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

Approved For Release 2005/08/02 : CIA-RDP82-00141R000100420001-7

PLEASE NOTE

This report presents unevaluated information extracted from recently received publications of the USSR, Eastern Europe, and China. The information selected is intended to indicate current scientific developments and activities 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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1. Research and Production of Plant Growth Stimulators in China

"Research Report on Production and Physiologic Action of Gibberellin," by the Auxin Group, Institute of Plant Physiology, Academia Sinica; Peiping, Chih-wu Sheng-li-hsueh T'ung-hsun (Plant Physiology News), No 2, Jun 59, pp 60-81

This paper constitutes a summary report of research on gibberellin conducted at the Institute of Plant Physicology of the Academia Sinica during the period September 1958-February 1959. The report presents details of the laboratory preparation of the auxin, its trial production at the Shanghai Agricultural Chemicals Plant, and laboratory studies of its effects on certain economic crops.

A seed strain, designated as F_{98}, was obtained from the Institute of Applied Mycology (renamed Institute of Microbiology) of the Academia Sinica. One designated as F_{64} was obtained from the Peking Agricultural University and used in pilot plant production. A combination of "native" and foreign methods of fermentation were used in the laboratory where the yield of crude crystalline gibberellin was 50-300 milligrams per liter culture filtrate.

In trial commercial production the yield in crude crystals was 50 milligrams per liter; in pure crystals (containing 93% gibberellic acid), milligrams per liter. The melting point of pure crystals was 218-232 degrees centigrade.

The article states that in 1958 the great leap forward in agriculture stimulated the commercial production of and experimental research on plant growth hormones -- especially gibberellin. It is estimated that over 500 research units in the country have engaged in the experimental preparation of gibberellin since September 1958. Twelve different organizations have advertised the sale of the auxin in the Jen-min Jih-pao since November. This number does not include advertisements which have appeared in provincial and other local newspapers.

Also the experimental use of gibberellin on agricultural farms is reportedly being conducted jointly by the Institute of Plant Physiology and the Peoples Communes.

II. CHEMISTRY

Electrochemistry

2. Potentials of the Deposition of Metals from a $BeCl_2$-NaCl Melt Used as a Solvent

"Potentials of the Deposition of Metals From the System $BeCl_2$-NaCl Used as a Solvent," by I. N. Sheyko and Yu. K. Delimarskiy, Institute of General and Inorganic Chemistry, Academy of Sciences Ukrainian SSR; Kiev, Ukrainskiy Khimicheskiy Zhurnal, Vol 25, No 3, May/Jun 59, pp 295-300

The deposition potentials of 16 metals dissolved in the form of their chlorides in $BeCl_2$-NaCl were determined in the temperature range of 300-500°. The polarization EMF and the electrode potentials with reference to platinum were also determined. A eutectic mixture consisting of 51% of $BeCl_2$ and 49% of NaCl (molar) was used. This mixture melts at 215°. The following electromotive series was established: Be, Al, Mn, Th, Cr, Zn, Cd, Pb, Fe, Co, Ag, Mo, Ni, Cu, Sb, Bi. In a preceding part of this investigation, corresponding data were obtained with the use of NaCl-$AlCl_3$ as a solvent.

Fuels and Propellants

3. Homogeneous Catalysis of the Decomposition of Hydrogen Peroxide by Sodium Tungstate and Strontium Chloride

"Homogeneous Catalysis of H_2O_2 by the Salts Na_2WO_4 + $SrCl_2$ and Isolation of New Strontium Pertungstates," by G. A. Bogdanov and I. K. Prokhorova, Chair of General and Inorganic Chemistry, Moscow Textile Institute; Moscow, Nauchnyye Doklady Vysshey Skholy -- Khimiya i Khimicheskaya Tekhnologiya, No 2, May 59, pp 264-267

It was established in previous experiments that strontium chloride as such does not catalyze the decomposition of hydrogen peroxide either in an acidic or neutral medium. On the other hand, sodium tungstate brings about decomposition of hydrogen peroxide. Addition of strontium chloride to sodium tungstate reduces sharply the rate of decomposition of hydrogen peroxide. The higher the concentration of strontium ions, the greater the effect exerted by $SrCl_2$. It was established that the catalysis of the decomposition of H_2O_2 by the salts $SrCl_2$ + Na_2WO_4

is reversible and homogeneous. The kinetic curves showed maxima. Furthermore it was established that the electrical conductivity of the reaction mixture during the course of catalysis does not depend on the acidity of the medium. The experiments were carried out with a 30% solution of hydrogen peroxide.

Four pertungstates of strontium were isolated, the formation of which was assumed on the basis of an investigation of the kinetics of the reaction and measurements of conductivity. The composition of these pertungstates was determined. The thermal effects connected with the decomposition of these pertungstates were established. It was found that the positive thermal effect connected with the decomposition of the strontium pertungstates increases with the amount of peroxide oxygen and decreases with the number of mols of water of hydration. This indicates that the dehydration of the pertungstates is an endothermic process.

4. Formation of Sodium Superoxide From Sodium Peroxide Hydroperoxide

"Formation of Na O_2 From Na_2 O_2. $2H_2$ O_2" by I. I. Vol'nov and A. N. Shatunina, Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, Academy of Sciences USSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 7, Jul 59, pp 1491-1493

By subjecting Na_2 O_2. $2H_2$ O_2 to vacuum -- drying at temperatures in the range of 70-120° at a residual pressure of 10 millimeters of mercury, preparations of sodium peroxide were obtained which contained approximately 30% by weight of Na O_2. This yield considerably exceeds those given in publications concerning the preparation of sodium superoxide by this method.

5. A New Process for the Production of Acetylene from Methane by an Electric Discharge

"Acetylene From Methane in Rumania," by Prof Dr E. Badarau, Director of Institute of Physics, and Active Member of Rumanian Academy of Sciences; Warsaw Problemy, No 8, Aug 59 pp 551-552

Rumania has imense reserves of natural gas, consisting of almost pure methane (99.8 percent). In recent years, in addition to the production of acetylene from carbide, the production of acetylene by passing electric discharges through methane has been started. The fact that acetylene is formed under such conditions has been known for a long time, but only recently, and to a relatively limited extent, has this process been introduced into industrial application.

The importance of the task of establishing under what conditions of discharge industrial production of acetylene can be carried out with a maximum output is very real; even more so if we take into consideration the fact that there exists an immense diversity of the forms of discharges under the action of which acetylene can arise. There are still many difficulties of a technical nature to be eliminated.

In our experiments, instead of the commonly applied arc discharge, we applied a high-frequency discharge through the use of external electrodes.

The installation was constructed so that it was possible, on the one hand, to control the flow of gas through the tube, and, on the other hand, constantly to control the solid, liquid, and gaseous products that are formed [sketch of installation given in source]. The ends of the tube (1 on sketch) are equipped with two external ring-shaped electrodes (2). The flow of the gas through the tube is controlled by a flow equalizer or controller (3), and a flow meter (5). Water vapor is eliminated by passing the gas through a tube containing calcium chloride (4). The gas pressure inside the tube is regulated with a mercury manometer (6). Gaseous products produced in the discharge zone are collected in a scrubber and cooled with liquid nitrogen (7), under the effect of which condensation or solidification takes place. While in operation, the installation is connected to a vacuum pump over a valve (8). After the removal of liquid nitrogen that collects in the vessel (7), the products pass through a series of scrubbers (9-14), in which precipitation [of silver acetylide] from a silver nitrate solution takes place. The reaction products are determined volumetrically [the free nitric acid is titrated].

Experiments conducted with this installatior have led us to certain conclusions pertaining to the mechanism of processes taking place during the electrical discharge in this form. It was possible to obtain acetylene with a yield exceeding 40% of the theoretical. This method has proved to be very profitable.

With this method, it was also possible to obtain directly from methane a polymer with a composition corresponding to the $(-CH_2-)n$ formula, which has very valuable properties. For example, it can withstand a temperature up to 400 degrees centigrade, is acid-resistant, and has good dielectric properties. Hence, it is suitable as an insulation material at temperatures which other organic insulators cannot withstand. We were also successful in synthesizing other valuable compounds.

6. Eighth All-Union Conference on the Chemistry of Coordination Compounds

"The Investigation of Complex Compounds," by S. S. Rodin; Moscow, Vestnik Akademii Nauk SSSR, Vol 29, No 8, Aug 59 pp 94-95

"The Eighth All-Union Conference on the Chemistry of Complex Compounds was held at Kiev on 26-29 May 1958. In addition to Soviet scientists, visitors from Poland and Czechoslovakia participated in the conference. The interest which was evinced toward this conference is explained by the fact that the importance of coordination compounds has grown considerably during recent years. Compounds of this type are being employed more and more extensively in the production of nuclear fuel and of auxiliary materials used in the nuclear energy industry and also for the production of substances of high purity applied in semiconductor technology, in the production of ferromagnetics, and in the production of piezoelectrics. Coordination compounds are used as catalysts in the synthesis of high polymers, in the detection and isolation of nonferrous, rare, and nobel metals, and in the production of pure chemical reagents to be applied in extraction and in ion-exchange processes.

"Furthermore, complex compounds are used in biology, medicine, and various fields of present-day technology, specifically the technology, of construction.

"At two plenary and 50 sectional meetings, 97 reports were presented. The majority of which were concerned with the chemistry of coordination compounds of elements of the VIIIth group of the periodic system, particularly platinum compounds, and the chemistry of coordination compounds of cobalt, rhenium, and rare-earth elements.

"Problems of trans-influence were discussed in several reports. Methods were described for the detection of trans-isomers contained in cis-isomers and the conditions were set forth under which it is easy to detect the presence of even a few percent of a cis-isomer in the trans-isomer. An argument was presented in favor of the employment of exchange integrals for the quantitative characterization of the trans-influence or trans-effect.

"One of the sectional meetings dealt with the chemistry of coordination compounds of actinides.

"A great deal of attention was paid to the chemistry of heteropoly-compounds. Data obtained in experimental research were reported and considerations presented which have a bearing on the mechanism of the extraction of heteropolyacids, problems related to the basicity of heteropolyacids, and problems concerning the nature of salts with a high degree of substitution.

"A number of reports dealt with experience acquired in applications of ion-exchange in the investigation and separation of coordination compounds of a number of elements. The possibilities of the application of ion-exchange in the investigation of coordination compounds of multiply-charged ions and the application of complex-formers in chromatographic separations were discussed.

"Among the reports presented at the conference, a prominent place was occupied by communications on the investigation of coordination compounds by physical and physicochemical methods such as spectroscopy, polarography, potentiometry, thermogravimetry, etc. Formation of complexes in inorganic redox reactions and correlations between complex-formation and electrical conductivity of solutions were discussed. Optical and thermodynamic data, information on the magnetic susceptibility, and other data were used in investigations on the structure of coordination compounds. Several investigations dealt with the crystal chemistry of of coordination compounds and with coordination compounds of individual elements (beryllium, titanium, vanadium, germanium, thallium, gallium, antimony, tin, lead, copper, zinc, and mercury).

"At a plenary meeting which concluded the conference, detailed consideration was given to problems with which chemists active in the field of coordination compounds are faced in connection with the current Seven-Year Plan of the development of national economy."

7. Titanium Chloride Melts

"Phase Diagrams of Binary Salt Systems; Part 5. $TiCl_3$-NaCl, $TiCl_3$-KCl, $TiCl_3$-RbCl, $TiCl_3$-CsCl," by B. F. Markov and R. V. Chernov, Institute of General and Inorganic Chemistry, Academy of Sciences Ukrainian SSR; Kiev, Ukrainskiy Khimicheskiy Zhurnal, Vol 25, No 3, May-Jun 59, pp 279-284

The binary salt systems listed in the title were subjected to thermal analysis. One eutectic was found in the system $TiCl_3$-NaCl, which was investigated up to a 36% content of $TiCl_3$. In the systems $TiCl_3$-KCl, $TiCl_3$-RbCl,

and $TiCl_3$-CsCl, the existence of congruently melting compounds with the general formulas $MTiCl_4$ and M_3TiCl_6 was established. In melts containing these salts titanium is present in the form of complex anions. It is pointed out that knowledge of the molecular state of lower titanium chlorides in salt melts, such as that acquired in the investigation described, is of importance for the electrolytic production and refining of metallic titanium.

8. Rare-Element Mineral Occurrences in the Sands of the Baltic Sea Shore

"Rare-Element Minerals in Sea-Shore Sands," by B. Kogan, Head of the Economic Division, Institute of Mineralogy, Geochemistry, and Crystal Chemistry of Rare Elements, Academy of Sciences USSR; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Vol 4, No 108 (563), 13 Sep 59, p 4

In the sands along the Baltic seacoast of the German Democratic Republic in the vicinity of Rostock and Stollberg, as well as on the Island of Hiddensee and in other localities, deposits of zircon, ilmenite, rutile, garnet, and a number of other heavy minerals have been found as a result of thorough geological investigations. The minerals content of these sands is 0.03-0.15% in large areas and reaches 4% in some sections. In the heavy fraction, the content of zircon varies in the range of 1-4%. The enrichment of sand banks along the shore with heavy minerals is said to occur as a result of the action of waves.

Since 1957, the Ostsee Schuerf Enterprise at Rostock has exploited sand in the areas of Ahrenshoop and Veskeritz. At present only the richest sections are being exploited. These sections can be readily seen with the naked eye or they can be detected by making tests. They are located along the line of the surf and consist of strips which are red or black in color. These strips have a width of one meter and a length amounting to hundreds of meters. The raw sand contains approximately 10% of iron, 6% of titanium dioxide, and 1-2% of zirconium dioxide.

The first stage of enrichment is conducted directly on the seashore by spiral classifiers of the Ostsee type. These classifiers have been developed by the experimental department of the E. Thaelmann Heavy Building Works at Magdeburg-Buckau.

The marine sand is charged into a feeding funnel where it is mixed with water and forms a sludge. This sludge flows down along the windings of the spiral. During this process the sludge is separated into a heavy fraction, an intermediate product, and a light fraction consisting of tailings. The separation takes place from the center of the tubes to the periphery. The quantity of quartz and other silicates separated in this manner amounts to 50 or 60%. The output of a classifier which treats poor raw sand amounts to 250 kilograms per hour with manual charging and one ton per hour with mechanical charging by means of a belt conveyor.

The crude concentrate produced in this manner contains about 30% of iron, more than 19% of titanium dioxide, and 4.1% of zirconium dioxide. Subsequent final treatment of the crude concentrate is carried out at a small stationary enrichment installation. At slime washing tables used in this installation, magnetite, ilmenite, zircon, and garnet are separated from residues consisting of quartz, amphiboles, and pyroxenes. Because they differ only insignificantly in their specific weight, magnetite, ilmenite, and zircon are obtained as a mixed concentrate. This concentrate is dried and subjected to dry magnetic separation. After the magnetic separation, a magnetite concentrate containing 65% of iron, an ilmenite concentrate containing 33% of titanium dioxide and 44% of iron, and a zircon concentrate containing 55-60% of zirconium dioxide are obtained.

At present work is being done in the GDR on the improvement and expansion of production of the type described and reduction of the cost of treatment by the operations involved in this production. It is planned to treat seashore sand that contains on the average 2% of heavy minerals rather than sand from selected strata with higher concentrations. The problem is considered of extracting additionally from the sand monazite, eudialyte, as well as some other minerals.

Results which are no less interesting were obtained in the GDR in the investigation of available types of kaolin for the presence of useful ingredients. In residues from the elutriation of kaolin coming from different deposits in central Germany, a considerable quantity of heavy minerals has been discovered. Although these minerals usually go to waste, they can be extracted. Experimental work on the enrichment of kaolin tailings at concentration tables has shown that the heavy minerals are concentrated predominantly in particle sizes within the range of 0.2-0.3 millimeters and that by using mechanical concentration methods one can obtain zircon concentrates in larger quantities and at lower cost than from the sands of the Baltic Sea coast.

In connection with this, it is intended to conduct systematic investigation of kaolin deposits in the GDR and to study, in connection with this, methods for the concentration of heavy minerals contained in kaolin.

Nuclear Fuels and Reactor Construction Materials

9. Conditions Under Which Microquantities of Uranium Are Present in Solutions

"The Problem in Regard to the Conditions Under Which Microquantities of Uranium Are Present in Solutions," by I. Ye. Starik, L. D. Kolyadin and D. S. Nikolayev; Leningrad, Radiokhimiya, Vol 1, No 3, May/Jun 59, pp 317-320

It was established that microquantities of uranium ($5X10^{-5}$ grams per liter) are retained in solution in the presence of a solid phase which has a high adsorption capacity in cases when the concentration of the carbonate ion in the solution exceeds n. 10^{-7} N. It was furthermore established that microquantities of uranium ($5X\ 10^{-5}$ grams per liter) are readily absorbed from solutions at a pH = 3-4 when the concentration of carbonate ions in the solution is lower than n. 10^{-7} N.

10. Extraction of Uranyl Nitrate With Solvents

"Effect of the Diluent on the Extraction of Uranyl Nitrate With Tributyl Phosphate," by V. B. Shevchenko, A. S. Solovkin, I. V. Shilin, L. M. Kirillov, A. V. Rodionov, and V. V. Balandina; Leningrad, Radiokhimiya, No 3, May/Jun 59, pp 257-261

The effect of diluents on the distribution of uranyl nitrate between aqueous nitric acid and tributyl phosphate (TBP) + diluent was investigated. The dipole moment of $UO_2(NO_3)_2 \cdot 2$ TBP was determined and found to be equal to $(3.1 + 0.02) \cdot 10^{-18}$. It is assumed that there is a correlation between the coefficient of distribution of inorganic nitrates and the polar properties of the system TBP - diluent. The following inert solvents were used as diluents: benzene, carbon tetrachloride, toluene, o-xylene, isopropylbenzene, kerosene, butyl bromide, tertiary chlorobutylbenzene, dibutyl ether, and isoamylacetate.

11. Purification of Uranium From Zr^{95} and Nb 95

"Adsorption of Zirconium and Niobium on Silica Gel," by V. P. Nikol'skiy, A. M. Trofimov, and G. G. Panfilova; Leningrad, Radiokhimiya, Vol 1, No 3, May/Jun 59, pp 283-289

An investigation of the selective adsorption of zirconium and niobium by silica gel established that a high selectivity with respect to the adsorption of niobium is exhibited independently of the content of nitric acid in the solution (within the limits of 0.1-10 N). The maximum adsorption of zirconium takes place in nitric acid solutions at the concentrations 0.5 - 1.0 N. When the concentration of nitric acid corresponds to 10 N, zirconium is adsorbed weakly and niobium strongly. In weakly acidic solutions (below 0.1 N) zirconium and niobium are adsorbed strongly during filtration through a column and weakly under static conditions. It was found that formation of complexes by zirconium and niobium reduces the adsorption of these elements on silica gel. Desorption of zirconium and niobium from the silica gel can be carried out by using a weak solution of oxalic acid.

The purpose of the investigation was development of a procedure suitable for the adsorption of Zr^{95} and Nb^{95} from solutions of irradiated uranium.

12. Rare-Earth Element Salts of Uranium - Oxalic Acid

"The Preparation and Properties of Salts of Rare-Earth Elements With Uranium-Oxalic Acid," by A. A. Grinberg, G. I. Petrzhak, and L. I. Yevteyev; Leningrad, Radiokhimiya, Vol 1, No 3, May/Jun 59, pp 300-308

The lanthanum and cerium salts of uranium-oxalic acid were synthesized. They were found to have the following composition: KLa $[U(C_2O_4)_4] \cdot 8H_2O$ and KCe $[U(C_2O_4)_4] \cdot 8H_2O$. It was established that these salts, which are stable in the solid state, undergo gradual decomposition in contact with a solution.

13. Electrolytic Separation of Microquantities of Uranium and Plutonium

"Concerning the Problem of the Electrolytic Separation of Microquantities of Uranium and Plutonium," by G. S. Sinitsyna, S. L. Faddeyev, and G. M. Sukhodolov; Leningrad, Radiokhimiya, Vol 1, No 3, May/Jun 59, pp 295-299

The conditions of the electrolytic deposition of uranium and plutonium as affected by the pH and the density of the current were investigated. The deposition of uranium and plutonium at the cathode apparently takes

place only after the pH bringing about precipitation of the corresponding hydroxides has been reached in the layer next to the cathode, independently of the pH of the initial solution. It was established that the rate of the deposition of uranium and plutonium at the cathode does not depend on the material of the cathode. This applies to the cathode materials investigated, which comprised Pt, Ni, Cu, Ta, Ag, Zr, and Cu amalgam. The work reported was carried out in 1954.

14. Complexes Formed by Neptunyl Ion With Acetate Ions

"Spectrophotometric Investigation of the Formation of Complexes of the Neptunyl Ion With Acetate Ions," by P. N. Mefod'yeva, T. I. Artyukhin, and A. D. Gel'man; Leningrad, Radiokhimiya, Vol 1, No 3, May/Jun 59, pp 309-316

A spectrophotometric investigation of the system neptunyl ion-acetate ion in a perchloric acid solution was carried out in the presence of an excess of the complex-former and under conditions when the pH of the solution was changed. It was established that neptunyl forms the complexes NpO_2Ac_2 and NpO_2Ac_3 in the presence of acetate ions. The constants of the formation of neptunyl diacetate and triacetate were calculated as well as their extinction coefficients.

15. Form in Which Radioactive Elements Occur in Crystalline Substances

"The Form in Which Radioelements Are Present in Crystalline Substances," by I. Ye. Starik, Radium Institute imeni V. G. Khlopin, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 6, Jun 59, pp 955-962

The results of work on the subject conducted by the author and his collaborators since 1929 are summarized. It is pointed out that the results obtained in this work and the relationships established are of importance from the standpoint of practical applications in the geochemistry of radioactive elements and of dispersed elements in general. It is also emphasized that the phenomena which have been studied are of significance in connection with the production of artificial radioactive elements and their isolation. The results obtained on the migration of radioactive elements from minerals are held to be applicable to the behavior of radioelements in synthetic salts, subject to experimental confirmation.

In summarizing the content of the article, the author states that the methods of comparative leaching-out and of investigating emanations proved to be useful in establishing the forms in which microquantities of radioactive elements are present in crystalline substances. The assumption that the parent substances occupy a position in the crystal lattice which is different from that occupied by the products of their decay is held to be confirmed by the results of experimental investigations carried out by the methods of leaching out and study of emanations. The separation of isotopes of parent substances from the products of their decay (Th and Rd Th, U I and U II, Pb and Ra D) is explained by the different positions occupied by these elements in the crystal lattice. The lower degree of leaching-out of Rd Th as compared with Th X is explained by the higher adsorbability of Rd Th. Available data on the content of radioelements in natural waters are found to be in complete agreement with the concepts concerning the mechanism of the migration of radioelements advanced by the author.

16. Separation of Zirconium From Hafnium by the Adsorption of Hafnium on Silica Gel From a Solution of Tetrachlorides in Methyl Alcohol

"Adsorption on Silica Gel of Tetrachlorides and Methoxychlorides of Zirconium and Hafnium," by I. A. Sheka and B. A. Voytovich, Institute of General and Inorganic Chemistry, Academy of Sciences Ukrainian SSR; Kiev, Ukrainskiy Khimicheskiy Zhurnal, Vol 25, No 3, May/Jun 59, pp 317-321

It was established in earlier work done in the US that when a natural mixture of Hf and Zr containing 1-2% of Hf is separated by selective adsorption of the terachlorides on silica gel from a methyl alcohol solution, one can obtain 30-40% concentrates of hafnium with a yield of about 60% and zirconium dioxide with a low content of hafnium (0.02-0.05% of Hf). The yield of zirconium dioxide amounts to 20-50% depending on the content of hafnium in the zirconium dioxide. Dioxides of zirconium and hafnium of higher purity and in higher yields are obtained by other methods. Results obtained in the investigation described in this instance indicate that alcoholysis of the tetrachlorides resulting in the formation of methoxychlorides is the reason for the imperfect separation by this method: the methoxychlorides, which always form, do not separate as well as the tetrachlorides.

Radiation Chemistry

17. Effect of the Radioactivity of Precipitates on Their Properties as Adsorbents

"Concerning the Problem of the Effect Exerted by the Radioactivity of Precipitates on Their Properties as Adsorbents," by V. I. Spitsyn and E. V. Gromov; Leningrad, Radiokhimiya, Vol 1, No 2, Mar/Apr 59, pp 181-184

The effect of the addition of radioactive isotopes (S_{35} and Ra) on the adsorption of dyestuffs by barium sulfate was investigated. It was established that the adsorption of methylene blue decreases as the specific radioactivity of barium sulfate produced by radioactive sulfur increases, while that of acid orange increases. A reverse relationship is observed when the radioactivity is produced by the presence of radium in the barium sulfate. It is assumed that the phenomena observed result from the generation of charges on the surface of the precipitate. The charge is positive when beta particles are emitted and negative when the emission is that of α particles.

