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PLEASE NOTE

This report presents unevaluated information extracted from publications of the USSR, Eastern Europe, and China. The information selected is intended to indicate current scientific developments and activities in the USSR, in the Sino-Soviet Orbit countries, and in Yugoslavia, and is disseminated as an aid to United States Government research.

SCIENTIFIC INFORMATION REPORT

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NOTE: Items in this report are numbered consecutively.

I. BIOLOGY

1. Wintering of Rust Fungi

"Notes on the Wintering of Certain Rust Fungi," by L. D. Kazenas, Tr. Resp. St. Zashchity. Rast. Kazakhsk. Fil. VASKhNIL (Works of the Republican Plant Protection Station, Kazakh Affiliate of VASKhNIL), No 3, 1956, pp 213-215 (from Referativnyy Zhurnal -- Biologiya, No 18, 25 Sep 57, Abstract No 77621 by L. D. Kazenas)

"In the vicinity of Alma-Ata, Puccinia glumarum Erikss. and Henn. winter in the spore form in areas where winter ground water is drying up. The higher in the mountains the wheat seeds are located, the later in the phenophase they are affected with this fungus. P. poasudeticae Jorstad also winters on Poa pratensis L."

2. "Referativnyy Zhurnal -- Biologiya" to Publish Separate Reprints in 1958

"The Biological Scientific Literature in the USSR in Honor of the 40th Anniversary of the Great October Revolution and the Referativnyy Zhurnal -- Biologiya," by Professor Alpatov, chief editor of Referativnyy Zhurnal -- Biologiya, Moscow, Referativnyy Zhurnal -- Biologiya, No 20, 1957, pp I-II

"One of the best and more objective indications of the development of science in any country is the quantity and quality of the growth of scientific literature. The experience in the publication of the Referativnyy Zhurnal -- Biologiya, which is beginning its fifth year of publication, makes it possible to obtain certain results on the publication of biological literature in the USSR.

"A analysis conducted testifies to the colossal changes in biology occurring during the past 40 years of the existence of Soviet power. For example, in issue No 1 of Referativnyy Zhurnal -- Biologiya for 1957, of the 4,621 works listed, 695 or 15% of the total were written by Soviet authors. During 1956, the periodical published information on 107,610 works on biology of which approximately 15% of the total belonged to Soviet authors. No less than 16,180 scientific works on problems of biology are published yearly in the Soviet Union. In the ninth volume of the Russkaya Bibliografiya po Yestestvoznaniyu i Matematike (Russian Bibliography on Natural Sciences and Mathematics), published by the Academy of Sciences in 1918, literature was collected for the years 1912-1913, and 6,152 works on biology were listed; that is, in Tsarist Russia for a single year only 3,076 works were listed. Comparing the above figures, we can see that for the past 40 years scientific production in our country has increased to almost 5 1/2 times the previous level. Not being able to trace the dynamic growth of biological literature for the past 40 years, we can note only that its most intensive growth belongs to the past 20 years.

"The rapid growth of native scientific literature naturally demands a reference bibliography of its output. Even in the last century, when Russian science was just beginning, progressive scientists understood that without a bibliographic source aid science could not successfully develop. Thus, one of the founders of Russian zoological science, Prof. A. P. Bogdanov of Moscow University, wrote in 1888 that the 'zoological publications of Russian scholars have begun to occupy such an outstanding position in science both in content and in quantity that it has become necessary to compile a bibliographic source of their results within a single reference work. Such a publication was conceived by the Zoology Department and will soon be published.' Under the conditions of Tsarist reaction of the 20's of the last century, even modestly progressive action in this vein was not possible. Only under a socialist state could there be established a special Institute for Scientific Information, which could publish a reference periodical for various fields of science, and in this case on biology.

"The Referativnyy Zhurnal -- Biologiya leads all other foreign reference periodicals, in existence for 30 years, in the listing of literature. Thus, in 1956, the Referativnyy Zhurnal -- Biologiya published 107,610 items, whereas the Biology Abstracts, published in the US since 1926, published only 37,276 items.

"Because of the great size of the Referativnyy Zhurnal -- Biologiya, which encompasses the fields of biology, zoology, botany, pathology, morphology, microbiology, physiology, etc., its ready use becomes difficult. Therefore, readers have proposed that the Referativnyy Zhurnal -- Biologiya be divided into separate sections.

"Starting in 1958, there will be, in addition to the regular publication of the complete Referativnyy Zhurnal -- Biologiya, individual reprints of the periodical. Reprint I will be devoted to general biology, microbiology, and parasitology; reprint II will be devoted to botany and zoology; reprint III will be devoted to morphology, physiology, pathology, and pharmacology."

II. CHEMISTRY

Fuel Chemistry and Technology

3. USSR Manual for Calculation of Combustion and Flow Processes in Rocket Engines

Raschet Protsessov v Kamere Sgoraniya i Sople Zhidkostnogo Raketnogo Dvigatelya (Calculation of Processes Taking Place in the Combustion Chamber and Nozzle of Liquid-Propellant Rocket Motors), by A. V. Bolgarskiy, Oborongiz, Moscow, 1957, 95 pp and 3 charts

According to the annotation on the back of the title page (p 2), this book deals with problems of combustion and flow at the high temperatures encountered in the operation of rocket engines. A method for the thermodynamic calculation of the operation of rocket engines is discussed in detail and illustrated by the solution of a number of problems encountered in practical work. The application of a graphic method for the calculation of rocket engine parameters is discussed and the considerable simplification of calculations achieved by the application of this method pointed out. A method for the construction of nomographs to be used in connection with these calculations is expounded in detail. The book is to be used as a text by students who study combustion and flow at higher educational institutions where instruction in aviation is given. However, it can also be of use to engineers who are active in this field.

It is pointed out (pp 5-6) that the introduction of a new type of heat engine, i.e., the liquid-propellant rocket engine, necessitated the development of new methods of heat calculation. These methods are characterized and discussed as follows:

The theoretical temperatures of combustion in rocket engines are considerably higher than those attained in other types of heat engines, because liquid oxidants richer in oxygen than atmospheric air are employed. With the use of these oxidants, the quantity of combustion products formed per a unit weight of fuel is considerably reduced, while the heat evolved remains approximately the same irrespective of the type of oxidant employed and is not changed appreciably by replacement of the oxygen of the air with hydrogen peroxide, nitric acid, or liquid oxygen. It is obvious that the smaller quantity of combustion products which is formed will be heated to a correspondingly higher temperature.

The high temperature of combustion brings about considerable dissociation in the combustion chamber of rocket engines, so that there is partial recombination during the flow of the gases through the nozzle, where reduction of the temperature takes place because of expansion. The necessity of taking into consideration these phenomena makes thermodynamic calculations more difficult. Otherwise, no fundamentally new conditions are encountered in connection with the operation of rocket engines, so that the heat calculation can be conducted on the basis of concepts generally accepted in heat technology.

The book Rabochiye Protsessy v Zhidkostno-Reaktivnykh Dvigatelyakh (Working Processes in Liquid-Propellant Rocket Engines) by A. V. Bolgarskiy and V. K. Shchukin, Oborongiz, Moscow, 1953, outlines the fundamentals of a method for the calculation of heat processes in rockets which is based on general concepts that apply to heat technology and heat engines under all conditions. The present work represents a more extensive and detailed exposition of a calculation method which follows logically from general methods of heat calculation and has been expanded to cover a new type of heat engine.

In view of the fact that all processes taking place in the combustion chamber and nozzle of rocket engines represent mutual transformations of energy of one type into another (i.e., transformations of chemical energy into heat energy and then into kinetic energy), the author bases his calculation method on the general heat equation, separating in this equation from the total quantity of heat Q the heat produced as a result of the combustion of fuel.

The general form of the energy equation is as follows (Equation 28, p 23):

$$x_1 - x_2 = i_2 - i_1 + A\,\frac{w_2^2 - w_1^2}{2g} + Q$$

where x indicates the quantity of heat which arises as a result of the transformation of chemical energy and $(w_2^2 - w_1^2)/2g$ represents the change in the external kinetic energy of the gas.

This equation is derived from the simplified expression

$$\frac{Q}{A} + \left(\frac{P_1}{\gamma_1} - \frac{P_2}{\gamma_2}\right) = \frac{U_2 - U_1}{A} + \frac{W_2^2 - W_1^2}{2g}, \quad \text{where} \quad \frac{P_1}{\gamma_1} - \frac{P^2}{\gamma_2}$$

represents the work done against external pressure and $U_2 - U_1$ the change in the inner energy of the gas (p 22).

After $x_1 - x_2$ has been separated from the total quantity of heat Q, the symbol Q represents only the heat of friction and the heat exchange with the environment; i.e., Q becomes so small that it can be neglected.

By using Equation 28 and the relationships underlying the chemical kinetics of the combustion of fuels, general methods of calculating the processes of combustion and flow are developed for the cases of equilibrium that is established very slowly (nonequilibrium flow) and equilibrium that is established rapidly (equilibrium flow) (Chapter 3, pp 28-42). The application

of these methods is illustrated in great detail on the example of tractor kerosene oxidized with 95% nitric acid (Chapter 4, pp 43-70). The section on methods of calculation is preceded by a general treatment of the subject of fuels as far as chemical composition, specific weight, calorific value, the stoichiometric coefficient, and the coefficient of excess of oxidant necessary to bring about complete combustion of the fuel are concerned (Chapter 1, pp 7-20). This treatment is illustrated by examples pertaining to the oxidation of toluene with 95% nitric acid and the oxidation of ethyl alcohol of different concentrations with 80% hydrogen peroxide. Data are given on the calorific values of ethyl alcohol and methyl alcohol at concentrations of 60, 65, 70, 75, 80, 85, 90, 95, and 100% and of nitric acid and hydrogen peroxide at concentrations of 70, 80, 90, and 100%.

The significance of properties of fuels and oxidants is discussed from the standpoint of processes that take place in the combustion chamber and nozzle of rocket engines. It is shown that these processes are described adequately by the general energy equation (Chapter 2, pp 21-27).

The last section of the book (Chapter 5, pp 71-88) deals with procedures to be followed in the construction of diagrams for the calculation of combustion processes and of those of the outflow of combustion products. The construction of these diagrams (nomographs) is discussed in detail and their uses are explained. The following tables are appended to the book: (a) equilibrium constants at 600 - 4,000° K of the reactions $CO + O_2 \rightarrow CO_2$; $H_2 + O_2 \rightarrow H_2O$; $OH + H_2 \rightarrow H_2O$; $O \rightarrow O_2$; $NO \rightarrow N_2 + O_2$; and $CO + H_2O \rightarrow CO_2 + H_2$ (Appendix 1, pp 90-91); (b) the energy content of H_2, O_2, N_2, CO, OH, NO, CO_2, H_2O, H, and O at 298-4000°K (Appendix 2, p 92); (c) the energy content of 100% ethyl alcohol, 100% methyl alcohol, kerosene, triethylamine, xylidine, toluene, hydrazine hydrate, 100% hydrogen peroxide, 100% nitric acid, tetranitromethane, and nitrogen teroxide at 298.16°K and of liquid oxygen at 90.16°K (Appendix 3, p 93); (d) the heats of solution of water in 96% nitric acid, in 98% nitric acid, in nitrogen tetoxide, in ethyl alcohol, and in hydrogen peroxide (Appendix 4, p 93); (e) two nomographs for the calculation of processes involved in the combustion of kerosene + 95% nitric acid (Appendixes 5 and 7; inserts); and (f) a nomograph for the calculation of processes of the combustion of 70, 80, 90, and 100% ethyl alcohol + 80% hydrogen peroxide (Appendix 6; insert).

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Industrial Chemistry

4. Electrodialysis With Use of Ion-Exchange Diaphragms

"Selective Ion-Exchange Resins and Selective Ion-Exchange Diaphragms," by V. A. Klyachko, All-Union Scientific Research Institute of Water Supply, Sewerage, Hydraulic Structures, and Engineering Hydrogeology (VODGEO); Moscow Zavodskaya Laboratoriya, Vol 23, No 9, Sep 57, pp 1049-1051

"Separation of ions of the same charge can ordinarily be accomplished with the aid of an ion-exchange column only by the application of the chromotographic method with subsequent fractionation or by elution of the ions with complex-forming agents. An increased efficiency in the separation with the aid of ion-exchange resins of ions close to each other in their properties can be achieved by the application of special selectively acting ion-exchange resins or selective ion-exchange resin diaphragms.

"Scogside in 1948 (see Samuelson's book, reference (1) synthesized by the nitration of a styrene-divinylbenzene copolymer a resin which has the capacity to adsorb potassium selectively. This cationite resin contains groups which are analogous to dipicrylamine. It exhibited such a high capacity for the selective adsorption of potassium from aqueous solutions that it was used for the conversion of calcium nitrate into potassium nitrate. As a source of potassium water of the North Sea was used, which was employed for the regeneration of a cationite filter.

"A. S. Smirnov and M. M. Bluvshteyn obtained by the condensation of pyrogallol with formaldehyde a cationite which adsorbed selectively lead and bismuth ions (reference 2). H. S. Miller and J. E. Kline (reference 3) established that sulfonated phenol cationites have a strongly pronounced capacity to absorb selectively cesium ions from alkaline media. H. Gregor concluded on the basis of purely thermodynamic considerations that the ratio between different ions adsorbed by an ionite under equilibrium conditions is determined by the ratio of the degrees of swelling of the ionite salts. He also demonstrated that the swelling of phenol sulfonic acid cationite in the form of its calcium, magnesium, and barium salts is proportional to the solubility of the corresponding sulfobenzoates (reference 4).

"Gregor and Citerel (cf. Samuelson's book) attempted to synthesize selective ionites by introducing into the ionite substances which form chelates with the adsorbed ions.

"Klyachko (references 5, 6, 7) demonstrated that introduction into cation-exchangeresins of complex-formers in addition to active sulfocarboxylic or hydroxyl groups makes it possible to obtain cationites which have an increased selectivity with reference to those cations which are capable

of forming complex compounds with the complex-former introduced into the cationite. By introducing ethylenediaminetetracetic acid into phenol sulfonic acid or resorcinol sulfonic acid cationites before condensation, cationites were obtained which have a selective effect toward divalent cations. By condensing resorcinol with formaldehyde in the presence of sodium sulfite and dithizon, a cationite was obtained which is selective with reference to lead. By introducing dimethylglyoxime into a resorcinol sulfonic acid cationite before condensation, a cationite was obtained which has a selective effect with reference to nickel and cobalt. By introducing chromotropic acid into a naphtalene sulfonic acid or phenol sulfonic acid cationite, a cationite was obtained which is selective with reference to titanium.

"By applying selective cationites in various fields of industrial and analytical chemistry, it is possible to increase the efficiency of ionite methods of separation, purification, and concentration.

"At present selective cationites are being applied industrially.

"During recent years, electrodialysis with selectively permeable ion-exchange diaphragms was introduced into practical applications in industrial work and research (references 8, 9).

"Such diaphragms can be prepared in a homogeneous state (for instance, by heating carefully a solution of p-phenol sulfonic acid in formalin which has been spread at the bottom of a porcelain trough) or in a heterogeneous state (for instance, by rolling a finely dispersed ion-exchange resin powder with polyvinyl chloride or rubber).

"The thickness of ion exchange resin diaphragms lies within the range of 0.5-1.5 millimeters. The electrical conductivity of diaphragms of this type is close to that of a free solution. The hydrostatic permeability of ionite diaphragms is close to zero and their resistance to diffusion is very high.

"When immersed into dilute solutions that are being subjected to the action of an electrical field, cationite diaphragms are readily permeable to cations, but practically impermeable to anions. Anionite diaphragms, on the other hand, are not permeable to cations, but transmit anions freely. Cationite diaphragms are also impermeable to those cations with reference to which the cationite used for the preparation of the diaphragm has a selective effect.

"These characteristics of ionite diaphragms make it possible to apply them very effectively in the separation of ions with different charges, the elimination of ions from solutions, the separation of electrolytes from non-electrolytes, the investigation of complex compounds, and the separation of ions which have the same charge but exhibit a different mobility. The separation of ions with charges of a different sign can be accomplished by means of a three-chamber cell.

"The solution in which the positively charged ions must be separated from the negatively charged ions is placed into the middle chamber of this cell. The middle chamber is separated from the cathode chamber by a cationite diaphragm and from the anode chamber by an anionite diaphragm. The cathode and anode chambers are filled with distilled water or a dilute solution of ammonia, ammonium carbonate, or some other substance which does not interfere with the separation. A direct current is applied. After some time, the positively charged ions are transported by the current through the cationite diaphragm into the cathode chamber while the negatively charged ions are transported into the anode chamber. The expenditure of electric power does not exceed 30-35 ampere-hours per one gram-equivalent of salts removed from the middle chamber.

"Experiments conducted by us on the separation by this method of Na^+ and $P^*O_4^{3-}$ indicated that electrodialysis with ion exchange diaphragms makes it possible to obtain Na and $P^*O_4^{3-}$ in a radiochemically pure state. By using the same method and varying the P_H of the solution in the middle chamber, it was possible to separate tungsten from molybdenum by treating a solution which contained a mixture of sodium molybdate and sodium tungstate. The three-chamber cell with ionite diaphragms was also used by us for investigating the composition of complex compounds and studying the effect of the P_H of the solution and of the ratio of different ions on the composition of the complex compounds that are formed.

"The separation of ions on the basis of their mobility by passing a direct electric current through a solution of an electrolyte or an electolyte melt is used in biochemical research. The theory of the process involved was developed by S. Ye. Bresler and G. Ye. Pikus (reference 11). The separation is done in tubes of sufficient length which are filled with an inert granular material that prevents mixing of the solution in the tube by convection and reduces the reverse transfer by diffusion of the ions being separated.

"The effectiveness of the separation of ions according to their mobility can be considerably increased by using a pile consisting of ionite diaphragms. By using this pile, the effects of convection and reverse diffusion are totally eliminated.

"In out experiments, the velocity of the motion of ions in the ionite diaphragm was found to be from one fourth to one sixth of that in a free solution. On the other hand, the ratio between the velocities of the propagation of different ions in the ionite diaphragms under the action of an electric field was found to be different from that in a free aqueous solution.

"The change of the ratio of mobilities of ions in the ionite diaphragm from the ratio that applies in the case of a free aqueous solution can be explained with a considerable degree of probability by assuming that the motion of ions through the diaphragm under the effect of an electrical field proceeds by gradual displacement of the ions from one active group of ionite to another in such a manner that this displacement is accompanied by ion-exchange. One may therefore expect that the process of the diplacement of ions through the ionite diaphragm under the action of an electrical field will be affected by the ratio of the strengths of bonds formed by the ions with the active groups on the one hand and with the matrix of the ionite diaphragm on the other hand.

"It is known that diaphragms consisting of a cationite which contains ethylenediaminetetracetic acid (Trilon B) do not transmit the divalent cations of calcium, magnesium, and barium under the action of an electric field, but transmit readily sodium and potassium, which do not form complex compounds with Trilon B (reference 10).

"By using diaphragms made of ionites which exhibit great affinity to one of the ions being separated, one may separate this ion from the other ions present in the solution, because the mobility of this ion in the ion-exchange resin will be lower than that of the other ions.

"Data published in the literature (reference 12) and also experiments conducted by us have shown that ionite diaphragms can be successfully used for the separation of ions which are very close to each other in their properties (e. g., Na^{+}, K^{+}, and Li^{+} or Ca^{2+} and Mg^{2+}) as well as for the separation of organic acids from each other or from inorganic acids.

"By using selective ion-exchange resins and ion-exchange diaphragms with selective permeability, one can successfully solve problems encountered in industrial and analytical chemistry that are not susceptible to solution by other methods."

The bibliography included with the article follows.

1. Samuelson, Primeneniye Ionnogo Obmena v Analiticheskoy Khimii (The Application of Ion Exchange in Analytical Chemistry), Publishing House of Foreign Literature, Moscow, 1955.

2. A. S. Smirnov and M. M. Bluvshteyn, Doklady Akademii Nauk SSSR, Vol 70, No 3, 1950.

3. H. S. Miller and J. E. Kline, Journal American Chemical Society, Vol 73, 1951, p 2741.

4. H. Gregor, Journal American Chemical Society, Vol 70, 1948, p 1293.

5. V. A. Klyachko, Doklady Akademii Nauk SSSR, Vol 81, No 2, 1951, p 235.

6. V. A. Klyachko, paper in the Collection of articles Teoriya i Praktika Primeneniya Ionoobmennykh Materialov (The Theory and Practice of the Application of Ion-Exchange Materials), Academy of Sciences USSR, 1955.

7. V. A. Klyachko, Trudy Komissii po Analiticheskoy Khimii (Works of the Commission on Analytical Chemistry), Academy of Sciences USSR, VI (XI), 1955, p 296.

8. O. S. Lenchevskiy, paper in the collection of articles Issledovaniya po Vodopodgotovke (Investigations on Water Treatment), Stroyizdat, 1956.

9. K. S. Spiegler, paper in the collection of articles Ion-Exchange Technology, Academic Press, New York, 1956.

10. J. Leicester, Chemical and Process Engineering, Vol 36, No 5, May 55, p 7.

11. S. Ye. Bresler and G. Ye. Pikus, Zhurnal Tekhnicheskoy Fiziki, Vol 24, No 1, Jan 56, p 109.

12. T. A. Kirkham, Proceedings of the American Power Conference, 1956, p 571.

[SIR Note: Although this article was written mainly from the stardpoint of possible applications of the method discussed in analytical chemistry and in research, electrodialysis with the use of ion-exchange diaphragms can be applied also in the desalting of sea water and saline waters, the purification of water contaminated with radioactive isotopes, and the processing of nuclear fuel. A full-scale industrial installation for the desalting of Black Sea water by a method of this type developed on the basis of work done at the VODGEO institute is in the process of construction at present or has already been constructed (cf. V. A. Klyachko, Vodosnabzheniye i Sanitarnaya Tekhnika, No 11, Nov 57, pp 20-22).]

5. Application of Ion-Exchange Resins in Water Treatment and in Concentration of Rare Metals

Materialy Neogranichennykh Vozmozhnostey (Materials of Unlimited Potential), by B. Ya. Rozen, Moscow, Znaniye, 1957, 39 pp

The following information is given in this popular booklet on plastics:

Natural waters always contain dissolved material, i.e., gases, air, and salts. An exceptionally large quantity of salt is contained in sea water and the water of salt lakes. Fresh water also contains salts (i.e., those of magnesium and calcium) and must be purified ("softened") before it can be used for the preparation of food, for industrial purposes, and as feed water for boilers. Salts dissolved in the feed water for boilers cause formation of scale. The thicker the layer of scale, the more fuel must be used, because the scale insulates the water from the wall of the boiler tubes. When the thickness of the scale reaches 3 millimeters, an additional quantity of fuel comprising 5% of the total must be used. The presence of scale in boilers may also result in an explosion of the boiler.

Water is purified by various methods, primarily chemical methods. Slaked lime, soda, and various special preparations are added to the water. Permutits are used most frequently for the purification of water. Permutits are artificial minerals which are produced by melting together kaolin, alum, and soda. The difficult problem of water purification has been solved quite recently by the application of synthetic resins, i.e., amino-formaldehyde resins [urea-formaldehyde resins], phenol-aldehyde resins, and polystyrenes [polystyrene sulfonic acids]. Resins of this type are referred to as ionites or ion-exchange resins. The softening and desalting of water by ionites at electric power stations alone results in a considerable reduction of costs.

Hitherto at many major electric power stations, turbines had to be specially washed to prevent deposition of salt. During this washing, the turbines were stopped. The cost of a single washing of a powerful turbine is 250,000 rubles. By passing the water through a barrier filter that contains cationites, this cost can be considerably reduced.

USSR scientists have developed efficient methods for the purification of saline ground waters with the aid of ion-exchange resins. In experiments on the desalting of water conducted at a number of sovkhozes of northern Kazakhstan (i.e., the Baydak, Chernigov, and Ukrainskiy sovkhozes), the salt concentration could be reduced to a normal level.

Workers at the All-Union Scientific Research Institute of Hydraulic Engineering and Sanitary Engineering Works [VNIIGS] designed a portable installation for the desalting of water. This installation consists of a number of sand, coal, and ion-exchange filters mounted together in a

common housing. The height of a single filter is 700 mm and its inner diameter is 80 mm. When originally introduced into industrial use, ion-exchange resins were used only for the purification of water; at present they are an indispensable aid in the most diverse fields of the national economy.

