

Class 21a¹, 10₀₁, No 68672; F. P. Reusov; Device for Storage and Transmission of Telegraph Messages

Class 21a¹, 11₀₁, No 116706; Ye. I. Tumanovskiy; Coincidence Circuit for Electronic Receiver of Telegraph Apparatus

Class 21a¹, 11₀₂, No 75830; L. A. Korobkov and V. V. Sharlikov; Electronic Start-Stop Regenerator

Class 21a¹, 32₀₄, No 116709; P. N. Ivanov, M. S. Berezko, M. A. Kudryashov, and V. S. Repin; Method for Correcting Curvilinearity of Field in Facsimile Apparatus with Swinging Mirror

Class 21a¹, 32₃₅, No 115923; B. V. Krusser, and I. K. Malakhov; Signal Plate for Single-Beam Tube

Class 21a¹, 32₃₆, No 115796; G. V. Braude; Method to Improve Resolving Power of Photographic, X-Ray Diffraction and Radiographic Images

Class 21a¹, 32₃₅, No 115990; Transmitting Television Tube With Photoresistor

Class 21a¹, 34₃₁, No 115925; G.I. Byalik; Method for Code Transmission and Reception of Color Television

Class 21a², 18, No 115940; P. Sh. Shafeyev; Method of Setting Zero Output Voltage in DC Amplifiers

Class 21a², 18₀₂, No 115978; V. A. Baramidze and I. G. Gol'dreyer; Multistage Self-Stabilizing DC Amplifier

Class 21a², 18₀₈, No 116505; S. Ya. Dunayevskiy and A. I. Zhuravlev;
Fast-Acting Multistage Magnetic Amplifier

Class 21a⁴, 8₀₂, No 116462; V. A. Voronel'; High-Frequency Wide-
Band Oscillator

Class 21a⁴, 14₀₁, No 116472; V. M. Volshonok; Frequency Modulator
with Transistor

Class 21a⁴, 21, No 116473 A. M. Pokrass; Device for Switching of
Filters

Class 42c, 43, No 117088; V. D. Vasil'yev and V. N. Bogomolov;
Method for Investigating of Magnetic Fields

Class 42d, 30₁, No 117081; S. P. Khlebnikov; Method of Compen-
sating for Effect of Instability of Carrier Velocity in Transmission of
FM Signal Through a Circuit of Magnetic Recording

Class 21g, 13₂₂, No 117056; V. A. Afanas'yev; Device for Electro-
static Focusing of Electron Beam

Class 21g, 13₃₁, No 117226; N. A. Iofis; Getter for Electro-Vacuum
Devices

Class 21g, 30₀₄, No 117823; L. V. Lebedkin; Method of Amplitude-
Phase Measurements

Class 42m, 14, No 118655; L. I. Gutenmakher; Storage Device

Class 42m, 14, No 118656; A. N. Radchenko; Device for Coding of
Voltages

Class 42m, 14, No 118657; A. A. Krupskiy; Storage Device

Class 42m, 14, No 118658; O. V. Bachin; Method of Information Reading
From a System of Storage Transfluxors

Electromagnetic Wave Propagation

35. Tropospheric Propagation With Diversity Antennas

"Experimental Research of Long-Distance Tropospheric Propagation
of Micro-waves Utilizing Dual-Antenna Reception," by A. V. Prosin,
I. P. Levshin, and G. I. Slobodenyuk, Moscow, Radiotekhnika, No 10,
Oct 59, pp 3-14

Experimental investigation of statistical properties of 10-cm radio-
wave was conducted during the summer and fall of 1958 on a radio-relay link
about 275 km long located in the central part of the European USSR. The
signals intercepted at the receiving end by two diversity antennas of dif-
ferent gain were displayed on a moving-coil and cathode-ray tube oscillog-
raphs. One of the diversity antennas with a gain factor of 10,000, simi-
lar to the transmitting antenna, was installed on the roof of a wooden
structure, and the other in the shape of paraboloid of revolution with 1.5
meters diameter was mounted on a mobile metal mast. Both receiving anten-
nas were mounted 9 meters above the ground and had provisions for 360°
rotation in the azimuth plane and inclination adjustment in the range from
-5° to +30°.

Statistical processing of the recorded signals provided data on mean value of attenuation factor, antenna gain, distribution of rapid fading and the effect of various arrangement for the diversity antennas. The data obtained in this investigation is useful in design of radio-relay lines utilizing tropospheric microwave (10 cm) propagation.

36. Surface-Wave Antennas

"Surface-Wave Antenna with Rocking Beam," by K. I. Grineva, Moscow, Radiotekhnika, No 10, Oct 59, pp 15-22

The article discusses the advantages of surface-wave dual antennas. The dual surface-wave antenna has a much higher pattern directivity than a single antenna of similar size; it can also change the direction of maximum radiation by varying the phase of supply voltages.

The circular dual antenna of this type is a combination of two single circular surface-wave antennas. The upper circular section of the dual antenna is much smaller than the lower circular section. The power supply to the antenna is conducted through a coaxial feeder. The resulting pattern directivity of dual antenna depends on pattern directivity of the upper and lower sections separately, the vertical distance between their electrical centers, and on phase and amplitude relationship between the supply voltages of the two antennas. Change in phase of supply voltage in one of the coaxial feeders changes the phase shift between waves radiated by the two antennas, resulting in rotation of directivity pattern in the vertical plane. The limits of beam rocking is restricted by the angle of radiation of upper and lower antennas.

An experimental surface-wave dual antenna was built for operation on 3.2 cm wave. On a 1,300-mm duralumin disk was deposited a 2-mm paraffin layer of 1,000 mm diameter, forming the lower antenna section. The excitation of surface-wave is accomplished with a radial line, the upper plate of which is 615 in diameter. A 2-mm paraffin layer was deposited on the upper plate in such a manner that the paraffin layer was about 20 mm smaller in diameter than the plate itself. The surface-wave in upper antenna was excited with radial line 190 mm in diameter. The height of upper and lower radial lines is 9 mm. In this experiment the phase change was accomplished by changing the length of the waveguides. The width of main radiation lobe, at the power level of 0.5, for various positions of the beam did not vary more than $\pm 2.5^\circ$ from the mean value of 11° .

Such a dual antenna can be used for equisignal-zone operation.

Electronic Components

37. Image Recording on Magnetic Tape

"For Recording Image on Magnetic Tape," (unsigned article);
Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 25 Oct 59

CPYRGHT A photograph of two men and their equipment is accompanied by a short description as follows: "In the photograph: Chief Designer and Candidate of Technical Sciences V. Parkhamenko (left) and Engineer A. Spirin are checking the equipment prior to recording.

CPYRGHT "A group of engineers from the All-Union Scientific-Research Institute for Sound Recording has developed a set of equipment for recording of image on magnetic tape. The equipment permits recording the image received via radio, as well as an image taken with a television camera. The new technology permits establishing a regular exchange of programs between television broadcasting stations and facilitates transmission of news via television."

38. Filter-Type Delay Line for Traveling-Wave Tubes

"Filter-Type Delay Line for Power Traveling-Wave Tubes of Decimeter Band," by G. A. Machulka and Ye. D. Naumenko; Moscow, Radiotekhnika i Elektronika, No 10, Oct 59, pp 1660-1665

The results of calculation and cold measurements of filter-type delay line composed of lumped capacitances and inductances are presented. Such filter-type delay lines can be used with power traveling-wave tubes operating in the decimeter wave range. Theoretical and experimental investigation have revealed that filter-type delay lines possess valuable properties and should find application with traveling-wave tubes. The advantages of the filter-type delay line, as compared to helical delay system, lie in the fact that the acceleration potential can be increased substantially and the transit path of the electrons can be lengthened.

The principal difficulty with the filter-type delay line is the satisfactory mounting of the line elements. Mounting of the elements with the aid of metallic stubs is simple, but has the disadvantage of narrowing the band-pass of the tube. Utilization of delay line with vacuum seals in each link promises to eliminate the limitations of metal mounting, because the inductance will be placed outside the vacuum, and the same tube will operate with various plug-in outer elements for various frequency ranges.

39. Quantum-Mechanical Semiconductor Oscillators and Amplifiers

"Quantum-Mechanical Semiconductor Oscillators and Amplifiers of Electromagnetic Waves," by N. G. Basov, B. M. Vul, and Yu. M. Popov; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, No 2 (8), Aug 59, pp 587-588

The article discusses the possibility of utilizing the electron drift between the conduction zone (valence zone) and donor-doped (acceptor) level of the semiconductor to obtain electromagnetic radiation with the aid of the mechanism of stimulated radiation, similar to one occurring in a molecular oscillator.

To build a semiconductor oscillator or amplifier it is necessary to secure such a distribution of electrons (holes) in the conduction zone, that the effective temperature of the conduction electrons (holes) becomes negative with respect to the ionized donors (acceptors). Such a semiconductor has a negative loss at the rate of electron (hole) drift from the conduction zone to the doped level. Therefore, by irradiating a semiconductor, while in the above described state, with an electromagnetic wave, it is possible to amplify such a wave by the quantum of stimulated emission. Also, when certain conditions for self-excitation are observed, the above device can operate as an oscillator. Such conditions of self-excitation are attained by proper selection of transfer coefficient and the reflection of waves at the boundary of the sample. By reducing the coefficient of surface reflection or by reducing the size of the sample it is possible to change the operating conditions from that of generating to that of amplifying.

Electronic Computers

40. Hungarian Analog Computer

"Gamma's New Electronic Computer" (caption under photograph); Nepszava; Budapest, 23 Oct 59, p 8

After more than a year of experimentation, an experimental model of an electronic computer has been built at the Gamma Optical Works (Gamma Optikai Muvek). The apparatus, with which linear simultaneous equations of eight unknowns can be solved in a short time, is a new Hungarian invention. It is made completely of domestic materials and has, among other parts, 140 tubes and 18 four-stage amplifier units. The push-button feed-in of numbers is automatic. A special unit controls the accurate operation and computing progressions of the machine. The new analog computer solves 8-unknown linear simultaneous equations on an average of 10 seconds. This would require 10 hours on a modern desk-type mechanical calculator, and 10 days by hand. The machine is the most modern by any standards and is the

highest-output and most accurate in Hungary. It can be used profitably for nuclear physics, geodetic, automatization, chemical, and plant designing calculations. The Gamma Optical Works plans to begin manufacture of the zero series of the machine in 1960. Photograph shows Peter AMBRO, physicist, and Imre HOMOKI, electrical engineer, checking the operation of the experimental unit.

Gas Electronics

41. Gas Electronics Conference

[Materials of the Second All-Union Conference on Gas Electronics];
Moscow, Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 23,
No 8, Aug 59, pp 934-1052

The entire issue of this publication is devoted to the conference held in Moscow, 2-26 October 1958. Titles of the articles, their authors, and short summaries follow:

"Some Results on the Formation of a High-Frequency Discharge at Low Pressure," by G. N. Zastenker and G. S. Solntsev, Moscow State University imeni Lomonosov, Physics Faculty; pp 934-940

A method is described for studying the behavior in time of various parameters of a high-frequency discharge (such as voltage across the discharge gap, discharge current, and the luminosity of the gas) during the process of discharge formation.

"Study of the Self Supporting Ultrahigh-Frequency Pulse Discharge in Air and the Process of Its Stabilization," by P. S. Bulkin, G. S. Solntsev, and V. N. Ponomar'yev, Moscow State University imeni Lomonosov, Physics Faculty; pp 941-947

A method is devised for the complex study of the formation of an ultrahigh-frequency pulse discharge by recording the standing wave coefficient, the local luminosity and the discharge dimensions. The correspondence between stages in the formation is indicated.

"The Measurement of Charge Concentration in Plasma by the Method of Ultrahigh-Frequency Probe," by S. M. Levitskiy and I. P. Shashurin, Kiev State University, Chair of Electronics; pp 948-951

It has been established that the introduction of ultrahigh-frequency oscillators is an efficient method for measuring the local concentration of ions in a plasma. If the interference caused ionic layers which arise on the surface of the ultrahigh-frequency probe could be avoided, the method would prove much more advantageous than the use of a cavity resonator.

"The Formation of an Ultrahigh-Frequency Pulse Discharge in Inert Gases," by V. Ye. Golant, Leningrad Polytechnical Institute imeni Kalinin; pp 952-957

The average frequency for the ionization of krypton and xenon by electrons is calculated. The critical voltage determining the formation of high-frequency pulse discharge in inert gases is obtained. Theoretical results are compared with experimental.

"The Relation Between Characteristics of Ultrahigh Frequency and Direct Current in Gas," by V. Ye. Golant, Leningrad Polytechnical Institute imeni Kalinin; pp 958-961

The conditions required for establishing a correspondence between characteristics of a direct and ultra-high frequency currents in gas are presented. Examples of the use of this correspondence are given.

"The Obtaining of High Temperatures by Means of a Spark Discharge," by M. P. Vanyukov and A. A. Mak; 962-964

The results of a study of the temperature of the channel of the spark discharge by measuring the spectral density of the brightness of the channel at the center of gravity of the strongly broadened lines of ionized atoms in a discharge, while the saturation of the brightness of the continuous emission had not yet occurred, are presented.

"Some Results of the Studies of Excitation Functions of Bands of the Negative System N_2 ," by I. P. Zapesochnyy and S. M. Kishko, Uzhgorod State University; pp 965-967

More reliable data on excitation functions of various bands of ionized nitrogen molecule was obtained.

"Cross Sections of Excitation of Some Spectral Lines of Potassium and Argon," by L. M. Volkova, Moscow State University imeni Lomonosov, Physics Faculty; pp 968-970

The relation of excitation cross sections of some spectral lines of potassium and argon to incident electron energies has been determined.

"The Effect of Vanishing Processes of Negative Ions on Their Concentration in a Column," by M. V. Konyukov, Tula Pedagogical Institute; pp 971-974 Formulas are derived for evaluation of the negative ion concentration in a positive discharge column with negative ions.

"Some New Results of Long Spark Studies," by I. S. Stekol'nilov, Laboratory of High-Voltage Gas Discharge, Power Engineering Institute, Academy of Sciences USSR: pp 975-979

The mechanism of development of a spark discharge 1 to 5 meters long has been studied in the above laboratory by means of specially designed oscillographs, multicell shutters, electron-optical converters and probes.

"Probe Study of the Corona Field of An Alternating Current," V. I. Levitov, A. G. Lyapin, and V. I. Popkov, pp 980-988

Probe measurements of the corona of an alternating current are described and the theoretical basis of the method is explained.

"Elementary Processes in the Ionization Zone of Corona Conductors at Atmospheric Pressures," by G. N. Aleksandrov; pp 989-994

The existence of a critical stage of a positive corona has been established, which occurs upon encounter with a stream of negative ions. It was also found that a corona discharge under bipolar or critical conditions is continuous from the time of its origin, whereas a unipolar positive corona is not.

"Waves of Density Oscillations of Discharges in a Cylindrical Plasma", by M. Ya. Vasil'yeva, A. A. Zaytsev, and E. D. Andryukhina, Moscow State University imeni Lomonosov, Physics Faculty; pp 995-998

It has been found that in the plasma of a positive column at low gas pressure a wave-like process is observed, moving from cathode to anode with velocities depending little on frequency.

"The Positive Column of a Discharge in a Diffusion State," by V. M. Zakharova, Yu. M. Kagan, and V. I. Perel, pp 999-1003

Several correlations have been obtained within the framework of the theory of L. Frost (Phys, Rev., 105, 354; 1957) which are convenient in comparing the theory with experiments. Such a comparison was carried out for the positive column in Hg, Ar, and K. The problem of the plasma boundary in the vicinity of the wall has been analyzed.

"Study of the Initial Stages of a High-Frequency Discharge From a Point in the Air at Atmospheric Pressure," by A. M. Prokof'yev, O. F. Kabardin, and K. F. Kuddu; pp 1004-1006

At low voltages a discharge which is similar to a high-frequency discharge, from a point in air at atmospheric pressure within the frequency range of 1.25 to 40 Mc may develop both from the preliminary streamer of the positive corona, and from the pulse of the negative corona. The reason for the lowering of the initial voltages for discharge formation from a point at high frequency only seems to be the accumulation of space charge of gas ions near the point.

"Study of Resonance Charge Transfer in Monatomic Gases and Metal Vapors," by R. M. Kushnir, B. M. Palyukh and L. A. Sena, L'vov State University imeni Franko; pp 1007-1011

The Laboratory of the L'vov University carried out measurements of cross sections of resonance charge transfer for argon, krypton, xenon, potassium, and cesium, as a continuation of research initiated at Leningrad University. These previously obtained results are generalized and compared with latest theories.

"Study of Anodic Fluctuations in a Low Pressure Discharge," by A. A. Zaytsev and K. I. Efendiyev, Moscow State University imeni Lomonosov, Physics Faculty; pp 1012-1016

"The Broadening and Shift of Spectral Lines in a Gas Discharge Plasma," by S. L. Mandel'shtam and M. A. Mazing, Physics Institute imeni Lebedev, Academy of Sciences USSR; pp 1017-1020

An experimental study of line broadening by charged particles with quadratic Stark effect was carried out. The experimental results concur well with conclusions of nonstationary theory.

"Separation of Binary Mixtures of Inert Gases in a Direct Current Discharge," by N. A. Matveyeva, Scientific Research Physics Institute of the Leningrad State University, pp 1021-1025

It is concluded that the separation of gases in direct current may be used for purification of gases from impurities and for improved analysis.

"Measurements of Electric Fields in a High-Frequency Low-Pressure Discharge by Means of an Electron Beam," by G. S. Solntsev, A. G. Porokhin, and N. M. Chistyakova, Moscow State University imeni Lomonosov, Physics Faculty; pp 1026-1030

For the first time experimental data was obtained on the distribution of electric fields, the potential, and space charge in a high-frequency discharge in argon at a pressure of 10^{-2} mm Hg at various times in the period of the high-frequency field.

"Measurement of the Electric Field in Ultrahigh-Frequency Plasma, V. Ye. Mitsuk, M. D. Koz'minykh, and I. V. Talayeva; pp 1030-1035

It has been shown in a previous article (V. Ye. Mitsuk, Zh. Tekhn. Fiz. 28, No 6, 1316; 1958) that the Stark effect can be used at ultrahigh frequencies for measuring electric fields in a microwave plasma. Some further results with the same equipment are described.

"The Effect of the Auxiliary Electrode Temperature on the Ignition of a High-Frequency Discharge in Helium," by Kh. A. Dzherpetov; pp 1036-1039

It has been established by graphs that with increasing filament current the ignition voltage at first remains constant, thereafter drops steply and remains unchanged with the further rise in temperature.

"Low Frequency Undulatory Phenomena in Plasma of a Glowing Discharge," by L. Pekarek; pp 1050-1052

Oscillograms have been obtained of the change in intensity of the luminosity at various points of a discharge.

Instruments and Equipment

42. Volt-Ampere Characteristic of Vacuum Tube

"Differentiation of Volt-Ampere Characteristics of Electronic Tubes," by L. Ya. Il'nitskiy, L'vov Polytechnic Institute; Kiev, Izvestiya Vysshikh Uchebnykh Zavedeniy, Radiotekhnika, No 4, Jul/Aug 59, pp 405-413

Measurement of vacuum tube parameters by the method of differentiation of volt-ampere characteristic is somewhat simpler than by the small-increment method. The accuracy of differential-parameters measurement in vacuum tubes, when applying the method of differentiation of volt-ampere characteristics, depends greatly on the distortion of oscillograms. Inherent sources of error for the method of volt-ampere characteristics differentiation are the distortion and instability of linearly-changing voltage pulses. Coupling links between the source of linearly-changing voltage and the tested tube affect the quality of linearly-changing voltage pulses, and should be limited to the permissible value of oscillogram distortion or permissible error in determination of differential parameters of the vacuum tube.

It is advisable to conduct the examination of differential parameters of vacuum tube with a capacitive coupling, which serves as a simplest and most reliable transmission link with least amount of distortion for the linearly changing voltage.

Materials

43. Semiconductors For Thermoelectric Cooling

"Chemistry in the Service of Refrigeration Engineering,"
by N. Torocheshnikov, Moscow Chemico-Technological In-
stitute imeni D. I. Mendeleev; Moscow, Kholodil'naya
Tekhnika, Vol 36, No 4, Jul/Aug 59, pp 6-9 (p 8)

CPYRGHT

"At present problems are being solved in connection with the develop-
ment of thermoelectric refrigerators which work on the basis of the Peltier
effect. This effect is brought about by the use of semiconductors of the
type of Bi_2Te_3 , Sb_2Te_3 , PbTe , PbSe , etc. Very important for the realization
of the process³ of thermoelectric cooling is addition to the semiconductors
of various impurities, specifically impurities consisting of the halides
of silver, copper, and other metals. It is necessary to initiate and/or
expand a whole range of chemical investigations on the synthesis of ther-
moelectrical materials and the properties of these materials, particularly
when they contain impurities.

"Similarly, work must be conducted on the development of paramagnetic
materials, by employing which exceptionally low temperatures can be obtained.
Fifty years ago Kammerlingh-Onnes succeeded in obtaining a temperature of
 4.17°K . Three years later this temperature was lowered to 1.05°K . In
1922, the temperature of 0.9°K was obtained. By using paramagnetic
materials, the temperature of 0.001°K is being obtained at present in
cryogenic laboratories."

Miscellaneous

44. Autoelectron Emission

"The Influence of the Space Charge on Autoelectron Emission,"
by A. S. Kompaneyets, Institute of Chemical Physics, Academy
of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 128,
No 6, Oct 59, pp 1160-1162

In the recently obtained current density of 10^7 a/cm^2 in autoelectron
emission the space charge and the geometry of equipment plays an important
role. The effect of space charge for flat electrodes has been found by
J. P. Barbour, et al. (Phys. Rev. 92, 45; 1953) and for spherical elect-
rodes by V. L. Kan (Zhurnal Tekhnicheskoy Fiziki, Vol 18, 483; 1948) and
by R. P. Poplavskiy (ibid, 20, 149; 1950). It is demonstrated that the
sphericity of electrodes affects strongly the magnitude of potential
difference necessary to produce the specified current.

IV. MATHEMATICS

45. Systems of Elliptic Differential Equations Studied

"The Behavior at Infinity of Solutions of a System of Differential Equations of the Elliptical Type," by Ya. B. Lopatin-skiy, Corresponding Member, Academy of Sciences, Ukrainian SSR; Kiev, Doklady Akademii Nauk Ukrainsoy SSR, No 9, Sep 59, pp 931-935

$$\text{Let } A \left(\frac{\partial}{\partial x} \right) = k_1 + \dots + k_n = s A_{k_1 \dots k_n} \frac{\partial^{k_1 + \dots + k_n}}{\partial x_1^{k_1} \dots \partial x_n^{k_n}};$$

$$B(x, \frac{\partial}{\partial x}) = k_1 + \dots + k_n = s B_{k_1 \dots k_n}(x) \frac{\partial^{k_1 + \dots + k_n}}{\partial x_1^{k_1} \dots \partial x_n^{k_n}} (x = (x_1, \dots, x_n)),$$

where $A_{k_1 \dots k_n}$ are p by p constant matrices, and $B_{k_1 \dots k_n}$ are p by p functional matrices. It is supposed that $\det A(\alpha) \neq 0$ for every non-zero real vector $\alpha = (\alpha_1, \dots, \alpha_n)$, and that $B_{k_1 \dots k_n}(x)$ in the real domain $x_1^2 + \dots + x_n^2 > R^2$, are sufficiently smooth and satisfy the conditions:

$$\frac{\partial^{\ell_1 + \dots + \ell_n}}{\partial x_1^{\ell_1} \dots \partial x_n^{\ell_n}} B_{k_1 \dots k_n}(x) = O(|x|^{-x-s+k_1 + \dots + k_n - \ell_1 - \dots - \ell_n})$$

$$(x \geq 1, x > s-2, \ell_1 + \dots + \ell_n \leq s+k_1 + \dots + k_n).$$

Then, for any real $\lambda, \lambda' < \lambda$, the factor-group $V_\lambda / V_{\lambda'}$ is finite-dimensional where V_λ denotes the additive group of solutions of the equation $[A(\frac{\partial}{\partial x}) + B(x, \frac{\partial}{\partial x})]u(x) = 0$ defined in the neighborhood of infinity and satisfying the condition $u(x) = O(|x|^\lambda)$.