Radiochemistry

18. Isolation of Radioactive Manganese

"Isolation of Radioactive Carrier-Free Manganese From Chromium Irradiated With Deuterons," by L. N. Burtseva, V. I. Levin, M. M. Golutvina, and V. S. Butnov; Leningrad, Radiokhimiya, Vol 1, No 2, Mar/Apr 59, pp 231-235

Checking of a method for the isolation of carrier-free radiomanganese from chromium irradiated with deuterons, which comprises oxidation of chromium to chromate and coprecipitation of manganese with ferric hydroxide followed by separation of the iron by extraction with ether + HCl, showed that application of bromine for the oxidation of chromium results in large losses of radiomanganese as a result of oxidation of the latter to higher valencies. If hydrogen peroxide is used for the oxidation of the chromium, the degree of recovery of radiomanganese comprises no less than 80%. The procedure modified in this manner enables one to obtain radiochemically pure preparations of carrier-free radiomanganese.

19. Concentration of Radiophosphorus by Using Triphenylphosphine Oxide

"Concentration of Radiophosphorus by Using Triphenylphosphine Oxide," by V. D. Nefedov, Ye. N. Sinotova, V. M. Smirnov, and M. A. Toropova; Leningrad, Radiokhimiya, Vol 1, No 2, Mar/Apr 59, pp 236-238

A method is described for the concentration of radioactive phosphorus produced by the irradiation of $(C_6 H_5)_3 PO$.

20. A Method for the Separation of Pa 233

"A Method for the Separation of Pa^{233}," by I. Ye. Starik and L. D. Sheydina; Leningrad, Radiokhimiya, Vol 1, No 3, May/Jun 59, pp 270-272

A new method has been developed for the separation of the artificial protactinium isotope with the mass 233. The method is based on the separation of the protactinium from the principal quantity of splinter radioelements contained in irradiated thorium by coprecipitation of the protactinium with zirconium mandelate and subsequent thorough purification of the protactinium from zirconium by selective adsorption of the first on the surface of glass filters. The method is rapid and simple. It does not require application of hydrofluoric acid and, for that reason, no platinum dishes are necessary. The yield of Pa^{233} amounts to about 70% of its content in preparations of irradiated thorium.

21. Method for the Separation of In^{150m}

"Methods for the Separation of Carrier-Free Radioactive Isotopes; Part 7. Separation by Means of an Electric Field of the Radioactive Isotope In^{115m} Formed as a Result of the β -decay of Cd^{115}," by Z. V. Pastukhova and N. P. Rudenko; Leningrad, Radiokhimiya, Vol 1, No 3, May/Jun 59, pp 273-276

A method has been developed for the separation of the radioactive isotope In^{115m} from cadmium irradiated with neutrons. The recoil atoms are collected by means of an electric field of a high potential.

22. Separation of the Isotopes Tc^{99m}, Nb^{97}, and Nb 95

"Methods for the Separation of Carrier-Free Radioactive Isotopes; Part 8. Separation by Means of an Electric Field of the Radioactive Isotope Tc^{99m} and Investigation of the Possibility of Separating by This Method the Radioactive Isotopes Nb^{97} and Nb^{95}," by N. P. Rudenko and Z. V. Pastukhova; Leningrad, Radiokhimiya, Vol 1, No 3, May/Jun 59, pp 277-282

The possibilities of separating the radioactive isotopes Tc^{99m} (formed by the β -decay of Mo^{99}), Nb^{97} (formed by the β -decay of Zr^{97}), and Nb^{95} (formed by the β -decay of Zr^{95}) by the collection of recoil atoms through the action of an electric field were investigated. It was established that Tc^{99m} can be separated quantitatively by this method. For Nb^{97} the yield does not exceed 50%. It was established that the method is not quite suitable for long-lived isotopes even when preparations with a very high specific activity are treated.

23. Solubility of Polonium Hydroxide in Water

"Determination of the Solubility of Polonium Hydroxide," by D. M. Ziv and I. A. Efros; Leningrad, Radiokhimiya, Vol 1, No 3, May/Jun 59, pp 220-224

The solubility of polonium hydroxide in water was determined and found to be equal on the average to $[3.7 \pm 1.5]\ 10^{-5}$ mols per liter. The solubility product of polonium hydroxide was calculated and found to be equal to 10^{-37}. The purpose of the investigation was to establish whether polonium is present in aqueous solutions in the form of a radiocolloid, i.e., whether or not the solubility of $Po(OH)_4$ is low enough to warrant the assumption that dilute solutions of salts of this element contain $Po(OH)_4$ in the colloidal state.

The work described was carried out in 1952.

24. Chemical Behavior of Radioactive Bromine Recoil Atoms Formed by Nuclear Reactions of Neutrons With Inactive Bromine

"The Chemical Action of Radioactive Bromine Atoms Formed as a Result of the Reaction With Neutrons of Bromine in Halogen-Substituted Methanes," by A. N. Nesmeyanov, Ye. A. Borisov, and I. Zvara; Leningrad, Radiokhimiya, Vol 1, No 3, May/Jun 59, pp 325-335

The distribution of active products formed by chemical reactions of recoil atoms of bromine generated as a result of the nuclear (n, γ) reaction of inactive bromine in CH_2Br_2, CCl_3Br, CCl_2Br_2, and $CHBr_3$ was investigated and the dependence of this distribution on the concentration of bromine and of allyl bromide added before irradiation was studied. It was found that the recoil atoms form only the original parent compounds by diffusion (thermal) processes. A scheme is proposed which describes the stabilization of recoil atoms in thermal reactions. It was confirmed that in high-energy processes there is replacement of bromine, chlorine, and hydrogen by recoil atoms in the compounds irradiated. On the basis of the results obtained, stabilization of bromine recoil atoms by the mechanism of inelastic collisions is regarded as proven. It was found that there is a difference in the distribution of Br^{80m} and Br^{82} after irradiation of CCl_3Br or CCl_2Br_2.

25. Investigation by the Emanation Method of Processes Taking Place in Solid Substances During Heating

"Application of the Emanation Method for the Investigation of Processes Taking Place in Solid Substances During Heating," by K. B. Zaborenko, A. M. Babeshkin and V. A. Beyevska; Leningrad, Radiokhimiya, Vol 1, No 3, May/Jun 59, pp 336-345

Curves have been plotted which show the changes of emanation with the temperature when barium sulfate and barium carbonate containing radium isotopes are heated. On the basis of the shape of the curve, temperature regions could be differentiated which correspond to changes taking place in the compound during heating. These changes comprise elimination of adsorbed water, loosening of the crystal lattice, sintering, polymorphous transformations, and decomposition. The regions in question found in this manner for $BaSO_4$ and $BaCO_3$ coincide with the corresponding regions detected by other methods. New equipment applied in this investigation made it possible to obtain curves which show more clearly the regions in question. For this reason, transformations could be detected which were not noticed in work done by other investigators who used the emanation method.

26. Application of Frontal Chromatographic Analysis for the Separation of a Microcomponent From a Macrocomponent

"Frontal Analysis in Ion-Exchange Chromatography Involving Complex Formation; Part 2. Application of Frontal Analysis for the Separation of a Microcomponent From a Macroimpurity," by N. N. Matorina, N. D. Safonova, and K. V. Chmutov; Leningrad, Radiokhimiya, Vol 1, No 3, May/Jun 59, pp 353-359

The possibility was studied of applying frontal analysis for the purification of a microcomponent from macroimpurities on the example of a mixture of ethylenediaminetetraacetate complexes of Ca^{2+} (the macrocomponent) and Sr^{2+} (the microcomponent). To calculate the yield curve of the microcomponent, the dissociation constants of the ethylenediaminetetraacetate complexes of calcium and strontium and the constants of the ion exchange equilibria $Ca^{2+} - NH_4^+$ and $Sr^{2+} - NH_4^+$ were used. The coefficient of internal diffusion of Sr^{2+} in $NH_4^+ - Ca^{2+}$ resin was determined. The experimental results obtained were in good agreement with the theory. Comparison of results obtained by the method of frontal analysis with those obtained by the method of displacement ion-exchange chromatography showed that the quantity of the pure macrocomponent which can be separated by the first method exceeds by a factor of at least 18 the quantity of calcium separated under optimum conditions by the second method.

It is pointed out that problems of this type are frequently encountered in radiochemistry and nuclear chemistry.

27. Determination of the Relative Difference in Mobilities of the Ions of Radium and Barium

"Determination of the Relative Difference in the Mobilities of Radium and Barium Ions," by V. K. Kiselov; Leningrad, Radiokhimiya, Vol 1, No 3, May/Jun 59, pp 360-363

On the basis of the experiments described, the relative difference in the mobilities of thorium-X and barium ions at rather high concentrations was determined. The results obtained for thorium-X are also valid for radium, which is an isotope of thorium-X, because during the short time of the experiment (several hours) separation due to the isotopic effect could not have taken place. The relative difference of mobilities at infinite dilution amounts to about 3%; at a concentration of the

electrolyte equal to 2 gram equivalents per liter, the relative difference of mobilities for radium and barium ions was found to be 7% and for barium and actinium ions approximately 2.5%. Unweighable quantities of thorium-X and mesothorium II were used; however, this circumstance could not have had an effect on the behavior of the ions in an electric field.

28. Purification of Zr^{95} From Nb^{95}

"A Method for the Purification of the Radioactive Tracer Zr^{95} from Nb^{95}," by V. M. Vdovenko, L. N. Lazarev, and Ya. S. Khvorostin; Leningrad, Radiokhimiya, Vol 1, No 3, May/Jun 59, p 364

Zr^{95} used as a radioactive tracer forms the radioactive isotope Nb^{95} by β-decay. If glass wool is placed into a solution containing radioactive zorconium, the radioactive niobium that has formed is continuously removed: solutions of the zirconium tracer kept over glass wool for several months were found to be free of Nb^{95}.

29. --

Miscellaneous

30. Glass Tubing Introduced into the Coke-Chemical Industry

"First Experience in Using Glass Tubing in the Coke-Chemical Industry," by G. K. Talalayev, Makeyevskiy Coke-Chemical Works; Koks i Khimiya, No 7, 1959, pp 70-72

Heat-resistant glass tubing is recommended for use in conveying all corrosive substances with the exception of phosphoric and hydrofluoric acids and the salts of the latter.

The "Gomel Glass Works" is supplying the following glass tubing assortment: 1.5, 2, 3, and 4" in diameter and 1.5, 2, 2.5, and 3 meters long (in all diameters).

The tubing is supplied in three grades: (1) Marking STB--for working at atmospheric pressure; (2) marking ST-4--for working at a maximum pressure of 4 atmospheres; and (3) markings ST-8--for working at a maximum pressure of 8 atmospheres.

31. Prof Ye. V. Bobko, Soviet Agrochemist, Dies

"Yevgeniy Vasil'yevich Bobko," [unsigned article]; Moscow, Pochvovedeniye, No 8 Aug 59, pp 122-123

Prof Yevgeniy Vasil'yevich Bobko, Doctor of Agricultural Sciences, Active Member of All-Union Academy of Agricultural Sciences imeni V. I. Lenin, and an outstanding Soviet agrochemist, died recently in his 69th year.

Bobko graduated in 1912 from Kiev University. From 1918 to 1931 he held various positions as an instructor in agricultural institutes. In 1931 Bobko became deputy head of the Laboratory of Mineral Fertilizers and head of the Division of Microfertilizers, All-Union Institute of Fertilizers, Agrotechnology, and Agro-Soil Sciences. During 1941-1946 he was also head of the Laboratory of Mineral Nutrition, Institute of Plant Physiology, Academy of Sciences USSR. In 1949 he again changed positions and worked until 1951 in the Institute of Medicinal Plants, and from 1954 to 1959 he worked on the editorial board of the Institute of Scientific and Technical Information, Academy of Sciences USSR.

Bobko was the author of nearly 150 works. Of particular interest are his works on the chemical processing of phosphorites, the investigation on the problem of the formation of soda in soils, and on factors pertaining to soil reactions.

III. ELECTRONICS

Communications

32. Ultrasonic Television

"Television--With Ultrasonic Waves" [unsigned article]; Nepszava, Budapest, 3 Sep 59, p 4

Based on a study of the life of sea animals, scientists of an institute at Leningrad have designed a new type of television equipment that operates by means of ultrasonic waves. A special apparatus forms the sound waves into visible pictures and projects them onto a television screen.

Components

33. Universal Functional Converter for Electronic Simulation

"Universal Diode Functional Converter," by V. B. Smolov, Leningrad Electrical Engineering Institute imeni Ul'yanov; Leningrad, Izvestiya Vysshikh Uchebnykh Zavedeniy - Priborostroyeniye, No 5, 1958, p 14-18

Diode functional converters with standard operational amplifiers are ordinarily used in work on low-resistance or variable loads and are the basic functional devices for electronic simulating systems.

The simulation of nonmonotonic functions, however, requires changing the sign of the coefficients of the scaling factors of the input voltage and subsequently leads to complication of the circuit.

The author describes a circuit for a diode functional converter based on the use of an operational amplifier with differential input stage which is universal, in that it may be used to simulate any continuous function $z(x)$ and any sign of output voltage.

34. New Germanium Phototriode with Increased Sensitivity

"Germanium Phototriode," by A. Ya. Vyatskin, A. A. Gutkin, and A. F. Makhov, Leningrad Institute of Precision Mechanics and Optics; Leningrad, Izvestiya Vysshikh Uchebnykh Zavedeniy - Priborostroyeniye, No 5, 1958, p 11-13

Preliminary results are given of studies of special germanium p-n-p junction phototriodes developed by the authors.

Illumination of the phototriodes was from the emitter side and covered an area of approximately 2.5 mm^2. An incandescent lamp with a filament temperature T=2400°K served as the light source in the tests.

"Integral sensitivity of the majority of phototriodes studied under the given conditions of illumination was in the range of 1-5 a/lumen. Individual phototriodes had a maximum sensitivity of 10 a/lumen. Dark currents were, on the average, within the limits of 100-300 μa and reached one milliampere for phototriodes with maximum sensitivity (10 a/lumen). Volt-ampere characteristics for various degrees of illumination were also studied."

Absolute sensitivities were determined in a maximum spectral characteristic range of 1.6μ. For phototriodes with a conditional integral sensitivity ≃ 1 a/lumen, sensitivity was ≃ 60a/w. Phototriodes with a conditional integral sensitivity ≃ 2 a/lumen had a sensitivity ≃ 135 a/w.

Voltage sensitivity and noise level for the phototriodes were also determined.

The authors suggest that a study of the physical processes involved in the germanium phototriode would be of interest.

35. Transistorized Servo System

"Servo System with Transistorized Amplifiers," by Ye. A. Tanskiy and N. S. Nikolaenko, Leningrad Institute of Precision Mechanics and Optics; Leningrad, Izvestiya Vysshikh Uchebnykh Zavedeniy - Priborostroyeniye, No 1, 1959, pp 28-33

The performance characteristics of a low-power servo system can be substantially improved by replacing electron tubes in the amplifier stages with transistors. The system acquires greatest stability when amplifiers without balancing stages are used.

Two synchros and one induction motor were incorporated in this experimental servomechanism circuit. A negative feedback, proportional to the speed of the follow-up shaft, was introduced by means of a tachogenerator to compensate for errors. Investigation of the transients occurring during a change of synchro-transmitter shaft speed from 0 to 2.4 radians/sec showed that the highest value for misalignment angle was 2.5°, and that duration of the transients was 0.2 sec. The frequency response of the system is such that at a frequency of 0.5 cycles, an amplitude error of 2% and relative frequency error of about 0.02 will result. Such a transistorized amplifier has two stages. The voltage amplification factor, excluding the divider, is about 400; power amplification is about 53 db. The operating conditions for both amplification stages are selected in such a manner as to assure the required voltage and power amplification factors, as well as linearity of response. Type P1G and P3V transistors were used in the amplification circuits. The efficiency of the output stage was about 60%, power dissipation for each transistor was 1.2 w.

The calculated frequency response of the system was in close agreement with the experimentally determined values.

36. Effect of Nonuniformity of Magnetic Field on Performance of Magnetron

"Effect of Nonuniformity of Magnetic Field on Dynamic Characteristics of a Magnetron," by S. I. Bychkov, Leningrad Red Banner Air Force Engineering Academy imeni A. F. Mozhayskiy; Moscow, Nauchnyye Doklady Vysshey Shkoly, Radiotekhnika i Elektronika, No 1, 1959, pp 91-97

For satisfactory performance of a centimeter-range magnetron, a rather uniform magnetic field is required; however, the maintenance of such a stable highly-inductive field is often connected with great technical difficulties. The possibility for further reduction of the size of a magnetron is often restricted by the formation of a nonuniform magnetic field in radial and axial directions.

This investigation establishes the dependence of the output power and electron efficiency of a magnetron on the mode and degree of nonuniformity of the magnetic field in the zone of interaction. It was also revealed that axial nonuniformity of the magnetic field leads to unbalanced loading of the cathode. The experimental measurements have confirmed that the derived relationships could be used for approximate evaluation in change of power and electron efficiency, as influenced by the nonuniformity of the field; it was also shown that nonuniformity of the magnetic field can reach considerable values without disturbing excitation of the dominant mode of oscillations.

It was observed in a number of magnetrons that they would maintain stable operating conditions even if field nonuniformity reached 20%.

37. Simple Pulse Delaying Device

"Concerning a Pulse Delaying Device," by A. Karaminkov, Sofia; Leipzig, Hochfrequenztechnik und Elektroakustik, Vol 68, No 2, Jul 59, pp 42-49

A matched phase-shifting network is altered to act as a pulse delay network. The arrangement is supposed to store short-duration pulses fed to it. The input pulses, with a scanning frequency of 1/T, are converted into sinusoidal oscillations by means of a resonant circuit matched to the same frequency. The resultant oscillation is fed to an RC phase-shifting network, which effects the delay. The sinusoidal voltage is fed to a pulse-shaper stage, which produces the output pulses. The delay is constant; the arrangement is small in size, simple in design, and stable in operation.

Electromagnetic Wave Propagation

38. Azimuthal Deviation and Fading at 10-cm Wavelength

"Reception Amplitude and Fading Distribution at a Wavelength of 10 Centimeters Depending On the Azimuthal Deviation From the Great Circle," by R. Schuenemann and G. Pucher, Heinrich Hertz Institute, Berlin-Adlershof; Leipzig, Hochfrequenztechnik und Elektroakustik, Vol 68, No 2, Jul 59, pp 37-42

Experimental studies of the reception amplitude and fading characteristic in relation to the synchronous azimuthal deviation of the transmitting and receiving antennas showed that the influence of the structure of the refraction index of the troposphere on the propagation of very-high-frequency waves over long distances is very frequently similar to that of a fine stratification, which makes partial reflections possible.

The sharp focussing (1.5° half width) required for these measurements was done with a 4-meter parabolic reflector at a wavelength of 10 centimeters.

39. High-Speed Ring Counter

"High-Speed Ring Counter," by V. Ye. Bandura and N. I. Borodin; Moscow, Priborostroyeniye, No 8, Aug 59, pp 11-15

The article describes a high-speed ring counter incorporating trigger circuits in which the number of interstage connections for each stage always remains the same and is independent of the number of stages. The performance of such a circuit is somewhat unique in that each tube is conducting for exactly one half of the cycle, a fact which contributes to the speed of operation of the counter. In addition to the internal connections, each trigger circuit has two external connections from the anode of the preceding trigger circuit to the grid of the subsequent one. These external connections are made in such a manner that the high potential from the plate of a nonconducting tube is applied to the grid of a conducting tube, and only in one of the trigger circuits is the connection made in such a manner that the high potential from the plate of a nonconducting tube is applied to the grid of a nonconducting tube from the next trigger circuit.

For satisfactory operation of this type of ring counter the relative deviation of the component parameters should not exceed 1%, and that of the tubes not over 5%.

An experimental ten-significant-digit ring counter was assembled with 6N1P tubes. Checking the performance of this ring counter showed that it will operate satisfactorily in the frequency range of 0 to 500 cycles.

40. New Hodoscope Circuits

"Some New Hodoscope Circuits," by G. S. Akopyan, G. L. Marikyan, and V. M. Kharitonov, Physics Institute, Academy of Sciences Armenian SSR; Yerevan, Izvestiya Akademii Nauk Armyanskoy SSR, Seriya Fisiko-Matematicheskikh Nauk, No 1, 1959, pp 85-91

The appearance of miniature tube 6Zh2P with two control grids has permitted improving the neon cells in the hodoscope used by the Physics Institute of the Academy of Sciences Armenian SSR for their high-altitude tests. The neon tube MN-7 with current consumption of 6 milliamps has been replaced by tube PN-3 which consumes only 0.5 milliamps.

In their study of charged particles of cosmic radiation, the Physics Institute has used self-quenched Geiger counters, the number of which at a single installation might be as high as 1,000. As the number of counters increases, the problem of power supply to these counters becomes more complicated since the operating voltage of each counter is different. At the Physics Institute installations, even now, power supply circuits are used in which the negative potential is common to all counters, while the supplementary potential is supplied from individual potentiometers. Such a supplementary potential does not exceed 250-300 v. The network incorporates two groups of triple coincidence circuits, two channels of anticoincidence, and two quenching channels. The coincidence is accomplished with junction transistors of DGTs-26 type having a common resistance. In this circuit the pulses of triple coincidence differ in magnitude from pulses of double coincidence by a factor of 8, permitting an easy differentiation of the two. The circuit has two channels of amplification, an anticoincidence pulse-shaping channel, and two quenching channels.

When only coincidence pulses arrive, the output blocking oscillator is triggered from the plate; when coincidence and anticoincidence pulses arrive simultaneously, then a trigger pulse is not admitted to the blocking oscillator. If coincidence, anticoincidence, and quenching pulses arrive simultaneously, then the output blocking oscillator is again triggered from the grid.

41. Sensitive Multipurpose Semiconductor Amplifier

"Photoelectrometric Amplifier and its Applications," by L. F. Kulikovskiy and Yu. I. Vidmanov, Kuybyshev Industrial Institute imeni V. V. Kyubyshev; Leningrad, Izvestiya Vysshikh Uchebnykh Zavedeniy - Priborostroyeniye, No 5, 1958, pp 37-45

Semiconductor amplifiers for measuring small values of d-c currents and voltages were developed by the authors and are characterized by a large input impedance (on the order of 10^{17} ohms), high sensitivity and stability. These characteristics extend the application of the amplifiers to such fields as "the dosimetry of ionizing radiation in mass spectrometry, in biology, for the control of electrostatic fields in various dielectric media and also for the control of variations in potential of the air in regions of explosion-hazardous industrial enterprises."

Principle circuits for the amplifier are given as is a brief description of the electrostatic voltmeter type FEU-ZP, developed by Yu. I. Vidmanov at the Kuybyshev Institute imeni V. V. Kuybyshev, which employs a photoelectrometric amplifier.

42. New Vibration Pickup with Low Natural Frequency

"Inductive Vibration Pickup of Reduced Frequency," by I. B. Barger and B. I. Mal'tsev; Leningrad, Nauchno-Tekhnicheskiy Informatsionnyy Byulleten' -- Razdel Fiziko-Matematicheskikh Nauk, No 12, 1958, p 3-8

The theory of vibration measuring devices is discussed and conditions necessary for the design of a vibration pickup for the measurement of low-frequency vibrations (10 cps or less) are derived.

Design of such a pickup requires that it have a sufficiently low natural frequency which may be accomplished with the use of elastic elements having a "negative rigidity." This system is the basis of the circuit developed by Golitsyn for use in seismometry and is analogous to the principle of operation suggested by V. G. Podol'skiy and used in the vibration pickup developed by the authors at the chair of "Dynamics and Strength of Machines" of the Leningrad Polytechnic Institute imeni M. I. Kalinin.

An assembly drawing of the pickup and the basic circuit of the converter and amplifier are given.

"The natural frequency of the vibration pickup is on the order of 5 cps, which is 2.5 times less than the frequency of the vibration pickup AV-43 which is presently being produced." Amplitude characteristics were taken on an electrodynamic stand at a fixed frequency of 50 cps. Threshold of response was on the order of 40-50 microns. Amplitude characteristics were linear up to 1 mm.

43. Method for Determining Dielectric Characteristics of High-Loss Materials

"Use of a Q-Meter for Determining Dielectric Coefficients at High Losses," by L. M. Imanov; Baku, Izvestiya Akademii Nauk Azerbaydzhanskoy SSR, No 2, 1959, p 29-35

A method is suggested by which the dielectric characteristics of materials with high losses ($tg\delta > 1$) may be determined with minimum error.