Ion-exchange resins are very useful in the concentration of many valuable metals (e.g., molybdenum, iridium, zirconium, and vanadium) which occur in a dispersed state in the earth's crust and are present in very small quantities.

To extract by ordinary methods a few kilograms of these metals, one must mine thousands of tons of ore. The ore can then be ground into a fine powder, placed in large vats, and combined with water to which a small quantity of tall oil has been added. The mixture is treated by blowing a powerful stream of air through it. The bubbles of air then collect and draw upward the particles of metal, while the particles of gangue precipitate to the bottom. The tall oil promotes adhesion of the metal particles to the air bubbles. A stable foam is formed. This foam is separated and dehydrated; what remains is a metal concentrate which is smelted.

This method of treating poor ores is expedient when the content of the metal is nc lower than 1-2%. When the content of metal amounts to small fractions of 1%, it is of no advantage to concentrate the metal by this method [i.e., by the flotation method].

In this case, ion-exchange resins are employed. The metal contained in the ore is converted into an aqueous solution of one of its salts. The solutions of the salts are filtered through ion-exchange resins. By this means one can not only concentrate the pure metal, but also separate metals from each other, e.g., separate nickel from chromium, bismuth from copper, or indium from thalium.

The effluents of plants at which copies of motion-picture films are printed always contain a certain amount of silver salts. This silver, which formerly went to waste, is now recovered by means of ion-exchange resins. Notwithstanding the very low concentration of silver in the waste waters, the quantity of silver formerly rejected with the wastes amounted to almost 10% of the total amount of silver used in this application.

Ion-exchange resins are not only of use in metallurgy in connection with the production of nonferrous metals, but are also a very valuable aid in work done by chemists, pharmacists, operators at sugar manufacturing plants, and biochemists. The employment of ion-exchange resins at sugar manufacturing plants has resulted in an additional production of tens of thousands of tons of sugar per year in the USSR, where ion-exchange resins are employed in the treatment of sugar refinery residues that were formerly discarded; the industrial losses of sugar have thus been reduced by a factor of 4-5.

Ion-exchange resins are often employed as catalysts in chemical production, particularly in the synthesis of synthetic resins and of various other organic substances.

With the use of ion-exchange resins, vitamins are purified, valuable drugs are extracted from plants, colored liquids are decolorized, and the antibiotics penicillin, gramicidin, and streptomycin are produced (pp 29-33).

6. Importance of Chemical Production for USSR Machine-Building Industry

"Progress of the USSR Chemical Industry During 40 Years," by S. M. Tikhomirov and I. K. Zamarayev, Ministry of Chemical Industry USSR; Moscow, Uspekhi Khimii, Vol 26, No 11, Nov 57, pp 1203-1229

"Work on industrial applications is of the greatest importance as far as the development of the technology and organization of the production of plastics and other materials including elastomers is concerned that are to be used in modern machine building, the construction of instruments, radio engineering, the nuclear energy industry, and the construction of jet and rocket engines. The machine-building industry occupies a very important place among consumers of chemical products: 50% of the production of the USSR chemical industry is consumed in machine construction and in the operation of machines.

"The importance of the chemical industry in this respect is illustrated by the following examples:

"1. In the assembly of the passenger plane TU-104 120,000 parts are used which are made entirely of plastics, plexiglas ("organic glass"), and rubber or represent combinations of these materials with other materials.

"2. Modern rocket technology requires from the chemical industry a great number of plastics, elastomers, and other materials with special characteristics as well as fuels and oxidizers. Among naturally occurring materials and ordinary metals one often cannot find any which are equal to the high demands put to them as construction materials from the standpoint of resistance to corrosion and stability at high and low temperatures. Many materials for applications of this type have been developed and are being developed by the chemical industry.

"3. In connection with peaceful applications of nuclear energy, many synthetic chemical materials are required, including materials which have a high resistance to corrosion, very pure reagents, heavy water, and some other chemical products. The USSR chemical industry has mastered methods for the production of chemical materials and elastomers to be used in this field. It supplies the nuclear energy industry with all necessary chemical products and articles derived from chemicals (p 1216).

"In view of the importance of chemical materials in machine construction, particularly in the fields of aviation, rocket technology, radio engineering, and electronics, it follows that one of the principal tasks of the chemical industry is development of new chemical materials for various applications which exhibit a number of characteristics of the following types: high purity, high elasticity, light weight, transparency, improved capacity for electric insulation and heat insulation, and high stability toward different effects exerted by the environment such as temperature, pressure, the action of corrosive media, etc. In a number of cases, the materials in question must exhibit a combination of the properties enumerated above and also possess other properties. Chemical materials of this type are necessary for assuring technical progress in the most diverse branches of the people's economy, primarily in the field of machine technology.

"The application of the new chemical materials will make it possible to produce at a great economy of the social effort machines which are much more perfect than those used hitherto. These machines will be more highly productive, have smaller dimensions, have a lighter weight, and be stronger than those produced earlier when the new, chemically synthesized construction materials and other materials were not available.

"Very important in this respect are the production of new ultrapure substances for semiconductor technology, development of new types of synthetic tires of superior quality, production of technical rubber products with properties superior to those of natural rubber or already known varieties of synthetic rubber and fibers, and development of many other high-polymer materials for the manufacture of plastic products, including transparent plastics ("organic glass") of increased stability, new fluorine plastics, and organosilicon compounds to be used for the production of organic coatings and paints of high quality, as well as for other purposes.

"It is therefore important to increase by every possible means the production of high-polymer materials and expand the number of available materials of this type. This class of materials comprises a huge number of synthetic organic products, including synthetic rubber, plastics, crude materials for synthetic fibers and synthetic fibers as such, copolymers of all types, grafted polymers, mixtures of polymers, and all types of combinations of polymers" (pp 1221-1222).

7. Hungary Develops Synthetic Fibers From Protein

"From Protein Solution -- Synthetic Wool," by Andras Turi, Budapest, Esti Hirlap, 17 Nov 57, p 4

The Biochemical Institute (Biokemiai Intezet) of the Hungarian Academy of Sciences is investigating the relationship between the structure and function of all proteins. In the course of this investigation, the engineering group of the Biochemical Institute, at the suggestion of Pal Foldes,

director of the institute, began cooperating with the Textile Research Institute (Textilkutato Intezet) in an effort to develop synthetic fibers having a protein base. The fibers were to serve as a first-class substitute for wool. Experiments were successful, and Tibor Devenyi, researcher, produced two types of synthetic fiber: "erilan" and "gizolan."

The experimental production of "erilan" is now under way in Lodz, Poland. The production of "gizolan," a woolly type of rayon made of protein and cellulose, is to begin at a pilot-plant level in 1957.

Inorganic Chemistry

8. Investigation of Physicochemical Aspects of Explosive Oxidation of Nitrogen With Ozone

"The Physical Chemistry of Concentrated Ozone; Part 3 -- Explosive Oxidation of Nitrogen in Mixtures With Concentrated Ozone," by N.I. Kobozev, V. P. Lebedev, B. V. Strakhov, and G. I. Zykova, Moscow State University; Moscow, Zhurnal Fizicheskoy Khimii, Vol 31, No 11, Nov 57, pp 2547-2550

A considerable number of investigations has been devoted to the explosive oxidation of nitrogen in mixtures of nitrogen with oxygen and fuels (e. g., H_2, CH_4, CO). The work on the subject has been reviewed in a monograph by Ya. B. Zel'dovich, P. S. Sadovnikov, and D. A. Frank-Kamenetskiy. In this work the dependence of the yield of nitrogen oxide (NO) on the composition of the mixture, the initial temperature, and other experimental conditions was studied.

However, in all the work of this type the explosive interaction of nitrogen with oxygen was indirect, because a third component, namely, a fuel, was always present in the mixture. The energy supplied as a result of the combustion of the fuel created the thermal and other conditions necessary for the oxidation of the nitrogen by the remaining oxygen.

Application of concentrated ozone instead of a fuel-oxygen mixture as a source of energy forms the subject of the present investigation and of subsequent work on the subject.

In the experimental work done in this instance, the explosive oxidation of nitrogen in mixtures with concentrated ozone has been carried out at various pressures and compositions of the mixtures. It was established that the yield of nitrogen oxide in the pressure range of 25-150 mm Hg increases linearly with the pressure, whereas the yield curves with respect to the composition pass through a maximum at a point corresponding to about 75% O_3. Addition of oxygen to the initial mixture was found to lower the nitrogen oxide yield. The maximum yield of nitrogen oxide attained in the final mixture was 2%.

9. Solubility of As_2O_3 - HF - H_2O Investigated

"Investigating Solubility in the System As_2O_3 - HF - H_2O," I. V. Tananayev and G. S. Savchenko, Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, Academy of Sciences USSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 2, No 10, Oct 57, pp 2449-2454

The solubility of the system As_2O_3 - HF - H_2O at 0° and at 25°C was investigated. As the concentration of HF was increased, the solubility of As_2O_3 was found to rise sharply. Phase analysis of the system by the precipitation method indicated the presence of two compounds, As_2O_3 and AsOF.

Nuclear Chemistry and Technology

10. Investigation of Thermodynamic Properties of Beryllium Chloride in Sodium Chloride Melts

"The Thermodynamic Properties of $BeCl_2$ in the $BeCl_2$-NaCl Fusion System," by B. F. Markov and Yu. K. Delimarskiy, Institute of General and Inorganic Chemistry, Academy of Sciences Ukrainian SSR; Moscow Zhurnal Fizicheskoy Khimii, Vol 31, No 11, Nov 57, pp 2589-2590

The E. M. F. of the chemical chains Be $[BeCl_2x_1 + NaCl(1 - x_1)]$ Cl_2 in dependence on the molar fraction of $BeCl_2$ has been determined. The E. M. F. of a chemical chain with free $BeCl_2$ was found by the extrapolation of experimental values. It was found to be equal to 1.986 at 500°. The partial thermodynamic properties of $BeCl_2$ were calculated. The energy of the formation of $BeCl_2$.NaCl in the melt at 500° was determined to be equal to 7.5 kilocalories.

11. Review of Work on Thermodynamics and Kinetics of Hydrogen Isotope Exchange

"Thermodynamic and Kinetic Characteristics of Reactions of Hydrogen Isotope Exchange," by Ya. M. Varshavskiy and S. E. Vaysberg; Moscow, Uspekhi Khimii, Vol 26, No 12, Dec 57, pp 1434-1468

This article reviews work on the thermodynamics and kinetics of hydrogen isotope exchange with particular attention to USSR research on the subject. A bibliography consisting of 76 references, of which 31 are USSR, is appended

to the article. The article is subdivided into two major sections dealing, respectively, with the thermodynamics of isotope exchange (Section I, pp 1435-1457) and the kinetics of isotope exchange reactions (Section II, pp 1457-1468).

The first section begins with a discussion of correlations between the coefficient of distribution of isotopes and the equilibrium constants of isotope exchange reactions. This subject is treated mainly on the basis of work done by A. I. Brodskiy, K. Wirtz, and the authors of the present article (Ya. M. Varshavskiy and S. E. Vaysberg). The following subdivision of Section I deals with methods of statistical calculation of equilibriums in isotope exchange and is based to a great extent on work by K. Wirtz, V. M. Tatevskiy, S. Z. Roginskiy, and M. I. Temkin, although British and American research is also considered. The discussion of statistical methods is followed by a detailed treatment of laws governing the distribution of deuterium in hydrogen isotope exchange. In this treatment, particular attention is paid to hydrogen isotope exchange in hydrides. The section on thermodynamics is concluded with an analysis of experimental data on the equilibrium distribution of deuterium in reactions of hydrogen isotope exchange.

The section on kinetics of reactions of isotope exchange discusses general problems in this field, equations of the kinetics of isotope exchange, and the limits of the applicability of the kinetic equation of the first order. In the section on general problems pertaining to the kinetics of isotope exchange, work by S. Z. Roginskiy, A. I. Brodskiy, and M. B. Neyman is discussed in some detail.

The significance of the work reviewed in the article is discussed by the authors as follows:

"The discovery of deuterium was of great importance for chemistry because it created the possibility of using the tracer atom method in the investigation of the transfer of hydrogen during chemical reactions. Deuterium has been applied most extensively in organic chemistry because of the special role which hydrogen plays in organic compounds.

"The interest in the subject of hydrogen isotopes increased considerably in connection with the utilization of nuclear energy. Since methods of producing nuclear fuel by the fission of uranium and thorium in nuclear reactors under the action of thermal neutrons were discovered, a new field of the practical application of deuterium has developed, because deuterium is the most effective moderator of neutrons. Still greater possibilities connected with the practical utilization of hydrogen isotopes, specifically of deuterium, have developed in recent years in connection with the work done by Soviet scientists on the peaceful application of nuclear reactions.

"Problems pertaining to reactions of hydrogen exchange are of particular importance for chemistry. This is not only due to the fact that the reactions of hydrogen isotope exchange form the basis of chemical methods for the concentration of deuterium. The exchange of protium atoms for deuterium atoms forms the simplest chemical reaction of hydrogen substitution as a result of which, however, the chemical structure of the molecule is not significantly changed. For this reason, the velocity of the transfer of tracer hydrogen atoms under definite conditions may serve as a criterion of the reactivity of different substances depending on their constitution and the properties of the medium in which the reaction takes place.

"The reactions of the exchange of protium for deuterium are also of interest from the standpoint of the understanding of general relationships which apply to reactions of isotopes of any elements. The reactions of hydrogen isotope exchange exhibit a considerable isotope effect brought about by the relatively great difference in the masses of protium and deuterium atoms. This circumstance considerably complicates the study of the fundamental relationships which govern the equilibrium distribution of isotopes and the kinetics of the reactions of hydrogen isotope exchange as compared with other isotope exchange reactions, so that these relationships must be expressed in a more complex but at the same time more general form.

"It follows from what has been said above that the investigation of reactions of hydrogen isotope exchange is at present of very great importance: new data obtained in this field will contribute to the solution of many scientific and practical problems.

"No attempt has been made to review all investigations dealing with the production and utilization of deuterium, the number of which runs into many hundreds. The extensive data on the application of deuterium as a tracer atom and the utilization of hydrogen isotope exchange reactions for the investigation of the reactivity of chemical compounds have been reviewed in a number of articles and monographs, some of which are listed in the bibliography. The present article deals only with the results of the most important investigations on the thermodynamics and kinetics of the reactions of isotope exchange.

"Although the present review is concerned primarily with deuterium exchange and the majority of the investigations discussed in it pertain to hydrogen isotope exchange, the general relationships have been treated in such a manner and the fundamental equations derived in such a form that they can be applied to the exchange of isotopes of any element. Deuterium exchange has been considered principally because the isotope effects expressed by the relationships that have been derived are particularly prominent in the case of hydrogen isotopes."

Organic Chemistry

12. Esters of Beta-Ketophosphonic Acids

"Esters of Beta-Ketophosphonic Acids. Communication 2. Esters of the Aromatic and Carbocyclic Series," by B. A. Arbuzov and V. S. Vinogradova, Chemical Institute imeni A. M. Butlerov, Kazan State University imeni Ul'yanov Lenin; Moscow, Izvestiya Akademii Nauk SSSR, Otdelemiye Khimicheskikh Nauk, No 3, Mar 57, pp 284-291

With the purpose of investigating the presence of tautomerism, the following compounds were prepared for the first time: dimethylphosphonacetophenone, 1-methylcyclohexanone-2-phosphonic acid, cyclopentanone-2-phosphonic acid, and alpha-phosphonocamphor. Their degree of unsaturation was determined by K. Mayer's method of bromine titration. The physical constants of phosphonacetophenone as prepared with triethylphosphite differ from those of phosphonacetophenone as prepared by the method of Michaelis-Becker. Ultraviolet absorption spectra were measured for the compounds. The absorption spectra of phosphonacetophenone and methylphosphonacetophenone indicate the presence of enolization; when in the presence of sodium methylate, they indicate the formation of enolate ions. The absorption spectra of phosphonacetophenone prepared by the phosphite method differ from that of phosphonacetophenone prepared by the Michaelis-Becker reaction.

13. Ethylideneglycerine Esters of Phosphoric Acid

"Some Ethylideneglycerine Esters of Phosphoric, Phosphorous, and Thiophosphoric Acids," by B. A. Arbuzov and D. Kh. Yarmukhametova, Chemical Institute imeni A. Ye. Arbuzov, Kazan Affiliate, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk, Otdeleniye Khimicheskikh Nauk, No 3, Mar 57, pp 292-302.

Nineteen new ethylideneglycerine esters of phosphoric, phosphorous, thiophosphoric, amidophosphorous, amidophosphoric, and amidothiophosphoric acids were synthesized and investigated. The Arbuzov rearrangement of the ethylideneglycerine esters of phosphorous acid was investigated. Six new ethylideneglycerine esters of phosphonic acid were prepared. Some of the new ethylideneglycerine esters of phosphoric, thiophosphoric, and amidophosphoric acid were subjected to testing for insecticidal activity, but the results were negative.

14. Alkylation of Fluorophosphonic Acid Amides

"Research on Alkylphosphonous and Phosphonic Acids. VIII. Synthesis and Properties of Some Alkylated Alkylchlorophosphonic Acid Amides," by A. I. Razumov, O. A. Mukhacheva, and Ye. A. Markovich, Kazan Chemicotechnological Institute; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 1, Jan 58, pp 194-197

Some examples of alkylphosphonic acids having mixed functional groups were synthesized: alkylated amides of chlorophosphonic and fluorophosphonic acids, and complete alkylphosphonic acid fluorides [$RP(O)F_2$]. Alkylated amides of chlorophosphonic acid were found to hydrolyze readily, while the P-N bond in alkylated amides of fluorophosphonic acid amides was found to be unstable. Alkylated amides of chlorophosphonic acid hydrolyze with water into alkylated amides of alkylpyrophosphonic acid quite readily. As a result of the instability of the P-N bond in fluorophosphonic acid amides, heating converts them into the corresponding complete acid fluorides.

15. Reactions of Ethylarsenous Acid Chlorides Investigated

"Concerning the Reactions of Phenylarsenous and Alkylarsenous Acid Chlorides With Triethylphosphite and Triethylantimonite," by Gil'm Kamay and N. A. Chadayeva, Chemical Institute imeni A. Ye. Arbuzov, Kazan Affiliate, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 5, May 57, pp 585-588

It was established that, during the reaction of diethylarsenous acid chloride with triethyl phosphite, the ethyl ester of diethylphosphonoarsenous acid having the As-P bond does not form. Triethylphosphate and triethylarsenite were isolated from this reaction. It was shown that in the reaction of alkylarsenous and phenylarsenous acid chlorides with triethylantimonite a simple exchange of the alkoxy group for a chlorine takes place with the formation of middle esters of arsenous and phenylarsenous acids and the corresponding alkoxychlorostibenes.

16. New Ganglioblocking Agent Synthesized

"Tertiary Amines of Certain Heterocyclics as Possible Hypotensive Agents," by Ye. S. Nikitskaya, V. S. Usovskaya, and M. V. Rubtsov, All-Union Scientific Research Chemicopharmaceutical Institute imeni S. Ordzhonikidze; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 1, Jan 58, pp 161-166

A number of substituted amides and amines of pyridine and piperidine were synthesized from lutidine. Pyridinecarboxylic acid amides, in contrast to piperidinecarboxylic acid amides, are rather difficultly reduced to the corresponding amines with lithium aluminum hydride. Pharmacological investigation revealed that of the 22 compounds synthesized, only 1,6-dimethyl-2-(diethylaminoethylaminomethyl)-piperidine has high ganglioblocking activity.

17. Insecticidal Activity of Polythiocyanatoalkanes Investigated

"Insecticidal Action of Organic, Silicon-Organic, and Inorganic Thiocyanates," by M. Ya. Marova, M. G. Voronkov, and B. N. Dolgov, Institute of Silicate Chemistry, Academy of Sciences USSR, and Laboratory of the Preservation and Restoration of Documents, Academy of Sciences USSR; Moscow, Zhurnal Prikladnoy Khimii, Vol 30, No 4, Apr 57, pp 650-652.

Polythiocyanatoalkanes (dithiocyanatomethane, 1,2-dithiocyanatomethane, 1,2,3,-trithiocyanatopropane) were found to have very high fungicidal and bactericidal activity. Certain alkylisothiocyanatosilanes were also found to have a noticeably high insecticidal activity. Thus, 0.3-1% addition of $C_4H_9Si(NCS)_3$, $(CH_3)_2Si(NCS)_2$, $(C_2H_5)_2Si(NCS)_2$, or $(C_2H_5)_3SiNCS$ to a mildew culture causes an arrest of development for one year or more. The authors are attempting to draw a relationship between toxicity and structure of polythiocyanoalkanes, but at present can only conclude that an increase in the number of thiocyanate groups in the molecule does not increase the toxicity. Similarly, the presence of two thiocyano groups at the same or different carbon atoms seems to have no practical effect on the fungicidal and bactericidal properties of the compound.

18. Diesters of Aromatic Acylamidophosphoric Acids Synthesized

"Diesters of Aromatic Acylamidophosphoric Acids," by A. V. Kirsanov and R. G. Makitra, Laboratory of Insecticides, Institute of Organic Chemistry Academy of Sciences, Ukrainian SSR; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 1, Jan 58, pp 35-40

The reaction of aromatic acylamidophosphoric acid dichlorides and trichlorophosphazoacyls with sodium methylate and sodium arylates was investigated. Twenty-three diesters of aromatic acylamidophosphoric acids were prepared and their properties described.

19. New Insecticides Synthesized

"From the Field of Organic Insectofungicides. XXIX. The Reaction of Hexachlorocyclopentadiene With Certain Unsaturated Compounds," by S. S. Kukalenko and N. N. Mel'nikov, Scientific Institute for Fertilizers and Insectofungicides; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 1, Jan 58, pp 157-161

The condensation reaction of hexachlorocyclopentadiene with complex esters of allyl alcohol and bicyclo-(2,2,1)-heptenyl-2-carbinol-5 and simple vinyl esters was investigated. It was shown that as a result of this reaction normal products of diene synthesis were formed in which hexachlorocyclopentadiene reacted as a diene while the other unsaturated compounds reacted as dieneophyls. A number of new compounds not previously described in the literature were synthesized. Investigation of the insecticidal activity of these new compounds revealed that they were significantly more active than aldrine or chlorindane (1,2,4,5,6,7,8,8-octachloro-4,7-endomethylene-3a,4,7,7a-tetrahydroindane). A footnote says that this work is from S. S. Kukalenko's candidate's dissertation.

20. Esters of Bicyclo-(2,2,1)-heptenyl-5-carbinol-2 Synthesized

"From the Field of Organic Insectofungicides. XXVIII. Synthesis of Certain Esters of Bicyclo-(2,2,1)-heptenyl-5-carbinol—2," by S. S. Kukalenko and N. N. Mel'nikov, Scientific Institute for Fertilizers and Insectofungicides, Moscow, Zhurnal Obshchey Khimii, Vol 28, No 1, Jan 58, pp 154-157

The reaction of cyclopentadiene with various esters of allyl alcohol was investigated. Eleven derivatives of bicyclo-(2,2,1)-heptenyl-5-carbinol-2 that have not previously been described in the literature were synthesized. A footnote says that this work is from S. S. Kukalenko's candidate's dissertation.

Radiation Chemistry

21. Work on Radiolysis of Aqueous Solutions Done at Radium Institute in Paris Published in USSR Periodical

"On the Nature of the Activation of Oxygen in the Radiolysis of Aqueous Solutions," by M. Haissinsky, Radium Institute (Paris), Zhurnal Fizicheskoy Khimii, Vol 31, No 11, Nov 57, pp 2507-2516

An explanation is given for the effect of oxygen and of the P_H of the medium on the radiation-chemical formation and decomposition of hydrogen peroxide. For this purpose the conditions are defined under which a molecule of oxygen can be activated by receiving an electron from an unstable product of radiolysis. The general relationships have been formulated which govern the transfer of charges in radiolysis and autooxidation. The conclusions which have been reached are used for the interpretation of the capacity of halogen ions to stabilize hydrogen peroxide and also to inhibit the formation of hydrogen peroxide and the chain oxidation of some inorganic substances, including phosphorous acid, hydrazine, and uranium (IV) sulfate.