46. Perturbed Motion Investigated

"Determination of the Region of Influence of an Asymptotically Stable Position of Equilibrium," by Kim Che Dzhon, Moscow University, Chair of Differential Equations; Moscow, Vestnik Moskovskogo Universiteta, Seriya Matematiki, Mekhaniki, Astronomii, Khimii, Fiziki, No 2, Mar/Apr 59, pp 3-14

Let

$$\frac{dx_s}{dt} = \sum_{j=1}^n a_{sj} x_j + X_s(x_1, x_2, \dots, x_n), \quad s=1, 2, \dots, n, \quad (1)$$

be given as the system of differential equations describing a perturbed motion where the a_{sj} are real numbers. It is assumed that the functions X_s have continuous first derivatives and bounded second derivatives in the region G :

$$|x_s| \leq \Pi, \quad s=1, 2, \dots, n.$$

As is known, these assumptions guarantee the existence and uniqueness of an integral curve passing through any point of the considered region G .

Definition. Let some region G_0 be given. The sphere $\sum_{s=1}^n x_s^2 \leq R^2$ is found in the gravitational field of the asymptotically stable position of equilibrium $[x_s = 0]$ relative to the region G_0 , if whatever trajectories incipient in the sphere R are located in the region G_0 for t greater than or equal to zero and unreservedly approach the point $[x_s = 0]$ as t becomes infinite.

It is assumed that the region $G = G_0$ is the parallelepiped $|x_s| \leq 1, \quad s=1, 2, \dots, n.$

Estimates of the gravitational field of the trivial solution are obtained in the works of V. V. Nemytskiy, DAN SSSR, Vol 101, No 5, 1955; Tr Mosk. Matem. O-ba, Vol 5, 1956, pp 456-482; I. G. Malkin, PMM, Vol 167, No 4, 1952; P. V. Atrashenok, Vestn. LGU, ser. Mat., Fiz., Khim., No 8, 1954; and M. A. Aizerman, Avtomatika i Telemekhanika, Vol 8, No 1, 1947.

A new estimate of the gravitational field is given in the present work based on a constructed function of Lyapunov.

47. Stability of Computational Processes Defined and Investigated

"Concerning the Stability of Computational Processes Arising During the Solution of the Cauchy Problem for the Equation $dy/dx = f(x,y)$ by Multipoint Difference Methods," by A. D. Gorbunov and B. M. Budak, Chair of Computational Mathematics of the Mechanical Mathematics Faculty and Chair of Mathematics of the Physics Faculty; Moscow, Vestnik Moskovskovo Universiteta, Seriya Matematiki, Mekhaniki, Astronomii, Fiziki, Khimii, No 2, Mar/Apr 59, pp 15-23

In the present work the concept of a computational process arising during the solution of the Cauchy problem for the equation $dy/dx = f(x,y)$ by the multiplepoint difference method is presented.

The concept of stability for such a computational process is introduced and the necessary and sufficient conditions for stability are given. The stability of several classes of computational processes is established and examples are considered.

Examples and concepts encountered in contemporary mathematical literature (S. L. Sobolev, Izv. AN SSSR, Vol 20, No 4, 1956; G. Dahlqvist, Math. Skand., Vol 4, No 1, 1956; V. S. Ryaben'kiy, A. F. Filippov, "Ob ustoychivosti raznostnykh uravneniy" (Concerning the Stability of Difference Equations), GITTL, 1956, pp 74-76) and in computational practice contributed to the formation of the concept reported in the present work.

48. Linear Functionals in a Banach Space Studied

"On the Connection Between Weak and Strong Convergence," by M. I. Kadets, Khar'kov Automobile Road Institute; Kiev, Doklady Akademii Nauk Ukrainskoy SSR, No 9, Sep 59, pp 949-952

Let Γ be a linear total set of linear functionals defined in a separable Banach space E and satisfying the following condition: there exists a number $\gamma > 0$ such that for every $x \in E$ an $f \in \Gamma$ can be found satisfying the inequality

$$|f(x)| \geq \gamma \cdot \|f\| \cdot \|x\|.$$

If E is a space which has a basis, Γ may be linear hull of functionals, which are biorthogonal to the elements of the basis. If $E = E_1$ is a separable conjugate Banach space, Γ may be a set of weak continuous linear functionals, i.e. functionals generated by the elements of the space E_1 .

The following theorem was proved:

A new norm $\| \cdot \|_*$ may be defined in E , equivalent to the usual one and causing the conditions

$$a) \lim_{n \rightarrow \infty} f(x_n - x) = 0 \text{ for all } f \in \Gamma,$$

$$b) \lim_{n \rightarrow \infty} \|x_n\|_* = \|x\|_*$$

to result in the strong convergence:

$$\lim_{n \rightarrow \infty} \|x_n - x\|_* = 0$$

With the aid of the above theorem, the following theorem is proved: All separable conjugate Banach spaces are homeomorphic.

49. Concept of a Strip of Initial Data Defined Regarding Meromorphic Solutions of a Difference Equation

"Concerning Meromorphic Solutions of a Difference Equation,"
by A. G. Naftalevich; Uspelki Matematicheskikh Nauk, Vol 14,
No 4(88), Jul/Aug 1959, pp 195-202

Meromorphic solutions of the difference equation

$$\sum_{k=1}^n a_k f(z + \alpha_k) = g(z) \quad (a_k \neq 0; k = 1, 2, \dots, n), \quad (1)$$

are investigated where a_k, α_k ($k = 1, 2, \dots, n$) are complex numbers and $g(z)$ is a meromorphic function. For finding a general solution (in the class of meromorphic functions) of the equation (1) a partial meromorphic solution of this equation and a general solution of the homogeneous equation

$$\sum_{k=1}^n a_k f(z + \alpha_k) = 0 \quad (2)$$

are constructed. To formulate the result obtained, we will indicate from the start the following definition. Let z_0 ($z_0 \neq \infty$) be an arbitrary point in the complex plane and π' a strip containing internally or on its boundary all the points $z_0 + \alpha_k$ ($k = 1, 2, \dots, n$), where one and only one of the points $z_0 + \alpha_k$ lies on each of the bounding straight lines in the strip π' . We will designate by π the semiclosed strip obtained by adjoining to the strip π' one of the straight lines bounding it and call it a strip of initial data.

The following theorem holds:

Meromorphic solutions of the homogeneous equation (2) as well as of the complete equation (1) exist which have in the strip of initial data π poles at the points and only at those points λ_i with the principal parts $R(z, \lambda_i)$ for any sequence of rational functions.

$$R(z, \lambda_i) = \frac{a_{i,1}}{z - \lambda_i} + \frac{a_{i,2}}{(z - \lambda_i)^2} + \dots + \frac{a_{i,n_i}}{(z - \lambda_i)^{n_i}}, \quad \lambda_i \in \pi, \quad (3)$$

$\lim \lambda_i = \infty$. The difference of two such meromorphic solutions is an entire solution of equation (2).

Estimates of the growth of meromorphic solutions of equation (1) are also given (see R. Nevanlinna, "Singlevalued Analytical Functions" (Odnobachnyye analiticheskiye funktsii), Gostekhizdat, Moscow-Leningrad, 1941, for notion of growth of a meromorphic function). In the work it was assumed that the points $z_0 + \alpha_1$ and $z_0 + \alpha_n$ lie on the straight lines bounding the strip of initial values π , and that the strip π is itself defined by the inequalities $0 \leq \text{Im } z < \alpha_n - \alpha_1$, and that $\text{Im } \alpha_1 < \text{Im } \alpha_2 \leq \text{Im } \alpha_3 \leq \dots \leq \text{Im } \alpha_n$. This may be attained by the suitable numeration of the numbers α_i , by the selection of the point z_0 , and by the rotation of the z plane about the origin of coordinates.

In the work the following assumption was utilized being an immediate consequence from a result of A. O. Gel'fond concerning differential equations of an infinite order (see A. O. Gel'fond, "The Calculus of Finite Differences (Ischisleniye analiticheskiye funktsii), Gostekhizdat, Moscow-Leningrad, 1952). If $g(z)$ is an entire function of order γ , then equation (1) has an entire solution of order γ .

Several characteristic properties of the strip of initial data π were then indicated.

V. MEDICINE

Aviation Medicine

50. Cosmic Flight Discussed

"The Cosmic Era," by Academician A. Bakulev, president of the Academy of Medical Sciences USSR, Meditsinskiy Rabotnik, No 81 (1829), 9 Oct 59, p 2

The author of this article states that the Soviet Union has successfully launched into space three artificial earth satellites and three cosmic rockets. He considers this an immense contribution to world science and a genuine revolution in such fields of science as astronomy, geophysics, and biology.

The successful launching of the third cosmic rocket is particularly significant. Flying around the moon, this rocket not only brought the important problems of travel through space closer to solution, but also obtained, for the first time, information about the far side of the moon. The day is not far away when it will be known whether life exists on the moon or not. It is possible that some moisture is present on this satellite. Temperatures on some parts of the moon are no more severe than those found in the Yakutskaya ASSR. It can be assumed, therefore, that simplest forms of microorganisms exist on an otherwise apparently lifeless planet. This is why the second cosmic rocket was fully sterilized.

Considerable progress has been made in rocket technology, radioelectronics, and other branches of knowledge. This knowledge is expected to contribute to the capability of sending space ships to the moon and bringing them back to earth. The orbit of the first cosmic rocket was near the orbit of the planet Mars. Possessing the data for the exact calculation of a rocket launching, the Soviet scientists and engineers can place an interplanetary laboratory within close proximity to Mars, and can thus demonstrate presence of life on that planet.

Sufficient progress has been made in rocket technology and enough knowledge is available in the field of natural sciences to assume that both animals and humans can successfully travel through outer space. Soviet physiologists have sufficient information to show that a living organism does not undergo any serious change during interplanetary flights. The reactions of the dog Layka, confined in an artificial earth satellite, demonstrates this point. The radiotelemetric apparatus placed in the hermetic cabin with Layka transmitted to earth the dog's pulse frequency, respiration, arterial pressure, and electrocardiogram. On the basis of data received, it was concluded that the experimental animal tolerated accelerations and subsequent weightlessness well and suffered no ill effects during the entire period of the experiment.

Members of a new branch of science, space medicine, are trying to overcome many obstacles before a man can be sent into outer space. Space medicine people are still looking for methods of protection against accelerations, ionizing radiation, oxygen insufficiency, and weightlessness. The results of experiments showed that systematic training, the use of an anti-G suit, and the position of an astronaut in the rocket make it possible for a human to tolerate for several minutes accelerations which are 12-15 times greater than the force of gravity of the earth. The results of numerous experiments showed that the human organism can easily tolerate weightlessness for 30-45 seconds. A human being repeatedly exposed to conditions of weightlessness usually becomes acclimated to weightlessness in space and can carry on coordinated muscular movements.

Oxygen insufficiency has been fundamentally solved. Hermetically sealed cabins with air-regenerating systems can fully protect "stratonauts" from extremely low pressure in outer space. If for some reason dehermetization takes place in some part of the cabin, a dependable altitude suit is capable of completely protecting the human occupant from outside factors. Supplying oxygen during a flight in outer space does not present any great difficulty. Liquid oxygen may be utilized for this purpose, and asbestos impregnated with alkali may be utilized to absorb carbon dioxide and water vapors. Vegetation can render invaluable service in protracted flights through space by absorbing carbon dioxide and liberating oxygen.

Protection of the human occupant of a space rocket from the effects of ionizing radiation still requires solution. The higher a man goes into space, the more he will be exposed to the action of cosmic rays. Equipment installed in the Soviet rockets helped to measure the ionization existing beyond the limits of the atmosphere and contributed to the study of cosmic rays. The information thus far collected will help designers to provide aircraft with reliable protection.

Soviet virologists are studying the effects of conditions in outer space on the vital activity of various viruses. A knowledge of the vital activity of virus-saprophytes living within the human organism and producing no harmful effects in it is of particular significance. It is possible that these viruses may become pathogenic and cause severe illness when exposed to conditions outside the earth's surface. The preliminary data obtained indicate that virus-saprophytes cannot cause any particular harm to the human organism in outer space, because the compensating mechanisms of the organism intensify their functions and halt the development of any infection. Sterilization and special prophylactic measures can free human astronauts from the danger of being infected by bacteria and viruses.

Soviet pharmacologists are now testing drugs which can prevent disturbances in higher nervous activity during flight through space; they are also testing drugs which accelerate or retard metabolic processes. Soviet scientists are also testing special food substances and food products which can be used by travelers through space.

Academician A. Bakulev concludes this article by stating that further experiments on animals will help solve numerous physiological problems involved in interplanetary flights. No humans will be sent beyond the limits of the earth's atmosphere until Soviet scientists become convinced that their life and health is not jeopardized in any way.

51. Visual Analyser Functions Altered at High Altitude

"Functional Alterations of the Visual Analyser Under Low Barometric Pressure Conditions," by O. Ye. Sidorov, Military Medical Academy imeni S. M. Kirov; Leningrad, Fiziologicheskii Zhurnal, No 8, Aug 59, pp 948-951

In the experiments described in this article, the sensitivity of vision to light at high altitude was investigated in experiments conducted under simulated conditions on 150 candidates in flight school. These candidates were between 17 and 18 years of age, and their general health qualified them for flight training. Rheobase and chronaxy were the two indicators used to determine the excitability of the optic analyser at night and at high altitude, where the pressure of O₂ in the inspired air was low. Changes in the lability of the optic analyser were investigated at the same time. A method developed by P. O. Makarov was used to determine lability. A decrease in excitability according to chronaxy and rheobase and a decrease in lability according to the intermittence interval were noted at an altitude of 2,000 meters and an altitude of 5,000 meters. The decrease in excitability and lability was more pronounced at an altitude of 5,000 meters. Changes in rheobase, chronaxy, and the intermittence interval of lability at high altitude were dependent on the extent of the decrease in O₂ saturation of the blood. Changes in the rheobase and chronaxy indexes occurred sooner and lasted longer at an altitude of 2,000 meters than did O₂ saturation of the blood; changes in the intermittence interval followed the O₂ saturation of the blood more closely.

Respiration of pure O₂ at altitudes of 2,000 and 5,000 meters completely prevented a decrease in the excitability and lability of the optic analyser.

Contagious Diseases

52. Anthrax in Wuhan

"Occupational Anthrax in the City of Wuhan," by Wang Hsing-che, Chung-hua P'i Fu Tsa-chih (Chinese Journal of Dermatology), No 3, 1958, pp 199-201 (From Meditsinskiy Referativnyy Zhurnal, No 7, Jul 59, p 159)

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"Nine persons with anthrax have been observed during the last 9 years. Eight of the nine patients were working in a tannery, working with raw hides without using protective gloves. Some 0.34-0.68% of the hides from local bulls and 1.44-2.88% of the hides from Sian bulls were infected with anthrax bacilli."

53. Type B Encephalitis Treated With Hibernation

"Hibernation Therapy of Epidemic Type B Encephalitis," Chung-hua Erh-k'o Tsa-chih (Chinese Journal of Pediatrics), No 1, 1959, pp 30-34 (from Meditsinskiy Referativnyy Zhurnal, No 7 Jul 59, p 120)

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"In July and August 1958, 28 patients with type B epidemic encephalitis were treated by the hibernation method; two of them (8.3%) died. The clinical symptoms are lost more quickly when patients are treated by hibernation than when the usual therapy is employed. The high temperature lasted an average of 1.4 days."

Epidemiology

54. Hemorrhagic Fever in Stavropol'skiy Kray

"The Problem of the Infectiousness of Hemorrhagic Fever in Stavropol'skiy Kray," by V. I. Bulynin and S. A. Poshekhnov, Gofitskaya District Hospital, Petrovskiy Rayon, Stavropol'skiy Kray; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 30, No 10, Oct 59, p 147

This article reports that seven cases of hemorrhagic fever were seen in Stavropol'skiy Kray in 1953. The author has concluded that this disease, endemic in the area, is transmitted to humans by tick bites. Analysis of group infection indicated possible transmission of hemorrhagic fever from human to human by direct contact.

One complete case history is given; the patient died on the sixth day of illness despite therapy, and subsequently a nurse, who had performed a transfusion, the patient's wife, and his sister all became ill. The course of the disease was severe, with a pronounced hemorrhagic syndrome in all cases. Patients who recovered did so during the third and fourth weeks.

The author considers these observations a clear indication that hemorrhagic fever is highly contagious, especially during the period when the hemorrhagic syndrome is most pronounced; he recommends strict observance of antiepidemic measures when dealing with this disease.

55. Role of Fleas in Epizootology of Plague

"*Neopsylla pleskei orientalis* and *Ceratophyllus laeviceps kuzenkovi* Fleas in the Epizootology of Plague," by Chin Kuo-hsiung and T'eng Ta-yu, Shui Tsung-k'an, No 1, 1958, p 51 (from Meditsinskiy Referativnyy Zhurnal, No 8, Aug 59 p 59)

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"*Xenopsylla cheopis* and *Ceratophyllus tesquorum sungaris* out of 40 species of ticks encountered in Inner Mongolia played an important role in the epidemiology of plague. In 1957, a *B. pestis* culture was isolated from *Neopsylla pleskei orientalis*, and *Ceratophyllus laeviceps kuzenkove* was removed from *Meriones unguiculatus*. *Neopsylla pleskei orientalis* fleas are widely distributed in the western regions of the province and are the principal parasite of *Meriones unguiculatus*; they are rarely encountered on *Citellus dauricus*, and still less frequently on *Cricetulus barabensis* and *Dipus saggita*. An average of 200 fleas of this species, and in some cases as many as 500, were found in *Meriones* nests in April-July. *Cer. laeviceps kuzenkove* are also parasites of *Meriones unguiculatus* and are sometimes found on *Citellus dauricus*, *Cricetulus barabensis*, and *Rattus norvegicus*. The index curve of prevalence of these two species of fleas corresponds in time with the epizootic curve for plague in *Meriones*. These curves rise in February-April."

56. Anti plague Research in China in 1958

"Natural Foci of Plague in China and Certain Aspects of Anti plague Research in 1958," by Yang Ch'ing-hsiu, Shui Tsung-k'an, No 1, 1958, pp 4-8 (from Meditsinskiy Referativnyy Zhurnal, No 8, Aug 59, p 58)

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"Citellus dauricus and rodents of the genus Ratticus, especially Rattus norvegicus, are the chief carriers of plague in natural foci in the three north-eastern provinces of China, in the northern part of the province of Hopeh, and in the south-eastern part of Inner Mongolia. M. sibirica is the chief reservoir of plague in the eastern part of Inner Mongolia along the borders of the USSR. R. rattus and M. unguiculatus play an important role in the epidemiology of plague in the central regions of Inner Mongolia; M. baibacina and M. caudata, in the province of Sinkiang; and M. himalayana, in the province of Tsinghai. There is every reason to assume that natural foci of plague exist in the province of Fukien, Chekiang, and Kiangsi."

Immunology and Therapy

57. Immunogenicity of Live Antitularemia Vaccine Increased

"The Problem of Increasing the Immunogenicity of Live Antitularemia Vaccine," by M. M. Faybich; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 30, No 10, Nov 59, pp 20-24

In introducing this article on the effects of several substances on live vaccines, the author refers to recently published reports which indicate that it is possible to produce experimental, generalized infection in slightly susceptible laboratory animals. These reports offered evidence that the intraperitoneal introduction of streptococcus, meningococcus, salmonella, and other cultures in solutions of several substances to laboratory animals will produce a lethal infection which cannot be caused by the same doses of microorganisms in physiological solution. The work of Roginskaya, who pointed out the possibility of producing experimental sepsis in mice by the intraperitoneal introduction of typhoid, paratyphoid A, and dysentery bacteria in 0.4% agar, is noted with particular interest. Agar, it is mentioned, is capable of reinforcing the distribution of microorganisms in the animal organism; it is also stable and very simple to prepare. The author was interested not only in the capacity of many mucous substances to "enhance the virulence" of microorganisms, but also in their capacity to increase the antigenic activity of killed vaccines.

The aforementioned reports suggested the possibility that colloidal and other substances such as glycerin could affect the development of immunity after the subcutaneous introduction of live vaccines (tularemia, antiplague, brucellosis, anthrax, etc.). In the author's experiments, the reactogenic and immunogenic properties of a live tularemia vaccine from strain No 10 were investigated on white mice. The vaccine was introduced subcutaneously in solutions of the following substances: 0.2% agar, one percent gelatin, 0.1-5% gum arabic, 5% glycerin, and 5% Malva decoction. Vaccine in physiological saline solution was used as a control in all experiments. The vaccine contained 500 million microorganisms per ml. The mice were given 0.2 ml of the vaccine, which contained one microorganism to 10 million microorganisms depending on the dilution. The animals were infected with 1,000 lethal doses of a virulent tularemia culture 30 days after vaccination.

Two tables containing survival rate and immunizing dosage data are given to show results, and the following conclusions are presented:

It was established that agar, gelatin, gum arabic, Malva decoction, and glycerin stimulated the immunogenicity of live tularemia vaccine; solutions of wattle gum and starch had no such properties. The minimum immunizing dose of live tularemia vaccine introduced to white mice in solutions of agar or gelatin was 10 microorganisms; in solutions of gum arabic, Malva decoction, and 5% glycerin, 100 microorganisms; and in physiological solution and solutions of wattle gum and starch, 1,000 microorganisms. The stimulating effect of agar was determined in studies of immunity not only in animals but also in humans (Zlatovskiy). The reactogenicity of the live vaccine introduced subcutaneously in solutions of agar, gum arabic, and gelatin was not increased. Solutions of 0.2% agar, one percent gelatin, and one percent gum arabic introduced subcutaneously to humans without the vaccine did not produce a more intensive reaction than the injection of physiological saline solution. The author suggests that the mechanism of the stimulating action of these substances on live vaccines should be regarded in the light of modern knowledge concerning factors which affect the distribution of microorganisms in the macroorganism.