In determining small Q-factors, the capacitor, which is connected to the circuit with a strongly attenuating substance, is inductively coupled and tuned to the Q-meter circuit. If the Q-factor of the measuring circuit is decreased, damping in the Q-meter circuit decreases, and a relationship may be established between the Q-factor of the measuring circuit and readings of the meter. This relationship takes the form:

$$Q_2 = \frac{1}{k^2}\left(\frac{1}{Q_1} - \frac{1}{Q_{01}}\right),$$

where Q_{Q1} is natural Q-factor of the Q-meter circuit, Q_1 is the Q-factor of the Q-meter circuit coupled with the measuring circuit, k is the coupling coefficient of the circuits, and, Q_2 is the unknown Q-factor of the second circuit.

The problem of constructing an equivalent circuit of the capacitor and sample material is discussed and errors in determining dielectric coefficients are computed. Maximum possible errors in determining tg δ and capacitance of the sample did not exceed 60% and 40%, respectively.

44. Graphic Description of Transformation Regime of Lossy Circuits

"A Graphic Method of Describing the Transformation Behavior of Lossy Circuits," by K. E. Mueller, Institute of High-Frequency Engineering and Electron Tubes, Dresden Technische Hochschule; Leipzig, Hochfrequenztechnik und Elektroakustik, Vol 68, No 2, Jul 59, pp 61-64

The article describes the use of the Smith diagram for lossy circuits, whereby the most suitable method of describing the transformation behavior is the conformal mapping of the right half plane of resistance and conductance, respectively, represented in polar coordinates on the circle of unit radius.

The general representation of the transformation behavior is explained in detail by means of two examples.

Materials

45. Method for Determining Electrical Properties of Semiconductors

"Method for Measuring Resistance and Capacitance of Semiconductors and Semiconductor Rectifiers," by I. M. Yashukova; Leningrad, Nauchno-Tekhnicheskiy Informatsionnyy Byulleten' -- Razdel Fiziko-Matematicheskikh Nauk, No 12, 1958, p 20-28

Circuits using a square pulse voltage source of small pulse duration were designed for measuring the resistance and capacitance of semiconductors and semiconductor rectifiers.

The circuit for measuring the resistance of a sample contains a resistance in series with the sample, an oscillograph for measuring current pulse, and a pulse voltmeter for measuring the applied pulse voltage. When the capacitance of the sample is large, two identical resistances are used on each side of the sample.

An equivalent circuit is also shown for measuring the capacitance and resistance of rectifiers.

The described method was used for measuring samples of polycrystalline cadmium selenide, cadmium sulfide, and selenium and copper oxide rectifiers.

46. New Plastic Scintillators

"Plastic Scintillators Containing 1, 2-di(1-Naphthyl)-Ethylene," by L. L. Nagornaya and A. P. Kilimov, Khar'kov Affiliate, All-Union Scientific Research Institute of Chemical Reagents; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul/Aug 59, pp 63-66.

The luminescence and scintillation characteristics of solutions of 1,2-di(1-naphthyl)-ethylene in polystyrene were investigated by the method of high-temperature polymerization. Plastic scintillators were prepared which contain 1,2-di-(1-naphthyl)-ethylene as the principal luminescent additive or as an agent which shifts the spectrum. The scintillators that were prepared give a yield of light radiation following excitation with gamma rays which reaches 125-130% and 140-145% of the light yield given by a 2% solution of p-terphenyl in polystyrene.

47. Distortion of Full Energy Lines By Na I(Tl) Crystals

"Concerning a Certain Type of Distortion of Full Energy Lines by Na I(Tl) Crystals" by Yu. A. Nemilov, A. N. Pisarevskiy, and L. D. Soshin, Radium Institute, Academy of Sciences USSR; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul-Aug 59, pp 72-73.

The doubling of full energy lines by some sodium iodide crystals activated with thallium is considered.

48. The Conversion Efficiency of Sodium Iodide Crystals Activated With Thallium

"The Scintillation Conversion Efficiency of Na I (Tl) Crystals," by I. I. Lomonosov, A. N. Pisarevskiy, and L. D. Soshin, Radium Institute, Academy of Sciences USSR; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul-Aug 59, pp 70-71

The scintillation conversion efficiency of Na I (Tl) crystals grown by different methods was investigated. It was established that the conversion efficiencies determined in previous investigations are too low.

49. Properties of Antimony Sulfide-Bismuth Sulfide Layers

"Properties and Structure of Three-Component Semiconductor Systems; Part VI - Electrical and Photoelectric Properties of Layers of the System $Sb_2 S_3$ - $Bi_2 S_3$," by B. T. Kolomiyets and V. M. Lyubin; Leningrad, Fizika Tverdogo Tela, Vol 1, No 5, May 59, pp 740-747.

Results are reported of an experimental investigation of electric and photoelectric properties of layers of $Sb_2 S_3$ - $Bi_2 S_3$. The data obtained are compared with those applying to the semiconductor properties of three-dimensional samples having the same composition as the layers. The effect of heat treatment on the properties of the layers is discussed.

50. Properties of Aluminum Antimonide With Conductivity of the n-Type

"Electrical Characteristics of AlSb of the n-Type," by D. N. Nasledov and S. V. Slobodchikov, Leningrad Physico-Technical Institute, Academy of Sciences USSR; Leningrad, Fizika Tverdogo Tela, Vol 1, No 5, May 59, pp 748-754

Changes in the temperature dependence of the specific electrical conductivity, the Hall constant, and the differential thermal electromotive force of aluminum antimonide alloyed with selenium and tellurium, i. e., exhibiting a conductivity of the n-type, were determined. The results obtained and the conclusions drawn from these results are presented in the paper.

51. Properties of Indium Antimonide of High Purity

"Electrical and Galvanomagnetic Characteristics of InSb of High Purity," by N. I. Volokobinskaya, V. V. Galavanov, and D. N. Nasledov, Leningrad Physico-Technical Institute, Academy of Sciences USSR; Leningrad, Fizika Tverdogo Tela, Vol 1, No 5, May 59, pp 755-760

Results are reported of an investigation of the electrical conductivity and the Hall effect in indium antimonide of high purity. The conductivity and the Hall effect were determined in the temperature range of 77-500°K in magnetic fields ranging from 60 to 25,000 oersteds. It was established that the Hall effect shows anomalies at low temperatures and that there are also anomalies in the low temperature range as far as the dependence of the electrical conductivity on the intensity of the transverse magnetic field is concerned.

52. Changes in the Thermal Electromotive Force of Indium Antimonide and Gallium Antimonide on Melting

"Investigation of the Thermoelectric Characteristics of InSb and GaSb in the Region of Melting and in the Liquid State," by A. I. Blum and G. P. Ryabtsova, Institute of Semiconductors (Leningrad), Academy of Sciences USSR; Leningrad, Fizika Tverdogo Tela, Vol 1, No 5, May 59, pp 761-765

Results of an investigation of the thermal electromotive forces of GaSb and InSb in the region of melting and in the liquid state are reported in the paper. A sharp change in the thermal electromotive force at the melting point and a complex temperature course of the thermal EMF in the region of melting have been observed on pure samples. The values of the thermal electromotive force and the temperature course of the EMF at the melting point and above the melting point which have been established in this instance are characteristic for a number of metals. The results obtained in the investigation of the thermal electromotive force of the two compounds in question as well as determination of other electric characteristics of these compounds indicate that they assume a metallic state on melting.

53. Thermoelectric Characteristics of Gallium Antimonide

"Thermoelectric Properties of Gallium Antimonide (GaSb)", by A. I. Blum, Institute of Semiconductors (Leningrad), Academy of Sciences USSR; Leningrad, Fizika Tverdogo Tela, Vol 1, No 5, May 59, pp 766-773

Results are reported of an investigation of the thermoelectric properties of GaSb of different degrees of purity in the temperature range from minus 190° to plus 60°C. Using known relationships derived from the theory of non-degenerate semiconductors with an atomic type of bonds, a calculation of the concentrations of electrons and holes has been carried out as well as of their mobility in the region of impurity conduction. Furthermore, the effective mass of current carriers in the region of impurity conduction has been determined. A formula has been derived which correlates the thermal electromotive force with the width of the forbidden zone and with the ratio of mobilities of current carriers. The value of this ratio which applies to the region of intrinsic conduction has been calculated.

54. The Resistance of Sputtered Bismuth

"The Specific Resistance of Sputtered Bismuth", by M. N. Markov and I. S. Lindstrem, Physics Institute imeni P. N. Lebedev, Academy of Sciences USSR; Leningrad, Fizika Tverdoga Tela, Vol 1, No 5, May 59, pp 827-828.

It was established in the work described that the critical thickness of sputtered bismuth layers, i. e., the thickness below which there is a sharp increase of the specific resistance, comprises approximately 0.1 μ. The specific resistance of bismuth layers deposited on different supports (glass, nitrocellulose, sodium chloride) was found to be the same independently of the nature of the support. On the basis of the results obtained, it is concluded that the critical thickness of sputtered bismuth is considerably greater than that found by P. G. Bryant, H. U. Rhoads, and A. H. Weber (Physical Reviews, Vol 92, 1953, p 1083). The critical thickness which was established is also considerably greater than that of gold, silver, platinum, and other metals with higher melting points than bismuth. This indicates that bismuth is no exception to the rule that the critical thickness increases rapidly with the reduction of the melting point of the metal.

55. A Method for the Determination of Germanium in Coal

"Concerning the Problem of a Method for the Determination of Germanium in Coal," by F. A. Baryshnikov, I. L. Ruzinova, and V. Ya. Fedosova, Institute of Mining, Siberian Department Academy of Sciences USSR; Novosibirsk, Izvestiya Sibirskogo Otdeleniya Akademii Nauk SSSR, No 6, Jul 59, pp 75-80

A simple and convenient method for the determination of germanium in coal has been developed. A colorimetric determination of the compound formed by the reaction of germanium with phenylfluorone forms the final stage of the analytical procedure. The discrepancy between the results of the chemical and spectroscopic analyses comprises 5-15% at quantities of germanium amounting to 0.01 - 0.005% of the coal ash. The results obtained apply to Kuznetsk Basin coals. It is assumed that equally good results will be obtained in the analysis of other coals by this method.

56. On Ceramic Electrets

"Ceramic Electrets," by E. Schleicher, VEB Keramische Werke, Hermsdorf; Berlin, Experimentelle Technik der Physik, Vol 7, No 4, 1959, pp 168-181

Ceramic electrets afford certain advantages over organic electrets with respect to practical use and manufacturing conditions. The behavior of the electric charge in relation to various external influences (material, polarization, thickness, dielectric material, storage) is discussed.

Thin polished electret circular plates less than one millimeter in diameter showed a rapid drop of surface charge as a result of the diffusion of the electrode material into the dielectric.

The electrode material and the conditions of its application are decisive for the magnitude and the time constant of the surface charge density of electrets, as long as the polarization field is sufficent.

Short-circuited (wrapped in metal foil) electrets stored with solidly connected electrodes (as usually recommended) showed a more rapid drop of surface charge than those stored in an open condition; the reason for the surface charge decrease was the disturbance of the field in the intermediate layer.

The timewise fluctuations of the surface charge density of electrets do not result from fluctuations of ambient temperature, air humidity, or air pressure, but must be ascribed to other external influences.

57. Rumanian Work on Ferrites Reported in Czechoslovak Periodical

"Interesting Items From Everywhere" [unsigned article]; Prague, Sdelovaci Technika, No 8, Aug 59, p 314

The Electrotechnical Research Institute in Bucharest has invented new types of ferrites which have a rectangular hysteresis loop, like other types, being distinguished by high permeability. Ferrites with a rectangular hysteresis loop are composed of magnesium oxide, manganese monoxide, and ferric oxide. By using technological methods utilized in ceramics manufacture, material with a fine, compact structure was obtained. Special attention was given to heat processing in production. These ferrites are suitable for use in memory cores, remote measuring and remote control equipment, electronic laboratories, and computers. Types of zinc manganate ferrites with high permeability, with anisotropic constant K and magnetostrictive coefficient very near zero, have been developed. The preliminary and supplementary processing assures homogeneous and compact material with large crystals. It has an initial permeability of 2,000 to 2,500 G/Oe. The tangent loss factor is δ= up to 10 x 10^{-6}

Ultrasonics

58. Ultrasonic Wave Generators

"Ultrasonic Wave Radiators with Y-Cut Quartz Piezoelements," by A. P. Sviridov, Ye. A. Karepin, A. I. Bystrov, V. G. Karpov, and S. K. Barashkov, Central Scientific Research Laboratory of Lengorispolkom of Local Industry; Leningrad, Izvestiya Vysshikh Uchebnykh Zavedeniy - Priborostroyeniye, No 1, 1959, pp 34-37

In a series of ultrasonic-wave generation tests with quartz peizoelements, it was discovered that a considerably higher intensity can be obtained with the Y-cut piezoelement than with the X-cut element, if such a Y-cut element is excited with electric potential applied along the Y crystallographic axis. It is assumed that at the interface of the excited piezoelement with the fluid medium there occurs a transformation of shearing oscillations in the quartz into the longitudinal oscillations in the fluid.

The experimental part of the test has shown that intensity of ultrasonic radiation with Y-cut piezoelectric quartz is almost twice that of the X-cut quartz. At the present time Y-cut piezoelectric radiators of ultrasonic waves are becoming more widely used for the purpose of cleaning delicate mechanisms and optical parts.

IV. ENGINEERING

Automatic Control Engineering, Instruments and Computers

59. Analysis of Transient Responses in Control Systems

"On Transient Responses in Optimalizing Systems of Control," by O. M. Kryzhanovskiy and V. M. Kuntsevich; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Energetika i Avtomatika, No 3, 1959, p 32-42

The authors note the necessity of studying transient responses in addition to steady-state oscillations for a more complete evaluation of control systems. It is shown how the present methods of studying transient responses in nonlinear control systems may be applied, in most cases, to the study of transient responses in systems of optimalizing control. The author limits his analysis to those control systems in which the optimalizing characteristic has only one maximum.

60. Optimum Characteristics in Servomechanisms With Varying Input

"On the Existence of Optimum Characteristics in Servomechanisms Activated by an Input Signal With Varying Sign, "by V. I. Kostyuk, Kiev Order of Lenin Polytechnic Institute; Kiev, Avtomatika, No 2, 1959, pp 56-70

This article considers the dynamic equations of linear servo systems of the second and third order which are activated by input signals of varying sign, as in the so-called corrective servomechanisms used in combined systems.

It is established that in servo systems of the third order and higher which are activated by a signal of varying sign, an optimum characteristic exists as a result of the fact that, in the enlargement of the amplification factor of the system, the forced component of the error decreases whereas the free component of the error increases at a rather rapid rate.

When the amplification factor of a linear servo system of the second order increases, the error decreases, since the free component of the error increases slowly; minima occur only when the frequency of the input signal increases to a point where a transient process cannot be completed. An optimum relationship exists also at the output of the system, beyond the limits of linearity. In this case, the location of the minimum depends also on the amplitude of the input signal.

It is possible to construct a servo system in which the amplification factor varies in relation to the frequency of the input signal, in accordance with the optimal compounding characteristic.

61. Theory of Combined Systems and Cybernetic Control

"Basic Problems of the General Theory of Adaptive Cybernetic Automatic Control Systems," by A. G. Ivakhnenko, Institute of Electrical Engineering, Academy of Sciences Ukrainian SSR; Kiev, Avtomatika, No 2, 1959, pp 1-18

This is the fourth and final article of this series and deals with the fundamental problems of the theory of combined cybernetic-ordinary control systems.

Cybernetic systems are defined as those possessing adaptive characteristics to enviromental conditions, such as reference, program, parameters, nonlinearity, algorithms, probability, sphere of action, impulses, structure, etc. An analogy is established between the basic schemes of cybernetic systems and ordinary systems which do not possess these adaptive characteristics. In both systems it is possible to apply the principle of control according to disturbances and control according to output (feedback principle). The theory of combined systems, which was devised for ordinary control systems, can also be applied to cybernetic systems. This can be illustrated by a comparison of the equations of systems involving stabilization and optimal systems. In steady-state routines, combined systems retain both the energetic and cybernetic (i.e., adjustment) advantages.

Two methods are discussed for eliminating the steady state error; one involves a change in the numerator and the other a change in the denominator of the static factor. The determination of the error due to search is also discussed. It is shown that a knowledge of the optimum characteristics is necessary only in the case of systems which react according to disturbances, whereas, in feedback systems, it is sufficient to know that an optimum exists. An example is given of a rough approximation method which gives precise indications for detecting disturbances and for proving the existence of the optimum.

Rules are given for selecting control system schemes which hold for both ordinary and cybernetic systems. The advantage of combined systems with transient response is the greater range of application of invariantness conditions, which increases precision and rate of response.

62. Modulating Pulses and Polarity Matching in Optimum Controller

"Optimum Controller With Pulse Modulation," by P. I. Akinin, Kiev Order of Lenin Polytechnic Institute; Kiev, Avtomatika, No 2, 1959, pp 71-80

An optimum controller is discussed which employs modulating pulses to determine the location of an object in relation to the optimum. During the modulation, a synchro receiver is switched on only after a certain magnitude of the deviation of the system from the optimum has been reached, and after the polarity of the modulating pulse has been matched with the sign or the required change of the controlling action (matching by means of a logic unit).

An analysis of the operation of the arrangement provides expressions for the determination of the time parameters of the modulating pulses, as well as for the construction of the transient forms.

Three operational regimes are recorded for the motive element (synchro receiver) influenced by the modulating pulses (switching on the synchro receiver, switching on the matching relay without switching on the synchro receiver, and switching on neither matching relay nor synchro receiver), and the zones which correspond to these regimes are isolated according to a common characteristic.

For an exceptional case, when the amplification factor of the object varies in proportion with the absolute value of the optimum, the use of a nonlinear correction link is proposed, which affords the possibility of adjusting the system of the optimum control with forced oscillations in accordance with the mean, rather than the lowest, value of the amplification factor.

63. Optimalizing Control Systems Based on Gradient Method.

"Dynamics of Continuous Systems of Optimalizing Control Based on the Gradient Method," by A. A. Krasovskiy; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Energetika i Avtomatika, No 3, 1959, p 43-49

Certain problems concerning the dynamics of continuous systems of optimalizing control with several control values and measurement of the component of the gradient of the optimalizing function are considered.

When deviations from the point of the extreme are small, such systems may be treated as linear. The properties of these systems are determined simply by the quadratic form which approximates the characteristic of the object in the vicinity of the point of the extreme.

The method of synchronous detection, using a signal generator to produce the required small oscillations, is used to measure the components of the gradient.

64. Simplified Solution of Synthesis of Optimal Control System With Bounded Third Derivative

"On the Optimal Transient Processes in a System With Bounded Third Derivative," by A. A. Pavlov, Moscow; Moscow, Avtomatika i Telemekhanika, No 8, Aug 59, pp 1020-1036

This work considers the optimal relay system of a third-order automatic control system, the linear section of which is represented by a combination of three integrating sections, relay, servomotor, and controlled device, the latter itself consisting of two integrating sections. The functional mechanism in the system is a servomotor with a constant speed and controlled by a relay, such as a hydraulic servomotor, and the third derivative of the control value in the system is bounded. The problem of the synthesis of the optimal control section of the system is carried out here only for a narrowly limited class of initial conditions connected with the distortions of the three main sections.

The problem involving the synthesis of an optimal control system with bounded third derivative was first solved by A. A. Fel'dbaum (Avtomatika i Telemekhanika, Vol 16, No 2, 1955), who obtained an expression for the surface of transition which guarantees an optimal motion of the imaginary points in the phase space toward the origin of coordinates under arbitrary initial conditions.

This article presents a different approach to the solution of the synthesis problem. A simpler expression is obtained for the optimal control principle, which guarantees an optimal handling of step-by-step distortions. Other types of distortions, such as those which are linearly variable with time according to the quadratic or cubic law, are not handled optimally by the system considered here, since the number of transfer processes is too high. The simplification of the structure of the controlling section of the automatic control system is, however, fully justified for several cases.

The work was done in the Institute of Automatics and Telemechanics, Academy of Sciences USSR, under the direction of B. N. Petrov, Corresponding Member of the Academy of Sciences USSR.

65. Floating Controller Employing Nonlinear Compensation in Delay System

"Control of a First-Order Delay System by Means of an Astatic Controller With Nonlinear Correction," by S. V. Yemel'yanov, Moscow; Moscow, Avtomatika i Telemekhanika, Vol 20, No 8, Aug 59, pp 1009-1019

This article considers the possibility of stabilizing and improving the quality of a dynamic delay system described by second-order differential equations by means of a nonlinear converter which changes the structure of the system during a transfer process, depending on the sign and ratio of two coordinates, the controlled parameter and its derivative.

The amplification factor of the regulator is selected so that the first half wave of the transfer process influenced by one form of perturbation will satisfy certain requirements of quality control. Various relative values are considered for the constant delay time and the time interval between maximum deviation of the controlled coordinates and the end of the first half wave of the transfer process, in the absence of auxiliary stabilization.

66. Motion of Precession Axis in Floated Gyro Studied

"Floated Two-Degree-of-Freedom Gyro-Compass with Elastic Bearings on Precession Axis," by M. A. Sergeyev, Leningrad Institute of Precision Mechanics and Optics; Leningrad, Izvestiya Vysshikh Uchebnykh Zavedeniy—Priborostroyeniye, No 5, 1958, p 69-75

A theoretical study is made of the motion of the sensing element of a two-degree-of-freedom floated gyro-compass with elastic bearings on the precession axis. The accuracy of indication of such a gyro is compared with that of an ordinary floated gyro-compass.

The author makes the following conclusions:

"1. To decrease the error of nonverticality of the precession axis it is necessary:

"a. that the relationship of the design parameters $\frac{P}{H}$ and $\frac{Q}{H}$ be sufficiently small in designing the instrument;

"b. to balance the sensing element so that the moment created by lift around its pivot axis balance the gravitational moment around the same axis $(\psi_z \approx 0, \psi_x \approx 0)$.

"c. to place the precession axis of the instrument along the vertical $(\rho \approx 0, \delta = 0)$.

"2. In relation to the position of the center of gravity and the center of volume of the sensing element along the east-west axis, it is possible to have damped, undamped, and divergent oscillations as well as aperiodic motion of the sensing element.

"3. The period of free undamped oscillations may be determined by the formula:

$$T = 2\pi \sqrt{\frac{A}{HU\cos\varphi} + \frac{H}{cU\cos\varphi}},$$

in which, in addition to the static moment of inertia of the sensing element A, the dynamic moment of inertia $\frac{H}{c}^2$ is also considered."

67. Ionic-Mechanical Accelerometer

"One Type of Ionic-Mechanical Acceleration Data Unit," by L. A. Goncharskiy and V. I. Ryzhenko, All-Union Correspondence Institute for Railway Transport Engineers; Moscow, Nauchnyye Doklady Vysshey Shkoly, Radiotekhnika i Elektronika, No 1, 1959, pp 226-231

The ionic-mechanical accelaration pick-up unit (acceletron), designed by the authors, incorporates as its basic element the TKh3B thyratron with cold cathode.

The arrangement of the components of this acceletron is as follows: on both sides of a movable nickel anode mounted on a tungsten spring are located two fixed molybdenum cathodes; the active surfaces of these flat electrodes are parallel and facing each other. The outer surfaces of the electrodes are protected by a layer of insulating material to prevent discharge leakage, which would disturb the normal performance of the device. The voltage at the tube's electrodes depends on the distance between them. The retarded glow discharge between cathode and anode has to pass through a rectangular aperture.

If a sufficiently sensitive electromagnetic oscillograph is connected to such an acceleration data unit, the readings of acceleration can be taken without any preliminary amplification of the signal.

The gap between electrodes is 1 mm and the gas pressure in the tube is 25 mm Hg. Under normal operating condition of 160 v, the sensitivity of electrodes with respect to acceleration is about 3 v/g (g being gravitational acceleration).

68. Large-Capacity Digital Computer "LEM-1" Described

"Experimental Digital Computer LEM-1 with Ferrite Components," by L. I. Gutenmakher and Yu. A. Makhmudov; Baku, Izvestiya Akademii Nauk Azerbaydzhanskoy SSR, No 2, 1959, p 47-60

The authors examine some of the problems involved in the development and construction of an experimental high-speed large-capacity memory device using contactless magnetic and capacitive elements which was developed at the Laboratory of Electromodelling of the All-Union Institute of Scientific and Technical Information of the Academy of Sciences USSR.

"In the laboratory a three-cycle circuit of magnetic elements is used because of its reliability and stability, although it requires more cores to store one unit of information and has a more complex supply circuit (three-phase) than the single-cycle or two-cycle circuits.

Basically, in logic and computer devices, the following types of magnetic elements are used:

"1. Storage element P -- used in registers for short-term storage of codes, in delay lines, etc.

"2. Amplification element M -- used for amplifying signal power.

"3. The 'sign-difference' element P -- performs the logical operation of changing sign.

"4. Coincidence element I -- performs the operation of logical multiplication.

"5. Suppress element Z -- performs the logical operation of 'negation'.

"6. Dynamic trigger.

"7. Oscillating element G -- performs the function of master oscillator."