[SIR Note: Although the article by Haissinsky is published in the form of an original contribution to Zhurnal Fizicheskoy Khimii, it lacks the customary English-language abstract. This possibly indicates that it was translated into Russian from the French after being published originally in French. The data on the behavior of uranium sulfate under the action of ionizing radiation which are contained in the article may be of some importance in connection with the chemical processing of fuel used in homogeneous nuclear reactors and with the dissolution of uranium fuel elements.]

Herbicides and Defoliants

22. Experiments With Preparations for Preharvest Removal of Cotton Leaves

"New Preparations for the Preharvest Removal of Cotton Leaves," by F. Mauer and L. Abramova, Khlopkovodstvo (Cotton Production), 1956, No 8, 24-27 (from Referativnyy Zhurnal -- Biologiya, No 22, 25 Nov 57, Abstract No 94172 by T. L. Rivkind)

"At the Institute of Agriculture, Academy of Sciences Uzbek SSR, various preparations were investigated for the preharvest removal of cotton leaves: calcium cyanamide with sodium fluosilicate, calcium cyanamide with calcium nitrate, magnesium chlorate, sodium ethylxanthogenate, endothal, thiourea, and aminotriazol.

"The cyanamide preparations reacted poorly because of low air humidity. Magnesium chlorate gave the best results. It produced swifter and more complete leaf removal and was not dependent on weather conditions. Spraying with a 0.4% solution of magnesium chlorate did not lower the cotton yield or impair the quality of the fibers and seeds."

III. EARTH SCIENCES

23. Soviet Geophysical Service

"Soviet Geophysics Toward the 40th Anniversary of the Great October Socialist Revolution" (unsigned article), Moscow, Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya, No 11, Nov 57, pp 1318-1319

During 1957 over 20 scientific research geophysical institutes, divisions, and laboratories carried on research in the USSR. Also during this period there were established anew a series of services, i.e., weather, geomagnetism, seismology, and ionosphere and propagation of radio waves. Toward the end of 1957 there were more than 3,000 meteorological stations in the USSR, 19 magnetic observatories, 75 seismic stations, and 18 ionosphere and radiowave propagation stations. During the same year, 16 special geophysical departments were established in universities for the training of personnel in general and prospecting geophysics, and in the geologico-prospecting educational institutions (institutes and tekhnikums) special geophysical faculties and departments were organized.

IV. ELECTRONICS

Communications

24. New Noise-Limiting Circuit

"A New Circuit for the Detection of Intermittent Signals Lying Below the Noise Level," by A. A. Pirogov, Sb. nauchn. rabot. Vses. zaoch. elektrotekh. in-ta. svyazi, Moscow, 1956, No 1, pp 44-57 (from Referativnyy Zhurnal -- Elektrotekhnika, No 6, May 57, Abstract No 13362)

The article describes a variety of circuits of mutual correlation used in separating intermittent signals which are hidden by noise. In the circuit is an "n"-phase heterodyne, the voltage of which as a reference voltage is fed to a middle point of the input transformer and through two arms of the latter to 2 n diodes (the frequency of the heterodyne equals the frequency of the incoming signal). After phase detection the rectified voltage is filtered and then reaches a common bus bar through output limiting diodes. It is shown that this circuit gives a gain in a signal-noise ratio equal to $N=10 \lg \delta/2F_M$ db (δ is the pass band of the input of the circuit; $2F_M$ is the frequency band of the signal). The gain is shown in relation to "white" noise. The article gives the basic formulas for computing the circuit elements, and a numerical example of computation is provided. In the event of a misalignment of frequency of the signal and the heterodyne on the load of the common bus bar, there results a parasitic modulation (PM) of pulses due to the "many-phases" detection. It is shown that in the reception of telegraph signals PM is not essentially important even in two phases (because of the small percentage of PM). The article points out the application of the method in telephony and radar and also in reducing impulse noises.

Components

25. High-Precision Resistors

"Manganin Microwire Resistors With Glass Insulation," by A. A. Merkulov; Moscow, Vestnik Elektro-Promyshlennosti, No 1, Jan 58, pp 32-34

Manganin (Cu, Mn, Ni alloy) microwire is prepared by a special process; its diameter varies from 3 to 10 microns and the thickness of the glass insulation from 2 to 4 microns. The breakdown voltage of such an insulation is as high as 1.5-2 kv due to the absence of surface scratches, a condition practically unattainable for the conventional method of wire drawing through a diamond die. The resistance of one meter of such microwire can be as high as 60 kilohms or higher. Up to 3 kilometers of microwire can be wound on a single bobbin.

The "noneks" type of glass is used for insulation of the manganin microwire. A finished 10 megohm resistor is about 50 mm long and 8 mm in diameter.

After 6 months of laboratory testing it was found that less than 40% of the microwire resistors changed the value of their resistance by $\pm$ 0.001%, which can be considered as an exceptionally stable performance. The resistance change with temperature is rather small for this type of resistor.

Precision resistors of 10, 100 and 1,000 megohms can now be easily manufactured from manganin microwire.

Instruments and Equipment

26. New Laboratory Instruments in USSR

"Toward New Achievements in Measuring Technique" (unsigned article); Moscow, Izmeritel'naya Tekhnika, No 1, Jan/Feb 58, pp 3-4

The following passages are taken from the article:

"In the field of temperature measurement it is planned to develop a method of measurement based on radio emission, a radiopyrometer, an objective type of spectropyrometer for checking up to 2,500°C, a device for checking radiation pyrometers in the range below zero temperature (down to -100°C), and methods for checking ac operated industrial optical pyrometers. A method will be developed for obtaining stable temperatures below 10°K, measurement of temperature of infrared radiation, measurement of flame temperature up to 8,000°C for nonsteady processes, and a number of thermodynamic measurements, and the design of appropriate instruments will be undertaken as well.

"In the field of magnetic and electric measurements it is planned to complete the development of methods and devices for checking gages and dc instruments having low resistance (up to 10^{-6}), resistors up to 10^5 ohms with a precision of 1% for frequencies up to 50 Mc, weak ac current from 20 microampere up to one milliampere in the audio-frequency range, standard measures of capacitance at frequencies below 50 c and down to one cycle, etc.

"In the field of radiomeasurements, a number of standard devices for measuring steady power in the frequency range of 150-40,000 Mc will be developed. Also, instruments for measuring current at superhigh frequencies, the impedance and the parameters of radio-frequency circuits, time parameters of the pulses, intensity of the field and noise, and the parameters of dielectric materials will be developed.

"In the field of frequency and time measurement it is planned to complete the development of a series of standard quartz and molecular oscillators.

"As a result of present work in the field of acoustic measurements, devices will be built for absolute measurements of ultrasonic pressure.

"At present extensive work is being done on the subject of formulating 7-year plan for the development of the national economy of the USSR for the years 1959-1965."

27. Analysis of Asymmetrical Performance of Three-phase Rectifier

"The Asymmetrical Performance of a Three-phase Rectifier Supplied by a Sinusoidal Current," by I. S. Kurdiani and O. K. Khomeriki, Tr. Gruz. politekh. in-ta., Tbilisi, 1956, No 2 (43), pp 91-98 (from Referativnyy Zhurnal -- Elektrotekhnika, No 6, May 57, Abstract No 13143)

The article gives an analysis of the operation of a three-phase bridge circuit of a rectifier, fed by a sinusoidal current source in an asymmetrical system. For solving the given problem, a graphoanalytic method of computation was used, since the classical method of symmetrical components results in unjustifiable awkwardness and less clarity due to the nonlinearity and commutation processes of a rectifier bridge. The degree of asymmetry of currents of a three-phase system is determined by the relation of the negative component to the positive component $\lambda = \frac{I_2}{I_1}$, where I_1 is the virtual value of the symmetrical positive-sequence component and I_2 is the virtual value of the symmetrical negative-sequence component. The indicated coefficient λ together with the angle δ clearly determine the asymmetrical system of currents. Curves are given for finding average values of rectifier current with the coefficient λ and angle δ. Analytical expressions for the voltage between phases and oscillograms of voltage for certain systems are provided. The results of the given analysis may find practical application in research on asymmetrical systems of compound wound synchronous generators and in the study of relay protection on operative alternating current which often must operate at asymmetrical shortcircuiting.

28. Control of Leakage in Cathode-Ray Tubes

"Concerning One Source of Leakage in Cathode-Ray Tubes," by V. I. Baranovskiy, A. M. Perel'tsveyg, Sb. materialov po vakuumnoy tekhnike, 1956, No 8, pp 3-8 (from Referativnyy Zhurnal -- Elektrotekhnika, No 6, May 57, Abstract No 13076)

The article points out that one of the reasons for leakage in cathode-ray tubes is electron emission from the unprotected ends of the preheater at the high-voltage input in the stem. For type LO-709 tubes, where only one high-voltage electrode enters the stem, the authors suggested placing a screen connected to a modulator between the preheater and the anode, which satisfactorily eliminated the loss due to increased leakage. In other types of tubes where high loss occurs, the presence of numerous high-voltage leads in the stem makes a solution of the problem more difficult.

29. Soviet Plans for Development of Instrument Building Industry

"The Future Path in the Development of the Instrument Building Industry" (unsigned article); Moscow, Priborostroyeniye, No 1, Jan 58, pp 1-3

The article includes the following passages:

"The present instrument building tempo demands the construction of new instrument building plants because the production capacity of existing plants is obviously insufficient. Capital investment appropriated for such construction in 1957 was almost twice that for 1956, which will permit starting production at several new plants in 1958, including a pyrometric instrument plant (which will produce, besides basic equipment, instruments utilizing radioactive isotopes), plants for manufacturing instruments, which will also produce new types of level indicators and some medical instruments (electrophoresis equipment, high-speed centrifuges, etc.), and many others.

"One plant will specialize in production of miniature automation equipment, instruments for the control of air conditioning equipment, etc.

"By the end of 1958 a new plant will start production of electrical servomechanisms."

"A thermal instrument plant by the end of 1958 will start the production of variable pressure meters and new types of transducers for measuring temperature and pressure fluctuation. Two new plants will start the production of computers in 1958. In the same year a mass-spectrometer plant and a new plant for manometers will go into production. A new plant now in the construction stage will produce instrument fittings, control components, and standard units for the instruments.

"It should be noted that the construction of the new plants was carried out at a much slower pace than originally planned, so that the increase of instrument building capacity lags considerably behind the scheduled tempo. Construction of the new plants was conducted last year in an unsatisfactory manner and therefore should require greater everyday attention on the part of the sovnarkhozes (councils of national economy).

Computers and Automation

30. Differentiating Circuits

"Differentiating Circuits," by A. M. Oranskiy., Tr. Ryazanskogo radiotekh. in-ta., 1956, 1, pp 164-174 (from Referativnyy Zhurnal -- Elektrotekhnika, No 6, May 57, Abstract No 12893)

The article offers an analysis of the performance of passive differentiating circuits. It is shown that an error in differentiating depends on the type of exciting function. The error increases with an increase in the time constant of the differentiating circuit (T) and decreases with an increase in allowable "observation" time. For a linear input signal, the differentiation becomes sufficiently accurate at $t \geqslant 4T$. A table is provided for the quantitative evaluation of the differentiation error and for the selection of optimum parameters of differentiating circuits. Usually, direct current negative feedback amplifiers are used for reducing errors in differentiation. But such amplifiers have considerable deviation, and their parameters depend on individual tubes. The author suggests a circuit which is free from the principle errors of differentiating circuits. Such a circuit is obtained with a capacitance and resistance differentiating circuit if voltage from a separate source is added to the input voltage which is equal to the drop in voltage across the resistance of the differentiating circuit. This is easily accomplished by means of a cathode follower. It is pointed out that this circuit is not susceptible to drift or changes in tube parameters.

31. Computers Used in Operation of Marshaling Yards

"A Computer" (unsigned article); Moscow, Avtomatika, Telemekhanika i Svyaz', No 12, Dec 57, p 8

This short article reads as follows:

"At the observation post of the Losinoostrovskaya station, Northern Railroad, mechanized classification hump a computer was installed.

"At the hump a radar installation which transmits to the computer the data on the speed of the freight car decoupling is also mounted.

"Another device registers and sends data to the machine on the performance of the couplers.

"Having obtained such data, the computer automatically calculates and estimates the needed braking action for the cars, i.e., assures such a speed at the time of decoupling that it will smoothly coast and stop just at the contact with the cars standing on the tracks.

"The new machine [computer] will precisely and automatically perform the functions of an operator of a mechanized hump and will relieve the car attendant of heavy and hazardous work."

32. Analog Computer EI-S for Oil Fields

"Mathematical Machine for Solution of Subterranean Hydraulic Problems in Petroleum Mining Industry," by V. I. Loskutov; Moscow, Priborostroyeniye, No 1, Jan 58, pp 4-9

The solution of subterranean hydraulic problems required the building of a special mathematical machine based on the principle of electrical modeling, i.e., simulation of processes taking place in the oil-bearing strata by means of special electric circuits.

An analog computer EI-S was recently built and put into operation at the All-Union Petroleum and Gas Scientific Research Institute. The EI-S machine solves problems related to the development and exploitation of large oil fields having strata of any configuration and extending as far as 120 km. The EI-S model is intended for approximate solution of problems related to subterranean hydraulics for either steady-state conditions (hydraulic pressure conditions) or for the transient-state conditions (elastic conditions)

The basic components of the EI-S machine are a matrix of resistors and capacitors with their service circuits.

The theory of simulating the processes which determine the efficient exploitation of the oil field was developed by Prof P. M. Belash. The EI-S machine is made of the following units: central zone matrix of electric resistors, middle and peripheral zone matrix of electric resistors, initial state unit, functional transformation unit, assigned boundary condition unit, a complex of control and metering devices, unit of primary stabilizers, unit of electronic stabilizers, and the power supply unit.

The initial values of the problem are placed into the matrix of resistors and capacitors, which has about 20,000 nodal points and a flexible commutation system permitting the handling of any possible configuration of the oil-bearing strata.

The matrix of the model is divided into three zones: the central, which simulates the behavior of the oil strata; and the middle and peripheral, which have a coarser mesh and are used to simulate the behavior of the adjacent water-bearing strata.

The process of the problem solution takes place in 20, 50 or 100 milliseconds, and is periodically repeated at designated intervals. The EI-S machine incorporates 8,000 electron tubes. The power consumption of the machine is about 60 kw for a "large" problem, and the machine can be easily serviced by a crew of eight men.

It is believed that the EI-S machine will considerably increase the oil production of the fields.

33. Use of Ascharite Ore in High-Voltage Porcelain

"High-voltage Porcelain with Increased Electromechanical Properties Using Boron-containing Raw Material," by G. N. Boronkof, A. A. Zvyagilskiy, and N. F. Kretova, Tr. Gos. issled. elektrokeram. in-ta, 1956, No 1, pp 5-16 (from Referativnyy Zhurnal -- Elektrotekhnika, No 6, May 57, Abstract No 11867)

Due to the necessity of increasing the mechanical and electrical characteristics of electrotechnical porcelain, the GIEKI (State Research Electrical Ceramics Institute) has developed porcelain using boron-containing (ascharite) ore, alumina, argillaceous materials, and a small quantity of alkali-earth compounds. Quartz and feldspar are not used. The utilization of ascharite ore ($2H_gO \cdot B_2O_3 \cdot H_2O$) as the fusing agent, together with $CaCO_3$ or $BaCO_3$, and also the introduction of commercial Al_2O_3 into the mass with an increased amount of porcelain clay resulted in the formation of porcelain having a solid structure, in which the mullite crystals form a matlike net and are evenly distributed in the vitreous phase. The amount of free glass in the ascharite porcelain is insignificant, but there is a small-grained accumulation of alpha-alumina. Because the thermal coefficient of expansion of ascharite porcelain (3.9×10^{-6} degrees^{-1}) is lower than that of ordinary feldspar porcelain (6×10^{-6}), new glazes were developed (white and brown) in which there was a small percentage of alkaline oxides.

Due to the more homogeneous structure and other factors, ascharite porcelain has almost twice the mechanical strength of feldspar porcelain. The presence of an alkaline-free vitreous phase results in a greater specific volumetric electrical resistance and electrical strength in the ascharite porcelain and sharply reduces the dielectric loss angle. The process of preparing the mass and manufacturing the insulators may be accomplished by the usual methods used in the production of electrotechnical porcelain. An additional operation is the introduction of sinter into the mass of ascharite porcelain. The optimum temperature for firing ascharite porcelain is 1,310-1,330 degrees. Insulators of ascharite and feldspar porcelain may be fired together, but the sintering range of ascharite porcelain (30°-40°) is somewhat less than the sintering range of ordinary electrotechnical porcelain (60°-80°). Thermographic and chemical tests conducted on ascharite ore have shown that for the production of electrotechnical porcelain the ore must contain at least 22% B_2O_3 and 23% MgO. The density of ascharite ore must be no less than 2.65 g/cm^3. [illegible] must not exceed 18%.

34. Fritted Cordierite Porcelain

"Fritted Cordierite Porcelain," by S. I. Sil'vestrovich. Tr. Mosk. khim-tekhnol. in-ta., 1956, No 21, pp 100-112 (from Referativnyy Zhurnal -- Elektrotekhnika, No 6, May 57, Abstract No 11868)

Ordinary feldspar is unable to meet the demands of the various fields of technology. The low level of physicomechanical and thermal properties of feldspar porcelain is due to the large (50-60%) amount of quartz-feldspar vitreous phase. Tests have been conducted with fritted cordierite porcelain (produced in the same manner as ordinary electrotechnical porcelain) in which the feldspar was partially or entirely replaced by frit, a synthetic vitreous compound of $2MgO \cdot 2Al_2O_3 \cdot 5SiO_2$, a suitable iron-free cordierite. Fritted glass, obtained by means of fusing magnesite, kaolin, and quartz sand, is distinguished by its increased strength, its increased solvent action in relation to quartz and argillaceous materials, and its tendency to crystallize, especially in the range of 1,320-1,380 degrees. The sintering of cordierite porcelain takes place in a narrower temperature range; hence, this process takes less time than that by feldspar porcelain.

A distinguished characteristic of the microstructure of cordierite porcelain is the presence of new crystalline formations apart from the mullite crystals, which are caused by the crystallization of the cordierite frit. The vitreous phase has a granular quality and is considerably less than that of feldspar porcelain. In relation to this, increases of 25-35 percent in the mechanical stability of samples of cordierite porcelain have been observed. Also observed have been a higher thermal stability and a much smaller coefficient of thermal expansion ($0.6\text{-}1.5 \times 10^{-6}$ per degree at 80 degrees). Some increases in mechanical stability have also been observed in samples of feldspar-cordierite porcelain.

35. Relation of Secondary Emission to Thickness of Certain Metals and Semiconductors

"A Study of the Secondary Emission of Some Metals and Semiconductors in Relation to Their Thickness," by N. G. Nakhodkin., Nauk. zap. Kyivs'k. un-t., 1955, 14, No 8, pp 209-221 (from Referativnyy Zhurnal -- Elektrotekhnika, No 6, May 57, Abstract No 13023)

Examination of secondary emission characteristics in relation to the thickness of a test layer makes it possible to determine that portion of the volume which is involved in the phenomenon of secondary emission, which characterizes the effective depth of secondary emission. This depth is measured by the thickness of the layer at which the relationship of secondary emission characteristics to thickness ceases to exist. The effective depth of secondary emission is related to the depth of penetration of primary electrons in a substance as well as with the depth of escape of primary electrons. At first, the effective depth was measured by the coefficient of secondary emission on successively sprayed layers of the test material on the base layer. However, the large scattering of experimental data and the imperfection of methods do not permit generalizations about this work. With the use of the wedge method, which gives more accurate results, experiments on effective depth of secondary emission were conducted with six different substances: metals and semiconductors (Ag, Cu, Cr, Sb, Te, Ge) in a specially built tube using an electron gun. A wedge-shaped layer of the test substance of necessary steepness was deposited on a glass plate by the vaporization of a spherical, almost pointlike source. The target with the wedge was placed in the proper position in the electron path by means of a magnet. The error in determining the thickness of the wedge due to inaccurate knowledge of the geometry of the system and weight of the volatile substance was estimated at approximately 20-23 percent. The results of the experiment are given in the following table.

Substance	Coeff of Secondary Emission Maximum	Energy of Primary Electrons V_p max. (volts)	Effective Depth of Secondary Emission z_0 ($m\mu$)
Ag	1.47	800	9-10
Cu	1.35-1.40	600	10-11
Cr	1.35	600	4.5-6

Substance	Coeff of Secondary Emission Maximum	Energy of Primary Electrons V_p max. (volts)	Effective Depth of Secondary Emission z_0 (mμ)
Sb	1.48	500	13
Te	1.51	1,000	18-20
Ge	1.21	400-500	65-70

The basic conclusions were as follows: (a) with a change from pure metals to semiconductors the effective depth increases; and (b) in the tested interval V_p the effective depth does not depend on the energy of primary electrons; the increase in effective depth in the change from metals to semiconductors may be explained by a decrease in loss of the primary electrons due to a decrease in concentration of conduction electrons.

Miscellaneous

36. New Electrography Institute Organized in Lithuanian SSR

"Institute of Electrography" (unsigned article), Moscow, Izvestiya, No 238, 6 Oct 57, p 3

A Scientific Research Institute of Electrography (Nauchno-Issledovatel'skiy Institute Elektrografii) of the Lithuanian SSR was organized in Vil'nyus. The institute is under the sovnarkhoz system of the Lithuanian SSR. The institute has been given a new building in the city for its laboratories and shops.

V. ENGINEERING

37. Stress and Deformation of an Elastic Medium Studied

"An Elastic Medium With a Cylindrical Cavity," by G. G. Chankvetadze, Tr. Gruz. politekhn. in-ta, No 6 (47), 1956, pp 38-46 (from Referativnyy Zhurnal -- Mekhanika, No 11, Nov 57, Abstract No 12984 by S. V. Boyarshinov)

The stress and deformation constants of an infinite elastic medium having a cylindrical cavity and loaded at a certain end section with a uniform internal pressure are studied. The solution is achieved by methods of the mathematical theory of elasticity and is represented in Legendre polynomials.

38. Effect of Holes in a Body Under Stress Studied

"The Effect of Circular and Crescent-Shaped Openings on Stresses During Pure Shear," by M. A. Savruk, Nauchn. Zap. L'vovsk. politekhn. in-t, No 38, 1956 (1957), pp 126-135 (from Referativnyy Zhurnal -- Mekhanika, No 11, Nov 57, Abstract No 13011 by Ya. S. Uflyand)

A plane problem of the theory of elasticity for an infinite body weakened by openings, the shape of which was formed by the two arcs of their mutually intersecting circumferences, is considered. The author proposes that at infinity the body will be in a condition of pure shear.

Using bipolar coordinates, two cases are studied: (a) one opening having the form of a symmetrical circular opening (the solution has the form of the expansion of a Fourier integral) and (b) two circular openings of similar radius (the solution is presented in the form of a trigonometric series). Numerical results pertaining to the concentration of stresses are obtained in both cases.

39. New Soviet Profilometer

"New Piezoelectric Profilometer," by V. A. Yegorov and A. N. Kartasheva; Moscow Izmeritel'naya Tekhnika, No 5, Sep/Oct 57, pp 15-16

Research work at the All-Union Scientific Research Institute of the Committee on Standards, Measures, and Measuring Instruments has successfully produced an experimental model of a new piezoelectric profilometer, designated DB, for measuring the roughness of surfaces in Classes 5-12 under GOST 2789-51. The instrument was built at the Moscow Aviation Technological Institute and consists of a piezoelectric probe, an amplifier, and a motor drive.

The probe consists of an electromechanical transducer which converts the vibrations of the feeler into electrical oscillations. The piezoelement in the probe consists of two 40 x 8 x 0.35-mm plates of barium metatitanate reinforced at the base. The feeler at the free end consists of a fixed sapphire needle with a radius of curvature of 10 microns at the point.

The amplifier unit consists of a double cascade voltage amplifier with two 6N2P twin triodes (left half). The right half of the first amplifier tube is used for reducing interferences (by negative feedback), and the right half of the second 6N2P tube acts as a phase inverter for matching the output amplifier, which is nonsymmetrical in respect to ground, with the push-pull circuit of the square-law rectifier. A voltage divider separates the cascades of the amplifier. A slide switch can be installed in four positions. The instrument has four measuring ranges: 0 - 0.1, 0 - 0.4, 0 - 1.6, and 0 - 6.4 microns.

The square-law rectifier consists of a push-pull rectifier circuit with two 6N15P twin triodes. The circuit operates on the plate-detection principle.