Oncology

58. Effect of Ethyleneamine Derivatives on Tumors

"On the Problem of the Antitumor Action of Ethyleneamine Derivatives," by V. A. Chernov, A. A. Grushina, and Zh. F. Zakharova, Laboratory of Experimental Chemotherapy of Tumors, Division of Chemotherapy, All-Union Scientific Research Chemicopharmaceutical Institute imeni S. Ordzhonikidze; Moscow-Leningrad, Voprosy Onkologii, Vol V, No 9, Sep 59, pp 350-361

Investigations were conducted to determine the effectiveness of the therapy of tumors with ethyleneamine derivatives, including TEM (Triethyleneiminotriazine), TioTEF (triethyleneimide of thiophosphoric acid), and dipin (tetraethyleneimide piperazine of N.N-diphosphoric acid). Rats were used in the experiments. TEM, TioTEF, and dipin were administered intraperitoneally. Dipin was administered simultaneously with the somatropic hormone which was injected subcutaneously. The experimental data obtained established that TioTEF and dipin induced regression processes of sarcoma 45 expressed by the atrophy of the thymo-lymphatic tissue, reduction in the weight the thyroid gland as well as structural modifications of the gland, loss of weight in the hypophysis and seminal glands, and a slight hypertrophy of the suprarenals accompanied by a slight decrease in the concentration of ascorbic acid, and with some accumulation of ketosteroids in some animals. The somatropic hormone was found to somewhat enhance the therapeutic effect of dipin and TioTEF.

59. Effect of Purine Preparations on Ehrlich's Tumor

"Inhibitory Effect of Some Substances Similar to Purine on the Growth of Ehrlich's Tumor," by L. V. Zolotova and T. F. Guseva, Chair of Pharmaceutical Chemistry, Chair of Anatomy and Physiology of the Leningrad Chemicopharmaceutical Institute and the Laboratory of Experimental Oncology, Institute of Oncology, Academy of Medical Sciences USSR; Moscow-Leningrad, Voprosy Onkologii, Vol V, No 9, Sep 59, pp 362-364

Mice were used in experiments conducted to determine the effect of compounds structurally similar to purine on the growth of experimental Ehrlich's tumors. The preparations were synthesized at the Leningrad Chemicopharmaceutical Institute. The following preparations were tested: 4,6-dioxypyrimidine-2,1,3-thiodiazole; 4-oxo-6-thiopyrimidine-2,1,3-thiodiazole; 4,6-dioxo-7-methylpyrimidine-2,1,3-thiodiazole; 4,6-dioxo-5,7-dimethylpyrimidine-2,1,3-thiodiazole; and 4-oxo-6-iminopyrimidine-2,1,3-thiodiazole.

Some 5-10 million Ehrlich's ascitic carcinoma cells were administered to the animals. Therapy with the above compounds was begun 24 hours later and continued for a period of 7-12 days. The compounds in physiological solution were administered intraperitoneally. The experiments established that of all the above-mentioned compounds, 4-oxo-6-iminopyrimidine-2,1,3-thiodiazole was the most effective. It inhibited the growth of the tumors up to 60 percent.

60. Hydrolysin L-103 in Therapy of Tumors

"Application of Hydrolysin L-103 to Patients With Malignant Tumors," by I. S. Rozhek, Tambovskaya Oblast Oncological Dispensary and the Tambovskaya Oblast Blood Transfusion Station; Moscow-Leningrad, Voprosy Onkologii, Vol V, No 5, 1959, pp 582-586

The article describes the experiments conducted to determine the effectiveness of hydrolysin L-103 when used in the therapy of malignant tumors. Hydrolysin L-103 is the product of the incomplete hydrolysis of the proteins of heterogenous blood obtained from cattle. Fresh whole blood kept for no longer than 2 or 3 days is used in the preparation of hydrolysin L-103. The preparation contains all the irreplaceable amino acids, including triptophan, glucose, and salt. One liter of hydrolysin L-103 contains the equivalent of about 60 grams of protein, the amount of protein required daily by an average-weight patient. The preparation was administered to the patients before and after surgical interference. In all cases, favorable results were obtained: there was an improvement in the general condition of the patients, their sleep and appetite improved, and pain diminished. The preparation was found to be completely nontoxic. No side effects were noted.

On the basis of the experiments, hydrolysin L-130 is recommended for use as a blood replacing fluid in the therapy of tumors. The preparation can be stored for long periods of time and can be transported without impairing its quality.

61. Malignant Tumors in Food Industry Workers

"A Study of the Frequency of Malignant Tumors in Workers of Some Enterprises of the Food Industry," by B. D. Kaufman, A. I. Mironova, and L. M. Shabad, Laboratory of Experimental Oncology and Division of Organization and Methodology, Institute of Oncology, Academy of Medical Sciences USSR; Moscow-Leningrad, Voprosy Onkologii, Vol V, No 9, Sep 59, pp 314-319

The two present-day methods for the prophylaxis of cancer are the early recognition and therapy of precancerous conditions and the discovery of cancerogenic substances in the environment and the prevention of their

action on the organism. Smoked food products (fish and meats) are suspected of being cancerogenic, since the smoke which is used to process these foodstuffs contains the higher hydrocarbons, including 3,4-benzpyrene, a well-known cancerogenic substance. Fluorescent-spectral examinations of some of these foods revealed that one kilogram of normally smoked fish contains 3.3-6.7 gamma of 3,4-benzhydrene, with some of the internal portions containing as much as 38 percent of the chemical. Different kinds of smoked sausage were found to contain 1.9-10.5 gamma of 3,4-benzhydrene per kilogram, with some of the internal portions containing 65 percent of the chemical.

Further investigations established that the cancer mortality rate of workers employed in the smoked food processing industry is greater than that of the average of workers engaged in other branches of the food processing industry. The cancer incidence among workers of the smoked food industry was found to be in direct proportion to the number of years they were engaged in this particular branch of the food industry.

Pharmacology and Toxicology

62. Properties of Adenosine Triphosphoric Acid

"Concerning Some Properties of Adenosine Triphosphoric Acid,"
by G. Rashkova, Czechosl. Med. Obozreniye (Czechoslovak Medical Review), 1957, 3, No 1, 25-36 (from Referativnyy Zhurnal -- Biologiya, No 15, 10 Aug 59, Abstract No 69414, by A. I. Brusilovskaya)

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"Adenosine triphosphoric acid intravenously administered to rats in doses of one milligram per kilogram of body weight disinhibited differentiation; in doses of 5 milligrams per kilogram of body weight, it depressed positive conditioned reflexes. Adenosine monophosphoric acid when administered intravenously or intramuscularly had a weaker effect on conditioned reflexes. Bacterial toxins (dysentery and typhoid) blocked the action of acetylcholine in experiments which were carried out on an isolated section of the upper mesenteric artery of a cat. Under the influence of a perfusion of a 0.1-percent solution of adenosine triphosphoric acid, the action of acetylcholine was increased. In some cases, it was possible with the help of adenosine triphosphoric acid to restore to normal a section of a nerve in which parabiosis was induced with the help of adenosine triphosphoric acid [sic]. Adenosine triphosphoric acid also decreases the toxicity of the dysentery toxin, the typhoid and dysentery endotoxins, streptolysin O, and diphtheria toxin for mice; it has no effect on KCN. Adenosine monophosphoric acid has an effect similar to that of adenosine triphosphoric acid in toxin intoxication; adenosine is ineffective. Adenosine triphosphoric acid also reduces lethality in radiation sickness. In rabbits

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which received 10 milligrams per kilogram of body weight of adenosine triphosphoric acid 36 hours after the animals were intoxicated with the Shiga toxin, the blood level of unstable phosphorus was not decreased, an effect usually produced by the toxin when no adenosine triphosphoric acid is used."

63. Effect of Malathion on Organism

"On the Investigation of the Chronic Toxic Effect of Malathion on Rats," by L. Vrbovsky, L. Rosival, and F. V. Selecky, Bratisl. Lekar. listy (Slovakia), 1958, 1, No 9, 518-529 (from Referativnyy Zhurnal -- Biologiya, No 15, 10 Aug 59, Abstract No 69566, by the authors)

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"In experiments conducted on rats, malathion in doses of 100-330 milligrams per kilogram of body weight exhibited a cumulative toxic effect. Malathion increased the weight of some of the organs, decreased the weight of the rats, depressed the ability of the animals to reproduce, induced anemia, leukocytosis, neutrophilia, eosinopenia, and lymphopenia. The maximum allowable concentration of malathion is 10 milligrams/m³, and of parathion -- 0.1 milligram/m³."

64. Serpasil as Antispasmodic Agent

"Effect of Serpasil on the Spastic Condition of Muscles as Revealed by the Kymographic Method," by V. Pit'ha, Z. Masin, and O. Polak, Ceskosl. Neurol. (Czechoslovakia), 1959, 22, No 1, 30-38 (from Referativnyy Zhurnal -- Biologiya, No 15, 10 Aug 59, Abstract No 69270, by the author)

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"The effect of serapsil on the spastic condition of muscles was studied in 16 patients suffering from diffused sclerosis, with the help of the kymographic method. A diminution of the pathologically raised knee reflex until its restoration to normal was noted; a decrease or complete disappearance of the spastic condition of the muscles and the restoration of voluntary movements took place."

65. Use of P^{32} in Investigation of Intoxications by Fluorine, Vanadium, and Manganese

"Application of Radiophosphorus in Investigating the Disturbed Metabolism of Phosphorus Containing Compounds in Intoxications of the Organism by Fluorine, Vanadium, and Manganese," by T. A. Prokopenko, Vopr. Gigiyeny Truda Profpatol. i Prom. Toksikol. (Problems of Labor Hygiene, Occupational Pathology, and Industrial Toxicology), Vol 2, Sverdlovsk, 1958, 244-254 (from Referativnyy Zhurnal -- Biologiya, No 15, 10 Aug 59, Abstract No 69542, by R. S. Vorob'yeva)

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"Rats received intraperitoneally 20-25 milligrams per kilogram of body weight of sodium fluoride (I); 15-20 milligrams per kilogram of body weight of ammonium vanadate (II); and 100 milligrams per kilogram of body weight of manganese chloride (III). The detoxication of the poisons was carried out in the following manner: by the intraperitoneal administration of 50 milligrams of lactate (IV); by the administration of 10-20 milligrams of ascorbate (V); and by the administration of 5 milligrams of vitamin B₇ (VI) in combination with 50 milligrams of (IV) subcutaneously. Simultaneously with the administration of the poisons and the detoxication preparations, P^{32} in the form of a phosphate having 3,000-5,000 impulses/gram was subcutaneously administered to the animals. Two hours later the animals were killed. The content of the total and radioactive phosphorus in different fractions of the acid-soluble phosphorus containing compounds in the liver were then determined. The administration of (I) sharply retarded the metabolism of phosphoric acid compounds in the liver, particularly their acid soluble fraction. The intensity of the inclusion of P^{32} into the organophosphorus compounds decreased under the effect of (II); this effect, however, was expressed to a lesser degree than it was with the use of (I). The administration of (IV) and (V) restored the metabolism of phosphorus containing compounds in the liver. Acute intoxication of the animals by (III) led to a considerable increase in the accumulation of P^{32} in the fractions of the inorganic phosphates with a simultaneous decrease in the intensity of the metabolism of the organic barium soluble phosphoric acid compounds. The administration of (IV) and (VI) had no effect on the disturbed metabolism of the phosphorus containing compounds."

66. Phospholipid Metabolism in Intoxications

"Phospholipid Metabolism in the Liver and Certain Other Organs in Trinitrotoluene, Dichloroethane, and Carbon Tetrachloride Intoxications," by A. A. Rubanovskaya, Tr. po Frimeneniyu Radioact. Izotopov v Meditsine (Works on the Application of Radioactive Isotopes in Medicine), Second Issue, M., Medgiz, 1955, 241-250 (from Referativnyy Zhurnal --- Biologiya, No 15, 10 Aug 58, Abstract No 69560, by V. Ya Rusin)

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"P³² was used in the investigation of phospholipid metabolism and the accumulation of P³² in the organs of rats intoxicated by trinitrotoluene (I), dichloroethane (II), and CCl₄ (III). The animals were killed 10 hours after the administration of P³² in the form of Na₂HPO₄ on the basis of 1,000 imp/g. (I) was administered to the animals in the form of a solution in vegetable oil either in a single administration or three times daily on the basis of 100 milligrams per rat. In some of the experiments, (I) was administered in a single dose into the stomach. The experiments revealed that intoxication by (I) had almost no effect on phospholipid metabolism. Accumulation of P³² in the spleen was noted. (II) was administered to the animals subcutaneously on the basis of 0.5 milligram per kilogram of body weight three times a day. In some of the experiments, the animals were intoxicated by the inhalation of (II) in the form of a vapor contained in a chamber in a concentration of 200 milligrams per liter; the animals were exposed to the action of the vapor twice daily, one day after they had been exposed to the action of the vapor for one hour. No modifications in the metabolism of phospholipids in the spleen were found; phospholipid metabolism in the liver decreased an average of 22.8 percent. (III) was administered to the animals subcutaneously every other day in doses of 0.3 milligram twice and in a dose of 0.4 milligram once. Phospholipid metabolism in this case decreased an average of 30.6 percent. A decrease in the quantity of phospholipids in the liver and some decrease in the intensity of their metabolism was noted only in cases of severe intoxications which were accompanied by expressed pathomorphological changes in the liver."

67. Largactil Intoxication

"Concerning a Case of Intoxication by Largactil," by V. Tacu, Rev. Med.-Chirurg. RPR, (Rumania), 1958, 62, No 3, 639-642 (from Referativnyy Zhurnal --- Biologiya, No 15, 10 Aug 59, Abstract No 69300)

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"Nervous disorders typical of intoxication by largactil developed in a patient who received 675 milligrams of the drug; however, neither arterial pressure nor body temperature were reduced. Symptoms of gastrointestinal paresis were noted for a period of 6 days. The patient recovered without special therapy."

68. Effect of Largactil on the Liver

"Acute Yellow Atrophy of the Liver Developed During the Period of Therapy With Largactil," by P. Donchev, K. Kirov, and B. Vasileva, Sovrem. Meditsina (Bulgaria), 1958, 9, No 9, 90-93 (from Referativnyy Zhurnal -- Biologiya, No 15, 10 Aug 59, Abstract No 69299)

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"Yellow atrophy of the liver, which terminated in death, developed in a patient suffering from cyclophrenia (maniacal phase) 2½ months after treatment with largactil was begun. Doses of 200-400 milligrams a day were administered."

69. Synthetic Antimicrobial Preparations

"Investigation of New Antimicrobial Substances of Synthetic Origin," by M. N. Rotmistrov, A. V. Stetsenko, G. V. Kulik, I. A. Vasilevskaya, and S. N. Kharchenko; Kiev, Mikrobiolochnyy Zhurnal, Vol XXI, No 3, 1959, pp 31-35

A report on the results of the investigations conducted to determine the spectrum of antimicrobial action of some alkyl phenols and haloidanilides of salicylic acid synthesized by the authors is presented. It was found that: of the alkyl phenols, 4-tertiary butylphenol and the sodium salt of 4-tertiary butylphenol have a wide spectrum of antimicrobial action, are slightly toxic, and can be therapeutically applied; and of the haloidanilides of salicylic acid, 4-bromanilide of 5-bromosalicylic acid and 4'-iodoanilide of 5-iodosalicylic acid have a wide spectrum of antimicrobial action and are almost nontoxic. The four preparations mentioned above do not irritate the skin or the mucous membrane of the mouth. They are themostabile and can be stored for long periods of time in dry form in solutions. They have antimicrobial and antibacterial properties similar to those of the antibiotics. The preparations have been clinically tested in the therapy of diseases of the mouth of microbial etiology.

70. Therapy of Psychoses With Serpasil

"Results of the Therapy of Some Psychoses With Serpasil [Reserpine]," by Iv. Temkov and N. Zaimova, Sovrem. Meditsina -- (Bulgaria), 1958, 9, No 9, 29-30 (from Referativnyy Zhurnal -- Biologiya, No 15, 10 Aug 59, Abstract No 69273, by the authors)

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"On the basis of experiences gained in the therapy of psychotic patients with reserpine, the authors concluded that reserpine is not only ineffective in alleviating depression states (depression phase of manic-depressive psychosis, involutional depression), but intensifies depression, internal tension, and alarm. Maniacal conditions (maniacal phase of manic-depressive

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psychoses and symptomatic psychoses which develop particularly as a result of vascular disorders and hypertonia) lend themselves well to the action of reserpine. Reserpine is ineffective when used in the treatment of patients suffering from acute stages of schizophrenia and of patients afflicted with paranoia. The prolonged treatment of patients afflicted with chronic schizophrenia with large doses of reserpine may improve their condition. The combined application of reserpine with largactil enhances the effectiveness of reserpine. Reserpine alone when used in the therapy of psychotic patients is not as effective as when largactil alone is used."

71. Effect of Some Chemical Preparations on Hemopoiesis

"Effect of Some Chemical Preparations on the Elements of Hemopoiesis in Tissue Culture, by Doctor of Biological Sciences E. I. Terent'yeva and R. A. Mokeyeva, Central Order of Lenin Institute of Hematology and Blood Transfusion, Ministry of Health USSR' Moscow, Problemy Gematologii i Perelivaniya Krovi, Vol IV, No 9, Sep 59, pp 29-35

A description is given of experiments conducted to determine the effect of myelosan, dopan, and 6-mercaptopurine on bone marrow cultures of healthy persons and of persons suffering from leukosis. Bone marrow was obtained by a puncture of the sternum. Myelosan when applied to healthy bone marrow cultures in a concentration of 0.2 milligram percent produced no significant changes in the cell composition of the control an experimental cultures. In higher concentrations, it produced a number of degenerating cells. Dopan applied in concentrations equal to those of myelosan produced an effect similar to that of the latter. The application of 6-mercaptopurine to cultures of healthy bone marrow had an effect similar to that produced by myelosan and dopan, although considerably larger doses of the drug were required.

Myelosan, dopan, and 6-mercaptopurine, when applied to bone marrow cultures obtained from persons suffering from leukosis, produced highly destructive changes in the cells of the blood producing tissue, even when used in low concentrations. This was particularly noticeable in patients afflicted with acute leukosis.

72. Detection of Poisoning by Coumarin Derivatives

"On Poisoning by Coumarin Derivatives and Its Detection," by H. Bentz and M. Kuehnert, Institute of Veterinary Pharmacology and Toxicology, Karl Marx University, Leipzig; Leipzig, Monatshefte fuer Veterinaermedizin, Sonderheft, Oct 59, pp 26-28

In East Germany, the commercial rat poisons which have an oxycoumarin base are Ratron, marketed by Delicia, and Horatan, marketed by VEB (People-Owned Enterprise) Fahlber-List. Both preparations have 3-(alpha-phenyl-beta-acetyethyl)-4-oxycoumarin as the active component. The above institute has had good success with experimental detection of this coumarin component in both feces and organic material by a method employing in ultraviolet absorption spectrum. Both pure samples and commercial preparations supplied by VEB Fahlberg-List, Magdeburg, and Delicia, Delitzsch were used in the experiments. For the determination of the ultraviolet spectrum, a Zeiss universal spectral photometer was used. The first step was the determination of curves for the pure samples in alcohol solution, in the wave length range of 270-310 millimicrons. The maxima found at 273, 283, and 307 millimicrons are approximately in agreement with the values found in the literature (Garner, Veterinary Toxicology, London 1957; Nord. vet. med., No 8, 1956, p 514; Coon, Richter, Hein and Krieger, J. Agric. Food Chem., No 2, 1954, p 739). On the basis of the concentration curves plotted for a maximum of 307 millimicrons, it was found that, in the case of concentrations between 0.25 and 1.75 mg-% (alcohol solution), there is a linear increase of extinction which can be expressed by a fixed factor -- 2.457. The commercial samples of the two firms showed no appreciable differences.

Physiology

73. Reactions of Respiratory Center to Excess CO₂

"On the Relationship Between Conditioned and Unconditioned Reactions in the Activity of the Respiratory Center," A.V. Pogrebkova, Laboratory of Interoceptive Conditioned Reflexes of the Institute of Physiology imeni I. P. Pavlov, Academy of Sciences USSR; Leningrad, Fiziologicheskiy Zhurnal, No 8, Aug 59, pp944-999

The author of this article states that the results of 324 experiments on three dogs revealed that the respiratory reaction of a healthy organism to an excessive carbon dioxide content (about 6%) in the inspired air takes the form of a complex, unconditioned reaction to a whole group of irritants. The entire respiratory analyzer is involved in the reaction of the organism to changes in the gaseous composition of the air in the immediate environment. This unconditioned reaction appears, first, as a conditioned reflex, the release and subsequent refinement of which occurs because of the involvement and interaction of the interoceptive and exteroceptive reflexes associated with the activity of the respiratory system. Subsequently, the conditioned reflex is extinguished when the gaseous composition of the ambient air becomes normal.

74. Relationship Between Muscle Tonus and Oxygen Consumption Studied

"Oxygen Consumption and Variation of Muscular Tonus During Hypoxia," by K. P. Ivanov, Laboratory of Ecologic Physiology, Institute of Physiology imeni I. P. Pavlov, Academy of Sciences USSR; Leningrad, Fiziologicheskiy Zhurnal, No 8, Aug 59, pp988-993

The author of this article states that electrophysiological recordings of muscle tonus variations and oxygen consumption were obtained in experiments on 40 rabbits in which hypoxia was produced by the administration of a gaseous mixture with a reduced oxygen content. Increased oxygen consumption was found to coincide with increased muscle tonus when the animal was inspiring a mixture which contained between 12% and 15% oxygen. Reduced oxygen consumption associated with the inspiration of a mixture of gases containing between 7% and 4% oxygen was accompanied by depression of muscle tonus. No alteration of muscle tonus was found to occur if there was no change in oxygen consumption during hypoxia. The level of metabolism under hypoxia conditions may be assumed to depend, to a certain extent, on variations of skeletal muscle tonus.

75. Research on Effect of Low Temperatures on Living Organisms

"New Developments in Work on the Effect of Low Temperatures on Organisms" by Prof L. K. Lozina-Losinskiy, Doctor of Biological Sciences, Institute of Cytology, Academy of Sciences USSR; Moscow, Kholodil'naya Tekhnika, Vol 36, No 4, Jul/Aug 59, p 64

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"The conditions have been investigated under which it is possible to store animal tissues and cells, at temperatures from minus 79° to minus 253° for a long time without injury. It was established that many tissues and cells, including tumor cells, are capable of reviving i.e., these cells can grow and multiply, after being kept at low temperatures within this range. Formation of ice crystals in the cells after freezing is the phenomenon which endangers life to the greatest extent. For this reason, the principal efforts of scientists are aimed at eliminating intracellular crystallization during freezing. The most important measures which prevent crystallization in cells are cooling at a rapid rate, rapid thawing, prior adaptation ["hardening"], and treatment of cells with protective substances. Treatment of cells and tissues with glycerin enables one to subject these cells and tissues to considerable supercooling, and reduces crystallization both outside and inside the cells. This method is of considerable importance from the practical standpoint. Successful experiments on the deep cooling and freezing of intact animal organisms have been carried out. In the case of insects, the temperatures were lowered to minus 79° and even to minus 190°. Successful research is being done in the USSR on the restoration of the cardiac activity of human beings after clinical death and on the application of low-temperature anesthesia in surgical operations. Research along this line is of great importance not only for medicine and agriculture, but also from the theoretical standpoint."

[SIR Note: This is an abstract of a paper presented at the All-Union Scientific-Technical Conference on Refrigeration Engineering, Leningrad, (6-9 April 1959.)]