Basic specifications of the LEM-1 computer are:

Arithmetic: binary, fixed point

Internal memory: 8,192 addresses

Permanent memory: 7,167 addresses

Operating memory: 1,023 addresses

Instruction code: single-address for main internal memory
three-address for operative memroy cells

Magnetic tape external memory unit capacity: 65,536 instructions
Power requirement: 4-4.5 kW
Space required: $2m^2$ (less external units)

Translation from one language to another is suggested as one of the many uses for the LEM-1 computer.

"It will be possible in the LEM-1 machine to solve the problems of checking the algorithm of nomenclature translation of names of organic compounds. This is unique translation from one language to another. One and the same object -- the structural formula of an organic compound -- may have several different designations. The problem involved is to build a structural formula from any designation and, from the structural formula, establish a designation in some specific system which is acknowledged as the standard.

"An analysis of the algorithm developed in the laboratory shows that the number of variable instructions in the translation program is small. This permits us to place the program, basically, in the permanent memory unit and thereby use the large volume of the high-speed storage of the machine.

"The problem of nomenclature translation using existing methods of organizing dictionaries is evolving very slowly. In order to increase the speed of this operation it is suggested that an automatic address-type dictionary be used; the principles of such a dictionary have been developed in the laboratory."

"Results of the development of the LEM-1 and experience gained in its exploitation will undoubtedly play an important role in the creation and construction of an information-logic machine with a large volume of high speed permanent storage."

Electricial Engineering

69. New Soviet Dielectric Material

"Asbodin," by M. Azarkh and V. Sidorov; Moscow, Nauka i Zhizn; No 7, Jul 59, pp 66-67

A new insulating material "asbodin" was developed at the "Asbest-Dinamo" plant in cooperation with the All-Union Scientific Research Institute for Technical Asbestos Articles. Asbodin possesses high mechanical properties, satisfactory dielectric characteristics, fair resistance to moisture, and will not disintegrate under the action of electric arc. Because of favorable combination of desirable properties, asbodin is now widely used in manufacturing certain parts for electric machinery. The asbodin mass, which is prepared from a mixture of asbestos fibers, synthetic rubber, iron oxide, and a few other minor constituents, is pressed to the desired shape at a relatively low temperature in special press-molds; then the parts are baked in electric furnaces.

Asbodin has replaced many other more expensive dielectric materials in manufacturing certain parts of electric machinery and instruments.

Mining Engineering

70. Mechanized Mobile Supports in Coal Mines

"The 'A-2' is Now Operating," by A. Goncharenko, Moscow, Yunyy Tekhnik, No 8, Aug 59, pp 15-17

The "A-2" coal-cutting and-loading combine with mechanized mobile supports was designed by the State Experimental Institute of Design and Construction for the Coal Machinery Industry (Giprouglemash) and was tested at a long-wall stope of the "Novo-Mospino" mine of the "Budennovugol'" trust.

With the aid of the "A-2" combine the coal extraction in thin seams has been increased almost three times as compared to the production of the coal-mining combine "Donbass." The mechanized-mobile supports of the "A-2" combine consist of a thick steel slab which supports the roof of a working stope with the aid of a huge telescoping column (jack). Beyond the row of supporting columns and along the long wall are located the coal conveyer and coal cutting machine. The "A-2" combine was tested in a 25-meter long-wall stope. The cutting machine travels the whole length of the long wall in a little more than one minute and takes a 8-cm deep cut. After every 8-cm bite into the coal seam, the cutting machine and every other roof supporting steel section with its column, called the "stope" section, are moved 8-cm closer to the working face, thus preventing any possible caving of freshly exposed roof in front of the working face. When 80 cm of coal has been removed (ten cuts), then the other alternate supports, called "caving" supports, are moved closer to the working face with the aid of a hydraulic mechanism, permitting the roof beyond the supports to cave in. It takes about 20 min to move the "caving" sections into the new advanced position. Thus the "stope" supporting sections and the "caving" sections are moved forward alternately to support the freshly exposed roof of the working stope.

Although this is the first experimental installation of its kind, it is expected that this method of coal mining will be widely used in the near future.

V. MEDICINE

Aviation Medicine

71. Training of Aviation Physicians

"Now We Shall Proceed With the Experiment," by Maj. A. Busyrev, Sovetskaya Aviatsiya, 19 Jun 59, No 142 (3312), p 4

"It is difficult and, at times, impossible to keep track of an airplane executing acrobatics. An inexperienced person admires the skill with which the aviator performs his stunts, having no idea of the enormity of the stress experienced by his organism at a high altitude and at high speed. The aviation physician, the aviator's constant and indispensable friend, enables him to tolerate this stress without experiencing any injury.

"Physicians of aviation squadrons and aviation units of the future must possess considerable knowledge and skill which they are acquiring under the supervision of prominent scientists and expert instructors. The future aviation physicians will have at their disposal a well-equipped, scientific base with facilities available to investigate the working conditions of flight personnel on earth and in the air, and to become familiarized with the peculiarities of medical safety in aviation under modern conditions.

"Aviation physicians must know well the effect that overload factors of a fast pursuit plane have on the organism of a flyer and they must find ways to control these harmful effects. Auditors at the Academy [S. M. Kirov Order of Lenin Military Medical Academy] accomplish all this with the aid of complicated instruments such as ground catapult trainers, special hermetic cabins, etc. Various electroencephalographs are also used. By analyzing biocurrents, they make it possible to compile a clear picture of the function of the higher organs of the central nervous system of a flyer.

"The S. M. Kirov Order of Lenin Military Medical Academy is not the only place where prospective aviation physicians are trained. Prospective aviation physicians serve their apprenticeship in air units where they receive practical training in the methods of medical supervision over the work of flight personnel, and they apply the knowledge which Lieutenant Colonels of the Medical Service I. M. Buznik, G. P. Lysenko, B. M. Savin and others have given them. The prospective aviation physicians also must go up in airplanes and make parachute jumps.

"Under the guidance of Colonel of the Medical Service Shishov, the large group of scientists of the academy observe the effects of acceleration on the organism of a flyer and study the problem of motion sickness control. The effects of temperature fluctuations on the efficiency of flyers is being studied in a laboratory directed by Doctor of Medical Sciences and Colonel, Medical Service, V. A. Bukov. Colonel, Medical Service, Prof V. P. Vasyutochkin and a group of scientists under his supervision have solved a number of problems connected with nutrition of flight personnel.

"Young physicians who have been trained by the best Soviet scientists will be entering our aviation units soon.

"A photograph accompanying the article, was taken by Ye. Kameneva. An oxygen respirator is shown and Candidate of Medical Sciences and Colonel Medical Service P. Vokhmyanin, saying to the auditor of the Academy, K. Sukhanov: 'Now we will proceed with the experiment.'"

72. Conduct of Aviation Medical Officers

"Professional Propriety of an Aviation Medical Officer," by Col Med Serv S. Dobrokhotov and Gds Col Med Serv S. Koloskov, Sovetskaya Aviatsiya, 18 Aug 59, No 193 (3363), p 2

The author of this article states that aviation physicians have great responsibilities. They must see that fliers remain in good health and must try to prevent causes for accidents in the air. Medical aid in aviation is increasing in importance as a result of new developments in aviation engineering. The aviation medical officer must be a man of principle, and if he is to speak with authority, he must be able to base his recommendations to the commanding officer on results of proper medical examinations and observations. Many medical officers change their recommendations when they deal with personnel of higher rank. In high ranking personnel, consideration must be given to changes that are due to age, professional propriety, in cases like this, must not be based on the rank or position of aviation personnel, but must be based on an objective evaluation of the health and general physical condition of each officer.

A case in which Maj Med Serv Tsitel'man observed the defects previously noted by the medical consultation board became more pronounced in flight officer Voronkov is described. Major Tsitel'man reported this fact to the commanding officer. Consequently, Voronkov was sent to a hospital for examination. The observations and conclusions of Major Tsitel'man were confirmed at the hospital and Voronkov was grounded.

The case of Kuznetsov is another example of the high professional decorum required of aviation medical officers. The regional commission declared that Kuznetsov was not fit for flight duty. Maj Med Serv Shcheglov disagreed. He knew Kuznetsov well and he knew the status of Kuznetsov's health. When Kuznetsov was ordered to be transferred, Shcheglov sent his opinion to the commanding officer, insisting that the flier be re-examined. The commanding officer accepted his opinion and the commission had to re-examine its decision.

Major General Platonov has stated that he thought it appropriate for an aviation medical officer to base his attitude on his daily contact with flight personnel as well as on objective data obtained from medical examinations and complaints of the aviator himself. The principal method of objectively evaluatiny flight personnel is a quarterly medical examination. Medical examinations are conducted differently by different medical officers: each follows a system found in a medical book.

The authors of this article do not think that this is sufficient. They think that the time is ripe for the Scientific Research Institute of Aviation Medicine and the Chair of Physiology of Military Work of the Kirov Military Medical Academy to establish a uniform method of medical examination. This method should take into consideration devices available to aviation medical officers and the conditions under which they must work. These scientific establishments also must consider supplying officers in aviation medicine with portable devices which will help preserve the health of flight personnel.

Bacteriology

73. Aerosol Particle Size

"A Simple Method for Determining the Size of Aerosol Particles," by A. I. Maslov; Moscow, Laboratornoye Delo, Vol 5, No 5, Sep/-Oct 59, p 42

"Inhalation therapy is being used more and more widely in medical practice, especially in treatment of diseases of the respiratory tract with antibiotic aerosols.

"It is known that the extent of the penetration of therapeutic aerosols into the respiratory tract depends on the size of their particles. It has been established that particles with a size of 100 microns or more are all deposited in the nose and mouth. Particles of 30 microns reach the large bronchi. Particles with a size of 10-30 microns penetrate the second- and third-order bronchi, and partially, the bronchioles. Only particles of 5 microns or less reach the terminal bronchioles and alveoli.

"It is apparent from this information that selective inhalation therapy of any branch of the respiratory tract requires the administration of a therapeutic aerosol with a definite degree of dispersion. Measurement of the particles is therefore obligatory.

"The degree of dispersion of an aerosol depends on many factors: the pressure of the air being supplied, the design of the sprayer, the viscosity of the solution, etc.

"We suggest the following, simple method of determining the dispersibility of an aerosol. A thin blood smear is put on a well-cleaned slide by the usual method. The smears are stained the same as for calculating the leukocytic formula, and are then dried. Two thirds American vaseline is mixed with one third purified vaseline oil. The mixture is carefully ground in a mortar, and a small amount of it is placed on the prepared blood smear. The mixture is then spread evenly over the entire surface of the slide so that a layer 1-2 mm thick is formed. After this, the slide is heated slightly until the mixture melts, and is then cooled. Such a slide can be prepared for storage and kept in a Petrie dish.

"For trapping the particles, the slides with vaseline on them are placed under an aerosol stream and left for 30-60 seconds (depending on the density of the aerosol). The diameter of the particles is determined immediately after this under a microscope; erythrocytes with an average size of 7.2 microns are used as a guide. Seven to ten particles are counted in one visual field. In each visual field, the count is again done on a 'sprayed' slide.

"In place of the mixture of American vaseline and purified vaseline oil, suggested by S. I. Endel'shteyn, we successfully used ordinary immersion oil to cover the slides; this oil does not affect the antibiotic particles of the aerosol, and keeps them on the slide. In this operation, two-three drops of immersion oil are placed on the blood smear and are spread over the slide evenly with another slide.

"Analogous data are obtained by either method of covering. The method which we propose affords the possibility of arriving at a very rapid conclusion concerning the suitability of the sprayer for treating any branch of the respiratory tract."

74. Bacteriological Studies of Reservoirs

"A Direct Method of Determining Bacteria in Sanitary Studies of Reservoirs," by L. Ye. Korsh, Institute of General and Communal Hygiene imeni A. N. Sysina; Moscow, Gigiyena i Sanitariya, Vol 24, No 5, Sep 59, p 85

"The author points out that one of the foremost highly urgent problems in the field of sanitary microbiology is the acceleration and improvement of sanitary-bacteriological investigation of water. This problem can be satisfactorily resolved by the direct method of determining microorganisms in water, which was proposed by A. S. Razumov in 1932 and which he used in sanitary studies of open reservoirs. By using this method, it is possible to determine the sanitary condition of the reservoir within 2 1/2 hours (instead of 24-48 hours when methods based on the calculation of bacteria on meat-peptone agar are used, as at present). On the whole, the method is as follows: a definite volume of water is passed through a membrane filter, which is then dried off, stained with erythrosin, dried again, and cleared with immersion oil; after this, microscopic counting of the microorganisms is done by the immersion system and an ocular micrometer. The number of microorganisms per ml (N) is calculated according to the formula: $N \frac{S \cdot n}{S_1 \cdot V}$, where S is the filtration surface of the apparatus (n in μ^2); n is the number of microorganisms on the surface surface of the ocular micrometer S_1 (in microns), and V is the volume of the filtered water (in ml).

"The use of direct calculation of microorganisms for a number of years in studies of the different sanitary conditions of the Klyaz'minskiy and Akulovskiy reservoir of the Canal imeni Moscow, and of the Moscow and Oka rivers permitted the author to determine the extent of bacterial contamination of the water in these reservoirs. Observations of them showed that the course of quantitative changes in microorganisms, calculated by the direct method corresponds to the indexes of the number of

saprophytic microorganisms and intestinal bacilli. In pure or moderately contaminated reservoirs or parts of reservoirs, the number of microorganisms calculated by the direct method was found to be within a range of 200,000-800,000 per ml. The number of microorganisms in contaminated reservoirs fluctuated from 800,000 to 2 million per ml and higher. In pure water, coccal forms of microorganisms were found to predominate (60-85% of the total), and in contaminated reservoirs, bacilliform. The method of direct calculation of microorganisms is simple and can be recommended for use in investigation of reservoirs."

75. Collection of Water Samples for Analysis From Open Reservoirs

"A Mechanized Method of Collecting Water Samples From Open Reservoirs for Physical-Chemical and Bacteriological Analysis," by S. A. Zakourtsev, Chair of General Hygiene, Tomsk Medical Institute; Moscow, Gigiyena i Sanitariya, Vol 24, No 9, Sep 59, p 80

"The author constructed an apparatus for the mechanical collection of water samples with a propeller motorboat (see illustration). The water receptacle is located at a depth of 0.5 cm and at a distance of one cm behind the propeller blade; it is a pointed iron funnel with a 2-cm opening at the front end. The rear end of the funnel passes into a horizontal pipe with a 1.5-cm opening which bends around the stern of the boat and passes under the top deck to the right, forward toward the engine. A T-piece is located at the center of the pipe; a stopcock with a diameter of 0.5 cm is screwed into the T-piece, which is installed in the passenger section of the boat. Water for laboratory investigation is drawn through this stopcock at a rate of one liter per 10-15 seconds during the lowest number of revolutions of the engine. The depth of sample collection can be changed within limits of 0.3-0.8 meter by transferring the weight or people from the fore or aft compartments of the boat. An elongated pipe with a diameter of one cm passes through the third opening of the T-piece and is used for cooling the engine with water. The possibility of oil, gasoline, or exhaust from the engine falling into the collected sample of water is prevented. The author regards the significant changes in the collection depth and the possible increase in the iron content of the sample from the iron receptacle and pipe as shortcomings of the method."

A diagram of the apparatus is given in the source.

76. Chamber for Observing Bacterial Growth

"A Chamber for Observing the Growth of Bacteria," by P. A. Ivashkevich; Moscow Laboratornoye Delo, Vol 5, No 5, Sep/Oct 59, pp 49-52

An apparatus designed for observing the development of separate microbial cells and the formation of microcolonies on the open surface of a culture medium is described. It consists of a heating table, a humid chamber, and a device which prevents condensation on the objective. The microorganisms are cultured on a thin (1.0-1.5mm) layer of cleared nutrient agar in a small bacteriological dish (with a diameter of 5.5-6.0 cm). After the droplets are placed on the agar in the center of the dish, the culture is dried for 5-7 minutes and placed on the heating plate which surrounds it on the bottom and sides. There is a window for illuminating the object in the center of the bottom of the heating plate. The heater is placed in the housing, whose lid touches the edges of the dish, thus providing a hermetic chamber. A thermometer, an objective holder, and a spiral are mounted on the lid. Details of the apparatus are shown in a diagram and the procedure is described. The working temperature of the chamber is 25-40° C.

A photograph of consecutive stages in the growth of microcolonies of separate spores of the STI antianthrax vaccine, viewed with the help of the chamber described, is shown.

77. Comparative Viability of Rickettsia Preserved in Vacuum

"Comparative Survival Time of Rickettsia prowazeki, mooseri, and burneti in Vacuum Preservation," by V. F. Ignatovich, Institute of Epidemiology and Microbiology imeni Gamaleya; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 30, No 7, Jul 59, pp 122-123

Results of a study of the effect of the composition of the medium, yolk sac concentration, and the residual moisture of dry preparations on the preservability of Rickettsia during the process of vacuum drying and subsequent storage are presented in this report. Yolk cultures of Rickettsia prowazeki (Breynl' and Ye strains), mooseri (B-1 strain), and burneti (Grita strain) were used. The method employed for preparing standard cultures is described. After titration on chick embryos, the infection titers of Rickettsia of the typhus group fluctuated from 10^{-6} to 10^{-8}, and of R. burneti, from 10^{-9} to 10^{-10}.

Vacuum drying was done by the usual method in the collector apparatus of a Dolinov system (exposure, 8 hours; drying at -18° to -20° for the first 2 hours and 15°-20° for the next 6 hours). The residual moisture of the dry cultures was determined by evaporation at 100° for one hour. The viable Rickettsia were determined quantitatively by titration in chick embryos.

The following media for drying were studied: buffer-physiological (5% phosphate buffer in physiological solution) and sucrose-buffer (10% sucrose with 5% phosphatebuffer) solutions, skimmed milk and a milk-sucrose medium (10% sucrose, 5% phosphate buffer, and skimmed milk), and a 5% peptone solution and a 5% peptone solution with 10% sucrose. The different Rickettsia were observed in these solutions for 1-2 years. The effects of the concentration of the yolk sac and of the residual moisture on Rickettsia were also studied for the same length of time. Initial and final titers are given.

The death of Rickettsia during the vacuum drying process was found to depend on the filler, the concentration of yolk sac (when sucrose media are used), and on the species sensitivity of the Rickettsia. Stability of the infection titers of the dry cultures guaranteed vacuum preservation at a low temperature. Preservation of rickettsial cultures without vacuum in dry air and especially in humidified air had a profound effect on the organisms.

78. Cryptococcus neoformans Phosphatases Studied

"Histochemical Studies of the Phosphatases of Cryptococcus Neoformans in Culture Medium and in Infected Brain Tissue," by Liu Yen-fang (刘彦仿) and Wang Po-yun (王伯澐), Department of Morbid Anatomy, Fourth Military Medical University, Peiping, Chung-hua Ping-li-hsueh Tsa-chih (Chinese Journal of Pathology), Vol 5, No 1, Feb 59, pp 30-34

This article reports the preliminary results of histochemical studies of the phosphatases of a strain of Cryptococcus neoformans as it appeared in infected brain tissue and when isolated and grown in a culture medium. The principal findings and conclusions were:

The capsule surrounding the cryptococcus found in the brain tissue of a patient with cryptococcosis and that of experimentally infected mice contained no acid phosphatase. But the cells of the fungus were rich in acid phosphatase and in this respect showed no noticeable change when isolated and grown in culture medium. Acid phosphatase, therefore, may be considered a constitutive enzyme.

Both the cells and the capsules of the fungus found in the brain tissues of the patient and experimental mice were abundant in alkaline phosphatase. But this enzyme was lost or greatly diminished during the cultural process. Alkaline phosphatase is probably an adaptive enzyme of Cryptococcus neoformans.

79. Ministry of Health RSFSR Concerned With Influenza During Fall and Winter 1959

"In the Ministry of Health RSFSR" (unsigned article); Moscow, Meditsinskiy Rabotnik, 6 Oct 59

In a special session of the Ministry of Health RSFSR, a report by Prof K. V. Bunin, chairman of the Problem Commission on Infectious Diseases of the Scientific Council, Ministry of Health RSFSR, on measures for the prohylaxis of influenza and catarrhs of the upper respiratory tracts during the fall and winter of 1959 were discussed. The report indicated a number of serious shortcomings in the struggle toward controlling this infection. Not enough studies have yet been made of the data on the morbidity of the influenza epidemic of 1957.

Professors P. N. Kosyakov, P. P. Dvizhkov, and others pointed out that practicing physicians still do not have sufficiently effective specific preparations against influenza. The vaccine currently produced still has little effect.

It was also pointed out that because of lack of space, numerous virology laboratories in eastern oblasts are unable to function and thus curtail certain prophylactic activities in regard to this disease. In addition, methods of treatment and diagnosis are still outdated in many instances, and mass vaccination is still limited in scope.

Epidemiology

80. Mechanical Protection From Insects

"A New Method of Mechanical Protection From Attacks of Blood-Sucking, Dipterous Insects," by Ya. S. Kon', Central Scientific Research Laboratory of Hygiene and Epidemiology, Main Medical-Sanitary Administration of the Ministry of Railways, USSR; Moscow, Gigiyena i Sanitariya, Vol 24, No 5, Sep 59, p 86

"The author describes the use of a vinyl plastic screen and a fiber glass protective screen treated with resins to strengthen the fibers for protection from blood-sucking, dipterous insects in buildings. Laboratory investigations showed that the rate of movement of the air in front of the plastic screen at a distance of 0.5 meter was 2.45 meters/sec, and behind the screen -- 2.1 meters/sec; the rate of movement of the air in front of the fiber glass screen at the same distance was 2.3 meters/sec, and behind, 1.8 meters/sec; the rate of movement of the air at the same distance in front of gauze was 1.3 meters/sec, and behind gauze, one meter/sec. The plastic screens can be made in various colors, and can be cleaned easily by rubbing the screen with a damp cloth or washing it with water); unrestricted penetration of ultraviolet rays through the vinyl plastic screen is noted. The fiberglass screen treated with resins can be used not only for windows and doors, but also for making canopies. The screen has the advantage of elasticity, which makes it possible to roll it on a drum; dust can be removed from it easily with a brush; it can be stained different colors; it provides reliable protection from blood-sucking, dipterous insects; the author therefore recommends it for extensive practical use."

Oncology

81. Therapy of Cancer of Thyroid Gland

"Therapy of Cancer of the Thyroid Gland With Radioactive Iodine," by Wladislaw Jasinski, Nowotwory (Poland), 1958, 8, No 2, 65-82 (from Referativnyy Zhurnal -- Biologiya, No 16, 25 Aug 59, Abstract No 73486, by M. Ye. Manikov)

"Patients suffering from cancer of the thyroid gland were administered I^{131} for the purposes of diagnosis, the determination of the size of the tumor, and the possible determination of the presence of metastases. Five of the total of 22 patients received no treatment, and three others were to be treated in the future. The other 14 patients received surgical

treatment followed by either roentgenotherapy or the administration of I^{131}. The results were as follows: considerable improvement was noted in five patients; the therapy was ineffective in three cases; a deteriorated condition was observed in one patient; two died; undetermined results were noted in three patients (brief period of observation). The author thinks that the results of the therapy of cancer of the thyroid gland with I^{131} are inconclusive."

82. Diagnosis of Cancer of Uterine Cervix

"Comparative Evaluation and Assessment of Data on the Clinical, Cytological, and Histological Investigations of Cancer of the Uterine Cervix," by V. F. Savinova, V sb.: Vopr. Klinich. i Eksperim. Onkologii (Problems of Clinical and Experimental Oncology), No 2, Stalingrad, 1957, 219-224 (from Referativnyy Zhurnal -- Biologiya, No 16, 25 Aug 59, Abstract No 73600, by I. D. Nechayeva)

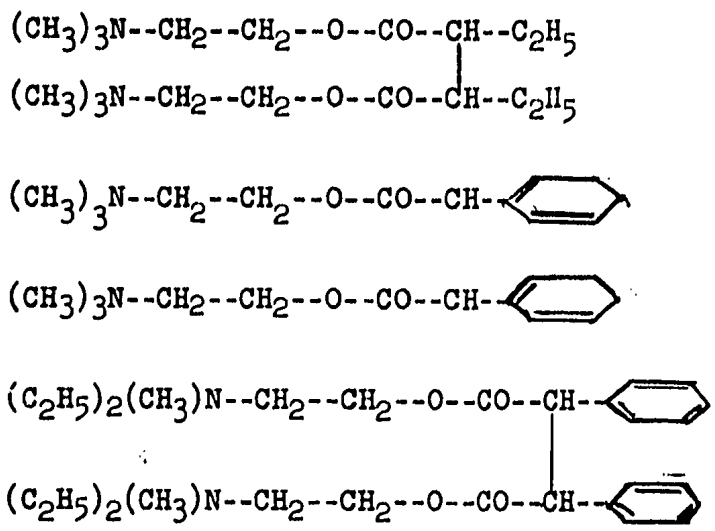
"Data obtained as a result of the complex investigations conducted on 84 patients (35 suffering from carcinoma in the first, second and third stages; 17 suspected of suffering from cancer of the uterine cervix; 17 suffering from erosion)are cited. It was found that the cytological method of investigation may be helpful in the diagnosis of cancer of the uterine cervix. Smears should be taken from the section of the uterine cervix affected by the disease."