The indicator is an M-24, Class 1, Microammeter. The drive motor is an APM-5, 18-volt induction motor. The probe moves at a rate of 2 mm per second.

Tests on the profilometer show that the indication error does not exceed plus-minus 18 percent (the Phillips instrument has an indication error of plus-minus 25 percent, the KV-7 plus-minus 15 percent, and the PCh-2 plus-minus 25 percent).

The profilometer can be used to measure the roughness of a flat surface, an outside cylindrical surface (up to 19-mm diameter), and an inside cylindrical surface (up to 38-mm diameter) to a depth of 300 mm. The entire instrument, including the motor, weighs 11.8 kg.

40. Improved Reversing Rolling Mill Motors

"Flywheelless Assemblies for Main Drives of Reversing Rolling Mills," by B. R. Gendel'man; Moscow, Elektrichestvo, No 12, Dec 57, pp 8-13

The following passages are taken from the article:

"Thus, for example, the previously used 7,000 hp (50/120 rpm) motors with a rated torque of 100 ton meter had the flywheel moment of 385 ton m^2, i.e. $\frac{GD^2}{M}$ equal to 3.85.

"The new 7,500 hp (60/120 rpm) rolling motor of the "Elektrosila" plant has a rated torque of 89 ton m and flywheel moment of 275 ton m^2, i.e., $\frac{GD^2}{M}$ equal 3.1.

"The KhEMZ (Khar'kov Electrical Machinery Plant) manufactures a rolling motor PBK 250/145 type, 4,600 kw, 70/120 rpm, for which the value of this ratio has been reduced to 2.2.

"Due to the reduction of the flywheel moment, the reserve power available for rolling is substantially increased. Also, the time consumed in control operations (start, reversal) has been reduced below that for identical loading. Besides, there is a possibility of obtaining rolling motor acceleration of the order 120-150 rpm per sec.

"The manufacturing of dc motors to drive the auxiliary mill mechanisms has begun recently, in which the ratio $\frac{GD^2}{M}$ is equal to 0.26, while in the previously used motors such a ratio was from 0.6 to 1.5."

41. Voltage of Kuybyshev-Moscow Power Line Raised to 500 KV

"Kuybyshev Giant Operates at Full Capacity," (unsigned article); Moscow, Gidrotekhnicheskoye Stroitel'stvo, No 12, Dec 57, pp 1-2

A passage from the article reads as follows:

"The fixtures and equipment installed on the Kuybyshev-Moscow electric power transmission line were such as to permit the raising of the line voltage up to 500 kv, thus increasing the power-transmitting capacity of the line in the direction of Moscow 34% and in the direction of the Urals 40%."

VI. MEDICINE

Bacteriology

42. Chemical Characteristics of B. pestis Growth Stimulators

"Isolation and Chemical Characteristics of the Active Fraction of Lysate of Microorganism 'Feeders' Which Stimulate the Growth of the Plague Pathogen," by A. A. Krichevskaya and K. S. Karpuzidi, Tr. Rostovsk.-n.-D. Gos. N.-I. Protivochumn. In-ta (Works of the Rostov-na-Donu Scientific Research Antiplague Institute), No 10, 1956, pp 54-59 (from Referativnyy Zhurnal--Biologiya, No 21, 10 Nov 57, Abstract No 89472, by G. P. Kalina)

"An active, water-soluble fraction was isolated from the lysate of Sarcinia 'feeders,' which stimulates the growth of B. pestis. Its activity was 1,000 times greater than that of the natural lysate. The method of preparation was as follows: the lysate was centrifuged for 10 minutes at 3,000 rpms; the supernatant liquid was separated and ammonium sulfate was added to it (45 g per 100 ml); the protein was separated by centrifugation after 2 hours and dissolved in a small quantity of water; insoluble residue was removed by centrifugation; and the water-soluble protein from the supernatant fluid was precipitated with an equal volume of acetone, washed with acetone, and dried on filter paper. One milligram is added to one liter of medium."

43. Biological Characteristics of B. pestis Cultured on Media With Growth Stimulators

"A Study of the Basic Biological Characteristics of the Plague Pathogen Upon Culturing and Prolonged Preservation on Media Containing a Growth Stimulator (Lysate of Microorganism 'Feeders')," by K. S. Karpuzidi and A. M. Kokhlova, Tr. Rostovsk.-n.-D. Gos. N.-I. Protivochumn. In-ta (Works of the Rostov-na-Donu State Scientific Research Antiplague Institute), No 10, 1956 pp 60-68 (from Referativnyy Zhurnal--Biologiya, No 21, 10 Nov 57, Abstract No 89473, by G. P. Kalina)

"The addition of Sarcinia 'feeders' to a culture medium on which B. pestis is being cultured is not reflected in the biological characteristics, virulence, biochemical activity, or antigenic characteristics, and does not increase or decrease the duration of the viability of B. pestis, but it does extend the period of growth. The authors recommend lysate as a growth stimulator after B. pestis cultures have been isolated."

44. Research on Brucella, Pasteurella, and Tularemia Bacteria

"Biochemical Investigation of Brucella, Pasteurella, and Tularemia Bacteria," by Yu. Parnas and P. Meliyechvskiy, Chair of Microbiology, Medical Academy and Division of Anthropozoonoses, Institute of Rural Hygiene in Lublin; Moscow, Zhurnal Mikrobiologii, Epidemiologii, i Immunobiologii, Vol 29, No 1, Jan 58, pp 106-107

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"A comparative study of the morphological characteristics, biochemical composition, and activity of certain enzymes in various strains of Brucella (bovis, suis, melitensis, S19, PD) and Pasteurella (tularensis, rodentium) was made.

"The aforementioned microorganisms differed in their morphological characteristics on investigation under the electron microscope (see illustration). On determination of the amino acid content of the microbial proteins by the methods of one dimensional, two dimensional, and radial chromatography, the presence of the following amino acids, (common to all cultures was established: lycine, phenyl-alanine, valine, methionine, proline, tryptophane, tyrosine, alanine, treonine, lysin, glycine serine, glutaminic acid, aparaginic acid, cysteine (Table 1). A difference in the carbohydrate content was observed upon chromatographic analysis of the polysaccharide fractions.

"The polysaccharide fractions of the tularemia Bacillus and Pasteurella multocida contain seven different components--- uronic acid, glucosamine, glucose, galactose, fructose or arabinose, xylose, and ribose. Glucosamine, xylose, and ribose were not present in Pasteurella rodentium. A difference in the quantitative content of two out of five of the hydrocarbon components isolated (glucosamine and fructose or arabinose) was observed in Brucella in relation to the virulence of the strain. Enzymatic investigation performed on a large number of Brucella strains showed that considerable catalase and urease activity occurred in them. It was thus established that catalase activity is lower in vaccine strains of Brucella than in virulent strains (in the former, from 14.3 to 54.7% in relation to the unused 0.1 N $KMnO_4$; in the latter, from 63.4 to 84%)."

Two tables included in the article are entitled: Amino Acid Content of Protein Fraction Hydrolysate; and Hydrocarbon Content of Brucella and Pasteurella Polysaccharides. An illustration depicts morphological characteristics of pathogens investigated as observed under an electron microscope.

45. B. coli as a Pathogen of Cholera-Like Intestinal Infections

"Hemolyzing Cultures of B. coli as a Possible Pathogen of Acute Intestinal Infections." by R. I. Kotlyarova and V. N. Ter-Vartanov, Tr. N.-I. Protivochumn. In-ta Kavkaza i Zakavkaz'ya (Works of the Scientific Research Institute of the Caucasus and Transcaucasus), No 1, 1956, pp 242-252 (from Referativnyy Zhurnal -- Biologiya, No 21, 10 Nov 57, Abstract No 89627, by M. A. Gruzman)

"Twelve cases of cholera-like diseases caused by hemolytic intestinal bacilli are described. Two of them terminated fatally after one day. Pure cultures of bipolarly-staining bacilli were frequently observed in smears of feces and vomit and of intestinal, splenic, liver, and lung contents taken from the patients who had died. In 83.3% of the cases, identical cultures were isolated from seedings on peptone water, Endo medium, and 5% blood agar. A large number of the microbial cells from the isolated cultures had capsules. All cultures were nonmotile. Bacilli grow well on one-percent peptone water and on the usual media with a pH of 7.3-7.8. The bouillon becomes uniformly cloudy, sometimes forming a film. The colonies on agar are 1-4 mm in diameter, round with smooth borders, smooth, gray, and glittering. All strains dissociate with the formation of acid and lactose gas, glucose, mannite, sucrose, maltose, arabinose, fructose, xylose, ramnose, and do not break down dulcite. They coagulate litmus milk with the formation of acid. They form H_2S and indol and do not dissociate gelatin. They do not grow on citrate agar, they react positively with methyl orange, and they do not form acetylmethylcarbinol. Hemolysis occurs on the second day with guinea pig or rabbit blood.

"Evidently not all strains have identical antigenic structure. Virulence for animals decreased rapidly on preservation under laboratory conditions. Identical strains were isolated from a door-knob on one of the patient's doors and from sour milk, which indicates the significance of food products and water in the dissemination of hemolytic intestinal bacilli. The role of direct contact cannot be ruled out (cases of laboratory infection). Large doses of sulfamides afford a good therapeutic effect -- one g of disulfane or sulfidine every 2-3 hours, 40% glucose internally, physiological solution subcutaneously."

16. Atypical Fowl Plague and Vaccinia Viruses Cultured Botched in [illegible] Tissue

"Data on Culturing of Atypical Fowl Plague and Vaccinia Viruses in Mouse Ascites Carcinoma," by M. K. Topchiy, Laboratory of Cancer Biotherapy, Kiev Scientific Research Institute of Epidemiology, Microbiology, and Hygiene, Voprosy Virusologii, Vol 3, No 1, Jan/Feb 58, pp 12-16

A study of the possibility of culturing atypical fowl plague [Newcastle Disease] and vaccinia viruses in mouse ascites carcinoma is reported in this article. The oncolytic properties of these viruses was also a subject of the research described. Details of the experimental method are given. The "Kishinev" strain of atypical fowl plague, isolated from sick roosters in 1949, was used; vaccinia experiments were carried our with a strain of neurovaccine obtained from M. A. Morozov. Two charts show the number of passages to which each virus was subjected. The atypical fowl plague virus was adapted to the carcinoma in vivo, and to the vaccinia in vitro.

The conclusions state that the atypical fowl plague virus was passed 78 times by the "zig-zag" method (tumor--chick embryo--tumor). The virus titer was decreased in the tumor tissue from 10^{-4} to 10^{-2} as the number of passages increased. It is stated that this may indicate insignificant activity of the virus in nonsusceptible animals. As a result of continued passage, the virus did not acquire pathogenic properties for mice and lost them in relation to its initial host, the rooster.

The vaccinia virus was subjected to 62 passages through intramuscular tumors. In another experiment it was passed through mouse ascites carcinoma 19 times after 55 passages through the intramuscular tumor, as a result of which it became contaminated with atypical fowl plague virus; further passages were impossible thereafter.

Attempts to detect the viruses in tumors by means of the hemagglutination reaction were unsuccessful due to inconsistency of results; the reaction was frequently negative when virus was present in the tumor.

47. Effect of Hibernation on Leptospirosis

"The Effect of Hibernation on the Course of Experimental Leptospirosis in Citellus pygmaeus," by Ye. N. Gorshanova, Uch. Zap. Dagestansk. N.-I. In-t po Proiz-vu Pitatel'n. Sred (Scientific Notes Dagestan Scientific Research Institute for the Production of Culture Media), No 2, 1956, pp 167-168 (from Referativnyy Zhurnal -- Biologiya, No 18, 25 Sep 57, Abstract No 77549, by Z. A. Yakubovich)

On infection of fully conscious susliks with a highly virulent strain of icterohemorrhagic Leptospora, incubation lasted not more than 5 days, and in a state of sleep, 38, 41, and even 74 days. Sleep facilitated survival. When the susliks awoke they were immune and became Leptospira carriers. Leptospira maintain their own viability in the sleeping organism; this fact is attested to by cultures isolated from kidneys of conscious animals, hemocultures of animals killed on the 20th day of sleep, and the death of animals infected with cultures from rodents awakened from hibernation."

48. Effects of Vi- and O-Phages on Antigenic Structure of Typhoid Bacteria

"Change in the Antigenic Structure of Typhoid Bacteria Under the Effect of Vi- and O-Phages," by Z. S. Ostrovskaya, Izmenchivost' Mikroorganizmov (Modifiability of Microorganisms), Moscow, 1956, pp 197-204 (from Referativnyy Zhurnal -- Biologiya, No 21, 10 Nov 57, Abstract No 89635, by M. D. Krylova)

"In experiments on mice, due to the effect of homologous typhoid Vi-I and Vi-II phages typhoid strains either lost Vi-antigen or the amount of it was considerably diminished, especially following action on V-form and during the first 2-3 days. Heterologous Vi-II phage produced the same changes, but at a slower rate. Variants which were agglutinated by O-serum but were not lysed by O-phage appeared under the effect of O-phage. This phage in a mixture containing Vi-phage or with Vi-phage alone did not completely sterilize the organism although the quantity of bacteria seeded was much smaller than it was following the action of monophages."

[For additional information on bacteriology, see Item No 71.]

Epidemiology

49. Diseases With Natural Foci in Siberia

"Diseases With Natural Foci in Siberia, and Basic Problems in Their Study," by S. P. Karpov, Trudy Tomskogo Instituta Vaktsin i Syvorotok (Works of the Tomsk Institute of Vaccines and Sera), 1956, 7, 5-15, (from Meditsinskiy Referativny Zhurnal, Part IV, No 5, May 57, p 54)

"The building of hydroelectric systems, the development of forest industry, and the improvement of virgin areas will lead to increased contact by various population groups with natural foci of infectious diseases. This problem will require further research by Soviet science as well as study of the nosography of diseases with natural foci.

Foci of the following disease have been found in Siberia and the Far East: tick-borne encephalitis, tick-borne rickettsiosis, hemorrhagic fever, leptospirosis, listerellosis, and Japanese encephalitis. The sources and carriers of the various diseases in the natural foci are described in detail."

50. Leptospirosis in Dagestan

"Certain Data Concerning Sources of Non Icteric Leptospirosis in Dagestan (Preliminary Report)," by Ye. N. Gorshanova, M. N. Bratkova, and B. M. Zemel'man, Uch. Zap. Dagestansk. N.-I. In-t po Proiz-vy Pitatel'nykh Sred (Scientific Notes of the Dagestan Scientific Research Institute for the Production of Culture Media), No 2, 1956, pp 171-186 (from Referativnyy Zhurnal -- Biologiya, No 18, 25 Sep 57, Abstract No 77560, by Z. A. Yakubovich)

"Investigations were performed from September 1955 to May 1956. The presence of Leptospira of the hebdomadis type in Dagestan was established for the first time. Mouselike rodents were probably the source of a small-scale outbreak among humans."

51. Ecology of Ixodes Ticks in the Armenian SSR

"Certain Data Concerning the Ecology of Ixodes Ticks of the Genera Hyalomma Koch, Rhipicephalus Koch, and Dermacentor Koch in the Armenian SSR," by M. M. Mamikonyan, Tr. Arm. N.-I. Inta Zhivotnovodstva i Veterinarii (Works of the Armenian Scientific Research Institute of Animal Husbandry and Veterinary Medicine), No 1, 1956, pp 149-151 (from Referativnyy Zhurnal -- Biologiya, No 21, 10 Nov 57, Abstract No 91011, by I. V. Tarasevich)

"Representatives of the genera Hyalomma, Rhipicephalus, and Dermacentor predominate among Ixodes ticks. Their hosts are small and large domestic animals. Species of the genus Hyalomma have great ecological plasticity and are encountered on solonetz-marsh type pastures, in floodlands and brackish semiarid areas, and in forest, steppe, and subalpine regions. Ticks of the genus Rhipicephalus are more numerous in floodlands and brackish semiarid areas, and representatives of the genus Dermacentor, in forested and mountain-steppe regions. The greatest infestation of animals with Hyalomma and Rhipicephalus is observed in the spring and in the beginning of summer, and the Dermacentor, in the early spring and fall. The pathogenic significance of ticks leads to transmission of pathogens of hemosporidoses of sheep, horses, and cattle."

52. Soviet Medical Personnel Receive Advanced Training in Epidemiology

"Broad Ties," by F. Barinskiy, Candidate of Medical Sciences; Moscow, Meditsinskiy Rabotnik, No 20, 11 Mar 58, p 3.

The Institute of Epidemiology and Microbiology imeni N. F. Gamaleya has during 1955 given advanced training to 192 physicians from all parts of the USSR; in 1956, to 229; and in 1957, to 381. These physicians were given detailed training in the various methods of scientific research and production in the fields of epidemiology, bacteriology, and immunology. The institute also gives advanced training to physicians from countries of the Soviet Orbit.

To render aid to organs of public health in the prophylaxis and eradication of infectious diseases and to improve laboratory diagnosis, members of the institute make periodic trips to various areas in the USSR. The visiting sessions of the Scientific Council of the institute are also important in the improvement of the treatment and prophylaxis of infectious diseases in the Ukraine, the Far East, Siberia, and the Baltic region. The institute has established a Scientific-Organizational Methodological Center for tularemia, brucellosis, dysentery, and natural-foci diseases, and has developed instruction materials on bacteriological preparations, methods of prophylaxis, and special treatment of infectious diseases.

53. East German Comment On Prevention of Brucellosis in Humans

"On the Question of the Diagnosis of Brucellosis in Cattle By Meat Inspection," by A. Krueger; Leipzig, Monatshefte fuer Veterinaermedizin, No 2, 15 Jan 57, pp 43-48

The article discusses the fact that the raw meat of brucellosis-infected cattle represents a means of human infection which should be countered vigorously. The possiblity of the metamorphosis of brucellosis bacteria in humans and animals is pointed out, and it is suggested that a single measure be taken which will apply to all types of brucellosis.

Since no legal possibility exists as yet of slaughtering cattle in which brucellosis has been established officially, new veterinary police regulations should be put into force which would make the revelation of instances of this disease obligatory.

Even though difficulties similar to those encountered in the new East German antituberculosis campaign should be encountered, the measures must be attempted in the case of brucellosis.

Hematology

54. Immediate and Remote Results of Treating Pernicious Anemia With Vitamin B_{12}

"Immediate and Remote Results of Treating Addison-Biermer Disease by Vitamin B_{12}," by N. A. Makarova, Vitamin B_{12} i ego Klinich. Primeneniye (Vitamin B_{12} and Its Clinical Use), Moscow, Medgiz, 1956, 102-119 (from Referativnyy Zhurnal -- Biologiya, No 12, 25 Jun 57, Abstract No 53549, p 485)

Clinical observations on 33 patients suffering from pernicious anemia and treated with vitamin B_{12} leads to rise of hemoglobin content by one percent per day, increase in the number of erythrocytes and thrombocytes, and a return to the normoblastic type of hemopoiesis, and the decrease or elimination of the syndrome of myelosis. With vitamin B_{12} treatment, the function of the gastrointestinal tract and that of the oral cavity is restored, and histamine-resistant achlorhydria does not occur.

55. Various Clinical Studies Prove That Effectiveness and Use of Antibiotics in Acute Leukosis Must Be Subjected to Further Clinical and Pathological Research

"Infectious Complications During Acute Leukosis," by V. S. Turusov, Chair of Pathological Anatomy (chief, Prof, A. N. Chistovich), Military Medical Order of Lenin Academy imeni S. M. Kirov, Moscow; Moscow, Klinicheskaya Meditsina, Vol 35, No 7, Jul 57, pp 59-65

The author analyzes indications and contraindications for the use of antibiotics in infectious leukosis. The development of these infectious complications is attributed to decreased resistance of the organism, decreased phagocytic activity of mature leukocytes, decreased immune properties of serum, and in a number of cases, also to granulocytopenia. A protracted course of small doses of antibiotics makes the microorganisms drug resistant and does not check their multiplication. Furthermore, the ineffecient effect of antibiotics may be connected with decreased response of the organism to the antibiotics.

The author comes to the conclusion that, at present, the effectiveness and use of various antibiotics in acute leukosis still awaits further clinical elucidation, and pathologicoclinical research.

56. Intravenous Transfusions of Polyglyukin up to 2,000 ml Cause No Reactions or Hemorrhage, and Blood Coagulation Time Not Disturbed

"Concerning Reactogenicity of Polyglyukin in the Clinic," by A. A. From, Candidate of Medical Sciences, and R. I. Murazyan, Candidate of Medical Sciences, Moscow, Surgical Clinic (head, Prof D. M. Grozdov), Central Order of Lenin Institute of Hematology and Blood Transfusion of Ministry of Health USSR (director, Prof A. A. Bagdasarov, Corresponding Member, Academy of Medical Sciences USSR), Moscow, Klinicheskaya Meditsina, Vol 35, No 7, Jul 57, pp 57-59

The term reactogenicity means the reactive properties which certain dextrans possess, and this includes increased temperature, skin eruptions and other allergic syndromes, and disturbed blood coagulation.

A total of 533 transfusions of various plant series of polyglyukin, ranging in amount from 250 to 2,000 ml reveals the following facts:

1. Transfusion of even large amounts of polyglyukin are not accompanied by clinically pronounced response reaction of an organism.

2. Intravenous administration of polyglyukin in doses up to 2,000 ml do not cause clinical symptoms of hemorrhage.

3. Usually after the transfustion of polyglyukin, blood coagulation time is shortened, but it returns to normal within 3-24 hours. Only in individual cases is there a small and temporary prolonged blood coagulation time.

57. Dangers, Complications, and Measures Used in Intra-Arterial Transfusion Reviewed

"Concerning Hazards and Complications in Intra-Arterial Blood Transfusions," by V. I. Pronin, Candidate of Medical Sciences. Moscow, Chair of Faculty of Surgery (head, Prof B. V. Petrovskiy, Corresponding Member, Academy of Medical Sciences USSR), Pediatric Faculty of the Second Moscow Medical Institute imeni I. V. Stalin; Moscow, Klinicheskaya Meditsina, Vol 35, No 7, Jul 57, pp 54-57

Reviewing Soviet and non-Soviet literature on intra-arterial blood transfusion (a total of 3,000 cases), it becomes evident that intra-arterial transfusion is dangerous and must be used only as the last resort when other means fail. Such cases include severe shock, severe hemorrhage, state of agony, and clinical death.

To make the consequences of intra-arterial transfusion less dangerous, the following rules are to be observed: (a) use peripheral arteries of the smallest dimension possible; (b) during the preparation of intra-arterial transfusion, infiltrate the arterial bed with 0.25% novocaine solution; (c) avoid binding the artery after the transfusion; and (d) after the completion of intra-arterial transfusion, introduce into the artery 10-15 ml of a 0.25% solution of novocaine.

In cases of vascular spasms, it is possible to avoid dangers by using novocaine, blockading means, and massaging the extremites. In severe cases in which such measures fail, it is necessary to sever the artery or effect sympathectomy.

58. Numerous Advantages of Plasma Substitute Solution L-103 Over Belenkiy's Serum Enumerated, and Curtailed Preparation of the Latter Recommended

"A Comparative Study of Certain Solutions From Heterogenous Protein," (Solution L-103 and Belenkiy's Serum), by Prof A. N. Filatov, Corresponding Member, Academy of Medical Sciences USSR, Z. A. Chaplygina, M. Ye. Depp, L. A. Grebenshchikova, V. S. Abramov, A. I. Blinova, N. S. Povergo, and I. S. Luganova, Leningrad, Leningrad Order of Red Banner of Labor Scientific Research Institute of Blood Transfusion; Moscow Klinicheskaya Meditsina, Vol 35, No 7, Jul 57, pp 47-53

Studies carried on during recent years on plasma-substitute solution L-103 and on Belenkiy's serum indicate that solution L-103 is superior because it is completely devoid of antigenic properties and is harmless to patients; it is easy to prepare, and therefore it is cheap; it is stable when preserved and may be desiccated then redissolved easily; and finally, it may be administered both intravenously and subcutaneously. Belenkiy's serum, on the other hand, is not completely devoid of antigenic properties, and its administration is especially dangerous to sensitized patients; it is much more expensive to prepare than solution L-103; it may be preserved for a comparatively short period of time; and finally, it can be successfully administered only intravenously.

The authors conclude that at present massive preparation of Belenkiy's serum must be curtailed and research conducted for improving other plasma substitute solutions, including solution L-103.