76. Book on Physiology of Fatigue Reviewed

Vaprosy Fiziologii Protssessov Utomleniya i Vosstanovleniya (Problems of the Physiology of the Processes of Fatigue and Recovery), edited by Academician G. V. Fol'bort reviewed by N. K. Vitte; Kiev, Gigiyena Truda i Professional'nyye Zaboli-vaniya, No 4, Jul/Aug 59, p 60

The reviewer of this collection of scientific works of associates and students of G. V. Fol'bort, member of the Academy of Sciences Ukrainian SSR, states that the vigor of any organ of the body becomes depleted, and its reacting ability decreases after prolonged and intensive activity. The subsequent recovery depends on the original condition of the organism. Recovery usually proceeds in a wavelike manner and takes the form of an

improved degree and quality of efficiency. If new work undertaken is accompanied by efficiency and stability, it can be assumed that the organ is becoming conditioned; otherwise, a state of chronic exhaustion develops.

V. V. Frol'kis, A. A. Yemchenko, Yu. Yu. Men'shik, S. I. Moldavskaya, S. M. Plotnikova, and other pupils of G. V. Fol'bort checked observations of the condition of the heart and skeletal muscles, pancreas, etc. and found confirmation of the above-stated theories in the salivary glands.

This collection of scientific works contains material on how the muscular activity in animals and humans is reflected in higher nervous activity, in the condition of metabolism, and in nutrition. V. A. Novi conducted work on humans, and S. I. Chernyy, on animals. Prof N. I. Putilin and his associates D. G. Nalivayko and S. I. Kondrashev showed the dynamics of vigorous processes in a salivary gland as far as the type of its activity and the condition of excitation and inhibition are concerned. Histological observations of E. L. Bromberg concerning the efficiency of salivary glands and B. A. Vartapetov's discussion of new methods of recording animal blood pressure are also found in this collection of scientific works.

The reviewer considers this book valuable in that it gives the reader a chance to become acquainted with the theory of fatigue as it was developed systematically by G. V. Fol'bort over a period of years. Scientific work that was not carried on in a laboratory under the direction of G. V. Fol'bort and information contained in foreign literature have not been used sufficiently.

Ideas developed in this book are the same as those expressed in the collection of scientific works of the Chair of Normal Physiology of the Kiev Medical Institute, published in 1951 under the title Fiziologiya Protssessov Utomleniya i Vosstanovleniya (Physiology of the Processes of Fatigue and Recovery). The book is quite useful not only to physiologists, but also to workers in the field of preventive medicine.

Public Health, Hygiene, and Sanitation

77. Allowable Concentration of Methanol Vapors in the Air

"Data on the Hygienic Norm for the Threshold of Allowable Concentration of Methanol Vapors in the Atmospheric Air," by Tuan Feng-ju, Chair of Public Hygiene, Central Institute for the Advanced Training of Physicians; Moscow, Gigiyena i Sanitariya, Vol XXIV, No 10, Oct 59, pp 7-12

Investigations were conducted to determine the allowable concentration of methanol vapors in the air. Methanol is an initial material used in the production of formaldehyde, phenolformaldehyde tars, and a number of synthetic products. It is used widely as a solvent in the manufacture of paints,

chemicopharmaceutical preparations, and other products. Large quantities of methanol vapors are discharged into the air by the wood-processing, paint, metal-processing, and chemical industries. The study of the effect of methanol vapors on man and animals, and of the threshold of permissible concentration of the vapors in the air is of particular importance at present, inasmuch as the current Seven-Year Plan for the development of the economy of the USSR envisages a considerable increase in production and use of methanol.

The investigations established that the threshold of olfactory perception for methanol is 4.3 milligram/c³; the threshold for optical sensitivity is 3.4 milligrams/c³; animals exposed to methanol vapors in concentrations of 50 milligrams/c³ for a period of 3 months for 12 hours a day developed modifications in motor chronaxy; and chronic intoxication with methanol vapors in concentration of 1.8 milligrams/c³ had no effect on the motor chronaxy and rheobase of the animals.

On the basis of the data obtained, the maximum threshold for methanol vapor concentration in the air was established at 1.5 milligrams/c³.

78. Microorganisms in Milk Destroyed by Electric Discharge

"The Universal Effect of an Electric Discharge on Milk," by V. D. Surkov, N. Ye. Fedorov and I. A. Rogov, Moscow Technological Institute of the Meat and Milk Industry; Krasnodar, Izvestiya Vysshikh Uchebnykh Zavedeniy-Pishchevaya Tekhnologiya, No 4, 1959, pp 66-72

When an electric impulse is produced in milk and cream, cavitation phenomena arise and become the basic reason for the changes occurring in the product. The changes were confirmed by means of microphotographing fat particles and by the determination of physical characteristics.

In all cases, the simultaneous development of fat coalescence and dispersion is noted in the initial stage. The intensity of the development of one or the other factor depends on the physicochemical preparation of the medium and the operation temperature of the actual process.

The concentration of fat in the plasma appears to be the deciding factor in achieving a given end product.

The action of the electric impulse in milk is accompanied by the destruction of microorganisms in the product.

Radiology

79. Polonium Distribution and Its Elimination From Animals After Unithiol Administration

"Distribution Characteristics of Polonium and Its Elimination From Animals After Unithiol Administration," by Ye. V. Erleksova; Moscow, Meditsinskaya Radiologiya, Vol 4, No 8, Aug 59, pp 54-60

The purpose of this research was to explain the effect of unithiol (2,3-dimercaptopropanol) on the processes of distribution and elimination of polonium from organisms and the nature of the changes in the organs of the animals to which this preparation was administered.

Photomicrographs and autoradiograms of the organs of control and experimental rats after the administration of polonium (Po^{210}) calculated at 0.1 microcurie/kg are presented.

The author presents the following conclusions:

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"1. The earlier use of unithiol, in the amount of 100-50 mg/kg after the entrance of polonium (0.1 mC/kg) into an organism speeds and quantitatively increases the amount of this element excreted from an organism. Polonium, on the whole, is eliminated through the urinary system (kidneys), where it is found in large concentrated quantities. Thereby, the polonium content in the rest of the organs and systems is diminished. This is markedly expressed in the hemopoietic organs (spleen and lymph glands).

"2. The life duration of experimental white rats is prolonged from 13 to 95 days. The acute course of the disease assumes a chronic form.

"3. After the use of unithiol, the morphological symptoms of the effect of polonium on the hemopoietic organs are delayed with the passage of time and do not assume such severe forms (the complete disappearance of blood formed elements) as compared with control rats at the time of their death on the 11th-13th-20th day after the subcutaneous administration of polonium (0.1 mC/kg). The macrophage reaction in the experimental rats is lowered, and with it, the number of zones producing strong ionization is diminished due to the capture of polonium by macrophages.

"4. In the kidneys, due to the accumulation of large quantities of polonium, dystrophic changes appear sooner than in the controls, and the changes are severe in nature (toward the 102nd-115th day, they assume the picture of acellular nephrosclerosis)."

80. Sequence in Development of Pathological Processes due to Ionizing Radiation

"The Sequence of Blood Reaction Changes due to the Effect of Ionizing Radiations," by A. N. Komissarov, N. Ye. Komissarov, and L. T. Kostitsyn, Main Military Hospital imeni N. N. Burdenko; Moscow, Terapevticheskiy Arkhiv, Vol 31, No 8, Aug 59, pp 3-11

A systematic study was conducted over a 5-year period on the peripheral blood of 30 people working in an X-ray therapy department, and of 100 patients suffering from thrombophlebitis and treated by small amounts of X rays (25 r per treatment). Results revealed a certain sequence in the reaction changes of the hemopoietic tissue. These reaction changes depended on the sensitivity threshold of the erythropoietic and leukopoietic systems (with their various cellular elements) to X rays. This sequence in the development of the pathological processes in the hemopoietic tissue due to the effect of ionizing radiation can be outlined as follows:

Phase of hemodynamic neurocirculatory reactions with the appropriate changes in the peripheral blood indexes.

Phase of stimulation of hemopoietic tissue proliferation

Stage of eosinophilia, lymphocytosis, and monocytosis

Stage of leukocytosis with eosinophilia, lymphocytosis, and monocytosis

Stage of leukocytosis with delayed differentiation of the myeloid elements

Stage of leukemoid reactions with the possible onset of acute leukosis (reticulosis and hemocytoblastosis)

Phase of inhibition of proliferation and differentiation of the hemopoietic tissue

Stage of leukopenia

Stage of leukopenia with the delayed differentiation of the myeloid elements

Stage of agranulocytosis (rare)

Stage of hemorrhagic aleukia

Panmyelocytosis.

81. Radiation Injuries of Ovaries Reviewed

"Radiation Injuries of Ovaries," by M. N. Pobedinskiy; Moscow, Meditsinskaya Radiologiya, Vol 4, No 3, Aug 59, pp 72-78

The author reviews Soviet and non-Soviet sources on the subject of radiation injuries of ovaries. Data from the past half century include both clinical observations and animal experimentation. Pertinent material discusses the radiosensitivity of the ovaries at various periods in their development and maturation. The reaction of ovaries (histological changes and disturbances in the estral and menstrual cycles) exposed to a single whole-body irradiation by large doses is compared with the reaction of ovaries exposed to small doses over a long period. The effects of local and general irradiation, the development of angioneurosis, the onset of malignancy, disturbances in fat metabolism, sterility, and the shortening of life are also discussed.

Treatment of ovaries subjected to radiation injuries includes the administration of gonadotrophic hormone, the implantation of hypophysial tissue, the transplantation of ovarian tissue, and the use of compounds such as BAL (2,3-dimercaptopropanol), mercaptoethylamine, and cystineamine.

82. Treatment of Acute Radiation Damages

"Basic Principles in Treating Acute Radiation Damages," by Prof V. B. Farber, First Chair of Therapy for Advanced Training of Physicians, Military Medical Order of Lenin Academy imeni S. M. Kirov; Moscow, Terapevticheskiy Arkhiv, Vol 31, No 8, Aug 59, pp 12-17

The syndromes of acute radiation damages most resistant to complex antiradiation therapy seem to involve disturbances in immunogenesis, hemopoiesis, and blood coagulation and, to a lesser degree, in respiration, circulation, and digestion.

To combat these syndromes most effectively, the author outlines the use of various preventive and therapeutic means, such as the use of vitamins (B group, C, PP, and PABA), neuroplegic and neurotrophic compounds, analeptics, mercamine-type compounds, tezan-25, the intravenous administration of whole blood and blood components (thrombocytes with an adequate "charge" of thrombokinase, etc., antibiotics, and a well-balanced diet of proteins fats and carbohydrates.

Best results are obtained when the antiradiation measures are taken prior to, during, and soon after irradiation, plus the subsequent combined therapy of radiation sickness.

83. Case of Portal Thrombosis Cured by Radioactive Phosphorus

"Portal Thrombosis in Erythrema Cured by Radioactive Phosphorous," by M. F. Taron-Fokina, Therapeutic Clinic, Central Clinical Hospital, Ministry of Railways USSR; Moscow, Terapevticheskiy Arkhiv, Vol 31, No 8, Aug 59, pp 41-43

The author describes a case of polycythemia with a clinically atypical course. Polycythemia was diagnosed in a 35-year-old patient long after thrombosis had developed in the portal system. This single case merits attention because despite the very severe clinical picture (vomiting, blood in stool, ascites, and acute abdomen), treatment by radioactive phosphorus resulted in complete clinical and hematological remission which is still maintained 2 years later.

The patient's clinical history, treatment, and detailed blood study are described for a 37-day period. The results are discussed, and several hypotheses are presented.

84. X-Ray Therapy of Infectious Encephalitides

"X-Ray Therapy of Infectious Encephalitides," by N.S. Kharov, X-Ray Department of Ukrainian Scientific Research Psychoneurological Institute; Moscow, Vestnik Rentgenologii i Radiologii, No 5, Sep/Oct 59, pp 3-6

This article presents data on results of X-ray therapy of 42 patients suffering from infectious encephalitis and meningoencephalitis.

The dose ranged from 50 to 100 r per treatment, with a total dose of 400-900 r per course of treatment. The majority of patients arrived with the chronic form of the disease and were treated by X-ray therapy combined with other therapeutic agents (glucose, urotropin, vitamins, antibiotics, etc.). Additional details of the patients' conditions, treatments, and responses are included.

Various degrees of improvement were noted in 32 patients; in some, there was partial or complete restoration of working capacity. There was slight improvement in 6 others, and no improvement in the remaining 4 patients.

The author presents the following conclusions:
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"X-ray therapy is an effective means of treating infectious encephalitides and meningoencephalitides. X-ray therapy is especially recommended in chronic processes which respond poorly to other methods of treatment.

CPYRGHT

"During X-ray therapy of patients suffering from infectious encephalitis and meningoencephalitis, the unpleasant subjective phenomena and disturbances of motor function are the first to disappear. The most stable are the disturbances of the sensory sphere and pathological changes in the cranial nerves."

85. Near-Focus X-Ray Therapy of Lip Cancer

"Our Experience of Near-Focus X-Ray Therapy of Lip Cancer," by M. S. Polushina-Fedorovich, Central Clinical Roentgenological Hospital, Ministry of Railways USSR; Moscow, Vestnik Rentgenologii i Radiologii, No 5, Sep/Oct 59, pp 7-11

This article describes results of near-focus X-ray treatment of 160 patients with various stages of lip cancer. Immediate results were as follows: 100% cure of 137 patients in the first stage and 95.6% cure for patients in the second stage of the disease. The cure for those in the third stage was 78.9%.

The author presents the following conclusions:

CPYRGHT

"Near-focus X-ray therapy is a simple and effective method of treating lip cancer.

"Treatment can be administered at the outpatient department without interruption of the patient's work.

"This method of X-ray therapy is most effective for the first and second stages of lip cancer."

86. Basic Problems of Contemporary Radiobiology Reviewed

"On Certain Problems of Contemporary Radiobiology," by Prof A. V. Pobedinskiy and Yu. I. Moskalev; Moscow, Vestnik Akademii Meditsinskikh Nauk SSR, No 9, Sep 59, pp 3-16

This article reviews Soviet and non-Soviet sources on several interesting, basic problems of contemporary radiobiology. The effect of ionizing radiations on organisms may be subdivided into radiation effects on the various cell components, on organs and systems, and on the organism as a whole.

The significance of studying the effects of ionizing radiations on individual cell components lies in the possibility of linking radiation sequelae to definite cellular components, such as the chromosomes, the microsome, etc. The subject of mutation and its various aspects, causes, and mechanisms is considered.

Radiation-induced changes in the nervous system and the endocrine system and the toxic products thus produced are reviewed. The high radiosensitivity of the central nervous system, especially its synaptic apparatus, and disturbances in vascular tonicity, permeability, and hemopoiesis are emphasized.

Additional significant information discusses radiation hazards to the organism as a whole, such as the stimulating effect of radiation, physiological injury, the radiation threshold, the natural (background) radiation level, dynamic "radioactive" equilibrium, adaptation, and death. The possibility of pathological regeneration leading to the onset of malignant neoplasms is also mentioned.

Numerous sources of ionizing radiations with their varying characteristics are discussed.

Surgery

87. Convalescing Burn Victims Acquire Active "Antiburn" Immunity

"The Effect of Immunotherapy on the Renal Functional Condition During Burn Sickness," by S. V. Skurkovich and I. I. Zaretskiy, Pathophysiological Laboratory, Central Institute of Hematology and Blood Transfusion, Ministry of Public Health USSR; Moscow, Khirurgiya, No 7, Jul 59, pp 16-20

Results of various renal function tests and general unanalysis on seven dogs subjected to severe burns are discussed. The authors present the following conclusions:

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"1. The administration of serum obtained from donor dogs convalescing from severe burns, to burn victims prevents the development in the latter of postburn anurea. Simultaneously, normalization of the rhythm of diureses and also of the renal concentration capacity are noted.

"2. Immunotherapy leads to improved intrarenal circulation. This is manifested by increased glomerular filtration, effective renal circulation, and the normalization of the permeability of the glomerular membrane.

"3. The administration of serum from convalescing burn patients aids in maintaining the secretory activity of the tubular epithelium at the optimum level all through the toxic phase.

"4. There is every reason to assume that the toxemic factor evident in burns exerts a marked negative effect on renal activity, especially on the functional condition of the tubular portion of the nephron.

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"5. In animals which had suffered burns and which, by virtue of this experience, had acquired active antitoxic 'anti-burn' immunity, repeated thermal trauma did not exert so pronounced an injury of the specific tubular function as was the case after the initial burn."

88. Rapidly Solidifying Liquid Plastic Substance Recommended for Primary and Postoperative Covering of Burned Surfaces

"A Film Made From a Rapidly Solidifying Liquid Plastic for the Primary Covering of Burns," by V. A. Polyakov, Central Institute of Traumatology and Orthopedics, Ministry of Public Health USSR; Moscow, Khirurgiya, No 7, Jul 59, pp 13-16

A rapidly solidifying film made from liquid plastic and containing analgesics, antiseptics, and antibiotics for the primary covering of burns is described and recommended for use in cases of simultaneous extensive burns and lack of thorough surgical treatment. The film, which was tested on 82 rabbits with favorable results, forms a harmless elastic sheath which hermetically seals the burned surface from unfavorable external effects without retarding the healing processes.

This film can be used for first aid and self aid at factories, under expeditionary conditions, and at polyclinics as a substitute for "kleol," for covering postoperative sutures after surgery, and to fix skin grafts in plastic surgery, etc.

The application is simple and can be performed by the nurse under the surgeon's supervision. The composition and certain advantages of this substance are described.

89. Burn Center Proposed for Treating Severe Burn Victims

"Treatment of Extensive Thermal Burns," by R. L. Ginzburg and Prof N. N. Priorov; Moscow, Khirurgiya, No 7, Jul 59, p 3-12

Certain Soviet and non-Soviet sources on the various procedures for treating extensive burn injuries are reviewed. Immediate aid and long-term therapy, local and general treatment of burn victims, and the use of sedatives, transfusion, antibiotics, skin transplantations, drugs, diet, etc. are considered.

Experiments are now being conducted on the use of the proteolytic activity of streptococcal enzymes in treating burn injuries. These enzymes -- varidase, streptokinase, and streptodornase -- which are obtained from streptococci, initiate lysis of burn scars and promote healing.

Prof N. N. Priorov, head of the Central Institute of Traumatology and Orthopedics, has organized a so-called "bank" for the storage of various tissues, including skin, thus making it possible to have the necessary materials available for emergency cases of severe extensive burns.

The authors conclude the article by stating that the tremendous and difficult task of treating severe burns requires that the subject be studied on a large scale by clinical observations. To do this, it is necessary to organize a burn center where appropriate conditions will be established for treating such patients, and where clinicians, immunologists, hematologists, bacteriologists, morphologists, biochemists, and histologists can combine their efforts.

Veterinary Medicine

90. Serological Diagnosis of Brucellosis suis

"Serological Diagnosis of Brucellosis suis, " by Ch. Lehnert, Institute of Veterinary Microbiology and Veterinary Medicine Karl Marx University, Leipzig; Leipzig, Monatshefte fuer Veterinaermedizin, Sonderheft, Oct 59, pp 65-69

Swine infected with brucellosis very rarely react to slow serum agglutination with high titers. Higher titers are obtained with the Coombs test and, at times, with agglutination in a 5-percent NaCl medium. The Coombs test can be used on animals for which a positive diagnosis cannot be obtained by ordinary agglutination. Nonspecific agglutination reactions occur in about 50 percent of healthy animals in dilutions of 1:10 and 1:20, more rarely 1:40, and often involve diagnostic difficulties. Agglutination at 56°C eliminates or mitigates these nonspecific reactions without essential influence on infection titers. This method is therefore suggested for clarifying questionable reactions.

Miscellaneous

91. Machine Capable of Being Educated Developed

"A Machine Capable of Learning," by Prof S. Braynes, director of Experimental Laboratories of Institute of Psychiatry, Academy of Medical Sciences USSR: Moscow, Izvestiya, 19 Aug 59, p 4

Individual principles developed during study of the cerebrum may be utilized for the construction of new cybernetic machines. This path of research promises to yield much for the technique of solving the actual theoretical problems posed at present.

It is necessary especially to emphasize that the matter concerns not only the application of already known laws, but also concerns new specialized investigations for the study of those problems which arise during the development of cybernetic machines.

The teaching of Academician I. P. Pavlov give a firm scientific basis to these investigations. The methods of objective study of higher nervous activity, developed by I. P. Pavlov and his apprentices, open the way for the solution of several theoretical questions posed in the field of cybernetics. In particular, physiological investigations were conducted by Prof S. Braynes and A. Napaldov to explain those principles which lie at the basis of cerebral function. They proved to be an extremely ideal, self-adjusting system of control. The investigators also studied the regularity of the reprocessing of information in the animal cerebrum which made it possible for them to utilize old experience in new situations, that is, to use information accumulated earlier. The mechanisms were clarified, which enabled them to quickly discover the required information in the cerebrum.

The authors of these works, together with young specialists of the Chair of Automation and Telemechanics of the Moscow Power Institute, which is headed by Yu. Kushelev, built the cybernetic machine "Obuchayushchiysya" (Learning) Automat.

The new automat, which is one of the initial efforts of this type, is capable of being educated. It may form its program by itself and may modify it when new conditions for its functioning arise.

92. Electronics in Medicine

"The Use of Electronic Technology in Medicine," by A. D. Voskresenskiy and A. I. Prokhorov; Moscow, Sovetskoye Zdravookhraneniye, No 8, Aug 59, pp 19-25

The author of this article states that with the use of electronic computers, a few mathematical techniques can be applied to aid certain aspects of medical diagnosis. Research on this possibility has shown that a computer can produce a list of possible diagnoses for a hospital case by analyzing the symptoms, by compiling statistics, by tabulating quantitative data derived from electrocardiograms, electroencephalograms, electrocardiophonograms, electrocardiomanometric recordings, and roentgenokymograms, and by making calculations based on such data. Several of these electronic diagnostic devices were developed in the USSR during 1957 and 1958 and have been successfully tested in clinical practice.

It is stated that Soviet medical statistics is the most advanced in the world in many respects. The use of electronic computers in medicine is continually expanding in the USSR, and much work still remains to be done in trying out computing techniques under practical conditions.

The reorganization of methods of recording statistics is one of the problems associated with the use of electronic computers. Close cooperation among members of various branches of science is necessary for the realistic application of computer systems in medical practice. But without a sufficient number of trained personnel it is meaningless to discuss their extensive utilization. An example of close cooperation among various groups of specialists is the combined effort of several scientists of the city of Kiev who are trying to solve the problem of diagnosing mitral cardiac stenosis. These scientists are Prof N. M. Amosov, Physician N. I. Mokrik, Engineers V. M. Glushkov, Ye. A. Shkobara, Mathematicians B. V. Gnedenko, and M. A. Kulikova, and others.

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The author of this article quotes Academician A. I. Berg, who said that "the initial expenditure on electronic computers will be large, but the economic, technical, and other advantages derived from their use will warrant these expenditures."

In any case, taking into consideration the prospects for the development of medicine, mathematics, cybernetics, and computing techniques, it can be said with certainty that the day is not far away when the prediction I. Pavlov made in 1909 will come true. Pavlov said that "all life from the simplest organism to the most complicated organisms, including human, is a long series of the highest degree of continually complicated, balanced adjustments to the immediate environment."