Pharmacology and Toxicology

83. New Curare-Like Preparations

"New Curare-like Preparations, Derivatives of Succinyl-choline (Ditilin)," by S. S. Krylov, V sb.: Gangliolitiki i Blokatory Nervno-myshechn. sinapsov (Volume: Gangliolytics and Blocking Agents of Neuromuscular Synapses), L. 1958, 141-146 (from Referativnyy Zhurnal -- Biologiya, No 16, 25 Aug 59, Abstract No 73766)

"Investigations were conducted on ditilin derivatives which were obtained by substituting the hydrogen atoms of the alpha and beta carbons of the succinic acid in a molecule of ditilin derivatives by ethyl and phenyl radicals, and substituting the two methyl radicals of each nitrogen atom by ethyl radicals.



Compound IEM--110

Compound IEM--105

Compound IEM--134

Studies were conducted on the effect of the preparations on respiration, blood pressure, contractions of the gastrocnemius on the rhythmic irritation of the sciatic nerve, and on the contraction of the palpebra tertia of a cat on the irritation of the preganglionic fibers of the sympathetic nerve. It was established that the above-mentioned changes in a molecule of ditilin derivatives do not destroy the curare-like action of the compounds. Their action, however, is manifested only when doses which are 10-20 times greater than those of ditilin derivatives are used. The duration of their effect is increased. IEM-134 also possesses ganglioblocking properties."

84. Effect of Curare-Like Substances on Spinal Cord

"Stimulant Transmission in the Spinal Cord Upon Curarization," by A. I. Shapovalov, Chair of Pharmacalogy of the First Medical Institute imeni I. P. Pavlov, Leningrad; Moscow-Leningrad, Fiziologicheskiy Zhurnal SSSR imeni I. M. Sechenov, Vol XLV, No 8, Aug 59, pp 952-958

A report on the results of experiments which were carried out to determine the effect of tubocurarine, diplacin, and ditilin [succinylcholine] on the transmission of impulses in the spinal cord is presented. Cats were used in the experiments. It was established that the preparations when administered in doses not exceeding those which completely arrest the transmission of neuromuscular transmissions have no effect on the mono- and polysynaptic reflex discharges of the ventral roots, regardless of the rhythms of stimulation of the corresponding muscular neurons

and dorsal roots. Tubocurarine and diplacin in large doses are able to decrease the post-tetanic intensification which develops in the spinal cord as a result of the passage of a series of high-frequency impulses.

85. Metabolism of Phosphorus-Containing Compounds

"Effect of Atropine on the Metabolism of Phosphorus Containing Compounds," by E. F. Sopin, Nauk Zap. Kiivsk. Un-t. (Scientific Notes of Kiev University), 1957, 16, No 18, 101-110 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 16, 25 Aug 59, Abstract No 21924, by S. Dolina)

"Atropine exerts a two-phase action on the intensity with which phosphorus fractions are regenerated (by inclusion of P^{32}) in the cerebral, hepatic, and muscular tissues of a pigeon, increasing it within 2 hours and reducing it within 4 hours after the administration of the drug. The first phase is connected with the effect of atropine on the nervous regulation of metabolism, and the second with its direct effect on metabolism. In the author's opinion, these data are a confirmation of the possibility of a direct effect of acetylcholine on the metabolic processes and make it possible to elucidate the mechanism of the action of acetylcholine."

86. Penethamate Hydroiodide Action

"On the Mechanism of the Action of Penethamate Hydroiodide (Penester)," by V. Sobek and M. Hava, Casop. lekaru cesk. (Czechoslovakia), 1959, 98, No 5, 147-150 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 16, 25 Aug 59, Abstract No 21990, by the author)

"In experiments on isolated lungs, the spasmolytic action of penester (the hydroiodide of the diethylaminoethyl ester of benzylpenicillin) was four times the action of novocain. In experiments on an isolated intestine, penester displayed an action equal to that of novocain in regard to spasms induced by histamine; its effect, however, was 1.5-2 times greater than that of novocain when used in the case of spasms induced by $BaCl_2$ and acetylcholine."

87. Irritability of the Organ of Equilibrium

"Effect of Largactil on the Organ of Equilibrium," by Josef Tarniewski, Otolaryngol. polska (Poland), 1958, 12, No 3, 259-264 (from Referativnyy Zhurnal -- Biologiya, No 16, 25 Aug 59, Abstract No 73650, by the author)

"Largactil in doses of 25-50 milligrams was administered to patients intravenously before an operation. Caloric and rotational tests carried out before and 1 1/2 hours after the administration of largactil revealed a rise in the excitability of the labyrinth in 21 of 30 patients; reduced excitability in six of the patients who at the time of the experiment were very sleepy; no changes were observed in the rest of the patients. The author explains the rise in the excitability of the labyrinth under the influence of the largactil as a functional affection of the cerebral centers which depress the activity of labyrinth."

88. Shock Prevention During Surgery

"On the Application of Neuroplegic and Ganglioblocking Preparations in Radical Surgery of the Lungs Under Local Anesthesia," by O. A. Dolina, Chair of General Surgery of the Therapeutic Faculty First Moscow Order of Lenin Medical Institute imeni I. M. Sechenov; Moscow, Grudnaya Khirurgiya, Vol 1, No 3, May/-Jun 59, pp 69-75

Clinical experiments conducted at the First Moscow Order of Lenin Medical Institute imeni I. M. Sechenov established that the administration of aminazine, ethyzine, diprazine [ethyzine -- the hydrochloride of N-(2-dimethylaminoethyl)-phenothiazine; diprazine -- the hydrochloride of N-(2-dimethylaminopropyl)-phenothiazine, Lekarstvennyye Sredstva, by Prof M. D. Mashkovskiy, Medgiz, Moscow, 1957, pp 161 and 162], promedol, anadol, atropine, and others, or mixtures of these preparations is effective in the prevention of shock during pulmonary surgery conducted under local anesthesia, or in the postsurgical period. Minimal doses must be applied to prevent a reaction of deep inhibition and to preserve the functional cough reflex and the correlative functions of the nervous system. The preparations may be administered either intramuscularly or intravenously. Rapid administration must be avoided so as prevent the development of convulsions. No complications were observed when the drugs were administered by the drop method.

89. Pharmacology of Some Amines and Ammonium Salts

"Synthesis and Pharmacological Testing of Certain Amines and Ammonium Salts Containing Polyhalide Radicals," by A. T. Babayan, I. Ye. Mozgov, A. A. Grigoryan, and M. G. Kashkin, Tr. Yerevansk. Zootekhn.-Vet. In-ta (Works of the Yerevan Zootechnical-Veterinary Institute), 1957, No 22, 327-328 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 13, 10 Jul 59, Abstract No 17706, by A. Travin)

"The following polyhalide alkyldimethylamines were synthesized and pharmacologically studied (the formula, yield percentages, boiling point in degrees centigrade per/mm, melting point in degrees, centigrade, d_4^{20}, P_D^{20}, of picrate, iodomethylate, hydrochloride, hydrobromide, and iodohydrate are indicated): $(CH_3)_2NCH_2CHClCCl_2CH_3$ (I), 66, 69/2, -, 1.1908, 1.4759, 166, 122, 214, 219, 201; $(CH_3)_2NCH_2CCl{=}CClCH_3$ (II), 90, 54-56/4, -, 1.0999, 1.4737, 156.5, 225, 202, 197, 164; $(CH_3)_2NCH_2CCl_2CCl_2CH_3$ (III), 90, 115/13, 46-47, -, -, 177, 187, 217, 215, 191. The toxic properties of the above-mentioned amines change in the following order: III>I>II. In nontoxic doses, the compounds produce a rise in body temperature and intensify respiration. In toxic doses, however, they reduce body temperature and weaken respiration. Reduced sensitivity of the nerve endings and inflammations are noted when the preparations are applied to the skin or the mucous membrane. In experiments carried out on isolated organs it was found that the preparations induced: (a) contractions of the blood vessels when applied in low concentrations and dilation of the vessels when applied in high concentrations; and (b) weakened cardiac and intestinal contractions. The preparations also possess acaricidal and bactericidal properties."

90. Containers for Aerosol Application of Drugs

"Containers for Pharmaceutical Preparations. II," by Josef [illegible] and Miroslav Sanda, Farmacia (Czechoslovakia), 1957, 26, No 1, 330-339 (from Referativnyy Zhurnal -- Khimiya, No 15, 10 Aug 59, Abstract No 54418)

"Survey of data on the design of containers for the application of medicinal and other preparations in the form of aerosols. Data on the design of the containers and on atomizing properties of gases. Bibliography -- 26 titles. See also Ref. Zhur -- Khimiya, 1959, No 6, 20489."

91. Antibiotics in the Therapy of Purulent Wounds

"Therapy of Purulent Wounds and Cavities with Antibiotics With Consideration for the Sensitivity of the Microflora to the Antibiotics," by N. M. Nikitina, R. N. Nebrova, Chair of the Surgical Faculty and Chair of Microbiology of the Ryazan Medical Institute; Kiev, Novyy Khirurgicheskiy Arkhiv, No 4 (220), Jul/Aug 59, pp 27-29

Penicillin, streptomycin, levomycetin, and biomycin were used in experiments conducted to determine the effectiveness of the antibiotics when used in the therapy of purulent wounds and cavities. It was found that the antibiotics were 100 percent effective only when the sensitivity of the microflora in the wounds or cavities to the drugs was preliminarily determined. When used in cases in which the sensitivity of the microflora to the antibiotics was not preliminarily established, the preparations were only 59 percent effective.

92. Chinese Study Effect of Samatine on Efferent Nerves

"Pharmacalogic Effects of Samatine on Efferent Nerves," by Chin Kuo-chang (金国章) and Hsu Pin (徐彬) Institute of Materia Medica, Academia Sinica, and Chin Yu-yu (金有豫) Peking Medical College; Peiping, K'o-hsueh T'ung-pao (Scientia), No 16, 26 Aug 59, pp 529-530

The authors explain that samatine is an alkaloid of the quarternary amine series which was first isolated from the root of Rauvolfia verticillata (Lour.) Baill. and named by Liu Chu-chin (刘铸津) and others. They give $C_{20}H_{25}O_3N_2Cl$ as the formula for samatine hydrochloride.

This article reports the results of cat experiments undertaken to elucidate the mechanism of action of the complete organic base isolated from rauvolfia. Previous Chinese studies had demonstrated that the complete organic base exerts an inhibitory effect on the n-choline reactive system of experimental animals and has an effect similar to that of arrow poison. The results of the present study indicate that in hibition of the n-choline reactive system may be elicited by samatine and that samatine may have something to do with the depressive action of the complete organic base of rauvolfia, the authors report.

Bibliographic citations include six Chinese works published during 1957-1959 and one 1959 report as yet unpublished.

Physiology

93. Therapeutic Use of Aero-Ions

"To Administer Aero-Ionotherapy Properly," by Corresponding Member of Academy of Medical Sciences Prof L. Vasil'yev and Candidate of Biological Sciences A. Skorobogatova, Meditsinskiy Rabotnik, No. 50 (1798), 23 Jun 59, p 3

The authors of this article state that a large group of physicians, physiologists, and hygienists have recently become interested in the physiological action and therapeutic effects of aero-ions. This interest arose because many years of research and clinical observations showed that ionozed air is a valuable and effective therapeutic and prophylactic agent. Scientists of the US, Germany, Japan, and other countries have reached the same conclusion.

The number of indications for using aero-ions must be greatly restricted, however, because their handling by incompetent people may cause harm. Reports of the successful use of negative aero-ions in the treatment of radiculitis, plexitis, and ulcerous infections must also be experimentally and clinically verified further.

Aero-ions with a negative charge are the ones which usually have a beneficial effect on the organism. The effectiveness of these aero-ions, like the effectiveness of other therapeutic agents, depends on the dosage used. Their special feature is their reflex action on the organism through the respiratory apparatus, which occurs by the irritation of the pulmonary interoceptors of both the lower and upper respiratory tracts, and their action through the blood stream. It has been proved experimentally that the principal prophylactic action of negative aero-ions is a result of their power to increase the organism's resistance against various secondary factors.

Since negative aero-ions have been successfully used in the treatment of certain infections of the respiratory organs and the cardiovascular system, it can be deduced that they can also be used successfully in the treatment of bronchial asthma and of acute and chronic catarrhs of the upper and lower respiratory tracts such as vasomotor colds, pharyngitis, laryngitis, and acute and chronic bronchitis. Aero-ionotherapy affords only temporary relief in cases of ozena and atrophic rhinitis. Aero-ions speed up the healing process in cases of burns and sores. Aero-ionotherapy produces good results, in combination with other methods of treatment, when used during the initial stages of hypertension. Aero-ionotherapy has also been successfully used in the treatment of whooping cough and aphthous stomatitis.

The presence of limited quantities of ions in the immediate environment is one of the necessary conditions for maintenance of a normal human and animal organism. Negative ions increase the vitality of a living organism; positive ions, on the contrary, decrease the vitality of a living organism. The presence of both the negative and positive ions in the air is necessary, because they contribute to normalization of physiological processes.

The physiological effect of aero-ions is not the same for all individuals. It is necessary always to take into consideration the condition of the organism, morbid disturbances, age, etc. It is necessary also to take into consideration the content of and relationship between negatively and positively charged aero-ions which are most favorable for maintaining the life, well-being, and physical and mental efficiency of the majority of healthy people.

Increasing the ionization of air in buildings by artificially adding a definite amount of light ions may help to free the air from dust, microorganisms, and heavy ions produced in the process of respiration. The number of light aero-ions decreases in a building because they are consumed by the respiratory apparatus; the number of expired, aqueous ions increases.

The Ministry of Health USSR and the Commission on Aero-ionization and Aero-ionotherapy (established in the Institute of Physiology imeni I. P. Pavlov of the Academy of Sciences USSR) have been receiving inquiries from many industrial establishments of the country concerning the possibility of using ionized air in industrial establishments. The authors of this article believe that the Ministry of Health USSR should take the necessary action to inaugurate the manufacture of generators and ion-measuring devices immediately if ionized air is be to widely utilized. A number of factories in Moscow, Leningrad, and Odessa have begun manufacturing aeroionizators.

No decision has yet been reached about the design and manufacture of aero-ion-measuring devices. They must be of two types: portable ones, to be used under various industrial conditions (factories, hospitals, mines, expeditions) and stationary, with self-recording facilities, to be used in research.

94. Administration of Oxygen to Divers

"Evaluation of Various Methods of Administering Oxygen for the Decompression of Divers," by A. P. Brestkin and A. G., Zhironkin, Department of Military Occupational Physiology, Military Medical Academy imeni S. M. Kirov; Leningrad, Fiziologicheskiy Zhurnal SSSR imeni I. M. Sechenov, No 7, Jul 59, pp 865-871

The authors of this article state that data obtained as a result of experiments with deep-sea divers showed that after exposure to high pressure, the nitrogen excess in human body tissues becomes desaturated at a lower rate when oxygen is supplied under a pressure of 2.5 atmospheres than when it is supplied under a pressure of 1.7 and 1.0 atmospheres.

The curve of nitrogen elimination from the human organism during oxygen respiration under pressure of 2.5 atmospheres shows a distinct depression. This sharp drop in the rate of nitrogen elimination evidently depends on the toxic action of oxygen, which causes a decrease in the blood flow rate. The sharp drop in the rate of oxygen elimination coincides with the sharpest drop in the skin temperature and pulse rate of the subject.

95. Effects of High Nitrogen Pressure on Mammals

"Comparative Physiological Evaluation of the Susceptibility of Some Warm-Blooded Animals, to Effects of High Nitrogen Pressure," by Chang Ch'un, Department of Military Occupational Physiology, Military Medical Academy imeni S. M. Kirov; Leningrad, Fiziologicheskiy Zhurnal SSSR imeni I. M. Sechenov, No 7, Jul 59, pp 872-875

The author of this article states that nitrogen at high pressure exerts a narcotic effect on warm-blooded animals of various species. The course of the development of the narcotic effect of nitrogen followed a similar pattern in all the experimental animal species. This narcotic effect of nitrogen takes the form of irregularity in muscular action (ataxia), intensification of excitation, decrease in reactivity, and development of narcosis. Resistance to the effects of nitrogen was found to differ among various species of animals in the following decreasing order: rabbit, dog, cat, guinea pig, dove, mouse, rat.

The rapidity with which nitrogen narcosis sets in is directly proportional to the magnitude of the nitrogen pressure. Excitability of the spinal cord is indirectly proportional to the magnitude of the nitrogen pressure.

The animals used in the experiments were 20 mice, 20 rats, 6 cats, 8 guinea pigs, 12 rabbits, 6 doves, and 4 dogs.

96. Efficiency Studies During Monotonous Work

"Scientists Came to the Workshop"; Moscow, Izvestiya, 21 Jul 59, p 4

This article states that attempts are being made to improve the working conditions of workers in shop No 4 of the Red Triangle Plant which produces rubber boats. Monotonous work, requiring great concentration, has been causing great nervous tension among women workers, resulting in the rapid advent of fatigue. Physiologists were called in to conduct experimental studies.

M. I. Vinogradov, professor at Leningrad University, and Candidate of Biological Sciences V. S. Vorob'yeva experimented with various work schedules. They changed the schedule for the lunch period and the 5-minute breaks. These measures increased the efficiency of workers substantially and improved the condition of their nervous systems.

The industrial physiologists are continuing their studies at the plant.

97. Advances in Evolutionary Physiology in USSR

"Second Scientific Conference on Problems of Evolutionary Physiology, Dedicated to the Memory of Academician L. A. Orbeli," by F. P. Vedyayev; Leningrad, Fiziologicheskiy Zhurnal SSSR imeni I. M. Sechenov, No 7, Jul 59, pp 891-896

The author of this article states that the resolution of the 21st Congress of the Communist Party of the Soviet Union is based on statements made by N. S. Khrushchev concerning development of the national economy during the 1959-1965 period. The resolution stated in part that "the essential theoretical prerequsite for progress in medical science, and in agricultural science as well, lies in the development of biology." There is no doubt that Soviet biological science is currently in a formative stage of development and it reflects the principles of dialectic materialism.

The works of I. I. Mechnikov, I. M. Sechenov, A. N. Severtsev, I. P. Pavlov, K. A. Timiryazev, N. Ye. Vvedenskiy, and other representatives of Soviet science have created a base for development of a new branch of knowledge called "evolutionary physiology." It has been generally recognized that Academician L. A. Orbeli is entitled to all the credit for identifying the problems, methods, and principles of evolutionary physiology. The Second Scientific Conference on Evolutionary Physiology, held in Leningrad 17-21 March 1959, recognized the contribution of Academician L. A. Orbeli by dedicating it to his memory. The Scientific Council, Academy of Sciences USSR, was instrumental in organizing the Second Conference on the Problems of Evolutionary Physiology. Many scientists from all parts of the USSR took an active part in all discussions.

The first conference on evolutionary physiology was held in 1956. Desire was expressed at that time to hold similar conferences in the future. It was decided that the main features of these conferences were to be reports of any progress made in the field of evolutionary physiology and to chart a path for further scientific research in that field.

The Organization Committee received the results of 114 experimental works which it published in the form of a collection of theses. The plenary sessions heard 40 of the theses.

The conference was called to order by the chairman of the Organization Committee, Prof D. A. Biryukova. Academician Ye. N. Pavlovskiy followed her with his report "On the Duration of Adaptation Process of an Organism to New Conditions of Existence, Both in a Free and in Parasitic Life."

Other reports read at the conference covered many sides of the study of evolution of functions. They included comparative physiology, ontogenesis, experimental pathology, and clinical pathology. The scientific material presented can be grouped into following subdivisions:

1. Phylogenesis and ontogenesis of the higher nervous activity
2. Evolution of the mechanisms of activity of the central nervous system
3. Questions in embryo-physiology
4. Evolution of the mechanisms of regulating water metabolism
5. Evolution of protective and compensating natural processes

Some questions of evolutionary histochemistry were also discussed at this conference.

M. Ye. Lobashev spoke on the problem of the phylogenetic development of the general characteristics of higher nervous activity. He said that after many years of research in the physiology of the behavior of one of the higher representatives of protostomia-arthropoda (the melliferous bee) and comparing the results with information found in literature, he came to a conclusion that the fundamental processes of the higher nervous activity (excitation, internal inhibition, blocking, analytical-synthetic activity, etc.) develop independently and in a parallel manner in a number of protostomia. He expressed the opinion that this conclusion is in an agreement with the Pavlovian principle of universality of temporary connections in the adaptation of animals to their outside environment.

B. V. Pavlov, A. V. Baru, N. A. Krasuskaya, N. V. Prazdnikova, V. I. Zaf'yants, and D. A. Chebykin presented experimental information on evolution of conditioned inhibition. They said that it is possible to form delayed conditioned reflexes in representative groups of various classes of vertebrates (fish, birds, and mammals). They stated that in their opinion, not only the animals with developed cortex of large hemispheres, but also the animals at the lower levels of evolutionary development, have equally high mobility in nervous processes and sufficiently strong process of internal inhibition.

L. G. Voronina reported on new data on the evolution of analytical-synthetic activity. She said that information obtained by her and her associates proves that the higher the level of development of the nervous system of an organism, the more refined is its analysis and synthesis of external and internal irritations. The dominant role of proprioceptive irritations over exteroceptive irritations in the automatization mechanism of chain motor conditioned reflexes was demonstrated. V. I. Ivanova, an associate of L. G. Voronina, gave a report entitled "Formation of Chain Motor Conditioned Reflexes in Fishes, Doves, and Rabbits."

E. Sh. Ayrapet'yants discussed interaction between various analysor systems in higher nervous activity. He put forward the idea about an analysor of space, which, he said, represents the functional system of a complex of exteroceptive and interoceptive analysors. The function of this analysor is an example of an integrated activity of the cortex of the brain. His report contained much data obtained as result of experiments on various animals.

A. A. Volokhova spoke on combination of comparative-physiological and ontogenic methods of study of the activity of the nervous system. Investigation of somatic neuromuscular andreflex reactions in the ontogenesis of comparable set of animals (amphibians, birds) showed that reflex reactions of phylogenetically ancient forms of automatic muscular and neuromotor somatic activity are found during definite stages of phylogenesis. "Spontaneous" types of muscular and neuromotor activity become lost altogether in animals which are at the higher level of phylogenetic development because of the centralization of their nervous system and subordination of all functions of the organism to it. They possess the reflex forms of a nervous activity already during the period of embryogenesis. N. I. Lagutina and A. A. Fufacheva read a report on peculiarities of the formation of cardiovascular reflexes in monkeys during ontogenesis. They established that the central mechanisms of the regulation of the function of the cardiovascular system in monkeys, in contrast to dogs and cats, appear to be already formed at birth.

Ye I. Kalinina, Ye. M. Korbakova, G. A. Obraztsova, and V. A. Troshikhina stated in their report that there exists a link between structure and function in the pattern of the ontogenetic development of the central nervous system. They said that they proved that conditioned reflexes (alimentary and defense), as a result of olfactory irritants, are formed considerably

earlier than those formed by means of sound irritants. Results of experiments showed that olfactory conditioned reflexes are formed earlier in kittens than in young rabbits. Z. D. Pigareva and N. N. Shilyagina presented new information concerning interrelation between biochemical and bioelectric activity in the visual area of the cortex of the large hemispheres in rabbits in ontogenesis.

N. I. Kosatkin presented data on the influence of earlier developed differentiated inhibition on the later forming motor analysor of a child. K. V. Shuleykina pointed out in her report that close relationship exists between the act of sucking and that of respiration in a child.

In her report, N. N. Traugott described the utilization of clinical material in investigating the evolution of the most complicated forms of higher nervous activity, particularly the nervous activity involved in speech. She came to the conclusion that the process of speech restoration after its profound depression resembles the process of speech development in a child. Conditioned connections, acquired in early childhood, are freed from inhibition before all others. Analysis of data, which characterizes the process of development and disintegration of the speech function, proves that grammatical stereotypes and phonetic laws of language are assimilated sooner and appear quite fixed in comparison with the time required for the restoration of vocabulary.

Ye. K. Zhukov showed the need for examining the adaptive possibilities of the human organism during muscular activity from the viewpoint of evolutionary physiology. He pointed out that development of functional potentials of a human being, while he is exercising or performing work requiring physical exertion, depends on the development of both the innate and the acquired morphophysiological characteristics. Inherited resources of a human being may be greatly developed and enriched during his lifetime. It is important, therefore, that the phylogenetic and ontogenetic sources of motor activity in a human being be taken into consideration for the successful development of the theory in physical education.