59. Rare Case of Hemorrhagic Diathesis Treated With Vitamins, Intravenous Injections, Well-Balanced Diet, and Rest

"Rare Case of Hemorrhagic Diathesis," by M. F. Bogatyrev, and R. D. Moiseyeva; Moscow, Klinicheskaya Meditsina, Vol 35, No 7, Jul 57, pp 130-131

A detailed medical history of a 19-year-old patient suffering from hemorrhage of the lower part of the left extremity is presented. The general condition of the patient is reviewed. Blood studies indicate improvement prior to the patient's discharge.

The author states that this case was a variation of local hemorrhagic diathesis in which, in addition to the injury of the capillaries of the shank vessels, the subcutaneous veins of the lower half of the shank are also injured. Hemorrhage was limited to only one extremity.

Therapy recommended for such types of patients consists of increased vitamin therapy, intravenous administration of calcium chloride, blood transfusion, a well-balanced diet, and rest of the affected part and of of the patient as a whole.

60. Pathogenesis and Therapy of Funicular Myelosis Analyzed, and Diagnosis and Immediate Cure Effected by Vitamin B_{12} Therapy

"Concerning the Pathogenesis and Therapy of Funicular Myelosis," by L. I. Yavorkovskiy, Candidate of Medical Sciences, Riga, Department of Hematology (head, G. A. Fonarev), Riga Republic Clinical Hospital (senior physician, F. F. Grigorash, Candidate of Medical Sciences); Moscow, Klinicheskaya Meditsina, Vol 35, No 7, Jul 57, pp 131-133

Combined injury of dorsal and lateral columns of the spinal cord, i.e., the so-called funicular myelosis, is most often met in Addison-Biermer's Disease, which is treated by vitamin B_{12}. Other cases of funicular myelosis become evident by achylia of the gastric juice, which indicates a possible relationship between the degenerative process in the spinal cord and distrubed normal absorption of vitamin B_{12} by the gastrointestinal tract. Additional information points to lowered vitamin B_{12} level in the serum of the blood of patients with funicular myelosis.

A detailed case history of a 45-year-old patient is presented. The patient responded quickly and well to only one vitamin B_{12} treatment, indicating the specificity of this vitamin in this disease, and also serving in diagnosing funicular myelosis.

The author considers that funicular myelosis, in this case accompanied by no anemia, could be considered as the result of disturbed vitamin B_{12} metabolism caused by infectious toxic injuries. The author remarks that the lack of association of the symptoms of vitamin B_{12}-avitaminosis, the development of funicular myelosis without anemia, and the maintenance of the normoblastic type of erythropoiesis (in this given case) still awaits solution.

61. Administration of Erythrocyte Mass Most Beneficial in Treating Hypochromic Anemia

"Observations on the Therapeutic Effect of Erythrocyte Mass in Various Hemolytic Diseases," by A. Mirkowska, Polsk. Arch. Med. Wewn., 26, 12, 1956, 1837-1841 (Polish) (from Meditsinskiy Referativnyy Zhurnal, No 4, Section 1, Apr 57, p 49)

In treating 58 patients with various forms of anemias, repeated transfusions of 150-250 ml erythrocyte mass was administered by the drip method. Significant improvement was noted in the majority of patients with hypochromic anemia. Positive therapeutic effect was noted in 9 out of 34 patients with hemolytic anemia. No therapeutic effect was noted in using erythrocyte mass on patients with aplastic anemia.

62. Thromboplastic Activity of Preserved Blood Changes Little With Time

"Concerning the Problem of Thromboplastic Activity of Preserved Blood," by A. Janiakowa, T. Janiak, T. Olearczyok, and J. Ziemnick, Polsk. Arch. Med Wewn. Vol 26, No 12, 1956, 1887-1890 (Polish) (from Meditsinskiy Referativnyy Zhurnal, No 4 Section 1, Apr 57, p 49)

Thromboplastic activity of preserved blood was studied according to the method of "Biggs" and "Duglas." Results indicate that thromboplastic activity of the plasma of freshly preserved blood is 80% of the activity of normal blood and that it is little changed after 4 weeks of preservation. This fact justifies the use of blood which has been preserved for long periods for hemostatic purposes in hemorrhagic diathesis.

63. Prophylaxis of Posttransfusion Shock and Its Therapy by Luminal

"Prophylaxis of Posttransfusion Shock and Its Therapy by Luminal," by K. Bojanowicz, Polsk. Arch. Med. Wewn., 26, 12, 1956, pp 1825-1831 (Polish) (from Meditsinskiy Referativnyy Zhurnal, No 4, Section 1, Apr 57, p 50)

The prophylactic and therapeutic effect of luminal was studied in posttransfusion shock on 57 patients. An hour and a half before the next transfusion, luminal was prescribed for internal use in 0.1-0.3-gm doses. When luminal was used in 0.3-gm quantities for prophylactic purposes, no posttransfusion reaction was observed in 54 of the 65 transfusions. Posttransfusion reactions were noted in 9 out of 10 patients who had received 0.1-gm luminal for therapeutic purposes. Therapeutic effects, due to the use of 0.3 gm luminal in cases where posttransfusion reaction appeared, were noted in 15 out of 20 patients.

64. Probable Cause for Hemolysis Not in Hemopoietic Organs But in Medium Surrounding Erythrocytes

"Concerning the Problem of Hemolysis in Addison-Biermer Disease," by I. Brus, Polsk. Arch. Med. Wewn., 26, 11, 1956, pp 1739-1741 (Polish) (from Meditsinskiy Referativnyy Zhurnal, No 4, Section 1, Apr 57, p 52)

Research conducted on 70 patients with a pronounced form of Addison-Biermer Disease, showed definite hemolysis in 46 of them. Of the 24 patients in whom no hemolysis was observed 21 had received either liver preparations of vitamin B12 before their admission. Cholesterol content in 16 out of 20 patients fluctuated between 56 and 156 mg %. Low cholesterol content was observed in six patients with the more severe form of

hemolysis. Erythrocyte resistance to saponin was decreased in 28 out of 34 patients, but it frequently remained normal in cases of pronounced hemolysis. In 13 patients out of 15 studied, there was a sharp decrease of the compliment activity of bone marrow punctate as compared with that of peripheral blood activity.

The author comes to the conclusion that, to find the cause of hemolysis in Addison-Biermer Disease, one should look not in the hemopoietic organs, but in the medium surrounding the erythrocytes.

Immunology and Therapeutics

65. Live Brucellosis Vaccine Tested

"Epidemiological Testing of the Effectiveness of Live Brucellosis Vaccine," by T. G. Abashidze, Tbilisi Institute of Vaccines and Sera; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 29, No 1, Jan 58, pp 114-119

This article reports vaccination of persons who were caring for cattle and small livestock with live dry BA vaccine in 1951-1954 in eight rayons of the Georgian SSR which were threatened with brucellosis; the vaccine was obtained from the Institute of Epidemiology and Microbiology imeni Gamaleya. Two tables show occupations of persons vaccinated in each rayon and times of vaccination and revaccination from 1951 to 1954. A chart is included to show percentage of inoculation reactions (Wright, Huddleston, and Burnet) produced by the vaccinations. Opsono-phagocytic tests were also performed. A third table presents data on the number of persons from control and inoculated groups who contracted brucellosis during these years. The last table reports the incidence of disease among various occupations, according to season. Final analysis of all data collected revealed that immunological reactions gradually increased in persons with the acute form of brucellosis, whereas they reached a high level in vaccinated persons only after 5-6 months, after which they gradually disappeared. These reactions were maintained for a number of years in persons who had had the disease.

66. Refractoriness of Immunizing Agents

"Acquired Refractoriness of Immunizing Agents," by D. G. Manolov, Yu, V. Chebotareva, and K. I. Vasyurenko, Cb. Tr. Khar'kovsk. N.-I. In-ta Vaktsin i Syvorotok (Collection of Works of the Khar'kov Scientific Research Institute of Vaccines and Sera) No 22, 1955, pp 151-154 (from Referativnyy Zhurnal--Biologiya, No 21, 10 Nov 57, Abstract No 89640, by A. K. Akatov)

"The phenomenon of refractoriness of the immunizing agent was noted in an experiment on 'sanitation' [complete eradication of the carrier state] of six typhoid bacillus carriers by hyperimmunization with autovaccine. Five vaccinations did not produce an increase in H-, O-, and Vi-agglutinins in the blood of the subjects tested in any case; three of them ceased to eliminate typhoid bacillus. Analogous results--the absence of increase of agglutinins after five vaccinations--were obtained in experimental bacillus-carriers (rabbits). The authors assume that in the case described there was acquired inertness of the immunizing agents brought about by prolonged bacillus-carrying following extreme antigenic irritation."

"Serological Investigation of Experimental Typhoid Bacillus Carrying," by N. I. Volovich, Sb. Tr. Khar'kovsk. N.-I. In-ta Vaktsin i Syvorotok (Collection of Works of the Khar'kov Scientific Research Institute of Vaccines and Sera), No 22, 1955, pp 117-125 (from Referativnyy Zhurnal--Biologiya, No 21, 10 Nov 57, Abstract No 89642, by Ye. I. Zharov)

"Prolonged typhoid carrying (up to one year) was obtained in rabbits by infection via the bone marrow. Sera of the rabbit bacillus-eliminators contained H- and O-agglutinins and complement-fixing antibodies for a long time (up to 100 days). On an average, the titer of the H-agglutinins was 4-6 times higher than that of the O-agglutinins. The titer of the complement-fixing antibodies was from one fourth to one fifth that of the O-agglutinins. Specific antibodies disappeared from the blood on the 30th to 40th days in rabbits immunized subcutaneously with formol vaccine, and agglutinins and complement-fixing antibodies were present in the blood for a longer period (120-140 days) in hyperimmunized rabbits and in rabbit bacillus-eliminators."

67. Research on Whole Antigens

"The Stimulating Effect of Alum on the Immunogenicity of 'Whole' Antigens," by Ye. A. Moldavskaya and L. A. Shvartsman, Nauch. Tr. Mosk. N.-I. In-ta Vaktsin i Syvorotok (Scientific Works of the Moscow Scientific Research Institute of Vaccines and Sera), No 8, pp 605-615 (from Referativnyy Zhurnal Biologiya, No 21, 10 Nov 57, Abstract No 89620, by M. A. Gruzman)

"The effect of depot administration of 'whole' antigens of typhoid, paratyphoid, and Flexner bacteria with calcium phosphate and 0.1% alum in a polyvaccine was studied. Experiments on mice showed that the deposited antigens provided more intense and prolonged immunity, particularly the deposited alum. Concurrent study of the immunogenic characteristics of the 'whole' antigens and their complement-fixing capacity indicated the possibility of using the complement-fixation reaction for tentative evaluation of the properties of 'whole' antigens under production conditions."

"A Study of the Suitability of the Complement-Fixation Reaction for Determining the Characteristics of 'Whole' Antigens of Typhoid, Paratyphoid, and Dysentery Bacteria," by Ye. F. Vakarina, Nauch. Tr. Mosk. N.-I. In-ta Vaktsin i Syvorotok (Scientific Works of the Moscow Scientific Research Institute of Vaccines and Sera), No 8, 1956, pp 616-625 (from Referativnyy Zhurnal--Biologiya, No 21, 10 Nov 57, Abstract No 89621, by M. A. Gruzman)

"The author considers that the complement-fixation reaction can serve as a rapid approximate method for determining the character of 'whole' antigens of typhoid, paratyphoid B, and Flexner dysentery bacteria under production conditions. The biological method remains the basic method for determining the immunogenicity and evaluating the characteristics of 'whole' antigens."

"The Effect of 'Whole' Antigens' During Their Combined Use," by O. G. Filippova, and A. K. Kossova, Nauchn. Tr. Mosk. N.-I. In-ta Vaktsin i Syvorotok (Scientific Works of the Moscow Scientific Research Institute of Vaccines and Sera), No 8, 1956, pp 67-73 (from Referativnyy Zhurnal--Biologiya, No 21, 10 Nov 57, Abstract No 89622, by M. A. Gruzman)

"The effect of whole antigens on the development in immunity following their combined use was studied in animals. After subcutaneous introduction, typhoid antigens immunize well in combination with paratyphoid A and B, and not as well in combination with dysentery; the combination

of typhoid and paratyphoid A and B antigens acts favorably on Flexner dysentery antigen. The same relationship was not observed after intraperitoneal administration of complex preparations of whole antigens. Intraperitoneal immunization confers considerably more pronounced immunity than subcutaneous."

68. Treatment of Hypertonic Disease by Prolonged Starvation Explained by Changes Occurring in Cardiac Muscle and Extracardial Regulation

"Dynamic Electrocardiographic Studies of Patients With Hypertonic Diseases Treated by Prolonged Starvation," by G. N. Borodina and M. G. Yanovitskiy, Moscow, Department of Therapeutic Physical Culture (head, Prof V. N. Moshkov) and Department of Functional Diagnosis (head, G. Ye. Marantidi, Doctor of Medical Sciences) of the Central Institute of Balneology (director, G. N. Pospelova, Candidate of Medical Sciences); Moscow, Klinicheskaya Meditsina, Vol 35, No 7, Jul 57, pp 123-129

The Central Institute of Balneology has successfully treated patients with various diseases by prolonged starvation, but the mechanism is still not sufficiently clear.

Various electrocardiograms illustrate changes in the T wave and in the S-T interval after prolonged starvation treatments. It is evident that prolonged starvation brings about some changes in a number of patients (in the cardiac muscle and in the cardiac conducting system). The positive nature of the electrocardiographic dynamics in the form of normalization of the T wave and the S-T interval indicates that starvation causes some biochemical changes in the cardiac muscle which results in improved circulation. Clinical observations and the subjective condition of the patients verify the same conclusion.

The authors come to the conclusion that the mechanism of the biochemical changes in the cardiac muscle are connected not only with the metabolic changes, but also with changes in the extracardial nervous regulations.

69. Newly Developed Antiburn Serum Proves Beneficial in Therapy of Third- and Fourth-Degree Burn Patients

"Antiburn Serum" (unsigned article), Meditsinskiy Rabotnik, No 1 (1645), 3 Jan 58, p 3

Severe burns are extremely difficult to treat successfully because of the autointoxication which develops in the patients.

A method of immunotherapy of burn sickness has been developed by Prof N. A. Fedorov, Corresponding Member of the Academy of Medical Sciences USSR, and by S. V. Skurkovich, at the Central Order of Lenin Institute of Hematology and Blood Transfusion.

Numerous experiments on dogs have proved the presence of autoantigens in the skin and blood of newly burned animals. This fact is the basis for using as therapeutic means serum obtained from animals subjected to severe burns. In addition, a therapeutic antiburn antitoxic serum has been obtained by a method of immunization of dogs with blood taken from the same animals during the period of burns.

Both sera seem very effective in the therapy of animals afflicted with lethal third- and fourth-degree burns and people with the same degree of burns. Prof D. M. Grozdov, and L. M. Pushkar', Candidate of Medical Sciences, at the Surgical Clinic of the above-mentioned institute, have, with great success, used the serum taken from convalescing people. After the intravenous administration of this serum to patients, symptoms of burn intoxication disappear, temperature drops, blood composition becomes normal, blood circulation improves, and the general condition of the patients improves.

At present antiburn serum is being used in a number of therapeutic institutions in Moscow. The Central Institute of Hematology and Blood Transfusion together with the Permskiy Institute of Vaccines and Sera recently developed a method for developing heteroimmune antiburn serum by prolonged immunization of horses subjected to repeated small burns.

70. Central Institute of Traumatology and Orthopedics Describes Various Means for Speedy Restoration to Health and Working Capacity

"So That People May Return to Work," by A. Dvorkin, head of the Scientific Methodical Division of the Institute of Traumatology and Orthopedics; Moscow, Sovetskaya Rossiya, No 48 (508), 26 Feb 58, p 4

The collective of the Central Institute of Traumatology and Orthopedics is engaged in treating the sequelae of injuries, burns, and functional disturbances from various diseases. A number of instruments have recently been designed for speedier restoration to health and working capacity. A few examples follow.

1. An apparatus designed by O. Gudushauri and Yu. Sverdlovyy can quickly and correctly reduce and support bone fractures.

2. A new method for using vitamin B_{12}, an amino acid preparation called "Parenpit," and special diets to speed the restoration of injured tissues.

3. Certain phosphorus compounds are administered to patients who have suffered electric shock, and a method has been developed to treat patients with cardiovascular deficiencies due to electric shock.

4. Burn therapy has been a significant stride, and in certain cases antiseptic coatings made from plastic material have proved effective. The coatings placed on the burnt places quickly harden and securely isolate the injured portion from infections. This speeds healing.

5. A preparation called "steklovidnoye telo," i.e., vitreous body, obtained from the eyeball of animals and administered in the form of injections, aids in softening and resorbing scar tissue. This preparation is used in treating contractures of joints and as an anesthetic in neuralgias and in radiculitis. Another preparation, "Ronidaza," is used in the form of lotion applied over scars, contractures, and other traumas.

6. A preparation called "Lidaza" was produced last year by the above-mentioned collective together with the Institute for Meat Industry. This preparation has a number of therapeutic properties, but it is most effective in cases such as contractures of joints and in the treatment of scars from burns and from postoperative complications. It is also helpful in treating hematomas and subcutaneous effusions, and may be used to make other drugs more effective. "Lidaza" is administered in the form of injections and only by prescription. Its industrial production has been approved, and very soon it will be produced on a large scale.

The scientists of this institute are at present working on many other problems.

71. Effect of Microcide on Brucella and Other Bacteria

"The Effect of Microcide on Brucella and Other Species of Bacteria," by V. I. Zarada, Nauchn. Tr. Ukr. In-ta Eksperim. Vet. (Scientific Works of the Ukrainian Institute of Veterinary Medicine), No 23, 1956, pp 77-83 (from Referativnyy Zhurnal -- Biologiya, No 21, 10 Nov 57, Abstract No 89598 by Ye. S. Geronimus)

"The bacteriostatic and bactericidal action of the new antibiotic microcide (liquid, natural, and dry) was studied in vitro on the following species of bacteria: Brucella abortus bovis, Br. melitensis, Br. suis, Staphylococcus aureaus, Streptococcus hemolyticus, Micrococcus lysodeicticus, Bacterium rhusiopathiae suis, Salmonella enteritidis, and Bacillus subtilis. The antibacterial effect of microcide on the species enumerated was established; it was weakly expressed with respect to S. enteritidis and Bac. subtilis."

72. Hygienic Characteristics of Tantalum and Niobium Dusts

"Data Concerning Hygienic Characteristics of Rare Metal Dusts -- Tantulum and Niobium," by Yu. L. Yegorov, Chair of Labor Hygiene, First Moscow Order of Lenin Medical Institute imeni I. M. Sechenov; Moscow, Gigiena Truda i Professionalnye Zabolevaniya, No 6, Nov/Dec 57, p 16

The purpose of the investigation, the author points out, was to experimentally study: (a) the fate of tantalum entering an organism through the respiratory or digestive tract, (b) the solubility of certain tantalum and niobium compounds in mediums similar to those found internally in an organism, and (c) the general action of tantalum on an organism, as well as the fibrogenic action of tantalum and niobium on lung tissue.

As a result of data collected the author draws the following conclusions:

"1. The dusts of tantalum, niobium, and their compounds found in industry (powder metallurgy) are highly dispersed and insoluble (tantalum), or hardly soluble (niobium) in liquid mediums with a pH similar to that found in biological mediums.

"2. Tantalum which has been taken in through the digestive tract is excreted within a few days. Intestinal resorption was not observed.

"3. In general, the toxic action of tantalum and niobium compounds is slight, apparently due to the slight solubility of the compounds.

"4. The action of the dust on lung tissue (after respirator and intratracheal administration) varied depending on the type of dust.

"There is reason to believe that protracted exposure to the dust of these compounds could lead to the development of a fibrous process in the lungs.

"5. Processes which result in the formation of dusts from tantalum and niobium compounds should have provision for dust-collecting equipment. In regard to the maximum permissible content of potassium fluotantalum and fluoniobium compounds in air, the present norms for fluoride compounds should be followed. In regard to other compounds and metallic tantalum, the possibility of fibrogenic action should be taken into account."

73. Recommendations in Field of Industrial Toxicology

"Certain General Characteristics of the Action of Industrial Toxins," by N. V. Lazarev, State Scientific Research Institute of Labor Hygiene and Occupational Diseases; Moscow, Gigiyena Truda i Professionalniye Zabolevaniye, No 6, Nov/Dec 57, p 23

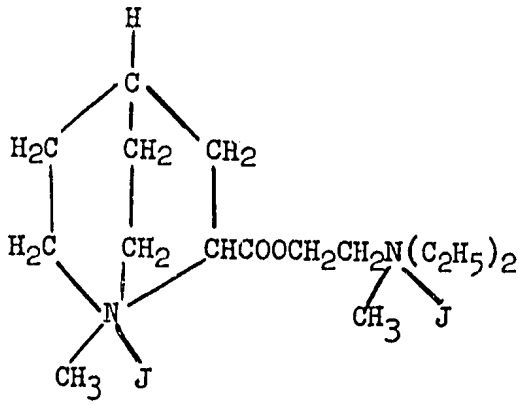
After reviewing the present practices and methods employed by industrial toxicologists and pathologists, the author recommends that chronic experiments be conducted on animals to discover the early and typical characteristics of the "shifts" in an organism caused by the action of small doses or concentrations of industrial toxins. The author explains, that attention should be given primarily to the shifts caused in the condition of the vegetative nervous system, the endocrine glands, and their interrelationships.

An answer to this problem, the author adds, would enable the clinician to give proper prognosis and suitable therapy and prevent further shifts.

74. Pharmacology of New Compound, Dioquine

"The Pharmacology of Dioquine," by I. M. Sharapov, Department of Pharmacology (chief, Prof M. D. Mashkovskiy), All-Union Scientific Research Chemopharmaceutic Institute imeni S. Ordzhonikidze; Moscow, Farmakologiya i Toksikologiya, No 6, Nov/Dec 57, p 9

In connection with the systematic work of the All-Union Scientific Research Chemopharmaceutic Institute in discovering and investigating ganglioblocking compounds during the past few years, a pharmacological investigation, the author explains, was conducted on a new, original compound, dioquine (diiodmethylate diethylaminoethyl ester of alpha-quinucleidenecarboxylic acid).



This white crystalline powder with a melting point of 217-218° C is readily soluble in water and warm alcohol, slightly soluble in acetone, and insoluble in ether.

It was established, according to the author, that dioquine produces a ganglioblocking effect and at the same time exerts a central nicotinolytic effect. The effect of dioquine resembles that of pentamine, however, it is slightly more active (4-6 times) in certain of its manifestations.

75. Comparative Evaluation of Poisons of Vipera lebetina and the Ecis carinatus on Coagulation of Human Blood

"Comparative Characteristics of the Coagulation Activity of the Poisons From the Vipera lebetina and the Ecis carinatus on Blood Plasma, and a Method for Their Sterilization," by Yu. B. Pokhaki, Trudy Stalinabadskogo Meditsinskogo Instituta (Works of the Stalinabad Medical Institute), 1956, No 18, 15-18; (from Referativnyy Zhurnal -- Biologiya, No 22, 25 Nov 57, Moscow, Abstract No 96062)

"It was determined that the coagulation activity of the poison from the Vipera lebetina on recalcified, citrated human blood plasma is 41-44% greater than the action of the poison from the Ecis corinatus in the same concentrations. Filtering the poison from the Vipera lebetina through a bacterial filter reduces (by more than 50%) its thromboplastic activity, while pasteurization reduces its coagulation activity (up to 47.8%). The addition of chloroform (1:200) to this poison does not lower its coagulation activity and guarantees complete sterilization.

"The author proposes that poison from the Vipera lebetina, which has been preserved in chloroform, be used to treat hemorrhages."

76. New Hungarian Drug

Budapest, Hetfoi Hirek, 23 Sep 57, p 6

The Chinoin pharmaceutical factory has put a new drug on the market under the name of "Tetrifan." Designed especially to appeal to children, the preparation is used to combat acute pneumonia, meningitis, whooping cough, and scarlet fever.

Public Health, Hygiene, and Sanitation

77. Evaluation of Various Methods for Detecting Beryllium in Air

"Comparative Evaluation of Certain Methods of Detecting Beryllium and Its Compounds in Connection With Air Analysis," by M. S. Bykhovskaya, Institute of Labor Hygiene and Occupational Diseases, Academy of Medical Sciences USSR, Moscow, Gigiyena Truda i Professionalnye Zabolevaniya, No 6, Nov/Dec 57, p 49

The purpose of the work, the author explains, was to compare certain methods of determining small amounts of beryllium in order to investigate the optimum method for detecting beryllium in air.