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93. Political Indoctrination at Medical Institute

"A Tested Form of Political Indoctrination," by I. Dvinskih; Moscow, Meditsinskiy Rabotnik, No 77 (1825), 25 Sep 59, p 2

The author of this article states that Communists of the Institute of Neurosurgery imeni N. P. Burdenko of the Academy of Sciences USSR have been preparing for the new school term. Members of the party began their planning as early as June 1959. They held a conference and decided that the course of political indoctrination given during the previous school term produced good results. This conference was concluded with a 2-day discussion on the subject of the building of Communism.

The Secretary of the Party Bureau, Candidate of Biological Sciences V. Ye. Mayorchek, stated that "the people who attended the course in political indoctrination last year displayed great diligence, showed profound comprehension of theories, and strove to organically connect these theories with life and with practical problems in medicine."

The majority of the Communists at the institute chose a method of political indoctrination which proved to be reliable. This method consists of independent research, using primary sources. This is followed by theoretical conferences and discussions. Four seminars will be offered this year. Professors, aspirants, and interns will be exposed to lectures on philosophical problems of modern natural science. The Party Bureau has approved the assignment of the best propagandists as instructors. V. M. Ugryumov, Doctor of Medical Sciences; A. Ya. Podgornaya, Doctor of Medical Sciences; and V. V. Arkhangel'skiy, (Candidate of Medical Sciences) are some of the propagandists who will act as instructors.

No program was drawn up at first, and the necessary literature was unavailable. However, scientific workers of the Institute obtained the aid of the Chair of Philosophy of the Academy of Medical Sciences USSR, which procured the necessary literature.

The philosophical seminar will discuss such topics as the Marxist-Leninist theory of perception and some problems in modern natural science and medicine.

Thirteen clubs have been organized to study the history of the Communist Party of the Soviet Union. Experienced propagandists have been selected to become leaders of these clubs. Membership of these clubs has been opened to Communists, Komsomol members, and to people without any party affiliation.

Subprofessional and technical personnel with limited political training will be exposed to popular-type lectures on general political and scientific subjects. Lectures will be supplemented with appropriate movies. These lectures and movies will show the achievements of Soviet people in their struggle to bring to reality the decisions of the 21st Congress of the Communist Party of the Soviet Union and of the plenums of the Central Committee. The foreign policy of the Soviet Union will also be discussed. Scientific associates of the institute and members of the All-Union Society for the Dissemination of Political and Scientific Knowledge will be asked to lecture.

94. Soviet Medical Vuzes in 1958/1959 Academic Year

"Higher Educational Institutions of Ministries of Health in the 1958/1959 Academic Year," by G. N. Sorvina; Moscow, Sovetskoye Zdravookhraneniye, No 10, Oct 59, pp 63-64

During the 1958/1959 academic year, 80 vuzes (higher educational institutions) operated within the system of the ministries of health: 72 were medical, 2 stomatological, and 6 pharmaceutical; in all, there were 70 therapeutic faculties, 27 pediatric, 22 sanitary-hygiene, 22 stomatological, 16 pharmaceutical, and one faculty on the technology of medicinal and aromatic substances.

During 1958, the following changes took place within the vuzes of the USSR; a medical institute in the city of Grodno, Belorussian SSR, was opened; the Medical Faculty of Vladivostok University was reorganized into an institute; and the Moscow Pharmaceutical Institute was reorganized into a Pharmaceutical Faculty of the First Moscow Medical Institute. The training of physicians in the 1958/1959 academic year was undertaken by the Medical Faculties of the Yakutsk, Uzhgorovsk, Vil'nyus, and Tartu universities.

Every year the number of medical students studying at evening and correspondence faculties increases. In the Ukrainian SSR, three semesters of evening faculties of medical institutes at which 1,551 persons are now studying have been conducted.

During 1958, some 91,829 persons took examinations in vuzes. In the 1958/1959 academic year, 27,815 students were enrolled in the first year course of medical vuzes, an increase of 7,415 persons over the 1950/1951 academic year. The number of first year students was increased in all faculties except in the sanitary-hygiene faculties. In the 1950/1951 academic year, the number of students enrolled in the first year courses amounted to 20,400; in 1956/1957, the number was 26,961; in 1957/1958, the number was 26,293; and in the 1958/1959, the number was 27,815. The number of male students was slightly larger than in the preceding years.

On 15 September 1958, the total number of students studying in vuzes of the ministries of health numbered 162,768, not counting the evening and correspondence departments. Of this total, male students represented 72% of the therapeutic faculty, 9% of the pediatric faculty, 10% of the sanitary-hygiene faculty, 5% of the stomatological faculty, and 4% of the pharmaceutical and engineering technological faculties.

The number of graduates in 1958 exceeded the 1950 graduates by 23% and the 1956 graduates by 25%. The number of graduates was most marked in the pediatric faculties, which was 77% higher than in 1950, and 42% higher than the sanitary-hygiene faculties and 19% higher than the therapeutic faculties.

In the 1958/1959 academic year, some 16,415 instructors of which 1,462 were professors and 3,116 docents, were employed in medical vuzes in the USSR; 1,496 held the degree of Doctor of Sciences and 7,011 held the degree of Candidate of Sciences. The 1958/1959 academic year had an increase of 5,365 instructors or 48.5% over 1950/1951; the number of professors increased by 123 persons and the number of docents by 897.

The union republic medical institutes, as a rule, enrolled students who were primarily native to a particular republic, i.e., the Yerevan Medical Institute had an enrollment which was 97% Armenian, the Tbilisi Medical Institute had an enrollment which was 86% Georgian, and the Kaunauus Medical Institute was 88% Lithuanian. This was not true, however, in the Medical Institute of Kazakhstan.

95. Plan for Scientific Research

"Recommendations for the Compilation of a Plan for Scientific Research," by Prof P. L. Senov, chairman of Problem Commission No 47 of Academy of Medical Sciences USSR; Moscow, Aptechnoye Delo, Vol 8, No 5, Sep/Oct 59, pp 3-7

Recommendations for the compilation of a plan of scientific research to be carried out by pharmaceutical research institutes of the country have been outlined by Problem Commission No 47 with the cooperation of the Central Pharmacy Scientific Research Institute. The recommendations call for the intensification of research work on the following main problems: (1) investigations of the medicinal plant resources of the USSR (search for new medicinal plants, study of wild plants, methods of cultivating medicinal plants); (2) development and improvement of methods of preparing medicinal substances and galenic preparations; (3) development of new methods of investigating medicinal substances and the improving and unifying existing drugs; (4) organizational-economical investigations (development of pharmacy at home and abroad, organization of pharmacy work, study of the demand for drugs); and (5) biological standardization of cardiac drugs (study of the biological activity of cardiacs, methods for their storage and preservation, development of standards for the evaluation of the drugs).

Problem Commission No 47 expresses the hope that the pharmaceutical scientific research institutes, faculties, and laboratories will utilize these recommendations as a basis for the compilation of a plan for scientific research on the problem "Search for New Methods of Preparing Drugs and Methods for Their Analysis."

96. Academy of Medical Sciences USSR to Elect New Members in 1960

"Statement of the Academy of Medical Sciences USSR" (unsigned article); Moscow, Meditsinskiy Rabotnik, No 92 (1840), 17 Nov 59, p 4

The Academy of Medical Sciences USSR announces that in the coming 1960 general assembly of the academy, elections will be held for new members. A total of 40 new members are to be elected, 22 active members and 18 corresponding members in the following departments: eight Active Members in the Department of Medico-Biological Sciences; eight active members in the Department of Clinical Medicine; six active members in the Department of Hygiene, Microbiology, and Epidemiology; three corresponding members in the Department of Medico-Biological Sciences; 13 corresponding members in the Department of Clinical Medicine; and two corresponding members in the Department of Hygiene, Microbiology, and Epidemiology.

The announcement also stated that applications for candidates for nominations are now being taken.

97. Laboratory Established in Moscow to Study Structure of Microbes

"The Study of the Structure of Microbes" (unsigned article); Moscow, Meditsinskiy Rabotnik, No 92 (1840), 17 Nov 59, p 4

A Laboratory of the Physical Methods of Research (Laboratoriya Fizicheskikh Metodov Issledovaniya) has been established at the Moscow Scientific Research Institute of Vaccine and Sera imeni I. I. Mechnikov.

The laboratory has three electronic microscopes, an ultracentrifuge capable of 50,000 revolutions per minute, various equipment for microphotography, and an apparatus for automatically photographing the cellular division process of microorganisms.

98. New Sanitary Institution Opened in Ukraine

"Short News Items" (unsigned article); Moscow, Meditsinskiy Rabotnik, No 91 (1839), 13 Nov 59, p 4

A University of Sanitary Culture (Universitet Sanitarnoy Kul'tury) has been opened in Lugansk, Ukrainian SSR. In its program of courses lectures, the institution will include the achievements of Soviet and foreign medicine and methods for the prevention and control of various diseases.

99. Status of Medical Research Organizations in Belorussian SSR

"Plenum of the Scientific Medical Council of the Ministry of Health Belorussian SSR," by M. Piletskiy; Minsk, Zdravookh-raneniye: Belorussii, No 10, Oct 59, pp 75-76

At present, there are three medical vuzes in Belorussia. In addition, there is the Institute for the Advanced Training of Physicians, eight scientific research institutes in the medical field, a number of scientific research laboratories, the Institute of Physiology of the Academy of Sciences Belorussian SSR, and the Sector of Gerontology of the Academy of Sciences Belorussian SSR. A new building with all the necessary equipment is now being built for the Institute of Blood Transfusion. In 1960, construction will begin on a new laboratory building for the Institute of Physiology, Academy of Sciences Belorussian SSR. Plans have also been discussed for the establishment of a new Institute of Experimental Medicine within the system of the Academy of Sciences Belorussian SSR.

At present, nearly 700 scientific workers are employed in the medical vuzes and scientific research institutions of the republic. Of these, 50 have the Doctor of Sciences degree and 263 the Candidate of Sciences degree. According to the Seven-Year Plan, it is estimated that the number of persons with higher degrees will double by 1965.

100. Soviet Medical Conferences Postponed

"In the Ministry of Health USSR" (unsigned article); Moscow, Meditinskiy Rabotnik, No 91 (1839), 13 Nov 59, p 4

By order of the Ministry of Health USSR, the All-Union Conference on Ambulatory-Polyclinic Service and the Expanded Conference on the Work of Lowering Infectious Diseases have been postponed until January 1960. Applications for attendance have been extended.

VI. METALLURGY

101. Prospects for Vanadium Production in Eastern Siberia

"Concerning Vanadium Raw Material for the Production of Alloyed Steels and Cast Iron in Eastern Siberia," by A. S. Chernyak, Irkutsk State Institute of Rare Metals; Novosibirsk, Izvestiya Sibirskogo Otdeleniya Akademii Nauk SSSR, No 7, 1959, pp 120-121

Chemical analysis was conducted several years ago on two one-ton probes of vanadium ores from deposits in the eastern slopes of the Kuznet-skiy Alatau. Ores contained 0.88% and 0.93% V_2O_5 in contrast to the minimum industrial requirement of 0.7% V_2O_5 . Ore was ground to -0.2 mm and sintered at 700°C with sodium chloride. Leaching of the cake with water carried 83-85% of the vanadium into solution. Analygous results were obtained by sintering the ore with sodium sulfate, although further extraction of vanadium was required by leaching with solutions of weak sulfuric acid. Iron vitriol precipitated practically all of the vanadium out of solution. The precipitate was found suitable for processing into ferrovanadium or calcium vanadate.

Author says that although the simple and economical method for extracting vanadium from the given ores was developed several years ago, no demand for the metal existed, and the evaluation of deposits of vanadium as industrial material was not conducted. At present, in conjunction with the establishment of a third metallurgical base, it is considered necessary to conduct detailed evaluation of local vanadium raw materials and conduct technological investigations of vanadium ores known in East Siberia.

102. New Rolling Mills for Variable-Profile Sheet and Thin Strip

"New Equipment for Cold Rolling Sheet and Strip," by Engr A. M. Kogos and E. R. Shor, Candidate of Technical Sciences, Central Scientific Research Institute of Technology and Machine Building; Moscow, Metallurg, No 8, Aug 59, pp 32-35

Descriptions of design and working cycles are given of two- and four-high mills developed by the Central Design Bureau of Metallurgical Machine Building of the Central Scientific Research Institute of Technology and Machine Building, under the supervision of A. I. Tselikov, for rolling variable-profile sheet and strip. Working principle is based on the continuous change of the distance between rollers during the rolling process. Sheet and strip with a taper of 1.5 mm/m can be rolled on mills now in

operation. All rolling and straightening operations are completely automatic. In some cases, the mills are equipped with stretching devices to decrease roller pressure. Rolling material is annealed intermediately or not at all, depending on the total reduction required at the thin end.

Four-stand reversible and continuous mills for rolling strip of low- and medium-carbon steels have been constructed and are being introduced into industry. Mills are designed with the new backing-roller drive system permitting use of working rollers with extremely small diameter (100, 150, and 200 mm). Mills have the capacity to roll 3.5-ton rolls of strip 300 mm wide and with a minimum thickness of 0.1 mm at a speed of 10 m/sec.

High-carbon strip 150 mm in width and down to 0.03 mm in thicknesses will be rolled on reversible mills with working rollers of 40, 55, and 70 mm diameter and individually driven backing-rollers. Highest rolling speed will be 10 m/sec.

Stainless and electrical steel strip in widths up to 1,000 mm will be rolled on 20-roller mills at a speed of 7.5 m/sec. Minimum thickness of strip that can be rolled will be 0.1 mm in rolls weighing 15 tons.

Strip made of high-carbon steels and precision alloys will be rolled on 20-roller mills having working rollers with diameters of 16 to 20 mm at a speed of 7.5 m/sec. Strip will range up to 300 mm in width and 0.02 mm in thickness. Weight of strip rolls will be 2 tons.

Strip made of high-melting alloys and alloys with special physical properties will also be rolled on special 20-roller mills in widths up to 30 mm and thickness of 0.001 mm.

103. Production of Titanium Dioxide by Sulfate-Sodium Fusion

"Full-Scale Tests on Obtaining Titanium Dioxide by Sulfate-Sodium Fusion," by A. A. Fotiyev and V. M. Andreyev, Ural Affiliate of the Academy of Sciences USSR; Novosibirsk, Izvestiya Sibirskogo Otdeleniya Akademii Nauk SSSR, No 7, 1959, pp 71-75

A flow chart and data are given for full-scale tests of the process of reduction sulfate-sodium fusion of ilmenite concentrates as developed by the Laboratory of Rare Elements of the Institute of Chemistry, Ural Affiliate of the Academy of Sciences USSR. Principle of the process consists of the sulfonation of iron with sodium sulfate and coal during fusion of an ilmenite concentrate. Sulfides of iron and sodium in the melt form complex water-soluble compounds permitting removal of the major portion of iron by aqueous lixiviation. Further removal of iron and other impurities is accomplished by processing the residue with weak acid solutions. Final product contained 0.77% F, 0.25% Si, 0.028% V, 0.28% Al, 0.20% Mg, and 97.47% TiO₂. It is

calculated that extraction of a minimum of 92% of the TiO_2 from ilmenite concentrates containing one ton of TiO_2 would be possible with a consumption of 2 tons of sodium sulfate and 0.62 ton of sulfuric acid (considering recovery from the acid filtrate). Fusion may be performed in either electric or reverberatory furnaces.

104. Argon-Arc Welding of Tantalum

"Argon-Arc Welding of Tantalum," by F. Ye. Tret'yakov and V. I. Konstantinov, Candidates of Technical Sciences, Technician I. K. Rogozhkina, and Engr Ya. M. Polyakov; Moscow, Svarochnoye Proizvodstvo, No 8, Aug 59, pp 5-7

Cold-worked and annealed specimens of tantalum were welded on an automatic machine employing direct current of positive polarity (alternating current proved unsatisfactory), thoriated tungsten electrodes, and shielding with 99.98%-pure argon. Welding current, arc voltage, and electrode diameter were varied according to thicknesses welded. Tests run on back-up materials made of steel, titanium, and copper showed copper to be most satisfactory. It was noted that reliable weld joints could possibly be obtained between tantalum and titanium. Mechanical properties of weld joint metal and base metal of annealed tantalum weldments were practically equal. Weld joint metal in weldments made of cold-worked tantalum had approximately the same mechanical properties as annealed tantalum. Corrosion stability tests conducted by the State Institute of the Nitrogen Industry and the Scientific Research Institute of Organic Intermediate Products and Dyestuffs indicated that the corrosion resistance of both weld joint metal and base metal was approximately equal.

105. Direct Heat Treatment of Spot Weldments

"Strength of Electrothermically Treated Spot Joints of Steels 30KhGSA, 12G2A, and EI659," by Engrs G. A. Maslov and B. B. Zolotarev, Scientific Research Institute of Technology and Organization of Production of the Aviation Industry; Moscow, Svarochnoye Proizvodstvo, No 8, Aug 59, pp 21-26

As-rolled and quenched specimens (0.8 to 3 mm thick) of the heat-treatable steels 30KhGSA, 12G2A, and EI659 were welded on a MTP-200/1200 machine and heat treated directly in the welding machine by second and third impulses with and without subsequent furnace treatment. Results given of static and cyclic tests indicated that electrothermal treatment directly in the welding machine excludes the necessity of further furnace treatment of spot joints of these steels to increase strength.

106. New Arc Welding Method

"Welding With an Electric Arc Rotating in a Magnetic Field,"
by N. Ya. Kochanovskiy and S. M. Katler, Candidates of Technical Sciences, and Engr Ye. S. Feder, All-Union Scientific Research Institute of Electric Welding Equipment; Moscow, Svarochnoye Proizvodstvo, No 8, Aug 59, pp 1-4

Descriptions are given of the principle, operating cycles, and variations of a new arc welding process developed and tested at the All-Union Scientific Research Institute of Electric Welding Equipment. Process is distinguished by the fact that both anode and cathode spots are displaced simultaneously in a magnetic field. Two adaptations of the principle were tested; in Case 1, the rotating arc (with a radial magnetic field and axial flow of arc current) was generated directly between the objects being welded, and in Case 2, the rotating arc (with an axial magnetic field and radial flow of arc current) was generated between the objects being welded and a nonconsumable electrode.

In Case 1, the objects (tubing) to be welded and two electromagnet coils were positioned coaxially with the coils at equal distances from the proposed weld joint plane. Magnetic fields created by the coils met, creating a radial component in the gap between the tubes. An electric arc was struck between the tube edges (tubes acted as electrodes). Axis of the arc and, consequently, the flow of arc current coincided in direction with the tube axis. Interaction of the axial flow of arc current and the radial component of the magnetic field created a tangentially directed force which caused the arc to rotate. The latter heated the tube edges uniformly and was observed as a continuous ring of light. Tubes were upset when welding temperature was attained.

In Case 2, the objects to be welded, an electromagnet coil, and a water-cooled copper ring were positioned coaxially. An electric arc was struck between the inner surfaces of the ring and edges of the objects being welded. Current of the arc flowed radially, whereas the magnetic field in the gap between the objects was directed axially. Interaction of the latter two created a force causing the arc to rotate and uniformly heat the object edges. Upsetting was performed after attaining weld temperature.

Welding conditions for steel tubing with an outer diameter of 30 mm, wall thickness of 2.5 mm, and welding area of 235 mm² were as follows: welding current, 235 amps; rotating arc voltage, 30 v; arc power, 5.1 kw; heating time, 15-20 sec; and number of amper turns in the coil, 2,040. For welding steel tubing with an outer diameter of 325 mm, wall thickness of 9 mm, and welding area of 9,200 mm², the following conditions were necessary: welding current, 1,150 amps; arc voltage, 40 v; arc power, 46 kw; heating time, 120-150 sec; and number of amper turns in the coil, 6,900.

Tests proved the new method to be satisfactory for welding butt joints in tubing of a wide range of diameter and thickness with flanges and components of other forms, including irregular profiles. Satisfactory weldments of copper, aluminum, and stainless steel were obtained with application of protective gases. Method requires only simple equipment and may be used in relatively inaccessible locations.

107. Plasma-Arc Research

"The Arc Plasma Jet as a Source of Heat in Working Materials," by I. D. Kulagin, Candidate of Technical Sciences, and Engr A. V. Nikolayev, Institute of Metallurgy imeni A. A. Baykov, Academy of Sciences USSR; Moscow, Svarochnoye Proizvodstvo, No 9, Sep 59, pp 1-4

Results are given of investigations performed at the Laboratory for Welding Metals of the Institute of Metallurgy imeni A. A. Baykov, Academy of Sciences USSR, in 1957-1958 on developing the method and equipment for creating a plasma jet. A study is presented of the basic heat parameters of a plasma jet, and the principal regions for its application in working different materials are reviewed (no elaboration of any specific case).

Four types of plasma-arc heads designated as IMET-101 (experimental), IMET-102 (manual), IMET-103, and IMET-104 (both machine) have been developed at the institute. Heads operate with argon or argon-helium mixtures. Basic components of the IMET-103 head consist of a nozzle, canal, electrode unit, and housing. Internal diameter of the canal is 4-10 mm, and the length is 25-40 mm. Both canal and nozzle are made of copper and are water cooled. Distance between nozzle and channel is 1.5-3 mm. Each head has a complex of interchangeable nozzles and canals of different shape and exit opening dimensions. The electrode holder with a 1.6-mm- to a 6-mm-diameter tungsten or carbon electrode is connected to the negative pole of the power supply and is adjustable, relative to distance from the nozzle exit opening. In working active metals, protective gases are supplied through a nozzle attachment. Power of the heads ranges up to 15 kilowatts.

108. Nickel Oxide Flux for High-Temperature Brazing

"Brazing Chromium-Containing Steels and Alloys," by Engr Ye. A. Kolenko, Institute of Semiconductors, Academy of Sciences USSR; Moscow, Svarochnoye Proizvodstvo, No 9, Sep 59, p 40

An aqueous suspension of a special flux containing Ni_2O_3 (no other information) is applied in a thin film to brazing surfaces of objects to be joined. Objects are then clamped and heated in a hydrogen furnace to

temperatures 20-50°C above the melting point of the braze employed. In the heating process, the nickel oxide in the flux is reduced to metallic nickel which becomes alloyed with the braze. The process is considered satisfactory for obtaining high-strength hermetic joints between chromium-containing alloys of ferrous and nonferrous metals, as well as between other metals. Fifteen applicable brazes are listed as having melting points ranging from 670°C (53% Ag, 32% Cu, and 15% Sn by weight) to 1,315°C (51% Ni and 49% Mo by weight). Pure copper or silver may also be used with this process.