The next subdivision of evolutionary physiology discussed at the conference was evolution of the mechanisms of activity of the central nervous system. Kh. S. Koshtoyants read a report on the problem of the formation of nervous system functions. He examined the theoretical aspects of the problem of the formation of nervous system functions and introduced new experimental data dealing with that problem. He said that, together with his associates, he had demonstrated that acetylcholine and cholinesterase are necessary in the biochemistry of the nervous system. Information obtained showed that biochemical and biophysical symptoms of irritability, excitation, and adaptation to environmental conditions are found even in the simplest forms of life.

The report of P. K. Anokhin contained theoretical hypotheses and some experimental data concerning the course of the evolutionary process. He mentioned systemogenesis (in contrast to organogenesis) as the general mechanism of evolution of functions. He differentiated two categories of the heterochronic processes of structural development: intersystem heterochronia and intrasystem heterochronia.

New experimental material was obtained during comparative physiological investigation of the functional connections of exteroceptive analysors (visual) with the muscular system. Examining this question from the ecolophysiological view, D. A. Biryukov presented data on effects from the retina of the eye on the level of muscular tonus.

A. I. Karamyan reported on new aspects of the functional interrelation between the higher branches of the central nervous system. Using various methods of research (exterpation, conditioned reflexes, electroencephalography), he obtained new and important experimental material for neurophysiology, proving that the cortex of the brain and of the cerebellum, together with their central formations, form the higher supersegmentary integrating system that regulates the functional properties of all forms of nervous activity, both the somatic and the vegetative. The integrating function of the two higher supersegmentary systems of the cortex of the brain and of the cerebellum may take place at various levels of coordination: at the level of the cortex of both systems and their central formations and also at the level of reticular formation which is regulated by the cortex of the brain and by the cerebellum.

There were other reports read on the subject of cortico-subcortical interrelations. A. Ye. Lichko investigated the orgin of subcortical byperkineses and other motor symptocomplexes. His observations were made under clinical conditions on patients who were in a state of insulin coma. F. P. Vedyayeva and Tsao Hsiao-ting also spoke on functional characteristics of some subcortical centers.

V. A. Pegel and his associates raised and substantiated a very important question which is of theoretical and practical significance. The question deals with the principle of relationship among various functions in phylogenesis as an index of normal and pathological conditions.

In reports on embryo-physiology, I. A. Arshavskiy put forward a theory of physiological immaturity. He analyzed conditions under which physiological immaturity is formed. This made it possible for him to formulate a hypothesis concerning pregnancy dominance or histase dominance. The role of histase dominance, in contrast to sex dominance, consists of providing regeneration during pregnancy. The course of embryonal and subsequently of postnatal development depends on the condition of histase dominance. L. A. Pronina spoke on the nature of respiratory movements in the fetus and in the

newly born, and regulation of these respiratory movements by the central nervous system. She explained that during the embryonic period of development of birds and mammals, respiratory movements are regulated by the respiratory center which is situated in the medulla oblongata. Emergence and development of motor reactions in a chicken embryo was reported on by V. I. Chumak. It seems, said V. I. Chumak, that spontaneous active movements are neuromotor and they arise as result of action of definite chemical agents of which CO_2 holds an important place. The physiological role of spontaneous reactions consists of their adaptive significance in that they pave the way for the development of specialized reactions.

The report of P. G. Svetlova was titled "Some Mechanisms of Action of Environment on Ontogenesis." Her hypothesis is based on critical periods of development which are characterized by very high sensitivity to the effects of environmental factors. The author's theory is that the result of outside action on the embryo (fetus) is determined largely by the course of its development rather than by the peculiarities of the acting agent.

L. G. Leybson and Z. P. Zheludkova spoke on the subject of "Effect of Cortisone on Glycogen Function of the Kidney in Chicken Embryos." They discovered that glycogen formation is possible only beginning with the 9th day of development of a chicken embryo. Bile formation of the kidney increases thereby.

The next subdivision of evolutionary physiology discussed was evolution of mechanisms of regulating water metabolism. The problem of regulating water metabolism in various classes of animals was reflected in the reports from the laboratory of A. G. Ginetsinskiy.

V. F. Vasil'yeva and M. M. Sokolova read a report on "Peculiarities of Water Elimination Functions of Kidneys of Various Classes of Vertebrates." They said that all vertebrates can withstand hyperhydration and dehydration with the aid of various physiological mechanisms only. Fishes limit their diuresis in a hypertonic environment solely by reducing filtration, because the tubular part of the nephron does not participate in this reaction. In amphibians, reptiles, and birds, the reaction of the kidney to dehydration embraces both the clew and the tubular components. Full development of the tubular type of reaction is reached in mammals. M. G. Saks and L. K. Titova explained in their report why the antidiuretic hormone does not function during early ontogenesis of mammals. Ye. V. Natochin investigated the hyaluronidase system. He said that although hyaluronic complexes were found in the kidney of fishes, their reaction to dehydration was found to differ from the reaction in mammals. How prominent the hyaluronic structures are depends on how complicated the kidney structures are in an evolutionary sequence of vertebrates.

The evolution of compensating and protective mechanisms was the next subdivision of evolutionary physiology taken up at the conference. E. A. Astratyan, L. S. Goncharova, V. N. Drozdova, and B. D. Stefantsova in their report presented data dealing with the disturbance and restoration of somatic and vegetative functions following surgical damage in the area of the medula oblongata in puppies and adult dogs. It was established that animals with the cortex of the brain preliminarily removed endure the damage in the area of the medula oblongata much easier than animals which remained in tact.

The questions of the compensation of functions of the central nervous system in phylogenesis and ontogenesis was discussed in the report read by F. A. Adamyan, A. S. Andreasyan, L. A. Matinyan, T. G. Urgandzhyan, and V. V. Fanardzhyan. S. I. Frankshteyn and O. A. Krylov introduced new data to prove that the functional symptoms, rather than the morphological symptoms, of the reactions of the organism to focal damage are subjected to development in the process of phylogenesis and ontogenesis. N. N. Sirotinin stated that many years of study in his laboratory point to the fact that not all functions of internal protection of the organism develop uniformly. The phagocytic function becomes fixed to the reticuloendothelial system, remaining substantially unchanged during phylogenesis. Greater changes are observed in ontogenesis. Evolution plays its part in the ability of an organism to form antibodies. Two reports were read on the adaptation of various phylogenetic groups of animals to the effects of irritations of outside environment. T. A. Dzhamusova pointed out that the thermal stability of the muscles of molluscs which like warmth is higher than in those which like cold.

Relationship between cellular mechanisms of adaptation and the mechanisms of adaptation in the entire organism of Actinia aguina was analyzed in the report by A. V. Zhirmunskiy.

E. M. Plisetskaya discussed in her report the functional peculiarities of smooth muscles in a number of cold-blooded animals. I. G. Antonova presented new electrophysiological data dealing with the development of the tonus of the skeletal musculature in ontogenesis.

An expanded session of the Scientific Council of the Academy of Sciences USSR was held at the end of the conference. Evolution of physiological functions of animals and humans was discussed at the session, at which time A. G. Ginetsinskiy spoke on "Accomplishments of the Conference and the Questions of Further Development and Planning of Research in Evolutionary Physiology." He reviewed the accomplishments of the conference and noted the high level of the scientific material presented. He stated that 74% of the reports read were on the evolution of the functions of the nervous system. He then dealt with the problems and the role of the Scientific Council, Academy of Sciences USSR, in planning and coordination of research. The question of the need for the inauguration of a periodical publication Evolutsionnaya Fiziologiya (Evolutionary Physiology) was presented. It was brought out that a need exists for coordinating the efforts of physiologists, morphologists, biochemists, radiobiologists, pharmacologists, and representatives of other related sciences.

The author of this article on the conference on evolutionary physiology concludes by saying that material presented at the conference shows that considerable progress has been made in the Soviet Union in the study of evolutionary physiology.

98. Conference on Evolutionary Physiology

"Resolution of the Second Scientific Conference on the Problems of Evolutionary Physiology, Dedicated to the Memory of Academician L. A. Orbeli, and the Second Expanded Session of the Scientific Council, Academy of Sciences USSR, on the Problem of 'Evolution of Physiological Functions of Animals and Humans'"; Leningrad, Fiziologicheskiy Zhurnal imeni I. M. Sechenov, No 7, Jul 59, pp 896-898

The author of this article states that the 21st Congress of the Communist Party of the Soviet Union has made Soviet biological science responsible for tackling many important theoretical problems, the solution of which will contribute to the successful development of the national economy and public health protection, will increase knowledge and improve skill, and will help considerably in building a Communist society within the shortest time possible.

Evolutionary physiology is very important in building a Communist society. The use of the evolutionary method in physiology has expanded considerably in the past few years; the foundation for the development of evolutionary physiology was laid primarily by Academician L. A. Orbeli. This created a fertile basis for the synthesis of physiological and embryological investigations. This synthesis was inspired by prevailing Russian and Soviet physiological ideas on nervism.

Evolutionary physiology is connected with the development of evolutionary theory which, up to now, was built mainly around morphological disciplines. The evolutionary approach has been warmly embraced also by disciplines such as biochemistry, pharmacology, pathology, and others.

The present scientific conference showed that while research in evolutionary physiology and in biochemistry has been extensive, other physiological functions are still not studied sufficiently from the viewpoint of evolutionary development. Investigations in the field of evolutionary biochemistry should be carried out by biochemical, histological, and ultramicrochemical methods.

Modern physiology is depending more and more on factual material obtained by means of biophysical, biochemical, histochemical, and pharmacological methods of research. It is thus evident that progress in evolutionary physiology depends greatly on the development of these branches of knowledge.

All-union conferences on evolutionary physiology should be held regularly so that the leading works in this field can be properly evaluated and long-range trends clarified. Uniform development of evolutionary physiology can be achieved by a improvement in coordination. Proper coordination will assist in focusing all efforts on long-range problems, and will also help to avoid duplication.

The time is ripe for the publication of a special journal, Evolutsionnaya Fiziologiya (Evolutionary Physiology), which should also embrace works in evolutionary biochemistry and appropriate pharmacological studies.

On the basis of what has been said, the Scientific Council on the problem of "Evolution of Physiological Functions of Animals and Humans," in conjunction with the participants of the second Scientific Conference on the Problems of Evolutionary Functions in Memory of L. A. Orbeli, resolved that:

"1. It is necessary to hold an All-Union Scientific Conference on Evolutionary Physiology once every 2 or 3 years, and to dedicate these conferences to the memory of Academician Leon Abgarovich Orbeli, the founder of evolutionary physiology; to vest the authority of calling these conferences on the evolution of the physiological functions of animals and humans in the Scientific Council.

"2. It is necessary to convoke a symposium on special questions in evolutionary physiology which will be attended by a limited number of people in a given field. The Institute of Evolutionary Physiology imeni I. M. Sechenov, Academy of Sciences USSR, should be authorized to conduct a symposium in fall 1959. The topic to be discussed is 'Evolution of the Osmosis-Regulating Function and of Water-Salt Metabolism.' A plan must be formulated at the next session of the Scientific Council, for symposiums to be conducted in 1959 and 1960.

"3. It is necessary to review the long-range plan of development of evolutionary physiology to see that it is directed toward fulfillment of problems of national significance, such as public health and agriculture. The successful development of evolutionary physiology is dependent on the proper utilization by physiologists of new discoveries in physics and chemistry.

"4. It is necessary to ask the Presidium of the Academy of Sciences USSR to approve publication of a special periodical, Evolutsionnaya Fiziologiya, and to ask the Bureau of the Department of Biological Sciences of the Academy of Sciences USSR, the Presidium of the Academy of Medical Sciences USSR, and the scientific councils of institutes to support this request.

"5. The Institute of Evolutionary Physiology imeni I. M. Sechenov and the Academy of Sciences USSR must be authorized to publish a collection of themes in the form of periodical articles which are to contain the substance of reports read at the second Conference on the Problems of Evolutionary Physiology.

"6. The Institute of Evolutionary Physiology imeni I. M. Sechenov of the Academy of Sciences USSR must be asked to incorporate into its plan publication of an annual critical survey of Soviet and foreign literature.

"7. The editorial office of the Fiziologicheskiy Zhurnal imeni I. M. Sechenov must be asked to publish this resolution in its next number."

Public Health, Hygiene, and Sanitation

99. Gelatin Filters for Investigating Air

"Gelatin Filters for Sanitary-Bacteriological Investigation of the Air," by V. M. Shul'zhenko and A. A. Antonova; Moscow, Gigiyena i Sanitariya, Vol 24, No 9, Sep 59, p 85

"The authors note that the filters prepared by Mitchell and co-authors have a number of drawbacks and propose an alternative method of preparing soluble gelatin filters. The method is as follows: a solution consisting of 40 g of nutrient gelatin in 100 ml of 7% glycerin water is carefully agitated for 15 minutes at a temperature of 55-60° C, and again for the next 10-15 minutes without heating, so that the temperature of the mass will not exceed 45-46° before it is poured into boxes. After the gelatin foam solution is poured into the wax paper boxes, it is quickly placed in a desiccator, from which the air is immediately evacuated. A vacuum of 450-300 mm should be maintained for 10 minutes; this vacuum should then be reduced to 250-200 mm by brief evacuations every 8-10 minutes for 1 1/2-2 hours. Some 3 1/2 - 4 hours from the beginning of drying, the vacuum is reduced to 150-100 mm and left for the rest of the drying time. Drying lasts for 3 days. The dried block is cut into 1.0-1.5 cm sheets, which are pressed with a pressure of 50-70 kg/cm^2 to a thickness of 1-2 mm. Before pressing, the film is dried so that the residual moisture will be no more than 10-12%. Filters of the necessary sizes and shapes are cut from these sheets. The porousness of the film is determined according to the rate at which air passes through it, and the sheets are numbered from 1 to 6, corresponding to the numbers of membrane filters. For sterilization by dry heat, the filters are previously dried at a temperature not exceeding 100° C for 3-4 hours, after which they are put in paper envelopes and sterilized at a temperature of 120° C for 40 minutes (it is necessary to make sure that the filters are isolated from the stream of hot air or the hot surface of the stove). It is also possible to sterilize the filters with ethylene oxide in the same desiccator in which they were dried. Sterilization is carried out for one day with a 2% concentration of ethylene oxide.

"The authors consider that the gelatin filters prepared by this method are sufficiently effective and can be recommended for use in sanitary-bacteriological investigation of air. (Editor's note: It is highly desirable that the formula and method of preparing the filters suggested by the authors be tested in scientific research sanitary-hygienic institutions.)"

100. Civil Defense Instructions for Protection Against Bacteriological Warfare

Bakteriologicheskoye Oruzhiye i Mery Zashchity ot Nevo (The Bacteriological Weapon and Measures of Protection From It); Moscow, Dosaaf Publishing House, 1959, 12 pp

A recently published civil defense pamphlet concerning protective measures to be carried out by the Soviet population in the event of a bacteriological warfare attack has the following table of contents:

The information contained in the pamphlet is presented pictorially, with brief explanations accompanying each illustration. The microscopic appearance of five pathogens --- plague, cholera, anthrax, smallpox, and typhus --- which could be used by an enemy is shown. Both clandestine and overt means of delivering bacteriological agents are depicted. Routes of entry of a pathogen into the human organism are described, and sources of infection, such as ticks, insects, and contaminated water and food products, are noted.

Illustrations are included to familiarize the population with characteristic symptoms of and lesions appearing with botulism, typhus, plague (bubonic form), tularemia (anginous-bubonic form), smallpox, and cutaneous anthrax.

Instructions for the use of various types of masks and protective clothing are given. Procedures to be followed after MPVO signals have been given are enumerated. Several pages are devoted to methods of decontaminating persons, objects and buildings after a bacteriological warfare attack has occurred. Material on antipersonnel, antilivestock, and anticrop bacteriological warfare is included.

101. Bacteriological Investigation of the Upper Atmosphere

"The Methodology of Investigation of High Layers of the Atmosphere," by Ya. G. Kishko, L'vov Scientific Research Institute of Epidemiology, Microbiology and Hygiene; Moscow, Laboratornoye Delo, Vol 5, No 5, Sep/Oct 59, pp 37-39

Following several references to previous work on this subject as early as 1860, the author describes his own upper atmosphere studies which were carried out in 1957 and 1958. The D'yakonov and Rechmenskiy apparatuses, based on the filtration of air through liquid, were used primarily; however, even brief exposure to low temperatures during collection flights caused the liquid to freeze. A simple apparatus consisting of a collector, a cartridge, and a flowmeter was designed, tested, and found to be completely suitable for collecting samples from an airplane. A diagram and a description of the device are given.

The apparatus, mounted in the window of the plane 2-3 minutes after take-off, makes it possible to pass up to 0.5 cu m of air within 3-6 minutes. To avoid freezing the surface of the culture medium in the Petrie dish, exposure time must be shortened; at heights above 2,000 m and at temperatures below 0° C, larger volumes of air are taken in for 1-2 minutes.

In 1958, experiments were performed in which the surface of the culture medium was covered with a fine layer of sterilized MK-10 oil with a low freezing point (90-100° C). Laboratory tests showed that more colonies (130.7%) grew on the oil-covered medium than on the ordinary medium (100%)

because the microorganisms were better able to adhere to the sticky medium. Since the growth of certain microorganisms was slightly inhibited on the oil-covered medium, another calculation was made 2 days later with an ordinary medium.

Investigation of the upper atmosphere at a temperature of 47° with the use of culture media covered with MG-10 oil showed that the surface of a medium in a Petrie dish did not freeze and that the number of microorganisms which grew on it was considerably higher than on an ordinary medium.

Thirty-seven flights were made in 1957-1958 and 1,213 samples were collected for bacteriological investigation by the proposed method. It was thus possible to obtain a characteristic picture of the bacterial aeroplankton in a vertical section.

102. Contamination of Air in Cities

"The Problem of Microfloral Contamination of City Air at Low Altitudes," by G. I. Sidorenko, Chair of Hygiene, Second Moscow Medical Institute imeni N. I. Pirogov; Moscow, Gigiyena i Sanitariya, Vol 24, No 9, Sep 59, p 84

"The author presents data from investigation of bacterial contamination of the atmospheric air in several sections of Moscow during the period November 1954-December 1955. Bacterial aeroplankton was studied by the use of the Krotov apparatus. A total of 2,876 bacteriological analyses were done. The study of microflora of city air was carried out at different altitudes -- from 1.5 to 152 meters. According to the author's data, bacterial contamination of city air depends on meteorological factors (temperature and relative humidity of the air, speed and direction of the wind, barometric pressure), and also on local conditions -- the intensity of the motion of traffic and persons, pavement of streets, the presence of green plants, and the altitude above the level of the soil covering."

Radiology

103. Nervous Mechanism Confirmed as Basis for Radiation Injury

"Investigation of the Receptive Capacity of Irradiated Parts of the Animal Body Under Experimental Conditions," by N. S. Delitsyna; Moscow, Meditsinskaya Radiologiya, Vol 4, No 8, Aug 59, pp 17-20

In a preceding article, the author reported on the reaction of the cerebral cortex in response to tactile stimulation of the irradiated areas of people subjected to X irradiation for therapeutic purposes. The research described in this article is a continuation of this work.

Tests were conducted on 30 rabbits; only the left shank of each was subjected to a single local X irradiation by doses ranging from 500 to 5000 r.

"Data obtained on animals agree with observations made on people and substantiate the presence of changes in the peripheral neuroreceptor apparatuses of those body areas which were subjected to the direct effect of the radiation factor.

"Immediately after irradiation, one can record changes in the reaction of the higher branches of the central nervous system, i.e., the cerebral cortex.

"A change in the functional condition of the central nervous system after irradiation leads to a completely different reaction of the cortex to tactile stimulation of the parts of the body that are removed from the site of irradiation, especially the symmetrical contralateral part of the body. The change in motor chronaxy not only of the irradiated, but also of the contralateral, nonirradiated extremity confirms the change in subordination (central) effects on the periphery.

"After a sufficiently strong effect of the radiation factor (a dose of 5,000 r), a further development of the pathological process is injury of the extremity not subjected to irradiation and also hemorrhage into the internal organs. It was observed that injury of the integument both on the side subjected to the direct effect of the irradiation factor and on the side not subjected to this effect proceeded through the same stages of development and assumed a completely identical clinical form; this confirms the fact that general mechanisms are determining the development of the process in both cases.

"The development of the segmental type of injury conclusively confirms the fact that a nervous mechanism lies at the basis of the process."

104. New Antigenic Component Detected in Proteins of Irradiated Tissues

"Further Study of the Problem of the Effect of Ionizing Radiation on the Antigenic Properties of Proteins," by V. A. Artamonova, Division of Immunology and Oncology, Institute of Epidemiology and Microbiology imeni Gamaleya, Academy of Medical Sciences USSR; Moscow, Meditsinskaya Radiologiya, Vol 4, No 8, Aug 59, pp 42-49

The purpose of this research was to study the antigenic properties of protein fractions of irradiated (800 r), and nonirradiated rabbits and rats, and also to study immunization by proteins from irradiated animals.

The methodology of the experiments is explained, and the experimental results are presented in four tables. The author presents the following conclusions:

"1. The study of the antigenic properties of the various protein systems, i.e., nucleic nucleoproteins, cytoplasmatic granules, and hyaloplasm, indicate the presence of a new antigenic component.

"2. In fractions of nucleic nucleoproteins and in cytoplasmatic granules of irradiated tissues, some component which is inherent in normal tissue is absent.

"3. The immunization of rats by proteins which have been altered by irradiation does not increase their resistance to irradiation."

105. Penetrating Radiation Effects on Higher Nervous Activity of Gravid and Nongravid Animals

"The Effect of Penetrating Radiation of the Condition of the Higher Nervous Activity of Animals," by V. P. Baskakov, Chair of Obstetrics and Gynecology, Military Medical Order of Lenin Academy imeni Kirov; Moscow, Meditsinskaya Radiologiya, Vol 4, No 8, Aug 59, pp 10-13

This research was conducted because the author was unable to find any reference to the effect of penetrating radiation on the functional condition of the central nervous system of gravid and suckling animals. Tests were conducted on rats subjected to a single whole-body irradiation by 250 r. Details of the method of study of the conditioned reflex activity of the experimental animals are included.

The author presents the following conclusions:

"1. Penetrating radiation affects the conditioned reflex activity of the animals and causes a number of changes in them. These changes appear in gravid and suckling animals significantly sooner (1-5 days after irradiation) and continue for a longer period than in nongravid animals. In nongravid rats these changes, as a rule, appear between the 12th and 14th days.

"2. More restless behavior is noted in the irradiated gravid animals than in the nongravid animals.

"3. The study of the reflex activity of animals makes it possible to detect changes which arise in an organism under the effect of irradiation at a time when other indexes (weight, attitude toward food, etc.) remain unchanged."

106 Decreased Tone of Venous Walls Lowers Venous Pressure in Radiation Sickness

"Changes in Venous Pressure in Acute Radiation Sickness in Rabbits," by A. S. Mozzhukhin, Military Order of Lenin Academy imeni S. M. Kirov; Moscow, Meditsinkskaya Radiologiya, Vol 4, No 8, Aug 59, pp 21-23

The purpose of this research was to study changes in venous pressure in various branches of the venous system in irradiated animals.

Results of experiments on rabbits irradiated by 800 r X-ray doses reveal a statistically reliable drop in venous pressure in all the branches of the venous system that were studied, both during the period of the initial reaction and at the peak of acute radiation sickness.

Simultaneously with a drop in venous pressure, distension of the walls of the veins of internal organs due to overfilling with blood was observed, which indicates a significant decrease in the tonus of the walls of veins, essentially in the internal organs, in acute radiation sickness.

107. Exudative Phase of Inflammation in Irradiated Animals

"The Course of the Exudative Phase of Inflammation in Irradiated Animals," by E. R. Bagramyan, Radiation Laboratory and Division of Pathophysiology of the All-Union Institute of Experimental Endocrinology; Moscow, Meditsinskaya Radiologiya, Vol 4, No 8, Aug 59, pp 23-28

The purpose of this research was to explain the effect of X-rays on the development of the exudative phase of inflammation; the effect of irradiation on the protein composition of the exudate as compared with the protein composition of the blood serum of irradiated animals; and changes in the nature of the inflammatory reaction in irradiated animals after the administration of ACTH.

Research was conducted on female rats by Selye's method. The animals were subjected to sublethal irradiation by 400 r.

The author presents the following conclusions:

"1. In the serum of irradiated and nonirradiated rats with aseptic inflammation, the content of albumins is decreased while the content of alpha globulins is increased. In contrast to nonirradiated rats, the content of gamma globulins is diminished in the irradiated animals.

"2. In the inflammatory exudate of irradiated rats, as compared with serum, the percentage content of beta globulins is sharply increased. Changes in the percentage of gamma globulins and albumins is dependent on the severity of the radiation sickness.