The work was conducted with standard beryllium solutions as well as with artificial mixtures containing known amounts of calcium, magnesium, aluminum, iron, zinc, and manganese.

A comparative evaluation of the methods of determining beryllium were conducted with morin, 1-amino-4-oxyanthraquinone, 1,4-dioxyanthraquinone, quinalizarin, thoron, N-resorcin, arsenazo, and beryllon II. At the same time, experiments were conducted utilizing trilon B to eliminate the effect of interfering cations and test separations of the mixtures were with the aid of paper chromatography.

As a result of the experiments it was determined that:

"1. The most sensitive and promising methods for detecting beryllium in connection with air analysis in industry are the fluorescent method with morin and the colorimetric method with beryllon II.

"2. The utilization of trilon B to form complex ions eliminates the effect of a series of interfering elements and permits, without separation, the determination of beryllium in the presence of calcium, magnesium, iron, zinc, aluminum, and manganese.

"3. The spectrographic method of determining beryllium is extremely promising.

"4. The paper chromatographic method can be used semi-quantitatively for determining beryllium in the presence of calcium, magnesium, iron, manganese, and aluminum."

78. Sanitary Problems in Use of Mercaptophos

"Labor Hygiene Problems During the Agricultural Use of the New Organophosphorous Compound, Mercaptophos," by Yu. S. Kagan, Kiev, 1956, Seriya Obmen Opytom, 55, (from Meditsinskiy Referativnyy Zhurnal, Part 4, No 5, May 57, Moscow, p 18

"Mercaptophos is slightly soluble in water, but it is readily soluble in organic solvents. The administration of 20 mg/kg on the skin is fatal to rabbits. With the administration through the respiratory tract, fatal concentration for rats and mice is 0.015 mg per liter. The narrow zone of its toxicological action attracts attention. The cumulative properties of mercaptophos are reviewed. Studies of labor conditions during the spraying of mercaptophos on wheat and cotton from airplanes revealed that its concentration in the respiratory zone of the workers reached on ten thousandths mg/liter of air. Lowered cholinesterase activity was observed in 12 of 14 people working with mercaptophos, but it was not accompanied

by any visible signs of intoxication. Therefore, it can be concluded that lowered cholinesterase activity was an early sympton of the action of mercaptophos on an organism.

"Recommendations are given to ensure personal and collective safety during the utilization of this insecticide. Every worker should get special instruction. The utilization of this preparation can be accomplished only by central control. Juveniles, pregnant women, and nursing mothers should not be permitted to work with mercaptophos.

"Mercaptophos should be applied mainly by aviation spraying. Aviation detachments utilizing mercaptophos should be protected by sufficient amount of special clothing which consists of two changes for each worker. The change should consist of: overalls with a helmet, apron made of polychlorvinyl, chemically stable gloves, special shoes, gogles, and respirators equipped with activated charcoal. The spraying should be done only in the morning or during the latter part of the day. Daily work with mercaptophos should not extend beyond 4 hours. The local population should be informed of the place and time of aviation spraying. For 3 days after spraying, people should not be permitted to enter the treated area.

"Mercaptophos, as well as the apparatus and equipment, should be stored in a separate, special place in hermetically sealed packages with the notation 'poison.' Mercaptophos can be issued only with the signature of the authorized chief of the detachment. It is necessary to treat the mercaptophos packaging with lime; it should not be reused. Areas where mercaptophos is being prepared for application should be at least 200 meters from any populated area and sources of drinking water. Workers should eat their food in special areas more than 100 meters from the place where the mercaptophos is being prepared. Smoking is forbidden. Work with mercaptophos should be conducted only under the constant observation of a medical worker. Before beginning work, the workers should undergo a preliminary medical examination.

"Contraindications for work with mercaptophos should be noted. It is necessary to determine the cholinesterase activity of the blood of all workers working with mercaptophos from the day they begin to work and once every 3 or 4 days during their work. If any lowered cholinesterase activity is observed, the workers should be transferred to other work until the original activity of the enzyme is restored. The maximum permissable concentration of mercaptophos is approximately 0.00002 mg/liter."

79. Sanitary Precautions During Use of Metaphos

"The Prevention of Intoxication During the Agricultural Use of the New Organophosphorus Insecticide, Metaphos," by I. T. Brakhnova, Kiev, 1956, Seriya Obmen Opytom, 64 (from Meditsinskiy Referativnyy Zhurnal, Part 4, Nov 5, May 57, Moscow, p 19)

"Metaphos is prepared in the form of a 2.5% dust with an inert filler, and is practically insoluble in water. It is readily soluble in inorganic solvents. The preparation can be introduced into an organism and produce toxicity through the respiratory tract, the uncovered skin, the eyes, or the gastrointestinal tract. An absolute lethal dose of chemically pure metaphos for white mice is approximately 40 mg/kg, and for rats 30 mg/kg. the predominant symptoms in the clinical picture of acute intoxication by metaphos indicate an affliction of the nervous system. If safety regulations are not observed during manufacturing, the preparation may enter the organism of the workers over a protracted period of time. Daily administration of small doses to animals for 3-6 months indicates that metaphos possesses an express cumulative action. Chronic intoxication of animals is characterized by sluggishness, lowered appetite, and sharp loss of weight. One of the early indications of intoxication is lowered cholinesterase activity. An important diagnostic indication, especially expressed during chronic intoxication by metaphos, is the development of toxic anemia. A study of labor hygiene conditions during the utilization of metaphos dust in agriculture (aviation dusting) indicated that, in the workers' zone, the concentration of the insecticide reached 'hundreds and thousands of parts of a milligram per liter.' When safety regulations were not observed, headaches, dizziness, nausea, and difficulty in breathing were frequently encountered. Small decreases in cholinesterase activity were observed, as were shifts in vegetative reactions e.g., increased tonus of the parasympathetic nervous system.

"To ensure the safety of workers who handle metaphos, it is necessary to adhere to the following regulations: all the work should be done under the direction of a responsible agronomist with constant observation on the condition of the workers' health by the medical personnel who should be present at the site. A person selected for work with metaphos should undergo a preliminary medical examination. Contraindications for work with metaphos should be listed. Juveniles, pregnant women, and nursing mothers should not be permitted to work with metaphos. During the preliminary medical examination, the following should be tested: cholinesterase activity, blood serum, complete blood analysis, blood pressure, EKG, and the condition of the vegetative nervous system. Work with metaphos should not be continued for more than 4 hours a day. All the workers should be protected with special equipment which should be laundered no less than than every 7-10 days. It is also necessary to wear goggles, respirators, and rubber gloves.

"The utilization of metaphos is permitted only in kolkhozes and sovkhozes and then only with special apparatus. Fields should be treated with metaphos during the morning and evening hours, with a wind velocity of 3 meters per second. Before the work begins, the local population should be warned that measures should be taken up to 1-2.5 kilometers from the area which is to be treated in order to protect themselves, their domestic animals, and sources of drinking water. Humans and pasture animals should not be permitted to enter the treated area for 2 or 3 days.

"The metaphos packaging should be burned in a special, separate place. In the warehouse, metaphos should be stored in special packages with proper markings, and should be released from the warehouse only by written release from the director of the kolkhoz or sovkhoz. Necessary measures must be taken to provide for first aid and medical assistance."

80. Safety in Handling Agricultural Chemicals

"Work Experience of a Feldsher-Midwife Station on the Prophylaxis of Poisoning by Chemicals," by M. Ya. Perkuta, feldsher-midwife, Moscow, Fel'dsher i Akusherka, No 8, Aug 57, pp 52-53

Agricultural chemicals contain arsenic, salts of hydrocyanic acid, fluorine compounds, and other chemical substances which are dangerous to the health of humans. When grain and other agricultural products are being treated with insecticides, the air becomes contaminated and the chemicals can enter the organism through the mucous membranes and the skin, causing acute and chronic poisoning. Unless proper precautions are taken, the chemicals can also enter the organism through the gastrointestinal tract. The author therefore insists that workers be properly instructed on the use of respirators or gauze masks and on the careful washing of their hands before eating.

81. Health Hazards to Persons Working Near High-Frequency Electromagnetic Fields

"Observations of the State of Health of Persons Working in Electromagnetic Fields of High-Frequency Currents," by V. G. Piskunova, V. S. Anatovskaya, M. D. Truten', and A. B. Nerubenko; Moscow, Gigiyena Truda i Professionalniye Zabolevaniye, No 6, Nov/Dec 57, p 27

On the basis of data presented in this article concerning the health of 128 persons who, in their work, were exposed to electromagnetic fields set up by high-frequency currents, the authors make the following conclusions:

"1. Functional changes in the condition of the central nervous system appeared in workers working near high-frequency currents.

"2. The changes were unstable and not inclined to be progressive.

"3. Nervous-system changes were more pronounced in persons working near a generator than in persons working further away.

"4. Women apparently are more sensitive to the action of a high-frequency current.

"5. The following sanitary measures should be introduced:

"a. Workers should be protected from electric and magnetic fields (screened, shorter exposure time).

"b. A suitable work and rest regime should be established."

Radiology

82. Radioactive Phosphorus Proved Most Effective in Treating Erythremia

"The Use of Radioactive Phosphorus in Treating Erythremia," by J. Kiauleikis, Sveikatos Apsauga, 1956, 8, 15-20 (Lithuanian) (from Meditsinskiy Referativnyy Zhurnal, Vol 4, Section 1, Apr 57, pp 54-55)

At the department of Hospital Therapy of the Republic Hospital of Kaunas, radioactive phosphorus was used in treating eight patients suffering from erythremia, from 1954 to 1956. The average dose was 6 millicuries P^{32}. Good therapeutic results were observed in all cases. The author comes to the conclusion that P^{32} is the most effective means for treating erythremia.

83. Therapy by Radioactive Phosphorus Proved Best Method in Mycosis Fungoides

"Case of Mycosis Fungoides Treated by Radioactive P^{32} Used Internally (per os)," by J. Lelis and S. Oboleviciute, Sveikatos Apsauga, 1956, 8, 21-23 (Lithuanian) (from Meditsinskiy Referativnyy Zhurnal, No 4, Section 1, Apr 57, p 152)

A 40-year-old patient suffering from Mycosis fungoides in the tumerous stage was subjected to treatments by radioactive phosphorus, internally, per os, according to the method of treating leukemia. Favorable

results were obtained. The author says that the use of radioactive phosphorus for treating this disease is by far better than the use of any other method.

84. X-Ray Therapy Proved Beneficial in Third-Stage Trachoma

"Use of X Rays in Treatment of Third-Stage Trachoma," by L. Ya. Itsikson and Ye. S. Vanshteyn, Sbornik Informatsionno-Metodicheskikh Materialov In-ta imeni Gel'mgol'tsa (Collection of Information -- Methodical Data of the Institute imeni Gel'-mgol'ts), No 4, 1956, 114-116 (from Meditsinskiy Referativnyy Zhurnal, No 4, Section 2, Apr 57, pp 145-146)

Thirty-four patients suffering from third-degree trachoma were treated by X rays (single dose, 30 r, and total of 300-350 r). In 18 patients X-ray therapy was in conjunction with massage by synthomycin, biomycin, and albucide. The remaining patients were treated only by X rays. Treatment by X rays in combination with massage and antibiotics showed no advantages over treatment with X rays alone. In conclusion, roentgenotherapy exerted beneficial effects on third-stage trachoma.

85. Simple, Safe Measuring Hopper for Radioactive Substances Designed

"Measuring Hopper for Radioactive Substances" (unsigned article), Meditsinskiy Rabotnik No 1 (1645), 3 Jan 58, p 4

A measuring hopper for radioactive substances, suggested by Assistant M. S. Rozanov, has been designed at the Chair of Medical Radiology of the Central Institute for the Advanced Training of Physicians. This instrument is used for measuring the dosage of therapeutic preparations of radioactive iodine used in treating thyreotoxicosis.

The apparatus consists of a glass pipette which holds the radioactive fluid which is released from a special reservoir by means of a type of rotary pump. The pipette is automatically filled with a given volume of fluid which in turn is admitted into the underlying vessels after the addition of a constant volume (about 40 ml) of water.

Paraffinned paper cups containing the radioactive fluids are moved on special rails with electrometers from protected shelves, and taken by patients who are to drink the preparations. Used paper cups are discarded into special containers.

The new apparatus is of great convenience to the attending personnel because of the quick and accurate measuring of the quantity of the preparation administered to patients and because of complete protection from irradiation by radioactive substances.

This measuring hopper can be used for measuring not only radioactive iodine, but also various radioactive, toxic, and disinfecting substances.

86. Changes in Carbohydrate Metabolism Following Total Irradiation of Experimental Animals by Small, Medium, and Large Doses of X Rays

"Changes in Carbohydrate Metabolism Following Total Irradiation of Animal Organisms by X Rays," by B. M. Grayevskaya and R. Ya. Keylina, Vopr. Radiobiologii, Leningrad, 1956, 352-356 (from Referativnyy Zhurnal -- Biologiya, No 12, 25 Jun 57, Abstract No 53079, p 428)

No changes were observed in the arterial blood sugar content of experimental animals irradiated with 300-500 r of X rays. However, tests with adrenalin proved definite disruption of hepatic glycogenesis. Restoration of this function was observed in rats in 4 days, and in dogs in 10-15 days, after total irradiation.

After irradiation by 1,000 r, liver glycogen depots remained depleted, and death occurred within 9-15 days after total irradiation. Irradiation with 2,000 r caused a sharp decrease of liver glycogen content, and death followed in 3-5 days.

87. Changes of Conditioned Reflex Activity of Dogs Following Varying X-Ray Doses

"Changes of Conditioned Reflex Activity of Dogs Following X-Ray Irradiation," by P. I. Lomonos, Vopr. Radiobiologii, Leningrad, 1956, 5-19 (from Referativnyy Zhurnal -- Biologiya, No 12, 25 Jun 57, Abstract No 53082, p 428)

Conditioned reflexes of dogs irradiated by 300-1,500 r which were reinforced by 0.25% solution of HCl were observed to be increased for positive conditioned reflexes 60% during the first and second days after irradiation, there was noticeable disinhibition of differentiation, and the latent period of conditioned reflexes was shortened. No changes were observed during the second and third days after irradiation in dogs in whom conditioned reflexes were fortified by meat-sugar powder, but after the third day there was a slight increase, and starting with the 7th-8th day conditioned reflexes started to decrease. After irradiation, the inhibitory process was intensified without any signs of decreasing the force of the stimulating process.

Both single and repeated irradiation of the abdominal organs by 700-4,000 r following reinforcement of conditioned reflexes by meat-sugar powder sharply decreased the value of positive conditioned reflexes (50-70%) during the first days after irradiation. (During the first 30 seconds even unconditioned reflexes decreased.) Afterward, conditioned reflexes gradually increased, although in some cases they did not rise to the original value even after a long time. No sharp changes were observed in cases where conditioned reflexes were reinforced by 0.25% HCl solution.

88. Distribution of Phosphoric Esters of Choline and Ethylene in a Living Organism

"Distribution, Rate of Exchange, and Conversion of the Phosphoric Esters of Choline and Ethylene in a Living Organism," by P. A. Komatiani, L. L. Tkeshelashvili, and T. A. Ofsyanko, Trudy Pervoy Zakavkazskoy Konferentsii po Meditsinskoy Radiologii, (Works of the First Transcaucasian Conference on Medical Radiology), 1956, pp 262-269; (from Meditsinskiy Referativnyy Zhurnal, Part IV, No 5, May 57, Moscow, p 69)

"The experiments were conducted on rats; inorganic phosphate and phosphoric esters of choline and ethanolamine, labeled with radioactive phosphorus (P^{32}), were utilized. It was determined that the phosphoric esters of choline and ethanolamine are contained in various organs and tissues in comparatively large amounts (in fresh tissue varying between 2 and 12 mg%; the largest amounts are found in the liver and the smallest in the muscles). The exchange of these esters proceeds rather intensively and approaches the restoration rate of phosphoproteids and macroergic compounds. Phosphoric esters of choline and ethanolamine are not formed by the decomposition of phospholipids, but as a direct result of phosphorylization."

Surgery

89. Soviet "Heart-Lung" Apparatus Permits Artificial Circulation and Intracardiac Surgery on Cardiac Valves and Chambers

"Outstanding Achievements in Cardiac Surgery" (unsigned article), Moscow, Meditsinskiy Rabotnik, No 9 (1653), 31 Jan 58, p 3,

Historical progress in cardiac surgery is presented with particular compliments to Soviet surgeons who as early as 1930 saw the possibility of intracardiac surgery. Such research was resumed after the war. In response to the need for intracardiac surgery, the Institute imeni A. V. Vishnevskiy, in conjunction with the Scientific Research Institute of

Experimental Surgical Apparatus and Instruments, and under the guidance of M. G. Anan'yev, director of the institute, and of Ye. A. Vaynrib, Candidate of Physicomathematical Sciences, has developed and experimented with artificial circulation for bringing about intracardiac operations.

The pump system and the oxygenation set up in this apparatus are efficient and differ from non-Soviet models. This apparatus is called the "AIK" (the so-called Soviet "heart-lung" apparatus). It is compact and easy to use. It has been successfully used in experimental and in clinical work. Its output may be as high as 10 liters per min, and it can saturate blood with oxygen up to 100%. Prominent men engaged in this work and apparatus include engineers, surgeons, hematologists, and physiologists. Two such instruments are described: one the "3B-3" constructed under the direction of S. S. Bryukhonenko, which is for experimental use, and a second, the "AIK," for clinical use.

On 24 January 1958, an 11-year-old boy was presented to the conference of the Moscow Society of Surgeons. The boy had been operated on for stenosis of the pulmonary artery. The heart was excluded from the circulation, and artificial circulation apparatus was used. Details of the operation on this boy are reviewed. Results include improved respiratory function, disappearance of cyanosis, etc. In this case, the heart was isolated from the circulation for 10 minutes, and artificial circulation was used for 25 minutes. This "heart-lung" apparatus makes it possible to repair cardiac valves and chambers. After the apparatus is connected, the heart is excluded from the circulation, but continues to beat with the frequency of the apparatus. A photograph of "AIK" apparatus and a sketch of artificial circulation within the heart accompany the article.

Miscellaneous

90. Institute of Therapy, Academy of Medical Sciences USSR Expands

"Expansion of the Institute of Therapy" (unsigned article), Moscow, Meditsinskiy Rabotnik, No 17, 28 Feb 58, p 3

The Ministry of Shipbuilding Industry USSR has handed over to the Academy of Medical Sciences USSR its building, which the academy has assigned to the Institute of Therapy. The building will now house a new department established in the institute and a 500-bed clinic with laboratories.

91. New Hospitals in Hungary

"New Hospitals in Hungary" (unsigned article), Budapest, Hetfoi Hirek, 30 Sep 57, p 1

A new, 400-bed hospital is being built in Sztalinvaros near the already completed dispensary.

Plans have been completed for a 480-bed hospital in Diosgyor. A dispensary capable of handling 2,000 patients per day will be built at the same time as the hospital.

Both Soifok and Fehergyarmat are to get 260-bed hospitals soon. Other hospitals will be built in Karcag and Salgotarjan.

92. Hungarian Hospitals and Medical Facilities To Be Extended

"The Health Committee Recommends Appropriation Amounting To Thirty Million Forints for the Purchase of Salk Serum," by Sz. G.; Budapest, Esti Hirlap, 15 Nov 57, p 6

Laszlo Cserba, head of the Main Administration, Ministry of Health, said at a meeting of the Committee on Social and Health Affairs that during the Three-Year Plan the number of hospital beds in Hungary would be increased by 2,000 to 2,200, while the number of medical districts would be increased by nearly 200.

The construction of a 1,200-bed hospital and megye health center in Miskolc will be completed. A 400-bed polyclinic will be established in Pecs, and the old clinic will be turned into a hospital; the former castle in Hatvan will be converted into a hospital, as will one of the barracks in Salgotarjan. Construction of a hospital will begin in Fehergyarmat.

Large medical dispensaries will be built at Ozd and in District III of Budapest.

The obstetrical clinic of Pecs and the ophthalmic clinic of Szeged will be renovated.

Isotope laboratories will be established at 24 hospitals.

In 1957, the central laboratory of Szeged is to receive an electron microscope. The universities at Pecs and Debrece will have such microscopes soon.

Each megye is to receive a high-powered disinfecting truck.

In 1958, the Ministry of Health would like to spend about 30 million forints for the purchase of Salk serum.

93. Ultrasonics in Crystallization of High-Temperature Aluminum Alloys

"Effect of Ultrasonic Oscillations on Primary Crystallization of Aluminum Alloys," by V. I. Slotin and G. I. Eskin; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, No 9, Sep 57, pp 33-36

Molten heat-resistant aluminum alloy of the Al-Cu-Mg-Si system containing (in percentage by weight) 2.0 Cu, 0.8 Mg, 2.5 Si, 1.0 Ni, 1.0 Fe, 0.3 Ti, and the remainder aluminum was treated by a high-frequency, 100-watt, 800-kc generator at an intensity of 7-8 watts/cm^2.

The ultrasonically treated casting and a control casting were halved and one half of each was heat-treated. Mechanical tests on the four specimens showed that the tensile strength and hardness of the ultrasonically treated cast increased 20-25% and 25-27% for the heat-treated specimen. At the same time elongation not only did not decrease but had a certain tendency to increase.

Microstructural investigations showed that ultrasonic oscillations improved the lattice structure of secondary crystallization and promoted finer structure in the cast and heat-treated materials. They also produced a more uniform distribution of the decomposition products of the solid solution along the grain boundaries.

The authors say that such treatment could be put into practice in the manufacture of small high stress items.

94. New Casting Technology of Bearing Alloys

"New Technology of Applying B-83 Antifriction Alloy to the Thrust Bearing Segments of a Hydrogenerator," by N. N. Mosolov and P. R. Virrilep; Leningrad, Sbornik "Elektrosila", No 14, 1956, pp 93-94

The thrust bearing of a large modern hydraulic generator supports a specific pressure of 3,000 kg/cm^2 and operates at a peripheral speed of 20 m/sec. The segments of such a thrust bearing are made of 80- to 120-mm-thick steel plates coated with a layer of B-83 bearing metal. The principal difference between the new technology of applying the bearing metal and that of the conventional casting technology lies in the fact that the B-83 bearing alloy is applied to the base metal of the segments not in the molten state, but in the form of pressed plates.

The B-83 bearing alloy plates are cast separately into the metal molds in the shape like that of the steel segments. The B-83 bearing plates thus cast are then placed in special press dies, heated to 190-200°C and subjected to a pressure of 800 kg/cm^2. After the pressing operation, the plate remaining in the die is coated with POS-40 tin solder. The steel segments, previously heated to 220°C, are then placed over the B-83 bearing plates and the whole assembly is subjected to 1.5-2.0 kg/cm^2 pressure. Under the action of pressure and temperature the B-83 bearing alloy penetrates into the grooves of the steel segment and also solders firmly on the whole surface of the contact.

The composition of the B-83 bearing alloy is approximately 83% Sn, 11% Sb, and 6% Cu. The tensile strength, hardness, ductility, and microstructure of the B-83 bearing metal processed by this new method are superior to those of the metal produced by the conventional method.

The application of this new technique in the manufacture of the hydrogenerator for the Kuybyshev Station will save approximately one ton of B-83 metal in each unit.

[For additional information on Metallurgy, see Item No 72.]

Nuclear Physics; Atomic Energy Development

95. Instruments in Nuclear Spectroscopy Used in USSR

Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 21, No 7, Jul 57, pp 907-1035

This issue of the periodical is devoted to the "Materials of The All-Union Conference on Nuclear Spectroscopy," held in Leningrad 25-31 January 1957. The following information on instruments is taken from the various articles presented.

Problems of measuring alpha decays of Pu-238 and Po-210 were discussed by L. N. Kondrat'yev, G. I. Novikova, B. D. Dedov, and L. L. Goldin. The knowledge of such decay on successive levels is of major importance, because it leads to conclusions on daughter nuclei. The instruments used in this research were a magnetic alpha-spectrometer and an ionization chamber. Other methods as gamma-gamma coincidences were considered unreliable.