109. Weldability of 12% Chromium Steels

"Investigation of the Weldability of High-Temperature Steels Containing 12% Chromium," by M. Kh. Shorshorov, Candidate of Technical Sciences, and Engr V. V. Belov, Institute of Metallurgy imeni A. A. Baykov, Academy of Sciences USSR, and V. N. Zemzin, Candidate of Technical Sciences, and Engr I. D. Smirnova, Central Scientific Research Boiler and Turbine Institute imeni I. I. Polzunov; Moscow, Svarochnoye Proizvodstvo, No 9, Sep 59, pp 6-10

Results are given of tests on the effect of different thermal cycles in one-pass arc welding of standard chromium steels 2Kh13, 1Kh13, and 08Kh12 and hardened steels 15Kh11MF, 15Kh11VF, 15Kh11MFB, 15Kh12VMF, 15Kh12VMF with Ti, Nb, and V, and 25Kh11M3F. Steels not supplementarily alloyed showed increased grain growth and lower ductility when welded with decreased cooling speeds. Hardening and grain growth increased with increased carbon content. Steels with hardening and alloying admixtures were less sensitive to changes in welding thermal parameters and were characterized by less affinity for grain growth in the weld zone. Studies on the selection of heat-treating conditions before and after welding indicated that annealing temperature before welding must be lower than the annealing temperature after welding.

110. Hungarians Publish Data on New Soviet Material "Of Fantastic Strength"

"Material With Fantastic Strength" (dateline: TASS, 27 Oct 59); Budapest, Nepszabadsag, 28 Oct 59, p 4

Soviet scientists, using a special method, have produced a material which has fantastic strength: 1,330 kilograms per square millimeter. Types of steel now in use generally have a strength of 30-50 kilograms per square millimeter. The researchers succeeded in condensing [compressing ?] the structure of the material, thus creating the special material.

CPYRGHT

Magyar Nemzet (Budapest), 28 Oct 59, p 6, adds: .. The researchers succeeded in condensing the atoms of the material, creating a chain [of atoms] so that there is no empty space between them as there is in common metals.

CPYRGHT

VII. PHYSICS

Nuclear Physics

111. Fission of Th-229

"Effective Cross Section of Th-229 Fission," by B. M. Hoxhber, G. A. Otroshchenko, and V. A. Shigin, Institute of Atomic Energy, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 128, No 5, Oct 59, pp 911-912

The relation of neutron induced Th-229 cross section to neutron energy within the range of 6-1,200 kev is studied. It has been found that the behavior of the cross section differs considerably from the typical curve of fission cross section vs neutron energy of nuclei fissioning on thermal neutrons. Within the range of 20-200 kev, the cross section decreases only 20%, thereafter drops sharply to a minimum at a neutron energy of 600 kev and rises with higher energies by 25%.

112. Design and Use of Radiation Sources

"The Design and Use of Strong Radiation Sources," by A. V. Bibergal', M. M. Korohtkov, and T. G. Ratner, Atomnaya Energiya, Vol 7, No 3, Sep 59, pp 244-251

The accumulation factor at small distances from point sources of gamma rays from Co-60 and Cs-137 has been studied experimentally. The possibility of practical use of available data on a homogeneous infinite medium in computations is shown (assuming barrier geometry conditions in relatively thin absorbing layers). The possibility of smoothing the dose field of the cylindrical irradiator by means of auxiliary filters is demonstrated. The substitution of Co-60 preparations by C-137 preparations is suggested for irradiating objects up to 40 cm thick at a density below 1.

113. Analysis of Six-Meter Synchrocyclotron

"The Energy Distribution of the Proton Beam From the Six-Meter Synchrocyclotron," by I. M. Vasilevskiy and Yu. D. Prokoshkin; Moscow, Atomnaya Energiya, Vol 7, No 3, Sep 59, pp 225-230

The energy spectrum and the mean energy of the extracted proton beam from the 6-meter synchrocyclotron of the Joint Institute for Nuclear Research have been measured for various accelerations. The spectrum may be represented by a Gauss curve with a dispersion of (2.8 ± 0.3) Mev. The mean energy has been determined with an accuracy of 0.1%.

114. Cross Section of Np-237 and Th-230 Fissions

"Effective Cross Sections and the Anisotropy of Np-237 and Th-230 Fissions," by B. M. Gochberg, G. A. Ostroshchenko, and V. A. Shigin, Institute of Atomic Energy, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 128, No 6, Oct 59, pp 1157-1159

The studied nuclei exhibit an anisotropy of fission near the threshold which changes rapidly at short range. An attempt to explain experimental phenomena has been made by D. L. Hill and J. A. Wheeler (Phys Rev 89, 1102 (1953)) by creating a "collective" fission model in which the angular distribution of fragments and the relation of fission cross sections to neutron energies are connected to quantum characteristics of rotational levels. The relation of the cross section of Th-230 to the neutron energy agrees with the "collective" model for even-even nuclei. The fission reaction has a threshold of 650 kev and the cross section rises rapidly at higher energy. It shows at the start a clear maximum, pointing to the possibility of a Th-231 level somehow distant from other higher levels.

115. K⁺ Mesons From Cosmic Rays

"Generation of K⁺-Mesons by Cosmic Rays Protons at an Altitude of 3,250 Meters Above Sea Level," by M. Ya. Balats, P. I. Lebedev and Yu. V. Obukhov; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sept 59, pp 589-595

The spectrum is presented and an estimation is made of the cross section for production of K⁺-mesons by cosmic ray protons in the K⁺-particle momentum interval up to 0.9 Bev/c. The investigation was carried out at an altitude of 3,200 meters above sea level. (Mount Alagez).

116. π^0 -Meson Formation in Stratosphere

"Investigation of π^0 -Meson Formation in the Stratosphere by Interaction of Cosmic Ray Protons and Alpha Particles With Carbon Nuclei," by K. I. Alekseyeva, S. I. Brikker, N. L. Grigorov, V. S. Murzin, and F. D. Savin, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 596-603

Pulse ionization chambers and a hodoscope were used in a stratosphere study at geomagnetic latitude 31° N of the interaction of primary protons and alpha particles with carbon nuclei. The electron cascade produced in lead by γ -quanta from decay of neutral π -mesons generated in the interaction is investigated. It is found that in the interaction of protons and α -particles with carbon nuclei in the 10^{10} ev energy region on the average $(10 \pm 3)\%$ and $(14 \pm 10)\%$ of the primary particle energy are respectively spent in π^0 -meson generation.

117. Hyperfragment Decay

"Nonmeson Decays of Hyperfragments," by I. B. Berkovich, A. P. Zhdanov, F. G. Lepekhin, and Z. S. Khokhlova, Radio Institute, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 604-610

In a systematic inspection of 47 cm^2 of an emulsion irradiated by 4.5 Mev π -mesons eight double stars were detected in which the connecting track narrowed down and one of the secondary tracks had a range $\geq 5,000 \mu$ and which could be attributed to nonmeson decays of hyperfragments with $Z = 2 - 6$. The hyperfragments and secondary decay products were identified. Possible decay schemes of the hyperfragments are presented under the assumption that one neutron is emitted.

118. Secondary Stars in Emulsion

"Secondary Stars Created in the Interaction Between 8.7 Bev Protons and Photographic Emulsion Nuclei," by G. B. Zhdanov, P. K. Markov, V. N. Streltsov, M. I. Tret'yakova, Chen Pou-in, and M. G. Shafranova, Joint Institute of Nuclear Research; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 611-615

Secondary interactions involving fast neutrons, protons, and π -mesons produced in a photographic emulsion stack by 8.7 proton bombardment were studied. It was found that on the average 0.69 ± 0.07 fast neutrons per star are produced. Fast nucleons carry off $(55 \pm 9)\%$ and fast π -mesons $(33 \pm 9)\%$ of the primary nucleon energy.

119. Nuclear Interactions With Photographic Emulsions

"Nuclear Interactions of 8.7 Bev Protons in Photographic Emulsions," by G. B. Zhdanov, V. M. Maksimenko, M. I. Tret'yakova, and M. N. Shcherbakova, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 620-633

Inelastic interaction between 8.7 Bev protons and photographic emulsion nuclei and, in particular, the interaction cross section, multiplicity of the generated particles, and their angular distribution were investigated. From comparison with computations based on the statistical theory, some conclusions regarding the existence of interactions of the peripheral (nucleon - nucleon) type are made, as well as conclusions on the role of secondary interactions inside a composite nucleus.

120. Pion Absorption by Carbon Nuclei

"Absorption of π^+ -Mesons With an Energy of Approximately 50 Mev by Carbon Nuclei," by J. V. Laberriguet-Frolova, M. P. Balandin, and S. Z. Otvinovskiy, Joint Institute of Nuclear Research; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 634-638

A propane bubble chamber was employed to study stars produced in the absorption of 50 ± 20 Mev π^+ -mesons in carbon nuclei. The cross section for production of such stars was found equal to (145 ± 36) mb. The star prong distribution is characterized by an average number of prongs equal to 2.6 ± 0.3 . An appreciable anisotropy of the angular distribution of

the prongs relative to the direction of motion of the π^+ -meson was observed. The main cause of this anisotropy is apparently preabsorption scattering of π^+ -mesons on separate nucleons in the nucleus. A distribution of two-prong stars with respect to the angle between the prongs is presented.

121. Gamma Transition in Tm¹⁶⁹

"Gamma Transition Multipolarities in Tm-169," by V. M. Kel'man, R. Ya. Metskhvarishvili, B. K. Preobrazhenskiy, V. A. Romanov, and V. V. Tuchkevich, Leningrad Physicotechnical Institute, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Fiziki, Vol 37, No 3, Sep 59, pp 639-642

The internal conversion coefficients for γ -quanta of 63, 94, 110, 130.5, 177, and 198 keV energy on the L-subshells of Tm¹⁶⁹ are found. From these data the transition multipolarities and, in the case of mixed radiations, the percent of the mixture components are determined.

122. Alpha Ejection

"Ejection of Alpha Particles From Nuclei by Fast Nucleons," by V. I. Ostroumov and R. A. Filov, Leningrad Polytechnic Institute; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 643-650

The cross section for ejection of α -particles with energies > 30 MeV from photographic emulsion nuclei under the bombardment of 100, 140, 200, 360 and 660 MeV protons was studied. Ejection of the particles by cascade nucleons was computed under the assumption that the intranuclear nucleons possess definite momenta. It is found that there is an appreciable probability of formation of α -substructures in light nuclei of the C¹² and O¹⁶ type as well as in the diffuse region of heavy nuclei.

123. Production of Composite Nuclei

"Production of Composite Nuclei in the Interaction Between O-16, C-12, and C-13 Ions With V and Nb Nuclei," by A. S. Karamyan and A. A. Pleve; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 654-662

Production of composite nuclei in the reactions $V_{23}^{51} + O_8^{16} \rightarrow Ga_{31}^{67}$ and $Nb_{41}^{93} + C_6^{12,13} \rightarrow Ag_{47}^{105,106}$ was investigated. The results are obtained in the form of excitation functions with evaporation of various numbers of nucleons. Comparison of these reactions with reactions induced by light particles and involving composite nuclei close to Ga^{67} and Ag^{105} show that, in the case of heavy ions, evaporation of a given number of nucleons occurs at a somewhat higher excitation energy. A possible explanation of this is that the large angular momentum which the heavy ion introduces into the composite nucleus significantly affects the de-excitation process.

Along with production of a composite nucleus with subsequent evaporation of nucleons, reactions were observed in which very energetic particles were emitted (60 Mev per two particles), a fact which is not consistent with the statistical theory.

124. Proton Scattering

"Scattering of 5 - 10 Mev Protons on He-3," by K. P. Artemov, S. P. Kalinin, and L. N. Samoylov; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 663-666

The angular distribution of protons elastically scattered on He^3 is measured for five values of the initial energy. The protons were recorded by their tracks in the photographic plates. The differential scattering cross sections thus obtained are compared with the theoretical ones computed under two different assumptions regarding the nature of exchange forces. Serber's type of the nucleon - nucleon interaction more satisfactorily agrees with the experimental data. Discrete levels in the Li^4 nucleus are not apparent from the energy dependence of the cross section.

125. Positron Spectrum

"Position Spectrum of Eu-152 and Eu-152m," by S. F. Antonova, S. S. Vasilenko, M. G. Kaganskiy, and D. L. Kaminskiy; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 667-671

A low background β -spectrometer was employed to study the spectrum of positrons created in the decay of Eu^{152} and Eu^{152m} . It is found that β^+ -decay of Eu^{152} takes place to the first (2+) and second (4+) excited states of Sm^{152} . The end point energies of the partial spectra are 713 keV and 470 keV and their intensities are respectively 1.4×10^{-4} and 5×10^{-5} β^+ -per decay. Formation of Sm^{152} in the ground and first excited states occurs in the positron decay of the Eu^{152m} isomer. The end point energies of the partial spectra are 890 keV and 770 keV and intensities are respectively 6×10^{-5} and 2×10^{-5} β^+ -per decay. The excitation energy of the Eu^{152} isomer is deduced from the difference of the end point energies of the β^+ -spectra and is found to be 55 ± 6 keV. Pair conversion coefficient and the multipolarities of a number of γ -transitions are derived from the positron internal pair conversion spectra.

126. Cosmic Showers

"Investigation of a Shower Consisting of 200,000 Particles, Recorded by a Photographic Plate," by N. L. Grigorov and M. A. Kondrat'yeva, Institute of Nuclear Physics, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 684-688

Electron sensitive photographic plates were used to study the space and angular distribution of particles in a large shower in lead. It is shown that for a shower energy of $4 \cdot 10^{13}$ eV, the spatial distribution of all the particles and the angular characteristics of particles of the central part of the shower agree with the cascade theory.

127. Betatron Design

"On the Capture Mechanism in Betatrons," by I. M. Samoylov;
Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol
37, No 3, Sep 59, pp 705-712

The motion of electrons in a betatron is considered with account of coulomb repulsion of particles in the beam injected in the chamber during a revolution of the electrons. It is shown that effective electron capture is due to variation of the conditions of the radial oscillations caused by repulsion of the particles in the beam and also to loss of part of the electrons as a result of collision of the beam with the injector or chamber wall.

128. Compton Effect

"Dispersion Relations for the Virtual Compton Effect," by I. S. Zlatev and P. S. Isayev, Joint Institute of Nuclear Research;
Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol
37, No 3, Sep 59, pp 728-734

Dispersion relations for physical amplitudes have been derived by the Bogolyubov method in the center-of-mass system for electron bremsstrahlung on a nucleon and pair production by γ -quanta on a nucleon in the lowest approximation in e .

129. Scattering of Gammas

"Resonance Scattering of Gamma Quanta on the Mg^{24} Nucleus,"
by I. Vashakidze, T. I. Kopaleyshvili, and Chilashvili, In-
stitute of Physics, Academy of Sciences Georgian SSR; Moscow,
Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37,
No 3, Sep 59, pp 750-755

Resonance scattering of γ -quanta on the Mg^{24} nucleus with excitation of the first two levels of 1.37 Mev and 4.23 Mev energy is investigated. An analysis of the correlational formula permits one to draw some conclusions concerning the nature of excitation of the nucleus.

130. Polarization of Gammas

"Circular Polarization of Gamma-Quanta Emitted by a Nucleus After μ - Capture," by I. S. Shapiro and L. D. Blokhintsev; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 760-764

Formulas are deduced for the circular polarization of γ -quanta emitted by a nucleus after μ -capture. Hyperfine splitting of the mesic atom levels is taken into account.

131. Betas in Forbidden Transitions

"Angular Distribution and Polarization of Beta-Particles in Second Forbidden Transitions," by A. Z. Dolginov and Ye. V. Kharitonov; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 776-785

Explicit formulas are derived for the polarization and angular distribution of β -electrons in second forbidden transitions involving V- and A-coupling. The angular correlation in unique transitions is examined for the case of an arbitrary order of forbiddenness. Unique second forbidden transitions are treated in detail.

132. Pair Production

"Pair Production in Collisions Between Charged Particles," by F. F. Ternovskiy, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 793-798

Pair production due to collisions between fast charged particles and atoms is considered. Expressions for the cross sections are obtained which are valid for positron and electron energies comparable with that of the mother particle.

133. Dipersion Technique

"The Dispersion Relations Technique and Perturbation Theory," by N. N. Bogolyubov, A. A. Logunov, and D. V. Shirkov, Joint Institute of Nuclear Research; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 805-815

The substance and results of the present investigation are closely related to Redmond's recent work (Phys Rev 112, 1404(1958)) on exclusion of nonphysical poles from propagators. In distinction to the work of this author, which is based on the relation between the spectral representations for a propagator and for the polarization operator, we proceed from the principle of summation of information derived from the perturbation theory under the sign of the Kallen - Lehmann spectral integral. By summing up in this way the contributions from the "main logarithmic diagrams," one can obtain expressions for the photon propagator in quantum electrodynamics and the meson propagator of the symmetrical charge theory which possess all the essential properties of the result obtained by Redmond, such as the correct analytical behavior in the complex plane of the momentum variable p^2 and a singularity with the respect to the square of the charge e^2 at the point $e^2 = 0$. However, in distinction to the results of the above reference (which correctly yields only the lowest order in the perturbation theory), the expressions of the present paper correspond to expansion terms in the perturbation theory in the range of large p^2 and of arbitrary order.

Account of lowest logarithmic terms shows that the region of applicability of the new formulas coincides with that of the older formulas possessing logarithmic singularities as it is restricted by the condition of smallness of the invariant charge. The technique of reducing the expressions obtained to a renormalization-invariant form is illustrated for the case of a photon propagator. In conclusion, some considerations regarding nonrenormalizable theories are discussed.

134. Decay of Transuranic Elements

"Spontaneous Fission of Am-241," by V. L. Mikheyev, N. K. Skobelev, V. A. Druin, and G. N. Florov; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 859-861

It was attempted to improve results obtained by E. Segre and others (Phys Rev, 86, 21 (1952)) in determining the periods of spontaneous fission of Am-241, by using a more sensitive method. $T_{1/2}$ has been found to be 1.5 times longer than that found by Segre.

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135. Work on Synchrocyclotron of Joint Institute of Nuclear Research

"The Cross Sections of Elastic Scattering of Positive π^+ -Mesons of 195 Mev Energy on Carbon and Lithium Nuclei," by V. G. Ivanov, V. T. Osipenkov, N. I. Petrov, and V. A. Rusakov, Joint Institute of Nuclear Research; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 863-866

Measurements have been made on the synchrocyclotron of the Joint Institute of Nuclear Research by using a cloud chamber in a magnetic field, as in previous experiments with negative particles (V. P. Dzhelepov, V. G. Ivanov, M. S. Kozodayev, V. T. Osipenkov, N. I. Petrov, V. A. Rusakov, ZhETF, 31, 923 (1956)). Experimental data of elastic scattering on C and Li nuclei, as well as theoretical data, obtained by quasi-classical approximation from formulas of the optical model (see reference above) are presented in graphs. The curves show a good agreement between experiments and theory.

136. New Book on Neutron Spectrometry

Spektrometriya Bystrykh Neytronov (Fast Neutron Spectrometry), by B. V. Rybakov and V. A. Sidorov, Moscow, 1958, 175 pp

A detailed discussion of electronic methods of spectrometry of fast neutrons (0.3 - 30 Mev) is presented. Particular attention is paid to the method of flight time which is new with respect to the specified energy range. The book is intended for scientific and engineering reserachers studying experimental nuclear physics, as well as for physics students.

137. Start of Experimental Reactor in Georgian SSR Announced

"Atomic Reactor Started Up in Georgia" (unsigned article); Moscow, Izvestiya, 6 Nov 59, p 3

A research reactor was started up at the Institute of Physics, Academy of Sciences Georgian SSR. The reactor reached its planned power of 2,000 kilowatts.

138. Construction Details and Operational Data on Hungarian Reactor

"The First Hungarian Experimental Atomic Reactor," by Gyozo Verde, chief engineer; Budapest, Magyar Tudomany, Jul/Aug 59, pp 379-385

An important task which arose during construction was the production of heavy concrete. For protection against gamma radiation, it was necessary to produce a protective concrete containing hematite, weighted with iron additives, and with a volume weight of 4.2 tons per cubic meter; and this had to be worked in among complicated structural materials without leaving any spaces. An even more difficult problem was presented by production of a protective concrete containing limonite, weighted with iron additives, and with a volume weight of 3.2 tons per cubic meter. In this case we achieved a bound water content of 160 liters per cubic meter which ensures that it will give outstanding protection against both gamma and neutron radiation.

The internal structural parts of the reactor were prepared from high purity aluminum. These were welded with argon gas protection arc welding.

The pipes of the cooling system, the pumps, the gate valves, the heat exchangers, the degasifier, and ion-exchange filter were all made of stainless steel. The pipes for leading off water with radioactive contamination were made of stainless steel, tested by X ray and water pressure, and, before being buried, were supplied with protective pipes made of carbon steel. Two underground concrete tanks, of 300 cubic meters' capacity each, serve to store radioactively contaminated water. These were prepared with stainless steel and carbon steel linings.

As a result of the careful washing procedures, the solid residue in water circulated just prior to the starting of the reactor was 2.1 milligrams per liter.

A total of 6,000 cubic meters of normal concrete and 700 cubic meters of heavy concrete had to be worked into the reactor building; 40 kilometers of cable were layed; 700 linear meters of ventilating conduit were built; and the oil painted wall area reached 12,000 square meters.

The Hungarian reactor is a water-water (VVRSZ) type, heterogenous system, operating on thermal neutrons. Distilled water serves as moderator and reflector. The moderator is itself the cooling medium. The maximum attainable neutron flux is 2×10^{13} neutrons per square centimeter per second. The maximum thermal output is 2,000 kilowatts. The maximum flux attainable through the horizontal experimental channels is 5×10^8 neutrons per square centimeter per second. The fuel is uranium oxide enriched 10 percent with isotope U 235. The uranium oxide is mixed with magnesium oxide and formed into rods 6 millimeters in diameter and 500 millimeters

long. These fuel elements are covered with a high purity aluminum jacket 2 millimeters thick. The aluminum jacket is hermetically sealed. The fuel elements are mounted in clusters for easier handling. They are placed in a square grid with their centers spaced at 17.5 millimeters. Each cluster contains 16 fuel elements. The clusters are mounted in a rough cylindrical form. The core is 645 millimeters in diameter and 500 millimeters high and contains 51 clusters or 816 fuel elements. (Only 31 clusters were actually loaded according to information given below. There is also a discrepancy between reported diameter of core and reported diameter of container.) The core is placed in a vertical aluminum pipe with a diameter of 600 millimeters. This pipe is braced in the center of a container with a diameter of 2,300 millimeters. This container, filled with water, is 5,700 millimeters tall. The large aluminum container is surrounded by a 200-millimeter-thick cast iron ring. All this is placed in the center of a limonite heavy concrete block 7,500 millimeters in diameter. At the top of the reactor, above the core, 3,500 millimeters of water and 800 millimeters of cast iron offer adequate protection against gamma and neutron radiation. Six experimental channels of 100 millimeters diameter and three of 60 millimeters diameter extend in a horizontal direction through the concrete, cast iron, and water filled aluminum container to the fuel element clusters. The experimental channels are empty aluminum pipes. The outer openings of the channels are closed by cast-iron plates. An eccentric hole in the plate corresponds to the channel opening. In a vertical direction there are eight channels of 45 millimeters diameter, these channels are suitable for isotope manufacture. Three of the vertical channels are suitable for fast irradiation. Materials let down through these channels proceed past the active zone and slip into underground hot chambers. The hot chambers are small areas lined with stainless steel and surrounded by heavy concrete. A manipulator extends into each hot chamber. The inside of the the chamber can be observed through a 720-millimeter-thick lead glass window. Radioactive isotopes from the reactor can be raised out of the sliding tube by means of a manipulator, can be broken up by means of a stainless steel breaking machine, can be weighed, etc. The radioactive isotopes are carried in a conveyer car to the loading chamber and can be loaded by manipulator into the opening arm of the transport container. The container closes automatically and is lifted to the operational level by a crane, whence it can be taken away by truck without danger.