"3. In irradiated rats as well as in nonirradiated animals, ACTH inhibits the development of exudation in aseptic inflammation.

"4. The administration of ACTH to irradiated animals with inflammation increases the percentage of deaths."

108. Irradiation Effects on Liver Lipids of Rats

"Chain Reactions in Liver Lipids Following Irradiation Damage," by A. I. Zhuravlev and Ye. E. Ganassi; Moscow, Meditsinskaya Radiologiya, Vol 4, No 8, Aug 59, pp 32-37

The purpose of this research was to study the effect of irradiation on preparations of liver lipids in vitro and the effect of irradiation of rats by gamma rays from Co^{60} on the intensity of the accumulation of peroxides in lipids of animal livers.

Four tables and two diagrams illustrate the results of lipid irradiation. Results of the experiments showed that irradiated lipid preparations and lipids from irradiated animals have an increased capacity for the formation of peroxide compounds and that the antioxidative capacity of the liver lipids of irradiated animals drops.

The authors are of the opinion that the increase in titratable fatty acids due to auto-oxidation can occur in the following manner: peroxides → aldehydes → free fatty acids. The increase in the quantity of free acids in fat due to both auto-oxidation and autolysis inevitably increases the hemolytic activity of the fat. The accumulation of free fatty acids in the tissues of an organism as end products of chain oxidation reactions can be the cause of the increase in the hemolytic activity of liver tissues of irradiated animals.

10. Primary Toxicity in Acute Radiation Sickness

"Primary Toxicity in Acute Radiation Sickness," by Ye. D. Buglov, S. I. Dovgalev, and V. G. Karavayev, Belorussian Scientific Research Institute for Blood Transfusion and the Chair of Roentgenology and Radiology, Moscow Medical Institute; Moscow, Meditsinskaya Radiologiya, Vol 4, No 8, Aug 59, pp 37-41

The purpose of this research was to investigate the toxic properties of the blood and tissues of animals subjected to the effect of ionizing radiation. Tests were conducted on 50 dogs which were X irradiated by a total of 816-2,160 r.

The methodology and results of the study are presented in detail, and the authors offer the following conclusions:

"1. Toxic substances which play a definite role in the pathogenesis of radiation sickness appear in the blood and organs of animals after their irradiation.

"2. The administration of blood from irradiated animals causes shifts in the blood composition of the recipients which are similar to those occurring after small doses of irradiation. In particular, from the 3rd to the 5th day and through the 10th-15th day after the blood administration, a decrease of 35-45 % is noted in the quantity of leukocytes, and from the 10th-15th day and through the end of the period of observation (2 months), a decrease of 10-15 % is noted in the quantity of hemoglobin and erythrocytes, along with other symptoms. Such an effect is noted more regularly after the transfusion of blood from animals which have been irradiated by large does (2,160 r).

"3. The administration of liver and spleen extracts of irradiated animals causes in the recipient a decrease in the content of hemoglobin, erythrocytes, lymphocytes, total protein, blood catalase, etc.; however, a decrease in the total number of leukocytes is not specific in radiation sickness.

"4. Hypotensive substances were not detected either in the blood or in the extracts of the organs of irradiated animals.

110. Diphtheria Toxin Prepared on Media Sterilized by Gamma Rays

"The Preparation of Diphtheria Toxin on Media Sterilized by Gamma Rays," by D. R. Kaulen, Division of Radiation Microbiology and Immunology, Institute of Epidemiology and Microbiology imeni Gamaleya, Academy of Medical Sciences USSR; Moscow, Meditsinskaya Radiologiya, Vol 4, No 8, Aug 59, pp 49-54

The author studied the ionizing radiation method of sterilizing liquid nutrient media for culturing diphtheria bacteria. Gamma rays from Co^{60} were used in 600,000; one million; and 1.5 million r doses. Details of the experimental method and four tables are included.

The author presents the following conclusions:

"1. The biochemical composition of liquid culture media which have been sterilized by gamma rays in doses of 600,000 r and 1.5 million r is not subjected to any essential changes as compared with autoclaved media.

"2. The diphtheria toxin titer (judging by Lf and Ln) which was determined for irradiated media is not inferior to that prepared on autoclaved media, and in certain cases (media irradiated by 600,000 r) even surpasses it.

"3. The acatoxins obtained are not inferior in immunogenic and antigenic properties to control preparations.

"4. The experimental data indicate the possible use of gamma rays for the 'cold' sterilization of liquid media which are employed for the preparation of diphtheria toxins."

111. Changes in Blood Oxygen Index in Acute and Subacute Forms of Radiation Sickness Due to Polonium Poisoning

"The Problem of Changes of Blood Gases in Dogs Injured by Polonium," by G. I. Bezin; Moscow, Meditsinskaya Radiologiya, Vol 4, No 8, Aug 59, pp 60-66

The purpose of this research was to explain "the respiratory work of the blood" in 12 dogs with acute and subacute radiation sickness caused by polonium.

Four graphs explain the changes in the gaseous composition of the blood and the changes in the hemoglobin content of the blood of these animals.

The author presents the following conclusions:

"1. In the acute form of radiation sickness caused by Po^{210}, symptoms of circulatory hypoxia, and in some cases of hypoxemic hypoxia, are noted starting with the second week.

"2. In the subacute form, symptoms of circulatory hypoxia, and in certain cases, symptoms of histotoxic and hypoxemic hypoxia, are noted by the 3d-4th week.

"3. In the acute form, arterial hypoxia develops by the first week; and in the subacute form, by the end of the first month.

"4. In acute and subacute radiation sickness, as a rule, an increased value for the blood oxygen capacity, which is connected with a change in the functional properties of hemoglobin, is noted by the first week.

"5. Discrepancies in the arterio-venous differences with regard to the oxygen in the kidneys and of the tissues of the hind extremities may indicate a dissimilar course of hemodynamics and metabolism in the kidneys and in the tissues of the extremities."

112. Effect of Polonium Injury on Reactivity of Peripheral Blood Vessels

"The Reactivity of Blood Vessels Following the Injury of an Organism by Polonium," by V. V. Vasil'yevskaya; Moscow, Meditsinskaya Radiologiya, Vol 4, No 8, Aug 59, pp 66-71

Under the effect of ionizing radiation, blood vessels, to a certain extent, lose their capacity to maintain normal wall tonus and to respond on stimulation by appropriate changes in the lumen. Therefore, the author investigated the reactivity of peripheral vessels withregard to the vasodilation effect following injury of an organism by a radioactive substance--polonium.

Polonium (with an activity of 0.07 microcuries/g of body weight) was introduced subcutaneously to 139 rats. Three sets of diagrams demonstrate the reactivity of blood vessels of the rat ear to the local application of heat and cold, mechanical irritation, general warming of the body, and the intraperitoneal introduction of acetylcholine.

The author presents the following conclusions:

"The reactivity of the blood vessels of the rat ear is changed upon acute injury by polonium, and changes in the reactivity of the capillaries are the most distinct.

"The weakening and the inversion of the reactivity of blood vessels of the ear to vasodilation effects are noted during the first hours after the administration of polonium, and are especially distinct during the period of the greatest development of the process of injury, i.e., starting with the 10th day."

113. State of Plutonium in the Blood

"The Physicochemical State of Plutonium (Pu^{239}) in the Blood After its Intravenous Administration," by Yu. A. Belyayev; Moscow, Meditsinskaya Radiologiya, Vol 4, No 9, Sep 59, pp 45-51

The author studied the state of plutonium (Pu^{239}) in and its elimination from rat blood.

Results indicate the following:

"The content of plutonium in the blood at various periods after its intravenous administration in the form of a simple salt (nitrate) and citrate complex is not identical. In the latter case, a higher plutonium concentration is preserved in the blood over a longer period of time.

"The quadrivalent plutonium is transferred by the blood chiefly in the form of complexes bound by proteins. Approximately 10 % of the plutonium (the citrate) is found in its ionogenic state in the blood, and these ions are negatively charged.

"The plutonium content is five times as high in the blood plasma as in the formed elements. The correlation changes slightly with time."

114. Chronic Effects of Low Doses of Ionizing Radiation on Sensitivity of Nervous System

"The Sensitivity of the Nervous System to Weak Radiation Effects," by M. N. Livanov and I. N. Kondrat'yeva; Moscow Meditsinskaya Radiologiya, Vol 4, No 9, Sep 59, pp 3-13

The authors review literature which has appeared during the past decade on the effect of small doses of ionizing radiation on the sensitivity of the central nervous system.

The data accumulated substantiate the high sensitivity of the nervous system to ionizing radiation and the fact that even very low doses can accumulate and can consequently create lasting alterative processes.

On the basis of the data considered the authors suggest that the limits of sensitivity of the nervous system to the radiation factor and the limits of its alterative effect due to reparative processes may not coincide.

115. Prophylactic Use of Certain Sulfur-Containing Substances in Experimental Radiation Injuries

"The Prophylactic Use of Certain Sulfur-Containing Substances Following Experimental Radiation Injuries," by Ye. A. Mukhin, Chair of Pharmacology, Pharmacy, and Pharmacognosy, Military Medical Order of Lenin Academy imeni S. M. Kirov; Moscow, Meditsinskaya Radiologiya, Vol 4, No 9, Sep 59, pp 29-33

According to the data of a number of authors, beta-mercaptoethylamine is one of the most effective chemical substances for protection against injuries from ionizing radiation. Consequently, the research discussed in this article is a comparative study of the various salts of beta-mercaptoethylamine, its derivatives, and isothiurone compounds.

All the compounds under study, except the hydrochloride of beta-mercaptoethylamine, were synthesized by F. Yu. Rachinskiy. Part of the work was completed at the laboratory by S. Ya. Arbuzov. Tests were conducted on mice, rabbits, and cats which were subjected to 700 and 800 r X-ray doses. Tables and diagrams accompany the article.

The author presents the following conclusions:

"1. The toxicity of the various salts of beta-mercaptoethylamine and beta-aminoethylisothiuronium depends on the acid part of the compound.

"2. The value of the protective effect of the preparations of beta-mercaptoethylamine and beta-aminoethylisothiuronium is determined by the nature of the anion of the salt being used, by the dosages, and by the time of their administration.

"3. With the replacement of the hydrogens of the amino group of beta-mercaptoethylamine and of beta-aminoethylisothiuronium by methyl and ethyl radicals, the preparations lose their protective properties and increase in toxicity.

"4. Beta-mercaptoethylamine and beta-aminoethylisothiuronium lower blood pressure partly as a result of the stimulation of parasympathetic innervation.

"5. Beta-mercaptoethylamine, beta-aminoethylisothiuronium, and ethylisothiuronium when used in effective protective doses possess hypothermal and antidiuretic properties; however, there is no parallelism between these properties and the strength of the protective effect of these agents."

116. Effect of Radioactive Phosphorus on the Blood

"On Certain Characteristics of the Effect of Radioactive Phosphorus (P^{32}) on the Blood Content of Nitrogenous Compounds," by I. V. Savitskiy, Chair of Biochemistry of the Odessa Pharmaceutical Institute; Kiev, Ukrainskiy Biokhimichniy Zhurnal, Vol XXXI, No 4, 1959, pp 550-561

Experiments were conducted on rabbits to determine the changes in the blood content of proteins and other nitrogenous compounds after relatively small doses of P^{32} were administered to the animals. The experiments were continued for a period of 21 days during which the animals were periodically bled. P^{32} was administered in the following quantities: 1.5 microcuries per kilogram of body weight; 0.3 microcurie per kilogram of body weight; and 0.1 microcurie per kilogram of body weight. Blood analyses were carried out before the administration of P^{32}, after the administration of the radioactive phosphorus, and then 21 days later. It was found that considerable changes in protein metabolism took place as a result of the administration of the phosphorus, the extent of these changes depending on the dose applied and the time passed from the time of the administration of the radioactive substance. Relatively small doses, 1.5 microcuries, intensified the process of protein regeneration, while does of 0.1-0.3 microcuries weakened the process of blood regeneration and aggravated the disturbed condition of protein metabolism caused by the loss of blood.

117. Radiation Sickness and Desoxyribonucleic Acid Metabolism

"Desoxyribonucleic Acid Content in the Mucosa of the Small Intestines in Experimental Radiation Sickness," by V. A. Kireva, Biochemistry Laboratory of the Ukrainian Scientific Research Institute of Nutrition, Kiev; Kiev, Ukrainskiy Biokhimichniy Zhurnal, Vol XXXI, No 4, 1959, pp 525-533

Guinea pigs were used in experiments conducted to determine the effect of radiation sickness on the metabolism of nucleic acids and the rate at which the nucleic acids are renewed after P^{32} is administered. The animals were examined 24, 48, and 72 hours after they were exposed to total irradiation in doses of 500 r. It was established that 24 hours after the irradiation, the relative specific activity of desoxyribonucleic acid in the mucosa of the small intestines sharply decreased, but that during the subsequent 48-72 hours the activity of acid was restored to normal. Investigations were conducted also to determine the effect of ascorbic, ribonucleic, and adenosine triphosphoric acids and of copper on the content of desoxyribonucleic acid in the small intestines mucosa of an organism exposed to total irradiation. The data obtained indicated that these substances have a stimulating effect on the biosynthesis of desoxyribonucleic acid in the cellular nucleus. Copper in combination with ascorbic and ribonucleic acids was found to be most effective in this respect.

Miscellaneous

118. Importance of Physics in Medicine

"Physics in Medicine," by Prof A. Lebedinskiy; Moscow, Meditsinskiy Rabotnik, No 50 (1798), 23 Jun 59, p 2

The author of this article says that the 21st Congress of the CPSU made it clear that any achievement in medical science depends on whatever progress is made in biology, and any significant advance in biological sciences depends on what is accomplished in physics and chemistry.

Only recently, certain physiotherapeutic methods and the X-ray machine were used to illustrate the utilization of physics in medicine. These methods and the X-ray machine are now considered part of medical practice. It cannot be stated that methods now used in medical practice are entirely satisfactory. It is entirely possible and necessary to make improvements in the X-ray machine: its shielding must be perfected, and radiography instead of roentgenoscopy should be used where such a substitution will not impair diagnosis Luminosity and contrast range can be made 800 and 1,000 times greater by the use of electrooptic transformers. It must be remembered, however, that the utilization of any discovery made in physics depends on engineering improvements.

Fluorescent methods of examination are still not used extensively despite their great value. Data obtained by histochemical methods during the photometric measurement of light intensity is of great interest. The use of ultraviolet rays for examining living objects is opening up new paths for medical science.

The outlook for the utilization of electronics in medicine is particularly good now. The use of electronics in biology and medicine began long ago. Amplifiers were used in electrophysiological examinations as far back as the 1920s. Electronics is now used in determining the electric activity of the heart, brain, retina, muscular tonus, and many other physical phenomena.

With the discovery of a triode (thermionics), the time became ripe to employ a cathodo-radial tube. This made it possible to conceive a vectorcardiographic method, which is one method of examination of the bioelectric activity of the brain. The electroencephaloscope of Livanov and Anan'yev, currently in use, is such a device: it occupies a firm place in the diagnosis of brain tumors.

The use of electronics in industry is just beginning. Electronic devices can be reduced both in size and in price by semiconductors, etc. It is realistic to use computing machines to determine the causes of any change in the electrocardiogram and to find other electrical manifestations of various disturbances in physiological functions.

Modern electronics has not yet exploited the possibility of automatically recording man's immediate environment, particularly in industrial establishments. There are devices already in operation which accurately tabulate the number of erythrocytes and white blood corpuscles within one second.

The use of radioactive isotopes is a relatively young field in biophysics. The use of radioactive isotopes in diagnosis is a firmly established practice in clinical medicine; their utilization is expanding. Isotopes with a short half-life eliminate the danger of excessive irradiation of the patient: they are now in production. Krypton-85 and iodine-131 are being extensively used in cases of pulmonary infections, etc. Success has been achieved in diagnosing brain tumors by the use of isotopes in conjunction with electroencephalography. Increase in the importance of tagged atoms in biochemistry leaves no doubt that before long they may be used to determine intermittent metabolism.

Ultraviolet radiation, aero-ionotherapy, electrosurgery, and ultrasound are firmly established in medical practice. Radiosurgery has great possibilities. Cobalt-60 and iodine-131 have been used in thyroid

gland surgery. A report recently read at the All-Union Conference of Neurosurgeons discussed the treatment of neuroectodermal tumors of the brain with radioactive gold. There have been reports concerning the utilization of yttrium-90 in the radioactive removal of the hypophysis.

Successful results obtained in the study of biophysical mechanisms of the action of ionizing radiation on the organism created the possibility of utilizing linear accelerators, betatrons, synchontrons, etc. in the treatment of malignant neoplasms. Accelerators are also the source of high-energy electrons and protons, which may be directed against localized tumors.

Experiments have been conducted on animals to test compounds which will allow the preservation of a living organism in an environment where the radiation is twice the magnitude of a fatal dose. Greater progress is expected in the improvement of the cold method of sterilizing surgical material, instruments, vaccines, and serums by the use of radioactive cobalt rays. The usefulness of infrared spectroscopy has been fully substantiated.

Natural science in our time, more than at any other time, offers proof of the validity of Engel's hypothesis that the special rules for vital phenomena are distinct from purely physical or chemical mechanisms. It is precisely for this reason that computing devices and other technical improvements and methods of examining patients do not purport to replace a physician in evaluating the condition of the whole living organism. On the contrary, the application of the discoveries in physics will help expand the logical reasoning of clinicists.

119. Catalogue of Courses Offered in Soviet Medical Institutes

Uchebnyye Plany Institutov Usovershenstvovaniya Vrachey (Lesson Plans for the Institutes for the Advanced Training of Physicians), edited by V. P. Lebedeva; Moscow, TsIUV [Central Institute for the Advanced Training of Physicians]; 1958, 127 pp

The catalogue-type booklet, which lists courses offered in all faculties of any institute for the advanced training of physicians, has been approved by the Administration of Cadres and Educational Institutions, Ministry of Health USSR. The course outlines are presented in tabular form and are preceded by a foreword in which the over-all purpose of the booklet is explained. Courses for the following types of faculties are included: therapeutic, surgical, sanitary-hygienic, and MS MPVO (medical service, local antiair defense.)

The numbers of hours which students are required to spend on given courses for each faculty are shown in the tables; in the MPVO medical service faculties, the study of toxic, radioactive, and bacteriological weapons occupies much of the time.

120. Role of Central Scientific Research Laboratories in Medical Vuzes

"The Role of Central Scientific Research Laboratories in the Organization of Scientific Work in Vuzes," by M. G. Sirotkina, Director, Second Moscow State Medical Institute imeni N. I. Pirogov; Moscow, Zdravookhraneniye Rossiyskoy Federatsii, No 9, Aug 59, pp 27-30

In February 1959, a Plenum of the Scientific Council, Ministry of Health RSFSR, was held at which concrete measures were established for improving medical sciences in vuzes (higher educational institutions) during the Seven-Year Plan. It was decided that one of the basic methods for elevating the theoretical level of biological and medical research is the complex solving of more important actual problems.

Of major importance in the solution of these problems is the organization of central scientific reasearch laboratories (Tsentral'naya Nauchno-Issledovatel'skaya Laboratoriya TsNIL). These laboratories have been and are now being established in major medical institutes of the USSR. The first central scientific research laboratories were organized 5 years ago. At that time, their function was to guarantee technological and methodological conditions for conducting research on basic problems where there was a need for an instructor-professor staff. The scientific work of the associates of these laboratories was considered as nothing more than consultative or as an aid for futher research.

Today, however, the situation has changed. Scientific associates of central scientific research laboratories now conduct major research and participate in the complex solution of major and actual problems.

The central scientific research laboratories are to become the scientific research centers of medical vuzes, where scientists in various specialties will successfully solve some of the most important problems of contemporary medicine. They are to be staffed by highly trained and talented scientific associates, capable of handling the most modern techniques and in conducting research on the highest level.

The central scientific research laboratories, acting as a base for serious and major scientific research in any field of medicine, are to have well-equipped biochemical, radiological, physicochemical, and clinicoexperimental laboratories and corresponding equipment.

An example of the type of work done by these laboratories is seen in the work of the Central Scientific Research Laboratory of the Second Moscow State Medical Institute imeni N. I. Pirozov, which has rendered valuable assistance to the Faculty Surgical Clinic, Therapeutic Faculty of the institute, by developing a modification of an operation on the heart and major blood vessels. This laboratory also promotes independent medical research by students and members of scientific student societies. Many aspirants for higher degrees use its facilities to carry out the experimental portion of their dissertations. The members of the laboratory also conduct lectures on contemporary methods of research and fulfill other responsible scientific methodological functions.

The author suggests that these central scientific research laboratories establish branches to facilitate their activities. These branches should incorporate various clinics, hospitals, dispensaries, and other facilities that are easily converted to scientific research.

121. USSR to Give New Hospital to Nepal

Moscow, Meditsinskiy Rabotnik, 18 Sep 59

The Institute for the Technical Planning of Terapeutic-Prophylactic Establishments, Ministry of Health USSR, "Giprozdrav" has completed the design and technical planning of a hospital which will be built in Nepal with Soviet funds.

The hospital will have 50 beds (30 for adults and 20 for children). The two-story building will house therapeutic, surgical, and children's departments and will have the latest medical equipment and instruments produced in the USSR.

The hospital will also be staffed by Soviet physicians and medical workers, and arrangements will be made for training local personnel to work in the hospital.

122. Hungarian Biometrics Conference

"Biometric Conference Opens" (unsigned article); Budapest, Magyar Nemzet, 8 Sep 59, p 3

A 3-day biometrics conference, organized by the Janos Bolyai Mathematics Society, began on 7 September 1959 at the Hungarian Academy of Sciences. More than 200 mathematicians, physicians, pharmacists, and plant and animal producers and researchers were present at the opening

session. Soviet, English, Czechoslovak, Polish, and German scientists participated. Academician Alfred Renyi, director of the Mathematics research Institute [Hungarian], opened the meeting, and the following persons read papers or offered comments: D. J. Finney, Aberdeen; Dr Irenusz Juvancz, Budapest; B. A. Sevastyanov, Moscow; J. Perkal, Wroclaw; and Afred Renyi, Pal Medgyessy, Bela Gyires, Janos Fischer, and Peter Csaki [all Hungarian].

VI. METALLURGY

123. Commercial Grade Selenium and Indium in Production

"Metals of a New Science," by Yu. Kuznetsov; Moscow, Izvestiya, 15 Sep 59, p 4

First quantities of commercial grade selenium and indium were produced on 14 Sep 59 at the Ust'-Kamenogorskiy Lead-Zinc Combine. Extraction of selenium was perfected by engineers Neverov and Volozhanin of the combine together with Nesterov and Isakova of the Institute of Metallurgy and Ore Dressing, Academy of Sciences Kazakh SSR. The indium extraction method was developed by another group of engineers of the combine and the All-Union Scientific-Research Institute of Nonferrous Metals and adapted to production by Tsyb, Candidate of Chemical Sciences, and engineers Takizhanov, Anosova, and Gayvoronskaya. The successful production of selenium and indium raised to 15 the number of metals being extracted or capable of being extracted commercially by the Ust'-Kamenogorskiy Lead-Zinc Combine.

124. Steam Bluing Cutting Tools

"Treatment of a Cutting Instrument With Steam," by Sr Engr V. Chernikov, Central Bureau of Technical Information, Voronezhskiy Sovnarkhoz; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 5 Aug 59, p 4

Considerable improvement in tool life and cutting speeds (no specific data given) is claimed for steam-treated cutting tools as compared with those treated by usual thermal methods.

Untreated tools are lowered into a special electric furnace preheated to 360-380°C. The furnace is then capped and temperature is increased slowly over a one-hour period to 500-540°C. Steam is then supplied to the furnace and maintained at a pressure of 1 atm for a period of 30 to 60 min depending on the size of instruments being treated. Instruments are then removed and cooled in oil.

Treatment is performed near annealing temperature of the tool steel whereby a portion of residual austenite transforms into martensite which increases wear resistance. Instruments become coated with an iron oxide film approximately 5 microns thick and dark blue in color. Chip seizure is decreased thereby decreasing resistance between work piece and tool.