The magnetic alpha-spectrometer of the Academy of Sciences USSR was used in an attempt to find the cause of the discrepancy in the measurements of alpha-energy levels of Po-210, as measured by F. Asaro, F. L. Reynolds, and I. Perlman (Phys. Rev, 87, 277 [1952]) and by L. Golding, Ye. Tret'yakov, and G. Novikova (Sessiya Akademii Nauk po mirnomu ispolzovaniyu atomnoy energii [Session of the Academy Sciences USSR on the Peaceful Use of Atomic Energy], Moscow, 1955), these values deviating from 5,476 ± 2 kev, as found by the Americans, to 5,482 ± 0.6 kev, as determined by the Russians.

The spectrometer described indicated relative energy measurements only; the strength of the magnetic field was as low as 6-7 oersted, but it could be varied to make the observed alpha-particle move exactly on the same path. The final result of measurements was found to be 5,297 ± 1.5 kev.

Achievement of higher accuracy in spectrometric measurements was attempted by making use of the ionizing power of nuclear radiation, as described by S. A. Baranov, A. G. Zelenkov, and Yu. F. Rodionov. For this purpose an ionization chamber was used -- its design somewhat improved by the addition of a grid -- which represented a Russian copy of an American design (O. Bunemann and others, Can. J. Res. A27, 191 [1949];

T. E. Granshaw and others, Can J. Res. A26, 243 [1948]; A. Chiorso and others, The Transuranium Elements [1949]; G. T. Seaborg and others, The Actinide Elements [1954]; D. W. Engelkemeier and others, Rev. Sc. Instr., 26, 3, 295 [1955]). The action of the grid consisted in eliminating the effect of positive ions to allow the amplitude of the electron pulse to be independent of the direction of the particles knocked out of the target. This type of equipment was built in the USSR in 1952-1953. It allowed the interchange of four alpha-active sources without altering the physical conditions of the experiment. The pulses from the receiving electrode entered the input of the amplifying stage and went through a pulse height selector which cut off a part of the amplitude and amplified that remaining to the desired level. This radio stage is necessary because the alpha-energies of the analyzed radioactive isotopes often differ by a few percent only. From the selector the pulses entered a multichannel differential amplitude analyzer.

The resolving power of the equipment depends considerably on the background noise of the first amplifier tube. To attenuate this noise the filament circuit of the preliminary amplifier was supplied by direct current and the first tube operated as a triode, thus reducing the noise 30%. A filament voltage of 3.5 volts was chosen as most favorable for noise reduction. The optimal resolving power of the equipment was about 8 kev. Analysis of microquantities of alpha-active isotopes could be made by means of this equipment. The alpha-particles were recorded by the ionization chamber and the gamma rays on a scintillation spectrometer. The multichannel analyzer received only those alpha-pulses which occurred together with gamma rays of a certain energy. Thus the alpha-gamma decay of Np-237 could be recorded. The instrument also proved very useful in the studies of the decay scheme of long-lived isotopes and of the multipolarity of the corresponding transitions to daughter nuclides.

A beta-spectrometer called "Ketron" was used for various studies of conversion electrons. This instrument, first constructed and set into operation by the Radium Institute in 1951, had at that time the following parameters: radius of curvature of the basic trajectory, i.e., the trajectory passing through the uniform field = 11 cm; angle of horizontal deflection 30°, of vertical deflection ± 3° (Izv AN. ser. fiz, 18, 563 [1954]). For the studies of conversion electrons of thulium the input slit was set 0.5 mm wide; the input window of the counter bypassed electrons of 3.5 kev up. Thulium lactate was vapor-deposited on an aluminum plate; the dimensions of the coating were 1 x 10 x 0.005 mm. The calibration of the instrument was based on measurements of conversion lines In-114, Ce-114, and Yb-169, the energies of which were carefully measured by J. M. Corc and others (Phys. Rev. 74. 1657 [1948]; ibid. 96,

1295 [1954]; ibid. 100, 1237 [1955]; ibid. 78, 95 [1950]) and C. S. Cook and others (Phys. Rev. 87, 464 [1952]). The mean discrepancy of the calibrated points from the continuous curve did not exceed 0.3%. As a result of their measurements, K. Ya. Gromov, B. S. Dzhelepov, and B. K. Preobrazhenskiy found that conversion electrons of neutron deficient Tu fraction exhibited lines of half lives of below 10 hr, 29 hr, 9 days, and 55 days. These periods closely approached data found by Seaborg and others (Rev. Mod. Phys. 25, 469 [1953]) and considerably facilitated the identification of lines.

The same research methods were applied at the Radium Institute studies of the spectrum of the internal conversion electrons of neutron deficient Lutecium isotopes. The studies were made by Yu. G. Bobrov, K. Ya. Gromov, B. S. Dzhelepov, and B. K. Preobrazhenskiy. They claim to be the first to have established spectra of conversion electrons of Lutecium isotopes 169, 170, 171, 172, 173 and 174.

The same type of Ketron spectrometer with a resolving power of 0.25% was used at the Physics Laboratory of the Leningrad Institute of Railroad Transport Engineers by V. D. Vorob'yev, K. I. Il'in, T. I. Kol'chinskaya, G. T. Latyshev, A. G. Sergeyev, Yu. N. Trofimov, and V. I. Fadeyev for study of the magnetic field by means of proton resonance. For the determination of energy of conversion electrons the instrument was calibrated according to the series of lines of active radiothorium.

Two-lens spectrometers were used at Leningrad State University for studying conversion spectra of erbium and holmium fractions separated from tantalum previously irradiated by protons of 660 Mev. The erbium fraction was studied at a solid angle of 0.5% and a half width of spectral lines of 2%. A line E = 44 kev, the intensity of which dropped during a few hours, was revealed, but could not be definitely identified. The holmium fraction was studied by means of a two-lens spectrometer. Its input window passed electrons from 2 kev up. The activity was deposited on a slightly aluminized collodion film; the diameter of the active spot was 5 mm. The short-lived Ho-164 and 161 and the long-lived Ho-163 and 162 could not be detected because the measurements were made 3 days after irradiation of the specimens. Some weak electronic lines were found but not identified.

At the Radium Institute imeni Khlopin the decay scheme of long-lived radioactive isotopes of europium-152 and 154 was analyzed by B. S. Dzhelepov, N. N. Zhukovskiy, V. G. Nedovesov, and G. Ye. Shchukin by means of a gamma-spectrometer. These studies were first done by the same scientists in 1954, using the gamma-spectrometer "Elotron" with improved focusing and

and making use of recoil electrons. Because of the great interest involved in the nucleus 63-Eu-152, the research was repeated by analyzing the gamma spectrum of the isotope mixture Eu-152-154. An improved "Elotron" was used, its chamber under continuous vacuum pumping; the counters were gas-filled (60% Argon and 40% methane) under 10-cm pressure. Thus the resolving power of the apparatus was improved and the width of spectral lines narrowed. Some new data on the decay scheme of Eu-152-154 were noticed, but the definite decay scheme could not be determined.

A similar apparatus was used at the same institute for studying the decay of Ag-110. B. S. Dzhelepov, N. N. Zhukovskiy, and Yu. G. Kondakov determined relative intensities of 12 gamma lines of Ag-110. This permitted verifying the balance of intensities according to separate levels and determining the multipolarity of a number of transitions. A gamma-line of 1,560 kev was observed for the first time but its belonging to Ag-110 could not be ascertained because no radiochemical analysis of the specimen was made. The checking of balance of intensities of gamma transitions according to excitation level of Cd-110 confirms the decay scheme suggested by Siegband for intensive gamma-lines.

Positrons in the emission of radioactive isotopes of In-114 were studied at Leningrad State University by B. S. Dzhelepov, O. Ye. Kraft, and V. E. Zhinkina. This isotope has the peculiarity that after its electronic decay a nucleus with a filled-out proton shell 50-Sn-114 remains. The investigation was undertaken, because the competitive beta+ and beta- decay of In-114 is not yet well-known. A magnetic beta-spectrometer with triple focusing was used. The betas were moving in a uniform field following a helical curve and were focused three times: after leaving the source and traversing a semicircle they emerged from the first slit behind which a counter was located; there on the betas traversed a second semicircle and a second slit beneath the source and finally a semicircular path and a third slit with a second counter behind. The counters were fixed one over the other and set on coincidence. A block of lead and tungsten was installed between the source and the counters for shielding the counters from direct gammas. Besides the slits six plexiglass diaphragms were located one mm from trajectories allowed by the slits. The two "floors" of the equipment were separated by a lead floor covered by plexiglass. This equipment was first designed by B. S. Dzhelepov, N. Anton'yeva, and S. Shestopalova in 1949 and later much improved (Izv. AN, Ser. Fiz., 20, 3, [1956]). The radius of curvature was 4.7 cm, the divergence of the beam in the plane perpendicular to the field was 30° and in the direction of the field, - 4°. A schematic decay diagram of In-114 was drawn and the difference in mass between In-114 and Cd-114 could be established as $1.022 + 0.395 = 1.147 \pm 0.20$ Mev. The writers consider their results more reliable than those obtained by P. Zweifel (Phys. Rev. 96, 1572 [1954] from (2.07 ± 0.20 Mev).

At the All-Union Scientific Research Institute of Metrology imeni Mendeleyev, B. S. Dzhelepov and S. A. Shestopalova attempted to establish standards of radioactivity by studying the complex gamma spectra of RaC. The preparation was analyzed for content of RaTh using the above-described gamma spectrometer "Elektron." The gamma ray energy was measured in the most active region of 2,614 kev. The counter gave less than 0.06 pulse per minute. The count of the line 2,450 kev of Ra recorded 2.2 pulses per minute. This points to the conclusion that the radium preparation did not contain RaTh in excess of 0.2%.

Research with this instrument with somewhat improved light power was continued by I. F. Uchevatkin and A. Shestopalova in the range of gamma lines from 2,450 kev to 2,700 kev. They found an excess of recoil electrons, suspecting the existence of some yet unknown gamma lines.

The big synchrocyclotron of the Joint Institute for Nuclear Research was used by G. M. Gorodinskiy, A. N. Murin, V. N. Pokrovskiy, and B. K. Preobrazhenskiy for studying neutron deficient isotopes of rare earths originating in the spallation of tantalum induced by 660-Mev protons. For this purpose a Ta target was irradiated in the synchrocyclotron, either 1-2 hours by internal beam, or several months by scattered beam, to obtain sufficient activity of long-lived isotopes. The rare earths were separated by a chromatographic method and the separate fractions studied by a specially assembled conventional gamma scintillation spectrometer carried out according to the usual single crystal and single channel design. The addition of several auxiliary attachments improved its bypassing ability. The sensitive unit of the spectrometer was a NaI (Tl) activated crystal 30 x 20 mm and a photomultiplier FEU-S. The instrument had the following characteristics: time of resolution $8 \cdot 10^{-7}$ sec; the half width of the Cs-137 line was 10% in each channel. The problem consisted in the determination of the relative intensities of gamma lines. The best results were obtained with a lead collimator with an opening in the shape of a truncated cone. To eliminate X-ray fluorescence in the lead the cone was covered inside by Ta, Sn, and Cu guard foils (0.5 mm Ta + 0.25 mm Sn + 0.3 mm Cu). In this geometry the half width of the Cs-137 gamma line was 9.3%.

M. Ya. Kuznetsova and V. N. Mekhedov, working in the Joint Institute's Laboratory of Nuclear Problems, developed a special methodology for radiochemical research of isotopes undergoing K-capture. The equipment devised was called a magnetic analyzer. It consisted of a Geiger counter recording X rays emitted at a K-capture and of an electromagnet with two end-window counters. The electromagnet had two pole shoes 60 x 60 mm in size and 25 mm apart and created a magnetic field of 2,000 oersted. The large end-window counter measured the total radiation and also the electromagnetic radiation in the case of a coupled magnetic field. It was filled with a mixture of krypton under 300 mm pressure and ether under 20 mm. It had a plateau 200 V long and nearly without slope. The operating voltage was 1,800 V.

The amount of X rays in the total electromagnetic emission was found by means of a lead filter 0.2 mm thick, located between the magnetic poles. Such thickness is practically sufficient for the total absorption of X rays of the elements under study. The ratio of positrons to electrons was determined by separate measurements on the small counter at various strength and polarity of the current of the electromagnet. The law of decreased activity corresponding to each component of radiation was followed independently.

The determination of the number of K-captures from the recorded amount of X quanta required the introduction of several corrections in the operation of the device. Nevertheless, the techniques described allowed higher accuracy of K-capture determination of a number of isotopes and the detection of cases which previously passed unnoticed.

A deficiency of this method consisted in the small solid angle, but this is expected to be improved in the future. A second deficiency, the difficulty of discriminating between X rays and soft gammas, is common to other methods, but it is not serious.

The design of photomultipliers, much used in nuclear spectroscopy, was given special attention at the Radium Institute imeni Khlopin. G. S. Vildgrube, A. P. Zharkov, and Ye. D. Teterin worked on the improvement of amplitude and time characteristics of a partition-type photomultiplier. The distance between the partitions was narrowed by half and the distance between the stages by a factor of 1.5. The use of a NaI (Tl) crystal produced a gamma line of Cs-137 (660 kev) of relative width of 10-11%. The usual amplitude noise at 1,600-1,800 kev did not exceed 5.7 kev. Tests proved that this photomultiplier was well suited for amplitude-time measurements.

96. Structural Changes in Uranium-Molybdenum Alloys Studied

"Investigation of Structural Changes in Uranium-Molybdenum Alloys Under Neutron Irradiation," by S. T. Konobeyevskiy, N. F. Pravdyuk, K. P. Dubrovin, B. M. Levitskiy, L. D. Panteleyev, and V. M. Golyanov; Moscow, Atomnaya Energiya, Vol 4, No 1, Dec 57, pp 34-44

An alloy of uranium with 9% molybdenum by weight was subjected to neutron radiation. Measurements of electrical resistance and X-ray diffraction and microscopic analysis of the structure were then made. Through preliminary heat-treatment, it was possible to obtain samples with [illegible] eutectoid structure and various grain sizes.

It was determined that the diffusion rate leading to homogenization under neutron irradiation in annealed samples is inversely proportional to the square of the grain size. In a homogeneous (γ-phase) sample, irradiation brought about changes in the properties and structure in only 2-4 hours. The limit reached in these changes is explained as due to radiation annealing.

Disordering in the γ-phase with transition to a cubic lattice was observed to occur under the effect of the radiation during the first hours of exposure.

It is claimed that all these phenomena can be explained on the basis of previously developed theory (S. T. Konobeyevskiy, Atomnaya Energiya, No 2, 1956, p 63). The size of the thermal peak region and the energy liberated in this region were found to be less than the values given by the theory.

97. Gamma Rays From Thermal Neutron Capture Measured for Rare Earths

"Investigation of Gamma Rays Occurring in Thermal Neutron Capture for Several Rare Earths," by V. V. Sklyarevskiy, Ye. P. Stepanov, and B. A. Obinyakov; Moscow, Atomnaya Energiya, Vol 4, No 1, Jan 58, pp 22-25

The gamma-ray spectrum from thermal neutron capture was measured for several rare earths. The measurements were made on the RFT reactor of the Academy of Sciences USSR with a scintillation spectrometer having an NaI (Tl) crystal.

A series of intense lines was observed below 300 kev in the neutron-capture gamma-ray spectrum of Eu, Gd, Ho, Er, Tm, Hf, and Ta. Lines corresponding to $4^+ \rightarrow 2^+$ and $2^+ \rightarrow 0^+$ transitions between rotational levels of Er^{168} and Hf^{178} were found in the spectra of erbium and hafnium. The intensity of these transitions was 0.5-0.8 quanta per capture.

98. Gamma-Ray Spectra From Neutron Capture Measured

"Spectra of Gamma Rays From Radiative Neutron Capture for Even-Even Radiating Nuclei With Rotational Levels," by L. V. Groshev, A. M. Demidov, V. N. Lutsenko, and V. I. Pelekhov; Moscow, Atomnaya Energiya, Vol 4, No 1, Jan 58, pp 5-21

The present work is a continuation of previous studies that the authors made on the gamma-ray spectra occurring in reutron capture by atomic nuclei The measurements were made with a magnetic Compton spectrometer over the 0.39-9 Mev energy region on the RFT reactor of the Academy of Sciences USSR. Methods used in the experiments were described in the earlier work (L. V. Groshev, B. P. Ad'yasevich, and A. M. Demidov, Fizicheskiye Issledovaniya: Doklady Sovetskoy Delegatsii na Mezhdunarodnoy Konferentsii po Mirnomu Ispol'zovaniyu Atomnoy Energii [Physical investigations: Papers Delivered by the Soviet Delegation at the International Conference on the Peaceful Uses of Atomic Energy], Publishing House of the Academy of Sciences USSR, 1955, p 252).

"The main portion of the gamma transitions form a spectrum which was not resolved by our apparatus in the spectrum of gamma rays from radiative capture by heavy nuclei that do not lie very close to the magic numbers. While measuring the spectrum for such elements, we noticed that when the radiating nucleus is even-even and has a system of rotational levels close to the ground state, the gamma-ray spectrum has a sharply defined singularity. In the background of the continuous spectrum there is a group of intense lines, very close together and with energies of approximately one Mev. This singularity does not appear in the case of even-odd and odd-odd nuclei.

"Unfortunately, even-even nuclei with rotational levels are formed in only a very limited number of cases in (n, γ) reactions. We were able to measure the gamma-ray spectrum for only four such nuclei, namely, $_{64}Gd^{156}_{92}$, $_{64}Gd^{158}_{94}$, $_{68}Er^{168}_{100}$, and $_{72}Hf^{178}_{106}$. For comparison, we obtained the spectra for even-odd (Dy^{165}) and odd-odd (Ta^{182}) radiating nuclei. The obtained results are given and discussed...."

99. Electromagnetic Radiation in High-Energy Interactions Studied

"Electromagnetic Radiation in High-Energy Nuclear Interactions," By N. M. Gerasimova, Physical Institute imeni P. N. Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 33, No 6 (12), Dec 57, pp 1457-1461

Electromagnetic radiation arising in nuclear collisions from Bremsstrahlung of high-speed charged particles is analyzed on the basis of Landau's hydrodynamical model of nuclear interactions.

It is shown that the fraction of radiated energy is constant, while the Bremsstrahlung of point charges increases logarithmically with energy.

100. Equivalence of Feynman Sum and Dirac Propagation Function Shown

"Sum by Paths for Dirac Equation," by G. V. Ryazanov, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 33, No 6 (12), Dec 57, pp 1437-1444

It is shown that under certain assumptions concerning electron motion, the Feynman sum by paths is identical with the propagation function of the Dirac equation.

101. 50 Bev Synchrophasotron to Employ New Principle of Acceleration

"Synchrophasotron of 50 Billion Electron-Volts" (unsigned article); Moscow, Trud, 3 Jan 58, p 1

The following is the text of a newspaper article datelined Leningrad 2 January 1958.

"The Institute of Electrophysical Apparatus is planning a new gigantic installation, a 50 Bev synchrophasotron. This huge machine is intended for 'firing' a beam of electrically charged particles used to bombard atomic nuclei. The higher is the velocity of these particles, the deeper will physicists be able to penetrate the secret of the atomic nucleus and understand the processes within it.

"In designing the new atomic machine, the members of the institute are using experience gained in constructing the 10 Bev synchrophasotron at Dubna.

"The new synchrophasotron not only will differ from the existing synchrophasotron in yielding particles of five-times greater energy, but it will employ a new operating principle. This principle is based on recently discovered strong focusing which permits a great decrease in the size of the oscillations of accelerated particles in their orbital motion and a similar decrease in the dimensions of the vacuum chamber.

"One of the most important components of a synchrophasotron is the electromagnet. Its dimensions and weight rise sharply with an increase in the energy of the accelerated particles. In the new machine the diameter of the electromagnet will reach 500 meters, but its weight will be reduced to 22,000 tons...."

102. Betatrons Manufactured for Use of Physicians and Physicists

"On Equipping Physicians," by B. Gal'perin, chief designer of Special Construction Bureau of Transformer Plant, Moscow, Moskovskaya Pravda 30 Aug 57, p 1

The betatron is one of the smallest and lightest apparatuses designed for the acceleration of atomic particles by science.

The most powerful betatron in the world is the Soviet synchrophasotron which produces energy in the range of several tens of billions of electron volts. The beam of protons which is dispersed in it is accelerated to 300,000 kilometers per second and in intended to split atomic nuclei and make it possible for physicists to peer into the depths of the atom and learn its structure and study nuclear powers.

Betatrons, due to their stream of gamma rays with an energy of about 25 Mev, will cure people from cancer, will help the metallurgists to pry into a half a meter thickness of steel casts to discover its defects, and will make it possible to study the structure of solid impervious substances, etc.

Betatrons designed for these purposes exist even now, but, on the whole, they are stationary, too large and too heavy (3.5-4 tons), and thus inconvenient to use. Betatrons constructed at the Bureau of the Transformer Plant are a little smaller in size and weight. Original and essentially new technical solutions were discovered and used in their construction. The weight of such betatrons has decreased from the former 4 tons to the present about half a ton.

The new portable apparatus is easily installed in a small rayon hospital. It is possible to suspend it from the ceiling or to fix it to a support. The designers under the leadership of Engr A. Mezhenikov (his photograph with the betatron accompanies the article) have developed very convenient mechanisms for the transportation and use of the betatron. The apparatus is started and stopped from a control panel.

This betatron has a novel assembly of the diaphragm and of the regulating filters. The diaphragm makes it possible to change the size and shape of the field of irradiation, and the filters create a uniform gamma flux falling on the place injured with the disease. Of special significance is that the betatron has a centering structure clearly indicating the input and exit of rays. It makes it possible for the physician to make sure that the gamma radiation acts only on the unhealthy tissue cells but not on the healthy tissue cells.

The so-called swinging betatron of the pendulum type is even more efficient in this respect. According to present procedure, gamma radiation is focused over internal organs affected with cancer, and due to the entrance and exit of radioactive substance from the body, healthy tissues are affected. In the betatron swinging as a pendulum with an amplitude ranging from 60 to 180° this defect is greatly lessened because radioactive rays with an energy of 15 Mev point at all times over the center of the injured organ, and only periodically pass over healthy tissues. The designers have made the weight of the active materials in this betatron only 450 kg.

A third original construction feature with which it is possible to become acquainted now at a plant is the betatron defectoscope. The new 1 1/2-ton apparatus is suspended in the workshop from a bridge crane and is conveyed to the casting or forging area. It irradiates over a radius of up to 20 meters and through a half meter thickness of metal and reveals any bubbles, cavities, or cracks in the internal structure of many tons of metal. Engr V. Grechishkin, senior foreman M. Kupriyanov, and others assisted in initiating production of the new betatrons.

At present the workers of this plant are endeavoring to construct the first three new betatrons by October.

103. Second All-Union Conference on Gas Electronics To Be Held in October 1958

"Announcement" (unsigned article), Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 34, No 1, Jan 58, p 264

"The Organization Committee for the Second All-Union Conference on Gas Electronics announces that the conference will be conducted by the Ministry of Higher Education and the Academy of Sciences USSK in October 1958 in the Hall of Moscow State University.

"The main topics of the conference will be:

"1. Elementary processes in a gaseous medium.

"2. Electric spark-over of rarefied gases and high vacuums.

"3. Electric sparks and lightening and practical applications of sparks.

"4. Electrodynamics and gasdynamics of strong currents in gases.

"5. High-frequency currents in gases.

"6. Methods of plasma research -- spectroscopic, mass-spectroscopic, high-frequency, and sonde.

"Applications for papers and paper subjects should be addressed to Moscow, B-234, Leninskiya Gory, Moscow State University, Chair of Electronics (Kafedra Elektroniki). Topics of papers (in two copies) may be presented until 15 March 1958"

104. New Nuclear Engineering Study Center Established in Czechoslovakia

"New Center for Nuclear Engineering Study" (unsigned article,) Prague, Rude Pravo, 18 Feb 58, p 2

On 17 February, a specialist group for nuclear engineering was established in Brno as part of the Czechoslovak Scientific and Technical Society (Ceskoslovenska vedecka technicka spolecnost). Its members, workers from research institutes, advanced schools, and electric power plants, are making it their task to increase their knowledge of atomic physics and further use it in the development of nuclear engineering.