In addition to the above channels, there is another horizontal experimental channel 120 millimeters in diameter opening into the core. This channel is embedded in a graphite disc. The length of the graphite block is 3,500 millimeters. The aluminum covered graphite block is built onto a cart which can be rolled in a circle. This is the so-called thermal column. Four vertical experimental channels open into the center of this thermal column. For protection against gamma radiation, a cast-iron protective layer can be rolled in front of the graphite block. Three vertical

250-millimeter-diameter experimental channels open into the protective layer of the reactor for doing biological experiments. A smaller lid with an eccentricity of 293 millimeters is built into the 800-millimeter-thick cast iron. This makes it possible to reach each point of the core without opening the lid. There is a periscope in the smaller lid by means of which the core can be observed during operation. At higher outputs, the blue-green Cerenkov radiation can be seen very well.

The core must be packed in such a way that the reactive reserve is approximately 5 percent. By liberating the reactive reserve, one can counterbalance the vitiating effect of fission products, the exhaustion of the U 235, and the reactivity changes appearing when temperature changes accompany experiments or isotope manufacture. When the core is completely packed, 1,300 megawatt-days of power can be attained. In the case of the experimental reactor, this packing is suitable for several years of periodic operation.

There are a total of nine control rods (3 safety, 4 gross manual, one fine manual, and one automatic) extending in among the fuel element clusters. Three rods made of boron carbide in aluminum jackets are suspended above the active zone as safety controls. The rods are suspended on steel cables held up by magnets. If there is trouble in the operation of the reactor, the magnets lose voltage and release the cables. Pre-stressed springs fire the boron carbide rods in among the uranium rods in 0.5 second.... This happens if reactor output goes above the permissible level by more than 20 percent; if the amplifier of the automatic control system fails; if the servo-motor of the automatic control loses voltage; if the automatic control rod reaches its lower end-position; if a pump in the cooling system fails; if circulation of cooling water goes below the permissible value; if water pressure drops after pump operation; or if the disaster button is pushed. Another four boron carbide aluminum-jacketed rods can be moved among the fuel elements by remote manual control. For precision control there is one boron carbide rod whose position can be set to an accuracy of 0.5 millimeter.

Output of the reactor is measured by means of a boron carbide coated argon-filled chamber. The chamber is fed by a 400-volt stabilized direct current. The current through the chamber is proportional to the magnitude of the radiation reaching it. Heat output is also measured. Automatic control is obtained with a steel rod with an aluminum jacket. Automatic regulation between 0.0012 and 100 percent is accurate to plus or minus 1.5 percent. The sensing element of the control system is an ionization chamber placed next to the core.

Temperature at the surface of the fuel elements should not exceed 90-92 degrees centigrade. Water circulated at 1.7 meters per second warms from 34 to 36 degrees centigrade. Three centrifugal pumps circulate 1,000 cubic meters of water per hour. Two more pumps are built in as reserves.

The reactor stands in the middle of a hall containing 11,000 cubic meters of air space. Above the reactor, there is a remote-controlled 10-ton crane. At right angles to the main hall there is a laboratory wing containing 23,000 cubic meters of air space. A one-meter concrete wall separates the two. The central control panel is in the laboratory wing. One engineer and one technician are constantly on duty at the control panel.

Signal lamps and danger alarms automatically signal an excess of the permissible radiation level. Personnel also carry pocket dosimeters. Everyone leaving the area must pass by a Geiger counter at the gate. Even a luminescent dial watch will set off the alarm.

The reactor went critical as fuel element cluster 24 was being loaded. The reactor was loaded until it was critical with the five manual control rods in place but the safety and automatic control rods raised. At this stage, the reactivity surplus rose to 6.9 percent. Since there was no need for so great a reactivity surplus, the number of fuel element clusters was reduced to 31, giving a reactivity surplus of 4.8 percent.

From 13 to 17 April 1959, the reactor was operated continuously for 100 hours. It was found that after 40 hours of operation, the reactivity surplus had dropped to 1.8 percent.

The reactor was officially opened on 30 April 1959 and has been operated periodically since.

139. Czechoslovak Provincial Paper Reports Soviet Light Alloy for Reactor Shielding

"Science and Technology" (unsigned article); Bratislava, Uj Szo, 24 Oct 59, p 8

CPYRGHT The following excerpts are from a popular science article:

"...We know that the TU-114 has a wingspread of 54 meters and a fuselage length of 47 meters, but it is also interesting that 80 tons of fuel are needed to fill its fuel tanks and that its oil reservoirs alone can hold 3 tons of oil...."

"Soviet mechanical engineers have already succeeded in finding the necessary solution [to the problem of aircraft nuclear reactor size], and they have found exceptionally light alloys which effectively protect against harmful radiation. The airplane of the future will need only 2 kilograms of nuclear "fuel" for a flight around the world...."

Plasma Physics

140. Plasma Wave Absorption

"Nonresonance Absorption of Electromagnetic Waves in a Magnetoactive Plasma," by B. N. Gershman, Radiophysical Institute of the Gor'kiy State University, Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp.695-704

Absorption (attenuation) of all three types of high frequency waves is determined from the general equation outside the gyro-resonance regions. Collisions, as well as the absorption mechanism specific for a plasma, are taken into account.

141. Electron Diffusion

"The Diffusion of Electrons in a Magnetic Field," by A. V. Zharinov; Moscow, Atomnaya Energiya, Vol 7, No 3, Sep 59, pp 220-224

The experimental data related to anomalous high mobility of electrons across a magnetic field are discussed. It is shown that the distribution of concentration of secondary plasma of the discharge with a heated cathode is practically independent of the coefficient of crosswise electron diffusion and, therefore, cannot be used in explaining the diffusion mechanism. An evaluation of the electron diffusion coefficient is made on the basis of the value of the density of the electron current to the anode. This evaluation confirms the presence of an anomalous high transverse mobility.

142. Increase in Electron Current in Gas Discharge

"A Stepwise Increase in the Electron Current to a Probe Held in a Gas Discharge in a Magnetic Field," by A. V. Zharinov; Moscow, Atomnaya Energiya, Vol 7, No 3, Sep 59, pp 215-219

Preliminary results from studying the effect of a magnetic field on electron diffusion in a plasma are described. A stepwise increase in the ratio of the electron current on the probe to the ionic current at a certain critical value of the magnetic field strength was observed. According to preliminary results, the critical magnetic field varies proportionally to the gas pressure. These facts seem to indicate the existence of two qualitatively different mechanisms of crosswise electron shift, one of which is diffusion by means of collisions.

143. Kinetic Plasma Equations

"Relativistic Kinetic Equations for a Plasma. I.," by Yu. I. Klimontovich, Moscow State University, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 735-744

The relation between the definitions of state probability and distribution function presented in the papers of various authors is established for the particular case of the kinetic equation for a charged particle in an external electromagnetic field.

A random function is introduced which defines the number of particles in an element of phase space. The electromagnetic field strength or number of oscillators are also considered as random functions. The equation set for these functions can be used as a basis for deduction of the equation chain relating the moments of the random functions or the corresponding distribution functions of various orders. A set of relativistic self-consistent equations had been derived by approximating this equation chain. Relativistic expressions for dispersion equations of transverse and longitudinal plasma waves are presented.

144. Polarized Wave Rotation

"Rotation of Polarization of Elastic Waves in Magnetically Polarized Magnetoelastic Media,:" by K. B. Vlasov and B. Kh. Ishmukhametov, Institute of Physics of Metals; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 745-749

Some peculiarities of propagation of magnetoelastic waves in magnetically polarized media are investigated (a medium possessing uniaxial symmetry is considered). It is shown that magnetoelastic wave moving along a symmetry axis consists of three waves: a longitudinal wave and two circularly polarized waves whose velocities of propagation are different and depend on the magnetic state of the medium (magnetization or polarization field). The latter circumstance should lead to rotation of the plane of polarization of linearly polarized elastic waves. The analysis is based on use of the phenomenological "states" equations which describe the dynamical properties of magnetoelastic media. For some particular types of magnetoelastic media, some considerations regarding the physical nature of the constants specifying the rotation of the plane of polarization are presented, and an estimation is made of the values of the frequencies at which an appreciable effect may be expected.

145. Waves in Plasma

"Simple Waves in the Chew, Goldberger, and Low Approximation," by I. A. Afdiezer, R. V. Polovin, and N. L. Tsintsadze, Physico-Technical Institute, Academy of Sciences of the Ukrainian SSR, Physics Institute, Academy of Sciences of the Georgian SSR; Moscow, Zhurnal Eksperimental'noy i Tekhnicheskoy Fiziki, Vol 37, No 3, Sep 59, pp 756-759

Simple waves in a plasma with anisotropic pressure are considered in the Chew, Goldberger, and Low approximation. It is shown that three types of waves exist: Alfvén and fast and slow magnetoacoustic waves. The direction of variation of the magnetodynamical quantities in these waves is investigated.

146. Electron Oscillations in Plasma

"Nonlinear Langmuir Oscillations of Electrons in a Plasma," by M. V. Konyukov, Tula Pedagogical Institute; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 799-801

An exact solution has been obtained for the problem of oscillation of the electron density in a plasma with a zero electron temperature. The restrictions on the initial conditions necessary for existence of the oscillations are established.

147. Electromagnetic Waves in Moving Media

"Build-Up of Electromagnetic Waves in Interpenetrating and Infinite Moving Media," by G. G. Getmantsev, Radio-Physical Institute of Gor'kiy State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 843-846

The propagation of plane monochromatic waves in mutually interpenetrating moving media is investigated. The equations derived for the refractive indexes permit one to solve the problem of stability of the waves. Build-up (decay) decrements of the waves and their dependence on time have been found for a plasma moving through a dielectric without dispersion.

Solid State Physics

148. Magnetization Processes

"Magnetization Processes In Ferromagnetic Substances," by L. V. Kirenskiy, M. K. Savchenko, and I. F. Dekhtyarov, Physics Institute of the Siberian Section of the Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 616-619

The dynamics of the domain structure during magnetization of silicon iron crystals containing 3% of silicon was studied with aid of powder figures and the Kerr magneto-optical effect. It is shown that, in general, magnetization involves the following processes: shift of interdomain boundaries, change in the domain structure and rotation of the magnetization vector in the direction of the field, and finally the paraprocess. The rotation process is the termination of technical magnetization, whereas the boundary displacement process precedes the change in the domain structure and completes it.

149. Anisotropy of Electric Conductivity

"Anisotropy of Electric Conductivity in a Magnetic Field and the Topology of Fermi Surfaces of Metals," by N. Ye. Alekseyevskiy and Yu. P. Gaydukov, Institute of Physical Problems, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 672-677

Anisotropy of resistance in a magnetic field is studied for Ag, Au, Cu, Sn, Pb, Tl, and Ga single crystals. Stereographic projections of singular directions of the magnetic field are constructed, and in accordance with them, some considerations concerning the topology of the Fermi surface of metals are discussed.

150. Magnetic Moment Relaxation

"Contribution to the Theory of Magnetic Moment Relaxation in Ferroelectric Substances," by V. G. Baryakhtar, Physico-Technical Institute, Academy of Sciences of the Ukrainian SSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 690-694

Magnetic moment relaxation and leveling out of the temperature between spin waves and the lattice in a ferroelectric substance is investigated at low temperatures, $T \ll \theta_c$

For $T \gg \theta_1$, $\theta_1 = \theta (\mu_M / \theta_c)^4 / 7$, a Bose distribution corresponding to a nonequilibrium magnetic moment is first established, and then the equilibrium value of the magnetic moment and, finally, rotation of the magnetic moment to its equilibrium direction takes place. For $T \ll \theta_1$, the magnetic moment assumes its equilibrium value simultaneously with establishment of the spin wave Bose distribution, and, thereafter, the magnetic moment turns toward its equilibrium direction.

Simple formulas are obtained for leveling out of the spin and lattice wave temperatures and relaxation of the magnetic moment.

151. Ionization in Semiconductors

"Kinetic Theory of Impact Ionization in Semiconductors," By L. V. Keldysh, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 713-727

The influence of impact ionization processes on the distribution function of electrons and holes in a strong electric field is investigated. It is shown that the energy dependence of the probability for impact ionization near the threshold is significantly different for crystals with small and large dielectric constant. The solution of the kinetic equation in each of these cases is discussed. Expressions are obtained for the equilibrium number of carriers in a strong field, impact ionization coefficients, critical field strength, etc. The dependence of the breakdown field on temperature, sample thickness, and law of interaction between the electrons and lattice is derived. The connection between the expressions obtained with the well-known breakdown criteria of Frohlich and Hippel is established. It is demonstrated that growth of the electric field leads to a decrease of the recombination rate, and as a result, the equilibrium number of carriers begins to increase with increase of the field much more earlier than impact ionization begins to appear.

152. Energy Absorption by Ferroelectrics

"Nonresonance Absorption by Ferroelectric Substances of the Energy of an Alternating Magnetic Field," by M. I. Kaganov and V. M. Tsukernik, Physico-Technical Institute, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 823-832

The imaginary part of the longitudinal magnetic susceptibility of a ferroelectric is computed by aid of spin wave theory.

153. Supercooling Superconductivity

"Supercooling Field in the Theory of Superconductivity," by L. P. Gor'kov, Institute of Physical Problems, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 833-842

The magnitude of the critical supercooling field H_{c1} in superconductivity theory is deduced. It is found that the field H_{c1} is greater or smaller than the critical field, depending on whether the superconductor is of a London or Pippard type in a weak field. In the first case, the behavior of a superconductor in a strong field should be similar to that of alloys. The ratio H_{c1}/H_c weakly depends on the temperature throughout the temperature range.

154. Hungarian-German Discussion of Physics of Solids

"Colloquium on the Physics of Solid Bodies" (unsigned article); Budapest, Magyar Nemzet, 16 Sep 59, p 6

The Lorand Eotvos Physics Society [Hungarian] and the Physics Society of the German Democratic Republic organized an international scientific meeting at Balatonfured under the title "Colloquium on the Physics of Solid Bodies." The 5-day conference will be attended by scientists from other foreign countries, in addition to researchers from the two organizing countries.

155. Splitting of Magnetic Reflection of Cr

"Magnetic Structure of Chromium," by V. N. Bykov, V. S. Golovkin, N. V. Ageyev, V. A. Levдик, and S. I. Vinogradov; Moscow, Doklady Akademii Nauk SSSR, Vol 128, No 6, Oct 59, pp 1153-1156

The anomalies of the physical properties of Cr are studied. It has been possible to split the magnetic reflection of polycrystalline Cr into three peaks at -100°C . It could be established that the magnetic lattice of Cr does not correspond to its crystalline lattice.

156. Linear Kerr Effect

"Theory of the Linear Kerr Effect in the Region of the Exciton Absorption of Light by Molecular Crystals," by A. F. Lubchenko; Moscow, Optika i Spektroskopiya, Vol 7, No 3, Sep 59, pp 341-348

The theory of linear Kerr effect for molecular crystals in which excitons appear is developed for weak connection of exciton excitation with lattice vibrations and at an arbitrary value of the absorption coefficient. Equations are derived determining the light propagation in the region of the exciton absorption in presence of a constant, homogeneous exterior electric field; the tensor of the third order is computed, and it governs the optical anisotropy, as well as the magnitude of the binary ray refraction for crystals of cubic and medium symmetries, at propagation of light along the direction of the external field, which is parallel to the axis of the highest order.

157. Faraday Effect in the Exciton Absorption Region

"Theory of the Faraday Effect in the Region of the Exciton Absorption of Light by Molecular Crystals," A. F. Lubchenko; Moscow, Optika i Spektroskopiya, Vol 7, No 3, Sep 59, pp 332-340

The theory of the Faraday effect is developed in molecular crystals in which excitons appear at weak connection of the exciton excitation with lattice vibrations and at an arbitrary value of the absorption coefficient. The gyration vector governing the rotation of the polarization plane in the external magnetic field is computed, and formulas are obtained determining the dispersion of the Verdet coefficient for crystals of higher and medium symmetries near the bands of exciton absorption, as well as for the refraction indexes in this region.

158. Sum of Phosphorescence Light

"Investigation of Light Sums in a Phosphor S_2S-Eu , Sm. I." by I. B. Keirim-Markus; Moscow, Optika i Spektroskopiya, Vol 7, No 3, Sep 59, pp 384-398

The sum of light is studied in detail in crystal phosphors S_2S-Eu , Sm by the method of thermal stimulation. Much new data have been obtained on electron storage, their distribution according to traps, and the trap parameters in phosphor.

Spectroscopy

159. Spectroscopy Conference

[Materials of the 12th All-Union Conference on Spectroscopy];
Moscow, Izvestiya Akademii Nauk, Seriya Fizicheskaya, Vol 23,
No 9, Sep 59, pp 1056-1156

The entire issue of this publication is devoted to the conference held in Moscow 19-26 November 1958, concerning atomic emission spectral analysis. Titles of the articles, their authors, and short summaries follow:

"The Determination of Atom Concentration in Plasma of an Arc Discharge From the Breadth of Spectral Lines and the Relation Between Concentrations in Solid and Gaseous Phases," by I. M. Nagibina, Leningrad Institute of Precision Mechanics and Optics; pp 1056-1059

Results of measurements are reported of some average atom and ion concentrations in the cloud of an arc ac discharge with allowance of the heterogeneity of the source, i. e., the uneven distribution of excited and ground states of atoms from the cross-section of the discharge.

"Peculiarities of an Arc Discharge in Atmosphere of Some Gases," by V. L. Marzubanov, pp 1059-1061

Peculiarities of a dc arc discharge, as power, spectral composition of radiation, electrode temperature, speed of element evaporation, etc., in helium, argon, air, nitrogen, chlorine, and carbon dioxide are under study.

"A Chart of Spectral Lines for a Spectrograph With a Diffraction Grating," by S. K. Kalinin, V. L. Marzubanov, E. Ye. Feyn, G. M. Zamyatina, V. N. Perevertun, and S. L. Terekhovich, Institute of Nuclear Physics, Academy of Sciences Kazakhstan SSR; 1061-1063

Spectrographs with diffraction gratings of high resolution have been manufactured in mass production. A new chart of spectral lines for use with these instruments has been in preparation during the last year. Copious material compiled in the chart facilitates the identification of spectral lines.

"Investigation of Matter Penetration Into Arc Plasma, The Case of Binary Mixture of Na and Li," by V. P. Zakharov and A. A. Shishlovskiy; pp 1063-1064

The "crooks" Rozhdenstvenskiy's method (Ye. I. Nikonova, V. K. Prokof'yev, Optika i Spektroskopiya, 1, 298 (1956) was used for determining the atom concentration in arc plasma. Data of matter having penetrated into an ac and dc arc discharges were compared. It has been found that a dc arc has 1.33 times more Na atoms and 1.41 times more Li atoms than an ac arc.

"Investigation of Matter Penetration of Silicon Brass in an ac Arc," by N. K. Rudnevskiy, G. I. Golitsyn, and V.P. Pybochkin, Scientific Research Institute of Chemistry, Gor'kiy State University imeni Lobachevskiy; pp 1065-1067

Penetration of zinc and copper into the gaseous arc cloud has been studied. It has been found that the penetration of zinc depends in a complex way on the Zn and Si concentration in the alloys.

"Investigation of Matter Penetration of Lead Brass Into the AC Arc," by N. K. Rudnevskiy and Ye. S. Obukhova, pp 1067-1069

It is attempted to clarify the effect of Zn content on the intensity of Pl lines in the spectrum of lead brass from an ac arc, as well as the considerable change of concentration of matter in the gas cloud and the variation of temperature. The results showed that the velocity of Pb brass entering the gas cloud depends on Zn and Pb concentrations in the alloy.

"Ratio of Solid and Gaseous Phases in Spectral Analysis of Alloy on Iron Base," by O. I. Nikitina, M. G. Slyar, An Ye. Gorevaya, and N. K. Ivanova; 1069-1072

The ratio of compound of the analyzed solid probe to the chemical compound of its vapors in the discharge cloud has been studied.

"The Effect of the Discharge Period on the Speed of Particle Vaporization From the Surface of the Metallic Electrodes of the Arc," by G.Ye. Zolotukhin and N.M. Zykova; pp 1072-1074

The evaporation speed of the surface of metallic electrodes of an ac arc discharge has been compared with discharge energy and the heat amount received by the electrode surface during a time unit. The period and intensity of a single discharge were given on an oscillogram.

"Study of the Role of the Polarity of the Sample at Excitation of the Spectrum in an AC Arc," by E.A. Silin'sh and L.F. Taure, Physics Laboratory of the Riga Electric Machine Construction Plant, Spectral Laboratory of the Riga Plant Avtoelektropribor; pp 1074-1077

The role of electrode polarity during spectral analysis of carbon, alloyed and stainless steel, and brass has been studied. Calibrated graphs, curves of burning and the spatial distribution of the intensity of spectral lines, as well as the effect of the current strength of the arc on the intensity of spectral lines with relation to polarity, have been established.

"On the Effect of the Compound of Powderlike Substances on the Relative Intensities of Spectral Lines, by A. M. Shavrin and M. A. Zotin, Perm State University imeni Gor'kiy; pp 1077-1079

Some data are presented on the effect of the compound of powdered samples on the relative intensities of lines in systems on SiO₂ basis and alkali halide carbonate elements during evaporation of the specimen from a cavity in the copper electrode.

"Rules of the Effect of 'Third' Elements at Spark Analysis of Solutions," by A.K. Rusanov and L.I. Sosnovskaya; pp 1079-1081

The relation of spectral lines intensity to the properties of the solutions and the effect of mutual ratio of elements have been studied. It has been established that the absolute intensity of lines decreases with increasing thickness of the film, hence with higher amount of the matter consumption in the spark of the solution.

"The Effect of 'Third' Elements in the Use of Non Dispersed Light as Internal Standard," by I.S. Abramson, S.N. Murzin, and V.A. Slavnyy, Laboratory of the Spectroscopy Commission, Academy of Sciences USSR; pp 1081-1083

Experimental work using nondispersed light as internal standard proved that this method has indubitable advantages with respect to reproduction of effects on metallic specimens, and it is not inferior to comparison methods of the spectral line of the base substance.

"The Effect of the Chemical Compound of the Sample on the Intensity of the Base Spectrum and the Results of Spectral Analysis," by NV. Buyanov; pp 1083-1085

It has been found that the diluting action of the alloyed elements strongly depends on the light source. Many elements, even in small concentrations, exhibit strong influence on the spectrum of the base.

"The Relation of the Diluting Action of 'Third' Components to Transfer a Matter in the Sources of Light for Spectral Analysis," by A.M. Borbat and A.A. Shishlovskiy, Kiev State University imeni Shevchenko; pp 1086-1087

Because of the very complex character of the effect of "third components, only their diluting action is analyzed.

"The Relation of Full Intensity of Spectral Lines to Atom Concentration in a Pulse Discharge," by Ye.I Vorontsov; pp 1087-1090

The study of holes on the surface of electrodes confirmed the conclusion on the yield of matter in relation to the compound of samples.

"Study of the Cause of Selective Destruction of Alloys by a Spark Discharge," by I.A. Grikit; pp 1091-1093

It has been found that boundary of crystallites are easier to be destroyed due to easy melting and higher mobility of atoms.

"Effect of 'Third' Elements at Spectral Analysis of Melted Metals with a Condensed Spark," by L.Ye. Vvedenskiy and V.I. Shekhobalova, Moscow Aviation Institute; pp 1093-1095

A vanishing of "third" element effect has been revealed in the spectral analysis of melted aluminum alloys in a spark from the arc lines of the spectrum, pointing to a relation of the effect of "third" elements in a spark to the variations in the crystalline lattice of the solid specimen at introduction of the "third" element into the binary alloy. A full destruction of distant order of the lattice by means of heating by 150 - 200° over the melting point eliminates the effect of "third" elements.

"Spectroscopic Study of Electric Erosion Properties of Oxygen Containing Titanium," by N.S. Sventitskiy and K.I. Taganov; pp 1096-1097

The possibility of evaluation of oxygen content in titanium from its erosion properties by spectral analysis has been established as well as from their thermoelectric properties.

"Some Spectroscopic Research of the Polarity Effect of Electric Erosion of Metals," by K.I. Taganov, pp 1097-1098

Some new factors influencing the polarity effect have been studied.

"The Application of a Contact-Spark Selection of Matter in Spectral Analysis Research," by V.S. Burakov and A.A. Yan-kovskiy; pp 1099-1100

The contact spark method of doses of samples is used for the study of relation of intensity of spectral lines to the amount of burned matter.

"Mirror Spectrograph With a Long Picture (Study of the Optical System)," by S.A. Khrshanovskiy; pp 1100-1102

The attempt is made to obtain a longer picture and higher dispersion by using bent mirrors.

"Photoelectric Equipment Based on Spectrograph ISP-22. A New Method of Automatic Spectral Analysis of the Electrolyte," by Yu.A. Yakobi and S.I. Maksimov; pp 1103-1105

A new method was tested for the solution of the above problem. Metal is electrolytically deposited on the basic electrode and serves as electrode at the excitation of the spectrum. The electrode is electrolytically cleaned of the deposit after the end of the exposure and is coated with another one.

"New Photoelectrical Spectral Apparatus," by M. M. Averbukh, N. V. Artsishevskaya, N. V. Belayev, I. I. Yerina, D. I. Pen'kov and I. G. Strel'tsov, Scientific Research Institute of Technology of Automobile Industry, 1105-1107

During the last years, two four-channel instruments, FESA-4 and FESA-4M, have been designed. The recording equipment of the new instruments differs from the previous ones in that the battery feeding of the amplifier is replaced by feeding from a stabilized rectifier.

"Analysis of Light and Refractory Alloys and Steels by Photoelectric Method," by K.A. Sukhenko, K.A. Moiseyeva, L.D. Metelina, I.G. Tishin, N.V. Penkina, and D.G. Bakarov; pp 1107-1110

Because photoelectric methods of element determination proved to be insufficient, new methods of determination of elements of alloys have been devised.

"Photoelectric Stylometers With Visual Control of the Position of Invisible Spectral Lines," by M. M. Butslav, A.K. Vinogradova, L.M. Ibartsov, G.N. Kutuzova, and S.L. Mandel'shtam; pp 1110-1113

Two types of operating models of the instrument FES in which the position of the spectrum is controlled by means of electron optical converters with an antimony cesium cathode and a uviol window have been designed. The converters secure a visual observation of the spectrum within the range of 6000-2400 A.

"Stabilization of the Position of the Spectrum by Means of Thermostatization of Spectral Equipments," by A.P. Atamanov, V.N. Balandin and L.M. Ivantsov; pp 1112-1113

A method of stabilization of the position of the spectrum by means of locating the spectral equipment inside a thermostat has been tested.

"A Photoelectric Attachment to the Mean Model Spectrograph," by L.M. Ivantsov and A.I. Sherudilo; pp 1114-1115

The photoelectric attachment to the spectrograph ISP-22 is essentially different from those used abroad.

"Determination of Oxygen in Technical Titanium by the Spectral Method," by K.A. Sukhenko, V.S. Grigoreva, I.S. Lindstrom, N.S. Sventitskiy, and P.P. Galonov; pp 1116-1118

Some preliminary tests in determining oxygen content in Ti have been carried out using a low volt spark discharge.

"Some Peculiarities in Spectral Determination of Oxygen in Titanium," by N.S. Svantitskiy, K.I. Taganov, and Z.I. Shlepkova; pp 1118-1120

Best results have been obtained by using a pulse or spark discharge for the excitation of the spectrum.

"The Problem of Using the Spectral-Isotopic Method of Determining Hydrogen," by T.F. Ivanova, M.E. Trentovius, and V. V. Fedorov; pp 1120-1123

The equipment consists of a diffraction spectrograph DS-1, a photoelectric recording stage, and a vacuum system. It is not mass produced and, therefore has not been introduced into factories.

"Nitrogen Determination in Steels of Various Compounds," by K.A. Sukhenko, P.P. Galonov, and T.V. Barasheva; pp 1123-1126

Further improvements of methods have been attempted by creating a combined source of light for the determining of gases.

"Effect of the Chemical Compound and Thermal Treatment of the Steel Specimen on the Results of Nitrogen Determination by Spectral Method," by N.B. Buyanov, L.M. Fedorova, and V.F. Korotkov; pp 1126-1128

The effect of "third" elements and of thermal treatment of the specimens on the result of nitrogen determination in various makes of steels has been studied.

"Nitrogen Determination in Chromium and Titanium," by S.A. Skotnikov, Institute of Metallurgy, Academy of Sciences USSR; pp 1128-1130

It has been found that the best conditions for determining nitrogen in steels, chromium, and titanium are : a low volt spark as light source, at 400 μ F capacity, 10 μ H induction and 200-300 mm Hg pressure of CO₂; interelectrode gap 0.5 mm and the antielectrode of sparked copper.

"Analysis of High Concentration With Allowance of Effect of 'Third' Components," by L.I. Topalov, Zaporogie Plant of Ferrous Alloys; pp 1130-1133

The problem is solved analytically and found to be in good agreement with experimental results.

"Spectral Determination of High Contents of Alloyed Components of Noble Metals," by N.I. Varlamova and N.S. Sventitskiy; pp 1133-1135

Attempts are made to improve former methods by adjusting the capacity and induction of the high frequency spark and replacing the transformer coupling by an auto transformer.

"Determination of High Contents of Elements in Steels and Alloys by Spectral Method," by A.G. Komarov, Central Scientific Research Institute of Technology and Machine Construction; pp 1135-1136

It has been found that the use of a localized strong pulse spark discharge of low voltage for the analysis of steels and alloys leads to a considerable decrease of a parallel shift of the calibrated graph.

"Statistical Research in Analysis of Matter," by V.V. Nalimov; pp 1137-1138

Problems facing the analysts in working out new methods of analysis are described.

"Standards for Determination of Admixtures in Powdered Complex Ferrous Alloys," by A.B. Shayevich, Ural Institute of Ferrous Metals; pp 1139-1140

It has been concluded that the best way to use a standard of Ferrous alloys is a step by step dilution of one standard sample.

"Methods of Preparation of Standards for Spectral Analysis of Noble Metals," by A.A. Kuranov; pp 1140-1143

A review of methods widely applied in USSR industry is presented.

"Spectral Determination of Uranium by Introduction of Isotopes (Precision Alternatives)," by N.P. Ivanov, Institute of Geochemistry and Analytical Chemistry imeni Vernadskiy, Academy of Sciences USSR; pp 1154-1156

Basic results of improvements of the previously used methods of introduction of lighter isotopes U-235 and U-238 in known amounts into the analyzed sample of uranium are reported.

160. Isotopic Analysis of Lithium

"Spectral Method of the Isotopic Analysis of Lithium," by F.F. Gavrilov; Moscow, Optika i Spektroskopiya, Vol 7, No 3, Sep 59, pp 285-288

A photographic method of spectral analysis of isotopic compound of lithium is developed by using the line Li I 6707.85 Å in conditions of absence of light reabsorption. The absolute error of analysis in determining Li 6 in the concentration range from 7.5% to 90% equals 0.2%. The weight of the sample equals $3 \cdot 10^{-6}$ g. The output amounted up to ten analyses in 8 hours. The relative abundance of Li isotopes Li^7/Li^6 found by this method equals 12.2 ± 0.3 .

161. Partial Frequencies of Triatomic Hydrides

"Partial Frequencies of Triatomic Hydrides and Deuterides of the Symmetry C_{2v} ," by V.P. Morozov; Moscow, Optika i Spektroskopiya, Vol 7, No 3, Sep 59, pp 289-293

The method of partial frequencies is used for solving problems of molecular vibrations theory: the construction of zero approximations in relation to the force constants and coefficients of influence and the construction of approximate correlations between the frequencies of isotopic modifications. In particular, the triatomic nonlinear symmetric hydrides and deuterides are studied.

162. Vibrational Spectra

"Theory of Vibrational Spectra of Polymers. I. The Structure of Bands in Vibrational Spectra of Spiral Polymer Chains," by Yu.Ya. Gotlib; Moscow, Optika i Spektroskopiya, Vol 7, No 3, Sep 59, pp 294-300

The intensity distribution is studied in the optical vibrational band for a regular spiral polymer chain. The band appearing in the splitting of vibration of a separate monomer separates into two components -- a parallel and a perpendicular. The intensity distribution in each component is analyzed. From the obtained expressions, formulas for particular cases are derived for intensities of chains parallel and antiparallel of bound oscillators.

163. Infrared Absorption Spectra of Hydrocarbons

"Study of Infrared Absorption Spectra of Hydrocarbons at Various Temperatures in the Liquid and Solid Phase," by Kh. Kesler, Yu.A. Pentin, Ye.G. Treshchova, and V.M. Tatevskiy; Moscow, Optika i Spektroskopiya, Vol 7, No 3, Sep 59, pp 301-310

Infrared absorption spectra of a number of hydrocarbons have been studied at room temperature and in liquid phase and at low temperatures (up to -172°) in solid phase in order to clarify those changes in spectra which may be observed in transition from liquid to solid phase. The studies of these changes facilitated the establishment of presence or absence of reversible isomers in each of the phases and the variation of concentration of reversible isomers in relation to temperature.

164. Water and Ice Spectra in Infrared

"Optical Characteristics of Water and Ice in the Infrared and Radio Wave Region of the Spectrum," by L.D. Kislovskiy; Moscow, Optika i Spektroskopiya, Vol 7, No 3, Sep 59, pp 311-320

Optical constants of water and ice in the region of infrared and radio frequency spectra have been computed by the method devised by the author. For the computation, use has been made of previously known data and the obtained experimental data. The obtained data of optical constants satisfactorily agree with experimental data found in literature.

165. Fluorescence Spectra and Quantum Yields

"Absorption and Fluorescence Spectra and Quantum Yields of Fluorescence of Some Methyl- and Methylmeso-ArylAnthracenes," by A.S. Cherkasov; Moscow, Optika i Spektroskopiya, Vol 7, No 3, Sep 59, pp 326-321

Absorption and fluorescence spectra are studied, as well as some quantum yields of fluorescence of some α - and β -methyl anthracene derivatives, mesodiorthohyl anthracene. It is shown that the vicinity of the space distribution of methyl and aryl groups at α -methylmesoaryl-anthracenes leads to the appearance of an interaction among them (stronger in excited state), revealing itself in the blurring of the vibrational structure of fluorescence spectrum, their strong shift towards lower frequencies, and, in some cases, the decrease of fluorescence yield.

166. Study of Absorption and Fluorescence Spectra

"The Application of the Additive Statistical Method to the Study of Absorption and Fluorescence Spectra," by P.G. Maslov; Moscow, Optika i Spektroskopiya, Vol 7, No 3, Sep 59, pp 355-365

The problem of a possible application of an additive-statistical method to the study of electron absorption spectra and fluorescence of organic molecules is discussed. Correlations are obtained permitting the computation of various characteristics of electron molecular spectra (location, intensity, quantum yield of glowing, etc.), based on the assumption of additivity of action of various substitutes on these characteristics. It is shown, with the example of a large group of aromatic compounds, that the indicated correlations are in satisfactory agreement with experimental data.

167. Plastic Scintillators

"Plastic Scintillators Containing 1, 3, 4-Oxadiazol Aryl Derivatives," by N.P. Shimanskaya, A.P. Kilimov, A.P. Grekov, L.M. Yegupova, and R.Z. Azen; Moscow, Optika i Spektroskopiya, Vol 7, No 3, Sep 59, pp 366-370

The scintillation efficiency, the luminiscence spectra, and the absorption of solutions of eight 2, 5-aryl-derivatives of oxadiazol in polystyrene have been measured. The obtained data were compared with data of previously measured eight derivatives of oxadiazol. It is shown, that among separate substitutes, the best influence on the scintillation efficiency is made by biphenylic and 1-naphthyl residues.

168. Luminiscence of Lithium Hydride

"Luminiscence of Lithium Hydride, by F.F. Gavrilov; Moscow, Optika i Spektroskopiya, Vol 7, No 3, Sep 59, pp 371-375

While studying the additive and photochemical dying of crystals of LiH, it was revealed that at excitation by a Hg lamp, these crystals luminesce brightly, predominantly in orange-red. Only those crystals which have a bluish grey color luminesce. All processing has been carried out in argon atmosphere.

169. Decay of Phosphors

"Initial Stages of Decay of Phosphors With Levels of Several Kinds," by V. V. Antonov-Romanovskiy; Moscow, Optika i Spektroskopiya, Vol 7, No 3, Sep 59, pp 376-384

In the case of phosphors with levels of several kinds and with a predominating possibility of recurrent capture of free charges over the possibility of their recombination with localized charges and absence of saturation, the decay curve in initial stages and under certain conditions may be expressed as a sum of exponents.

170. Study of an Electroluminophor

"Effect of the Electric Prehistory of an Electroluminophor on Its Luminescent Characteristics at Excitation by Short Voltage Pulses," by I. Ya. Lyamichev, and I.N.Orlov; Moscow, Optika i Spektroskopiya, Vol 7, No 3, Sep 59, pp 398-406

Experimental data on electroluminescence excitation of rectangular voltage pulses are reported. They show the influence of preliminary electroluminophor excitation on the behavior of its luminescence. The relation of the preliminary excitation of the phosphor by the electric field has been studied during the action on the electroluminescent layers of three independently governed voltage impulse series, supplied in a specified time sequence. A qualitative mechanism for the origin of two peaks in each luminescence pulse of the electroluminophor is suggested.

171. Scattering of Light According to Rayleigh's Law

"Luminous Conditions Within a Medium Scattering Light According to Rayleigh's Law," by G.V.Rozenberg; Moscow, Optika i Spektroskopiya, Vol 7, No 3, Sep 59, pp 407-417

Theoretical computation is carried out of basic characteristics of luminous conditions within a medium with Rayleigh scattering and dependence on the properties of the medium, the specific absorption and depolarization. Various methods of computation are compared, and errors due to neglect of polarization effects are found. The possibility of application of the established rules to spectroscopic objectives is discussed.

172. X-Ray Diffraction

"Diffraction of X-Rays in Polycrystalline Samples of Hydrogen Isotopes," by V.A. Kogan, G.G. Lazarev, and R.F. Bulatov; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 678-683

Comparison of the interference patterns obtained in X-rays scattering on the polycrystalline samples of hydrogen isotopes indicates the existence of isotopic polymorphism. The difference in the structure of hydrogen and deuterium and the proximity of the structure of the latter to that of tritium indicates that polymorphism is due, not to a difference in the energy spectra, but to a difference in the atomic weights of the hydrogen isotopes. The observed differences in structure of the hydrogen isotopes agree with the hydrogen-deuterium state diagram. Data presented in the paper pertaining to the parameters characterizing the structure of hydrogen isotopes (tritium and deuterium have a tetragonal lattice with $c/a = 1.73$ and $a = 3.3$ and 3.35 Å, respectively; hydrogen has a tetragonal lattice with $c/a = 0.82$ and $a = 4.5$ Å or hexagonal lattice with $c/a = 1.73$ and $a = 3.7$ Å), although in agreement with density data and with the results of roentgenographic investigations of isotopic mixtures, require further correction by methods which yield the complete interference patterns.

Theoretical Physics173. Thermoelectric Tensor

"Thermoelectric Coefficients of Metals in Strong Magnetic Fields and the Effect of Drag of Electrons by Phonons," by L.Ye. Gurevich and G.M. Nedlin, Leningrad Physico-Technical Institute, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 765-775

The behavior of the thermoelectric tensor in strong magnetic fields when the electron Larmor frequency is greater than the collision frequency is considered by the methods proposed by Lifshitz, Azbel, and Kaganov (ZheTF 32, 1183 (1957); 31, 63 (1956); 35, 1251 (1958)). Drag of electrons by phonons is taken into account, and it is shown that this effect significantly changes the asymptotic values of the tensor (for large field values), as well as its dependence on the direction of the magnetic field relative to the crystal axes (in the case of a complex topology of the Fermi surface).

174. Quantum Theory of Space Dispersion

"Quantum Theory of Space Dispersion of the Electric and Magnetic Susceptibilities," by O.V.Konstantinov and V.I.Perel, Leningrad Physico-Technical Institute, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 786-792

A general expression has been obtained for the electric and magnetic susceptibilities with account of space dispersion. It is shown that electromagnetic phenomena in a homogeneous medium can be described by a conductivity dependent on frequency and wave vector and by a magnetic susceptibility which depends only on the wave vector. An universal relation has been derived between the conductivity and magnetic susceptibility.

175. Magnetic Resonance

"The Effect of a Coherent Magnetic Dipole Radiation on Magnetic Resonance," by G.V.Skrotskiy and A.A. Kokin, Ural Polytechnic Institute; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 802-804

Corrections to the relaxation time due to the effect of the radiation field are computed. The effect of the resonator on the nature of the observed phenomenon is taken into account.

176. Potential of a Quantum Field

"On the Determination of the Potential in Quantum Field Theory," by M.A. Braun, Leningrad State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 816-822

The problem of determination of potential in quantum field theory is investigated in connection with the restrictions imposed on the transition amplitude by the conditions of ortho-normality and completeness for systems of interacting and noninteracting particle states. A nonlinear integral equation for the transition amplitude is used to set up the potential. It is demonstrated that the proposed potential correctly describes scattering of particles in the energy region in which creation of new particles does not occur and also correctly describes the bound states of the particles. Problems connected with nonuniqueness of the potential are discussed.

177. Representation of Green's Functions by Spectral Functions

"Asymptotic Behavior of a Photon Propagator in Quantum Electrodynamics," by B.A. Arbuzov; Moscow, Doklady Akademii Nauk SSSR, Vol 128, No 6, Oct 59, pp 1149-1152

The asymptotic behavior of a photon propagator is determined by solving approximate equations of Schwinger-Nambu (Phys Rev, 100, 394 (1955)). The spectral representations of Green's functions not fully demonstrated by Nambu are analyzed.

Miscellaneous

178. Separation of Air Along a Temperature Gradient at the Cold End of Vortex Tube

"Temperature Separation of Air at the Cold End of a Vortex Tube," by Prof V. S. Martynovskiy, Doctor of Technical Sciences, and Prof B. B. Paruleykar, Odessa Technological Institute of the Food and Refrigeration Industry; Moscow, Kholodil'naya Tekhnika, Vol 36, No 4, Jul Aug 59, p 63

CPYRGHT

"The authors analyzed results obtained in the investigation of different designs of vortex tubes and of the influence which individual construction parts exert on the Rank effect. The phenomenon of the separation of cold air makes it possible, as has been found in experiments, to lower the temperature of the air by 10-15° as compared with vortex tubes of ordinary design. Designs were described which make it possible to accomplish in a simple manner the separation of cold air. The degree of approach to the adiabatic drop at different pressures was established on the basis of experiments carried out with the designs mentioned. In some cases, it is possible to use the Rank effect for air conditioning. There is also the possibility, from the practical standpoint, of operating the vortex tube in such a manner that the effect is reversed."

[SIR Note: This is an abstract of a paper presented at the All-Union Scientific-Technical Conference on Refrigeration Engineering, Leningrad, 6-9 April 1959.]

179. Negative H-ions

"Formation of Negative Hydrogen Ions on an Incandescent Tungsten Surface," by V.I.Khvostenko and V.M.Dukel'skiy, Leningrad Physico-Technical Institute, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 3, Sep 59, pp 651-653

Formation of H^- ions on an incandescent tungsten surface has been observed. A value of 0.8 ± 0.1 eV has been obtained for the electron affinity of the hydrogen atom, from the temperature dependence of the ratio of the negative ion current to the electron current in the $2600-2900^\circ$ K range.

180. Resolution of Two Light Sources

The Possibility of Resolving Two Light Sources Strongly Differing in Intensity," by A.N.Ryazanov; Moscow, Optika i Spektroskopiya, Vol 7, No 3, Sep 59, pp 417-421

It was found that for the resolution of two sources of light interfering in a diffraction pattern, it is necessary to lower the background around the zero maximum. It may be achieved by broadening the central maximum.

181. Optico-Acoustic Radiation Receiver

"The Sensitivity Threshold of an Optico-Acoustic Radiation Receiver," by A. O. Sall; Moscow, Optika i Spektroskopiya, Vol 7, No 3, Sep 59, pp 432-436

Formulas derived for numerical determination of the threshold of sensitivity of a selective optico-acoustic radiation receiver with a light receiving chamber of complex design is described. Examples of computation of the depth of the chamber are given.

VIII. MISCELLANEOUS

182. Hungarians Are Hosts to Foreign Mathematicians and Geochemists

"Scientific Conferences in Budapest" (unsigned article); Budapest Nepszabadsag, 7 Oct 59, p 9

The Janos Bolyai Mathematics Society has organized a 3-day conference which is being held in the House of Technology. At the conference Hungarian, Bulgarian, Polish, German, and British scientists will exchange views on problems of series theory. On the first day of the conference, 6 October 1959, papers were read by Academician Alfred Renyi, Pal Erdos, and Peter Szusz (all Hungarian), and by V. D. Obreshkov of Bulgaria, by M. Zamansky of France, and W. Maier of the German Democratic Republic.

A 5-day international geochemistry conference began the same day at the academy; it was organized by the geochemistry main committee of the Hungarian Academy of Sciences. Soviet, British, Czechoslovak, Finnish, French, German, and Swiss guests are participating, including P. Eskola, Finland; H. Schneiderhohn, Freiburg; V. S. Sobolyev, Soviet Academician; A. A. Saukov, Corresponding Member of the Soviet Academy; V. Y. Lebedyev and V. Shcherbina, Soviet Doctors of Mineralogical Sciences; and M. A. Grimbert, director of the Central Nuclear Research Institute of the French Atomic Energy Committee.

Hungarian Academician Elemer Szadeczky-Kardoss gave the introductory address. Papers were then read by P. Eskola, H. Schneiderhohn, A. T. V. Rothstein (London), E. Kartsch (Berlin), and Balint Ballay, Aladar Vidacs, Gabor Panto, Mrs F. Vilma Szeki (all four Hungarian), F. Fiala (Prague), and Ohmas Kaemmer (Berlin).

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