105. Czechoslovak Atomic Energy Industry

"The Large Atom Industry in Czechoslovakia" (unsigned article), Stuttgart, Deutsche Zeitung, 18 Dec 57

An Institute for the Study of the Effects of Atomic Radiation, to be completed in 1959, will be built in Brno. An atomic electric power plant with a capacity of 150,000 kilowatts will be built in Bohunice near Trnava and is to be completed in 1960. It will have natural uranium as the basic fuel and heavy water as the moderator.

106. Czechoslovak Efforts in Measuring Level of Radioactivity in Water

"Measurement of Very Low Activity in Waters," by Vladimir Vesely and Jiri Napravnik, Institute of Nuclear Physics of the Czechoslovak Academy of Sciences, in Prague; Prague, Jaderna Energie, No 12, Dec 57, pp 406-409

The article proposes a method for measuring the very low content of beta and gamma-active cations contained in water samples. The active cations are concentrated by absorption on Czechoslovak-produced "ionexes." Activity is indicated on an all-glass beta counter located directly in the "Ionex" column. This method enables the measurement of beta and gamma activity at the 10^{-7} microcuries per milliliter level.

107. Czechoslovak Achievements in Atomic Energy in 1957

"Into the New Year" (unsigned article), Prague, Jaderna Energie, No 1, Jan 58, p 1

In 1957, Czechoslovakia advanced in the area of atomic energy with the opening of the first atomic reactor and continuation of joint planning with the Soviet Union on the first Czechoslovak atomic electric power plant, to be started in 1958.

A significant advance was also achieved in the preparations for construction of plants for the production of heavy water and processing of uranium ores. A plan for the "semiproduction" equipment for the production of metallic uranium, which is to be constructed in 1958, has been prepared.

Study, research, and developmental work in the nuclear field developed more than ever.

There was a marked increase in the number of new workers in nuclear fields and in the Faculty of Technical and Nuclear Physics and the Industrial School of Nuclear Engineering. Nuclear study courses were also taught in other advanced schools. Over 200 students and "aspirants" from Czechoslovakia are in Soviet advanced schools specializing in nuclear studies. Several tens of scientific workers, engineers, and physicians took nuclear courses and practice in Soviet research institutes in 1957.

However, great shortcomings exist in Czechoslovak book publications and in the publication of periodicals. Although Jaderna Energie increased in size about one third in 1957, its coverage of foreign and domestic developments and criticism must grow in 1958.

108. Construction of Hungarian Atomic Reactor Progressing

Budapest, Esti Hirlap, 20 Dec 57, p

Work on the construction of the shield of the Hungarian atomic reactor will begin before the end of 1957. The shield will be made of a special type of concrete, 90 centimeters thick.

In the spring, the facade of the building which houses the reactor will be finished. The materials to be used are vitrified brick and travertine stone.

109. Organization and Functions of Central Physics Research Institute, Hungary

"We Introduce the Central Physics Research Institute," by Gyorgy Sarbo, Budapest, Muszaki Elet, 6 Feb 58

The Central Physics Research Institute consists of six large buildings situated on grounds having an area of 40 holds [one hold equals 1.42 acres]. The departments of the institute were established in the following order: spectroscopy, cosmic radiation, electromagnetic waves, atomic physics, radiology, ferromagnetic phenomena, and the departments of neutron physics, nuclear chemistry, and engineering, which operate in collaboration with the reactor now under construction.

At present the institute has several hundred employees and is the fourth-largest institute of this type in Europe.

The Department of Cosmic Radiation, under the direction of Lajos Janossy, Academician, is conducting research on cosmic radiation and on high-energy nuclear interaction. The department began to evolve the Geiger counter technique in 1951. In 1953, the implementation of the scientific program got under way, in the course of which high-energy nuclear interactions and electromagnetic interactions were investigated. With the help of Geiger counters and the Wilson chamber, studies were made of extensive aerial showers caused by very high-energy (10^{13} - 10^{16}) nuclear interaction. The department also mastered the so-called photo-emulsive technique and was thus able to participate in the international research project, concerned with the investigation of electron and photon showers, conducted by the USSR, Poland, Germany, Great Britain, Italy, and Czechoslovakia. One research group of the department constantly registers the intensity of cosmic radiation at a depth of 10 meters below ground to determine the relationship between variations in intensity and solar erruptions, magnetic storms, and other geophysical phenomena.

The theoretical research initiated by Janossy for investigati: the nature of the wave particles of light deserves special mention. At present, the characteristics of light pulses having a duration of 10^{-9} seconds are being investigated.

The Department of Atomic Physics is investigating the internal structure of atomic nuclei, nuclear reactions, and the interaction of atomic particles. The department is equipped with accelerating installations consisting of 800,000- and 600,000-volt cascade generators, a fast neutron spectrometer, and a nearly completed 4-million-volt "ribbon generator," "one of the most modern research implements in the field of nuclear physics." All department equipment was made in Hungary.

The following departments are associated with the atomic reactor and are under the direction of Pal Lenard, deputy director of the institute:

The Department of Neutron Physics -- This department conducts investigations in the fields of fundamental and applied neutron physics as well as in the techniques and physics of the reactor. The most significant research in the field of fundamental neutron physics is the investigation of (n, γ) reactions and the experimental investigation of the mechanism of nuclear fission. Research in the field of applied neutron physics is concerned chiefly with the physics of solids. Efforts are being made to clarify the influence of the lattice dislocations induced by exposing solids to radiation on the physical properties of said solids. The inelastic diffusion of cold [subthermal?] and supercold neutrons occurring in solids is also being investigated. The task of reactor technology and physics research is to evolve a method for measuring the macroconstants required for studying the reactor. At present the department is investigating the parameters of organic moderators by stationary methods. Soon they will be investigated by nonstationary methods as well. The construction of first a subcritical and later a zero-power homogeneous reactor having an organic moderator is also part of the research program.

To accomplish the foregoing, many instruments and installations have been and will have to be built. A precise system had to be evolved for measuring the absolute intensity of neutron flux. A gamma-spectrometer which registers automatically was constructed as an aid in studying the (n, γ) reaction. A 100-channel time analyzer, to be used in neutron spectroscopy, is nearly completed.

The Department of Chemistry conducts research relevant to the preparation of radioactive isotopes and is investigating Hungarian uranium ores. The department has put into operation an isotope enriching apparatus in order to produce the B^{10} stable isotope, which is used in making neutron counters. A number of new procedures for analyzing uranium and thorium have also been established.

The technical departments develop and manufacture a limited number of research instruments. In most cases, once prototypes have been developed, they are turned over to factories for series production. However, by doing much of this work on the spot and using standard components, the department can produce and assemble the equipment required for a physics experiment in a few weeks, as compared with the usual 6-10 months.

110. Hungarian Claims Valuable Results in Theoretical Research on Hydrogen Fusion

"What Is Fire Having a Temperature of One Million Degrees Like?" Imre Nemeth, Budapest, Esti Hirlap, 17 Nov 57, p 4

In a general discussion of hydrogen research and hydrogen as a source of power, the author quotes Lajos Pocs, Hungarian atomic physicist, as follows: "These experiments [in controlling hydrogen fusion] are extremely costly; therefore, we can conduct only theoretical research. However, Hungarian researchers have achieved valuable results in this field, results achieved concurrently with, but entirely independent of, foreign research."

Pocs feels that possibly in one or two decades hydrogen and uranium power plants will completely supplant power plants which operate on coal.

111. USSR to Hold "Atoms for Peace" Exhibit in Oslo

"Soviet Atom Exhibition to Oslo" (unsigned article); Oslo, Friheten, 1 Mar 58, p 1

Komarov, charge d'affaires of the Soviet Embassy in Oslo, announced that the Soviet exhibition "Atoms for Peace" is scheduled to come to Oslo at the end of May for a stay of one month. At the exhibition atomic fission apparatus, photographs, and motion pictures will be shown. Soviet scientists will describe the uses of atomic energy in agriculture, medicine, industry, and research.

112. East German Uranium Company Shows 400 Million Mark Loss

"Uranium Ore Poor Business for East Germans" (unsigned article); Stockholm, Svenska Dagbladet, 17 Mar 58, p 6

The following is the text of a news item datelined Berlin (TT-DPA).

"A former leading official of the German-Soviet company which exploits uranium deposits in East Germany reports that the company has shown a loss of 400 million East marks for the past year. The uranium ore is sold by the company to the USSR for a price which barely covers the production cost. The USSR paid only 450 million East marks for all of last years's production, while production costs were about 850 million East marks."

Mechanics

113. Linear Oscillations in a Plate Moving at High Speed Considered

"Linear Oscillations of a Plate Moving at High Speed in a Gas," by A. A. Movchan, Tr. 3-go Vses. Matem. s'yezda., Vol 1, M., AN SSSR, 1956, p 206 (from Referativnyy Zhurnal -- Mekhanika, No 11, Nov 57, Abstract No 12549)

The problem of linear oscillations of a plate moving in a gas is considered. The force of the excessive pressure is calculated by an approximate formula. The problem is reduced to the investigation of the range of the eigen values of a non-self-adjoint boundary-value problem for a fourth order equation. Certain conclusions concerning the stability of the oscillations can be drawn from the changes in eigen values with variations in the speed of the plate's motion.

114. Nonlinear Theory of a Compressible Fluid

"Nonlinear Theory for the Laminar Boundary Layer of a Viscous Compressible Fluid", by V. P. Shestopalov, Uch. zap. Khar'kovsk. gos. ped. in-ta, No 18, 1956, pp 113-120 (from Referativnyy Zhurnal -- Mekhanika, No 11, Nov 57, Abstract No 12803 by V. A. Sukhnev)

A short exposition of a nonlinear theory of a viscous, compressible fluid, based on the fact that the tensor of the pressures is the quadratic function of the tensor of the deformation rates, is given. A generalized equation of the motion and transfer of heat is presented. The author regards, as the zone of application, the boundary layer where

the larger gradients of velocities and temperatures exist and can disrupt the linear relationship of the tensor of pressures to the tensor of the deformation rates which are taken as the basis of the usual theories of a viscous fluid. Equations of a plane laminar boundary layer, obtained on the basis of the nonlinear theory of a viscous fluid, differ from ordinary equations by the presence, in both of the equations of motion, of the term

$$\frac{d}{dy}\left(\mu \frac{du}{dy}\right)$$

where μ is the coefficient of viscosity. Due to this $d\mu/dy \neq 0$ in the boundary layer. Equations of continuity and energy transfer remain as before. The practical significance of this theory must be established experimentally.

115. Subsonic Currents With Regional Supersonic Zones

"Subsonic Currents With Regional Supersonic Zones," by F. I. Frankl', Tr. 3-go Vses. matem. s'yezda, Vol I, Moscow, AN SSSR, 1956, pp 213-214 (from Referativnyy Zhurnal -- Mekhanika, No 11, Nov 57, Abstract No 12510)

Work on currents with a finite supersonic field, limited by density jumps and adjoining only one wall, was conducted by the author. One such example was a supersonic zone limited underneath according to the current with a direct density jump. This example was based on applying the Molenbruk-Chaplygin hodograph method in combination with a theory of mixed partial derivatives.

In further work, the author formulated boundary problems giving the possibility of building a two-dimensional parallel subsonic flow past a profile with a supersonic zone at infinity. The boundary problem is reduced to a second order integral equation. Conditions in density jumps are also calculated.

116. Gyro Stabilizer Stability Study

"Stability of a Gyroscopic Stabilizer With Calculation of the Time Constant in the Response Channel," by Yu. N. Kushelev, Sb. statey nauch. stud. o-va, Mosk. Energ. in-t., No 8, 1955, pp 80-90 (from Referativnyy Zhurnal -- Mekhanika, No 11, Nov 57, Abstract No 12421 by G. A. Slomyanskiy)

The stability of a uniaxial, powered gyroscopic stabilizer, lacking a device for creating a directional moment, is considered. It is assumed that the time lag in the response channel takes a value noticeably different from zero, and the amplification factor according to this channel is proportional to the amplification factor of the basic signal and has an opposite mark. The time constant of the basic signal amplification channel is taken as equal to zero.

117. Explosion in a Gas With Variable Initial Density

"Exact Solution of the Nonlinear Problem of Explosion in a Gas With Variable Initial Density," by V. P. Korobeynikov; Moscow, Doklady Akademii Nauk SSSR, Vol 117, No 6, Dec 57, pp 947-948

V. P. Korobeynikov and Ye. V. Ryazanov develop the discontinuous solutions of an exact solution of the nonlinear problem of point explosion in a gas with variable initial density. Their solution was obtained from the exact solution of Academician L. I. Sedov, presented on 22 June 1957.

The problem is reduced to the solution of a system of equations on the one-dimensional adiabatic motion of the gas behind the shock wave under given initial conditions and also for a boundary condition at the center of symmetry with specified conditions at front of the shock wave.

IX. MISCELLANEOUS

118. Composition of the Siberian Branch, Academy of Sciences USSR

"The Development of Science in Siberia and the Far East," by Academician M. A. Lavrent'yev; Moscow, Vestnik Akademii Nauk SSSR, No 12, Dec 57, pp 3-7

The following affiliates of the Academy of Sciences USSR are now included in the composition of the Siberian Branch of the Academy of Sciences USSR: West Siberian; East Siberian; Yakutsk; and Far Eastern; also included is the Sakhalin Complex Scientific Research Institute and the Institute of Physics, Academy of Sciences USSR, located in Krasnoyarsk.

119. New Siberian Scientific Centers

"The Development of Science in Siberia and the Far East," by Academician M. A. Lavrent'yev; Moscow, Vestnik Akademii Nauk SSSR, No 12, Dec 57, pp 6-7

"The scientific center near Novosibirsk will have a university with Physics, Chemistry, Mathematics, Mechanics, Geologicogeophysics, and Medicobiological faculties, where some 1,500 students will study.

"Near the scientific center an experimental plant employing some 1,000 persons will be built, which will prepare instruments and equipment for all of the institutes of the Siberian Branch of the Academy of Sciences USSR. The center will also have facilities for housing 15,000-20,000 persons.

"In 1958, a building for the Institute of Radio Engineering and Electronics (Institute Radiotekhniki i Elektroniki) of the West Siberian Affiliate will be completed in Novosibirsk. Also slated for construction and organization in Novosibirsk is the Institute of Mining (Institut Gornogo Dela) and the Institute of Transportation and Power Engineering (Institute Transporta i Energetiki) which are based on the scientific forces of the West Siberian Affiliate. A library, which will contain some 4 million volumes, is also to be built.

"In 1958, plans are to be made for the construction of buildings for the Institute of Nuclear Physics (Institut Yadernoy Fiziki), the Institute of Hydrodynamics (Institute Gidrodinamiki), and the Institute of Geology and Geophysics (Institute Geologii i Geofiziki), and for an experimental plant and living quarters for 1,000 persons.

"Simultaneously with the formation of the scientific center in Novosibirsk a second center is planned in the area of Irkutsk. The West Siberian Affiliate is located in Irkutsk, and a scientific center for chemical research and study (organic chemistry, catalysis, geochemistry, and electrochemistry), for metallurgy, geology, and economic geography is proposed for establishment in the new city of Angarsk.

"In Yakutsk, a complex Institute of Diamonds (Institut Alazov) is scheduled to be organized, and work in the field of geology is to be improved; in addition, a scientific group for power engineering and transportation is to be formed.

"In Kemerovo, an Institute on the Problems of the Chemical Processing of Coal and Coking (Institut po Problemam Khimicheskoy Obrabotki Uglya i Koksovaniyu) is scheduled to be organized.

"Buildings are to be built in Krasnoyarsk for the Institute of Physics and the Geology Laboratory, and a building for the Far East Affiliate in Vladivostok."

120. List of Institutes Within the Siberian Branch, Academy of Sciences USSR

"The Formation of a Major Scientific Center in Siberia," (unsigned article); Moscow, Vestnik Akademii Nauk SSSR, No 12, Dec 57, pp 8-14

The following list of institutes and their directors shows the organizational breakdown of the Siberian Branch of the Academy of Sciences USSR.

Institute of Hydrodynamics (Institute Gidrodinamiki); Academician M. A. Lavrent'yev, director

Institute of Theoretical and Applied Mechanics (Institut Teoreticheskoy i Prikladnoy Mekhaniki); Academician S. A. Khristianovich, director

Institute of Mathematics With a Computer Center (Institut Matematiki c Vychislitel'nym Tsentrom); Academician S. L. Sobolev, director

Institute of Geology and Geophysics (Institut Geologii i Geofiziki); A. A. Trofimuk, Corresponding Member of Academy of Sciences USSR, director

Institute of Automation and Electrometry (Institut Avtomatiki i Elektrometrii); K. B. Karandeyev, Corresponding Member of Academy of Sciences Ukrainian SSR

Institute of Thermophysics (Institut Teplofiziki); I. I. Novikov, Doctor of Technical Sciences, director

Institute of Inorganic Chemistry (Institut Neorganicheskoy Khimii); A. V. Nikolayev, doctor of Chemical Sciences, director

Institute of Chemical Kinetics and Combustion (Institut Khimicheskoy Kinetiki i Goreniya); A. A. Koval'skiy, Doctor of Chemical Sciences, director

Institute of Physics (Institut Fiziki), G. I. Budker, Doctor of Physicomathematical Sciences, director

Institute of Experimental Biology and Medicine (Institut Eksperimental'noy Biologii i Meditsiny); Ye. N. Meshalkin, Doctor of Medical Sciences, director

Institute of Cytology and Genetics (Institut Tsitologii i Genetiki); N. P. Dubinin, Corresponding Member of Academy of Sciences USSR

Institute of Economics and Statistics (Institut Ekonomiki i Statistiki); Academician V. S. Nemchinov, director

121. Role of the Technical-Economic Council of a Sovnarkhoz

"On the Path Toward Technical Progress," by V. Novikov, chairman of the Leningrad Sovnarkhoz; Moscow, Sovetskaya Rossiya, No 235, 4 Oct 57, p 2

One of the basic functions of a sovnarkhoz is to eliminate shortcomings in the application of scientific research to industry, i. e. to put into practice an idea developed by a scientific research institute. "An important role in this is to be taken by the technical-economic council [of a sovnarkhoz]. It must become the center of progressive technological thought, and must unify the efforts of innovators in industry and the work of scholars." In addition, it becomes

necessary that there be organizational unification of the majority of scientific research institutions with sovnarkhozes, plants, factories, and construction projects. This will aid in the organization of more correct practically useful scientific research and experimental design work."

"In the Leningrad economic region there are nearly 90 scientific research and experimental design organizations, but only one third of them have been transfered to subordination under the Sovnarkhoz." Some believe that within the system of a single sovnarkhoz, scientific research institutions will not serve other economic regions of the country as well. This could never happen, for the planning of major scientific research and experimental design work will, as in the past, be conducted by Gosplan USSR and RSFSR."

122. New Periodical to be Published by Karelian and Kola Affiliates of Academy of Sciences USSR

"On the Publication of the Periodical Izvestiya Karel'skogo i Kol'skogo Filialov Akademii Nauk SSSR, (unsigned article); Moscow, Vestnik Akademii Nauk SSSR, No 12, Dec 57, p 85

The Presidium of the Academy of Sciences USSR commissioned the Karelian and Kola Affiliates to organize the publication of their own joint periodical entitled, Izvestiya Karel'skogo i Kol'skogo Filialov Akademii Nauk SSSR (News of the Karelian and Kola Affiliates, Academy of Sciences USSR). The periodical will be published four times a year in 1,500 copies. The chief editor is V. S. Slodkevich, Doctor of Geological and Mineralogical Sciences.

The basic aims of the periodical will be to present the results of scientific research, the exchange of experiences of scientific-organizational actions, problems on the coordination of scientific work, and to introduce into industry practical proposals in the fields of physics, mathematics, geology, chemistry, biology, technology, and the humanities.

123. Scientific Establishments in Slovenia

"Study of the Status of Scientific Establishments," by B. L.; Ljubljana, Slovenski porocevalec, 19 Feb 58, p 2

On 18 February 1958, the Council for Science (Svet za znanost) of Slovenia under the presidency of Milka Gorsic elected from its membership three subordinate commissions for the social, natural, and technical sciences, which will expedite the work of the council by studies

in their respective areas and by preparing material for the meetings of the council. The council also discussed regulations on the founding of scientific establishments and measures to be used in determining the status of scientific establishments. It adopted a regulation concerning the registration of scientific establishments.

In connection with provisions of the republic law on scientific establishments, passed by the People's Assembly of Slovenia, the council considered the problem of certain scientific establishments whose founders, according to the law, can no longer found scientific establishments. Up to now, the republic Council and Education generally exercised the founding right. The new law permits the founding of scientific establishments by the People's Assembly of Slovenia, the Executive Council, the srez people's councils, the Slovenian Academy of Arts and Sciences, the university, the faculties, and the economic and social organizations. The elected commissions will study the activities and problem those establishments whose founders have been abolished and will se the organs which appear most suited according to the law to ise the rights and responsibilities of a founder for these establishments.

The Council for Science announced that every scientific establishment governed by this law, within 30 days of the effective date, must report to the Council for Science concerning its founder, its organization and work, its personnel both scientific and professional, and its material means. On the basis of the commissions' investigations and recommendations, the Council for Science will decide which establishments will be entered in the register of scientific establishments.

124. Russian Scientists Visit Czechoslovakia

"From the Day," (unsigned article); Prague, Prace, 9 Feb 58, p 5

The Czechoslovak Minister of Education and Culture, Dr Frantisek Kahuda, received Prof Kozlova, director of the Moscow Engineering-Economics Institute imeni S. Ordzhonikidze and Prof E. A. Satel, director of the Moscow Higher Technical School imeni Bauman, on Saturday, 8 February 1958.

125. Changes in Academia Sinica Reported

"News Briefs," (unsigned article); Peiping, K'o-hsueh T'ung-pao (Scientia), No 20, 1957, p 640

Recent changes in the Academia Sinica, which were first approved by the State Council, include the following:

Liu Ch'un-jen ( ) has been elected chairman of the Institute of Nationalities Research (Min-chu Yen-chiu-so) Preparatory Committee.

The Peiping Work Group of the Institute of Experimental Biology has become the Institute of Experimental Biology, Peiping. Pei Shih-chang ( ) is director.

The Laboratory of Vertebrate Paleontology has been renamed Institute of Vertebrate Paleontology. Its director is Yang Chung-chien ( ).

The Laboratory of Zoology has been renamed Institute of Zoology. Ch'en Chen ( ) is director; Liu Chiao-fei ( ), deputy director. [Ch'en Chen died at the age of 63 on 15 November 1957, according to report in K'o-hsueh T'ung-pao, No 24, 1957.]

The Marine Biological Laboratory has been renamed Institute of Marine Biology and is headed by T'ung Ti-chou ( ), director; Tseng Ch'eng-k'uei ( ). Chang Hsi ( ), and Sun Tzu-p'ing ( ), deputy directors.

The Commission for the Preservation of Cultures of Microorganisms has become the Peiping Microbiological Laboratory. Fang Hsin-fang ( ) is deputy director.

126. China Academy President Visits USSR

Moscow, Pravda, 14 Jan 58

Kuo Mo-jo, president of the Academia Sinica, arrived in the USSR on 13 January to discuss Sino-Soviet cooperation in scientific research work. He will hold discussions with the State Scientific and Technical Committee of the Council of Ministers USSR and the Academy of Sciences USSR.

127. Hungarian University Dean on Soviet Lecture Tour

Budapest, Esti Hirlap, 17 Nov 57, p 7

Dr Miklos Kadar, Dean of the Lorand Eotvos University of Science, has left for a 4-week stay in the USSR. He is to lecture at the universities in Moscow and Leningrad.

128. Belgrade University Confers Doctorates

"New Doctors of Belgrade University" (unsigned article), Belgrade, Politika, 6 Feb 58, p 8

"At a formal presentation yesterday afternoon at Belgrade University, 13 scientific workers received titles of doctor of sciences. Vladimir Milanovic was given the degree of Doctor of Pedagogical Sciences; Stojan Subotin, the degree of Doctor of Letters; Marija Nakic, the degree of Doctor of Historical Sciences; Lazar Vujicic, the degree of Doctor of Forestry Sciences; Budimir Ilic and Radojica Kljajic, the degree of Doctor of Agricultural Sciences; Panca Kiroski, the degree of Doctor of Economic Sciences; Jovan Reseta and Nebojsa Knezevic, the degree of Doctor of Veterinary Sciences; Dejan Bajic, the degree of Doctor of Technical Sciences; and Dobrosav Perisic, Svetislav Arandjelovic, and Ljubisa Milosevic, the degree of Doctor of Jurisprudence."

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