125. High-Speed Induction Heating of Titanium Alloy VT-5

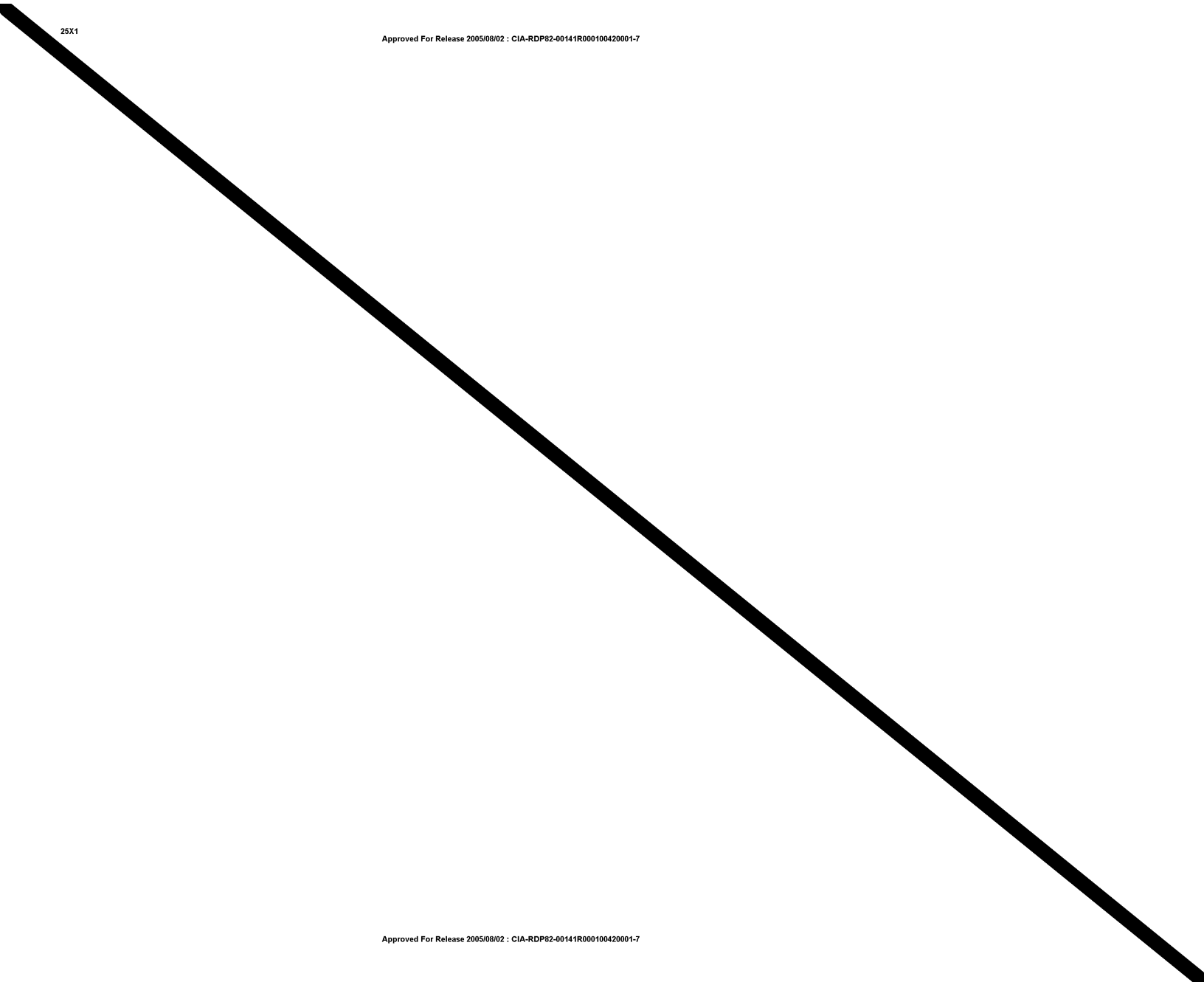
"Scale Formation on Titanium Alloy VT-5 During Induction Heating," by V. I. Parkhimovich and M. N. Bodyako, Physico-technical Institute, Academy of Sciences BSSR; Minsk, Doklady Akademii Nauk BSSR, No 5, May 59, pp 211-212

Specimens of titanium alloy VT-5 were treated in a MGZ-102 high-frequency apparatus (111 kw-2,500 cps generator, atmosphere not specified) at rates of 25 and 150°C/sec to 100-degree intervals in the range from 800-1,200°C. Specific increase of weight for specimens heated to 1,100°C at a rate of 150°C/sec was 50% that for specimens heated to the same temperature at a rate of 25°C/sec and approximately 3% that for furnace-heated specimens. Depths of the altered layers in specimens treated as indicated immediately above were 0.02-0.03 mm, 0.06-0.08 mm, and approximately 1 mm, respectively. Deviations in absolute values of microhardness at a distance of 0.02 mm from the surfaces of specimens heated under various conditions were insignificant. Microhardness at the surface varied from 550 to 500 kg/mm^2 and from 350 to 300 kg/mm^2 at the center of specimens.

126. Electrolytic Heating for Pressure Working

"New Developments in Electrolytic Heating for Pressure Working," by G. Muras, Candidate of Technical Sciences and Sr Scientific Associate, Physicotechnical Institute, Academy of Sciences BSSR; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 23 Aug 59, p 4

General descriptions are given of test equipment designed for heating metals and alloys electrolytically for subsequent cold or hot pressure working. Equipment operates on the principle of controlling movements of ions in a fluid and its mechanical displacement upon application of current (electrolytes not specified). Special features of the process are claimed to be its speed and oxidation-free character. Process is an adaptation of electrolytic heating methods finding increased application in industry for heat treatment of parts.



127. Calcium Oxide in Platinum and Palladium Melting

"Sintering Calcium Oxide and Preparing Crucibles for Melting Platinum and Palladium," by P. S. Mamykin and P. N. D'yachkov, Ural Polytechnic Institute imeni S. M. Kirov; Moscow, Ogneupory, No 6, 1959, pp 267-272

Data are presented on the physical and mechanical properties of experimental calcium refractory components prepared by firing charges of calcined chalk and various plasticizers. Best plasticizer liquids were a 4-5% solution of shellac in pure alcohol and a 2-3% solution of Plexiglass in dichlorethane or trichloroethylene. Addition of 8-10% by weight of these solutions assures normal forming of crucibles, cylinders, and other components. An addition of approximately 1% TiO_2 delays hydration slightly. Usual firing of components is conducted at temperatures of 1,720-1,740°C for 30 min. Satisfactory results were obtained in melting commercially pure platinum and palladium in fired crucibles set in induction and vacuum induction furnaces. Gas-free, dense-structure ingots of platinum, platinum-rhodium and palladium-silver were obtained using similar crucibles in plant vacuum induction furnaces. Spectrally pure platinum was obtained in nonfired crucibles consisting of an outer shell of magnesia and an inner shell of the usual calcium oxide charge faced with chemically pure sintered calcium oxide.

128. Occurrence of Germanium in Brown Coal

"Distribution of Germanium in Various Components of Brown Coal," by I. S. Sofiyev, I. N. Semasheva, and D. T. Zabramnyy; Tashkent Doklady Akademii Nauk Uzbek SSR, No 8, Aug 59, pp 34-36

It is a well known fact that germanium is associated with the vitrain portion of coal. The reducing decomposition of vegetable matter especially favors concentration of germanium.

"We have established the fact that the germanium content might be unusually high in the high-vitrain lignite of the Lower Jurassic period, composed of 90-95% fusian group components, and formed under oxidizing conditions. The presence of germanium in fusian-xylain coals already manifests the incompleteness of our understanding about conditions favoring germanium concentration.

"Our research data indicates that in certain sections of the examined coal field about 60-70% of all the germanium is associated with the stem vitrain, which comprises from 3 to 5% of the coal mass.

"Generally the germanium content in the ash of vitrain of the examined coal deposit is measured in hundredths, or less often, tenths of one percent, while the germanium content in the stem vitrain of the same deposit is measured in several tenths of one percent, often close to one percent, and in a few cases is even as high as 7-8% which is equivalent to 4,000 g per ton of stem vitrain."

Thus it is seen that concentration of germanium in stem vitrain of the examined deposit is 7-10 times higher than the maximum concentration of it in vitrain of other deposits.

To improve the old method of germanium extraction from coal ashes, efforts should be made to perfect petrographic concentration by which the vitrainized components can be separated from the rest of the coal mass.

[For additional information on metallurgy see also under Chemistry, Inorganic Chemistry.]

129. Chinese Propose New Zone-Refining Method for Gallium of High Purity

"A New Zone-Refining Method for Gallium of High Purity," by Liu Min-chih (刘 民治), Institute of Physics, Academia Sinica; Peiping, Wu-li Hsueh-pao (Acta Physica Sinica), Vol 15, No 7, Jul 59, pp 387-392

For refining gallium to a high degree of purity (99.9999%), the author presents a new zone-refining method, featuring the use of a helix of plastic tubing which contains the material to be refined. The helix provides many molten zones on the side nearest the heating element. As the helix is rotated, the zones move continuously through the entire contents of the plastic tube. The author states that only 3 hours were required to purify a quantity of gallium which would have required 42 hours for purification by the conventional straight line single zone method.

VII. PHYSICS

Atomic and Molecular Physics

130. Filters for Ultraviolet

"Interference Filters for the Ultraviolet Region of the Spectrum," by R. S. Sokolova and T. N. Krylova, Moscow, Optika i Spektroskopiya, Vol 6, No 6, Jun 59, pp 788-791

Multilayer deposits of alternate coatings of thorium dioxide and silicon dioxide, transparent in the region of 220 to 400 mμ, are described. Multilayer coatings which selectively increase reflection from a quartz surface to 95% were obtained and may be used as reflecting filters. The obtained stable interference filters for the region of 250 to 400 mμ transmit a maximum of 80% at a half-width of 6 to 14 mμ.

131. Improved Spectrometric Measurements

"On the Selection of a Speed of Scanning, Optimum Time Constant, and Slit Width for Spectrometer Measurements," by G. G. Petrash, Moscow, Optika i Spektroskopiya, Vol 6, No 6, Jun 59, pp 792-797

The requirements of minimum total mean square error yielded optimal conditions of spectra recording. A case of small systematic distortions is analyzed. The results are applicable to a large class of measureable distributions, functions of apparatus, and characteristics of the recording system.

132. SiO as Emitter of Heretofore Questionable Bands in Quartz Vapor Spectrum

"The Emission Spectrum of Quartz Vapor," by A Lau, First Physics Institute of Humboldt University, Berlin; Berlin, Experimentelle Technik der Physik, No 3, 1959, pp 104-117

SiO bands have been definitely identified in the spectrum of quartz vapor, and reported in the literature. Cameron (Phil.Mag. 3 (1927) 110) obtained, in a low-pressure arc (carbon electrode with Si- or SiO_2 added) in an oxygen atmosphere, additional bands, which he assumed to be emitted

by the SiO molecule. These and many other new bands were produced by Pankhurst and Woods (Proc.Phys.Soc. 52 (1940) 707; Phys.Rev. 63 (1943) 426) with a heavy current discharge through a quartz capillary. Woods (Phys.Rev. 63 (1943) 426) was able to identify one of these bands as the (0-0) band of a $^2\Sigma$-$^2\Sigma$- transition of the SiO^+ molecule. The others were ascribed to the SiO_2 molecule by Pankhurst and Woods.

This work reports an attempt to produce the questionable bands with a high-frequency discharge and to determine whether SiO_2 or another silicon oxide is the emitter of these bands. The spectra of the vapors of quartz, silicon monoxide, and silicone metal were studied under various conditions.

The measurements indicate that all the questionable bands are emitted by the SiO molecule.

Mechanics

133. Heat Transfer in Highly Ionized Gas

"On Flows With High Thermal Conductivity," by M. N. Kogan; Moscow, Doklady Akademii Nauk SSSR, Vol 128, No 3, 21 Sep 59, pp 488-490

The various types of flows which are characteristic of a gas with high heat conductivity are studied. Gases considered are ionized gases, which have a high conductivity due to the mobility of the electrons, and plasmas, which are highly heat-conducting because of radiation processes. The thermal boundary-layer problem is solved and heat transfer to a wall or viscous layer is found.

134. Equations for Nonstationary Flows in Laval Nozzles Solved

"On Nonstationary Gas Flows in Laval Nozzles," by O. S. Ryzhov and G. M. Shefter, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 128, No 3, 21 Sep 59, pp 485-487

An exact solution of the nonlinear equations for the velocity potential of the near-sonic motion of a gas through a Laval nozzle is obtained. Changes in the parameters of the flow are assumed to occur slowly, while the character of the motion remains essentially nonstationary. The solution is said to be a generalization of the solutions for stationary gas flows in the neighborhood of the transitions surface in Laval nozzles.

135. Magnetogasdynamics of Gravitating Gas Masses

"Certain Exact Solutions of the Equations of Magnetogasdynamics in the Presence of Gravitational Forces and a Null Temperature Gradient," by Ye. V. Ryazanov, Mathematics Institute imeni V. A. Steklov, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 126, No 6, 21 Jun 59, pp 1224-1226

Certain exact solutions of the equations of magnetogasdynamics describing the one-dimensional nonstationary motion of a gravitating ideal gas with cylindrical symmetry are obtained. The absence of a temperature gradient is assumed in the region of the flow. It is further assumed that the velocity of a gas particle is a linear function of its distance from the axis of symmetry, that the conductivity of the gas is infinite, and that there is no viscosity or heat conductivity. It is stated that the problem is applicable to the study of the motion of cosmic gas masses.

136. Solution for Nonlinear Partial DE in Magnetohydrodynamics

"On an Approximation Method for Investigating Plane Vortex Flows in Magnetohydrodynamics," by I. I. Nochevkina, Moscow State University imeni M. V. Lomonosov; Moscow, Doklady Akademii Nauk SSSR Vol 126, No 6, 21 Jun 59, pp 1220-1223

The plane, stationary, vortex motion of an ideal compressible fluid in a magnetic field perpendicular to the plane of flow is studied. A method is given for solving the system of nonlinear partial differential equations representing interactions between magnetic and hydrodynamic phenomena in a conducting medium with infinite conductivity. The method is applied to study subsonic and supersonic non-isentropic flows in the M number range between 1.56 and 1.9.

137. Shock Waves Resulting From Point Explosion Studied

"On Singularities Close to the Center of an Explosion and on the Origin of Two Shock Waves," by N. N. Kochina, Mathematics Institute imeni V. A. Steklov, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 126, No 6, 21 Jun 59 pp 1216-1219

The problem of a point explosion in a compressible medium is considered under the assumption that the equations of state of the medium are close to the equations of state corresponding to automodeling motions. A particular medium which is almost an ideal gas and has an adiabatic index of seven is taken as an example. The differential equations are solved for an exact solution and analyzed. Motion behind the front of the shock wave is described.

138. Equations for MHD Flow Around Corner Given

"Stationary Flow of an Infinitely Conducting Gas Around an Angle," by G. A. Lyubibimov, Moscow State University imeni M. V. Lomonosov; Moscow, Doklady Akademii Nauk SSSR, Vol 126, No 4, 1 Jun 59, pp 733-735

The flow of an infinitely conducting gas around an angle in a magnetic field is studied. The magnetic field is arbitrarily oriented with respect to the flow. A stationary solution of the equations of magnetohydrodynamics is obtained which depends only on the angle.

139. Equations of Motion of Cone Under Sliding Load Solved

"On Asymptotic Integration of the Differential Equation of an Automodeling Dynamics Problem," by I. S. Gerasimov, Institute of Mechanics, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 126, No 4, 1 Jun 59, pp 727-729

A solution is given for the system of differential equations for the automodeling dynamics problem for the motion of a conical shell whose thickness is proportional to the distance from the vertex. An axially symmetric sliding load, which moves with constant velocity from the vertex along the axis of the cone, acts on the surface of the cone. The system is reduced to a single linear ordinary differential equation of the sixth order and solved by an asymptotic differentiation method. The Poisson ration is taken as 0.33.

140. Nonlinear Partial DE Reduced to Linear Ordinary DE to Solve Boundary Layer Problem

"On the Integration of Boundary Layer Equations," by V. Ya. Shakadov, Moscow State University imeni M. V. Lomonosov; Moscow, Doklady Akademii Nauk SSSR, Vol 126, No 4, 1 Jun 59, pp 730-732

A method is given for reducing a calculation of a boundary layer described by nonlinear partial differential equations to the solution of the boundary value problem for linear ordinary differential equations. The functions determined from these equations are independent of the pressure gradient and may be used to calculate flow around any surface. In the case of a compressible gas, the functions may be dependent on the physical characteristics of the gas and on boundary conditions for temperature at the surface of the object.

141. Integral Equations With Finite Limits

"On Integral Equations With a Kernal Which Depends On the Absolute Value of the Difference in the Arguments and a Finite Interval of Variation of the Variable," by G. A. Grinberg, Corresponding Member of the Academy of Sciences USSR, Physicotechnical Institute, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 128, No 3, 21 Sep 59, pp 450-453

The solutions of integral equations with kernals which are functions of only the absolute value of the difference in the arguments are considered. Equations of this type are involved in such physical situations as when the kernel represents the potential of several central forces and depends on only the distance from the force center. The diffraction of electromagnetic waves on individually conducting, plane screens and on a band of finite width are also problems involving such equations.

The possibility of reducing the solution of equations of the type.

$$\int_{a_1}^{a_2} K(|x - \xi|)\ u(\xi)\ d\xi = f(x),$$

where a_1 and a_2 are finite real numbers, to the solution of a pair of independent second-order equations is shown. Relationships between the integral equations and other more simple "key" equations to which the solution of the general equation is reduced are also given.

142. Spark Gap Studies Under Very High Gas Pressures

"A Spark Gap For Very High Gas Pressures," by G List, Physical-Technical Institute, German Academy of Sciences in Berlin; Berlin, Experimentelle Technik der Physik, No 3, 1959, pp 118-125

A description is given of a spark gap and a gas compressing apparatus with which spark discharges in highly compressed gases can be studied. The discharge chamber is designed to withstand a pressure of more than 1,000 atmospheres. The volume of the available discharge space is 8.5 cm^3; the maximum electrode spacing is 0.6 cm. One electrode is grounded, and the other is connected to a 300-kv rectifier which supplies a variable voltage.

To date, the apparatus has been operated with a pressure of 400 atmospheres and a voltage of 120 kv. The pressure drop amounted to less than 5 atmospheres per hour. The breakdown voltages of industrial nitrogen (containing 0.1% H_2O, 0.01% O_2, and 0.004% CO_2) and of a mixture of 77% neon and 23% purest helium were measured for a positive DC voltage between plane parallel nickel electrodes.

The results obtained in these first tests support an earlier made view (G List, Ann.Phys. (6) 20 (1957) 238) that fluctuations of the breakdown voltage in compressed gas, and with slowly increasing electrode voltage, are connected with an extremely long delay time and that, for this reason, the probability of developing an independent discharge in the case of the field breakdown is very slight.

Nuclear Physics and Atomic Energy Development

143. Different Cyclotron Design

"A Cyclotron With a Radially Traveling Magnetic Wave," by Ye. G. Komar, Atomnaya Energiya, Vol 7, No 1, Jul 59 pp 57-63

Various construction designs of a cyclotron with a radially traveling wave of the magnetic field are analyzed, as well a relationship among the basic parameters of this type of cyclotron, suggested by the author. By means of special ring-shaped windings fed by AC generators, one or several concentric radially traveling magnetic field waves are formed in the gap between the poles of the cyclotron magnets. Two versions are suggested. In the first, the traveling wave is made up by the field in which the acceleration takes place. In the second the traveling wave is superposed on the usual cyclotron constant magnetic field and acceleration occurs in the cumulative field. The spatial field distribution in the wave secures a region of stability ($1 > n > 0$) which should move in a radial direction with the radial velocity of the particles. A region of stability is also secured in the case when the absolute magnetic field value in the acceleration zone rises sharply from the center toward the external diameter.

The suggested system permits in principle, the construction of a cyclotron for as high energies as are desired. Notwithstanding the cyclic action of such an accelerator, there are reasons to assume that the mean intensity in it may be higher than in a synchrocyclotron, because of better focusing.

Examples of calculations of this type of accelerators for various energies are given. The computations prove that the weight and dimensions of such accelerators may be much below those of accelerators of other types for the same energies.

144. A Model for Computing the Critical Mass of a Reactor

"A Method of Predicting the Critical Mass and Neutron Flux Distribution of a Reactor by Use of a Physical Model," by V. A. Dmitriyevskiy and I. S. Grigor'yev; Moscow, Atomnaya Energiya, Vol 7, No 1, Jul 59, pp 27-32

A new method for preliminary determination of the critical mass of a reactor and of the distribution of the neutron flux is suggested in the form of physical modeling. For experimental purposes a reactor model is used without fissionable material. The "operational" channels of the model are filled with a neutron absorber simulating the fissionable material by its cross section of neutron absorption. The production of fast fission neutrons is simulated by a neutron source which is successively shifted along the channels. The distribution of the thermal neutron beams is measured by means of detectors sensitive to thermal neutrons. It the power of the source is known and the absolute value of the neutron flux, then the critical reactor mass may be found experimentally. This method of modeling is checked on an uranium hexafluoride reactor. The experimentally obtained critical mass value agrees well with the value obtained during reactor operation.

Together with critical and exponential experiments the suggested method may be advantageous for the study of projected reactors, the choice of optimal parameters of the lattice, etc. The method is very simple and does not require fissionable material or a strong neutron flux for its application.

145. Neutron Diffusion in a Reactor

"The Effect of a Cylindrical Channel on Neutron Diffusion," by N. I. Laletin; Moscow, Atomnaya Energiya, Vol 7, No 1, Jul 59, pp 18-26

Cavities found in the active zone of a nuclear reactor essentially influence neutron leakage from the reactor. The allowance for this effect is important in the computation of the critical mass of the reactor. It is sometimes of interest to know the effect of empty channels on the neutron distribution outside the active zone. The effect of a single cylindrical cavity on neutron diffusion is studied. Expressions for neutron leaks through a channel located in the center of the reactor are obtained, and for additional neutron leakage due to the presence of a neighboring channel. The effect of the distribution law of the neutron stream along the channel on the applicability of diffusion formulas is analyzed.

146. Radiation Producing Loops

"The Nuclear Reactor Circulating Loop as a Source of Radiation," by Yu. S. Ryabukhin and A. Kh. Breger; Moscow, Atomnaya Energiya, Vol 7, No 2, Aug 59, pp 129-137

The solution of the problem concerning a circulating loop with one isotope, described previously by the authors in this journal, Vol 5, No 5, 533 (1958), is expanded to a general case in which several radioisotopes form the activating substance and have radioactive descendents. The problem of the absolutely maximum power of the circuit is analyzed and of the expenditure of neutrons for a unit of power for a number of elements which may be used as activating substances in the circuit. The most advantageous seems to be indium and its alloys. The circulating loop in which the activating material is fissible (uranium loop) is given particular attention. It is shown that the specific power of such a loop is, with all remaining conditions unchanged, much lower than the specific power of loops with metallic indium or its alloys. As a particular case of a uranium loop, the circulation of incompletely burned heat emitting elements from the reactor to the radiation equipment and back is analyzed. It is demonstrated that in this case, the power of the equipment may be increased two to fourfold in comparison with the power of the equipment with a single use of fully burned out heat emitting elements.

147. Stability of Nuclear Equipment

"Stability of Nuclear Power Equipment," by A. S. Kochenov; Moscow, Atomnaya Energiya, Vol 7, No 2, Aug 59, pp 122-128

The stability of nuclear power equipment consisting of a water-water reactor with a negative temperature coefficient of reactivity, a steam generator producing saturated vapor, and turbines, is studied. It is assumed that the system has only two regulating devices: a throttle governor before the turbine and a regulating device keeping the water level in the steam generator steady. Kinetic one group equations are used with allowance for one group of delayed neutrons. The study is carried out at small perturbing parameters. Nonlinear equations are linearized. A conclusion on the stability of the equipment is obtained.

148. Beta Radiation Dosimetry

"Method of Beta-Dosimetry Based on Studies of Electron Spectra in Beta Emission Fields," K. K. Aglintsev and V. P. Kasatkin; Moscow, Atomnaya Energiya, Vol 7, No 2, Aug 59, pp 138-143

A dosimetry method for beta-radiation is devised, based on the study of acting electron spectra in fields of beta radiators. The study of beta spectra has been carried out by means of a scintillation spectrometer. It has been shown that the value of the dosis $D = N(dE/dx)$, where N is the number of beta particles penetrating an infinitely small volume around the studied point; (dE/dx) is the averaged (along the spectrum) value of ionization losses. It has been established that the value (dE/dx) is determined by the maximum energy of the beta spectrum of the isotope and practically does not depend on the depth of the medium and the diameter of the source. Curves of depth doses for S-35, W-185, Tl-204, Y-91, Ce-144 + Pr-144 are presented and the criteria of isotope choice to secure the optimal conditions of irradiation are established.

149. Yield of Fission Fragments of U-233

"The Fine Structure of the Yield Curve of Fission Fragments of U-233," by V. K. Gorshkov and M. P. Anikina; Moscow, Atomnaya Energiya, Vol 7, No 2, Aug 59, pp 144-147

The yields of Ba-138, Sr-88, Sr-90 and Y-89 were measured, as well as of five isotopes of zirconium, formed at fission of U-233. The relation of the fine structure of fragment yield to the mass number was revealed. Independent yield of C_s-136 was obtained and the evaluation of the independent yield of R_b-86 was carried out. As a result of these measurements and of previously obtained data, important sections of the yield curve of fission fragments were plotted. The boundary of transition from one neutron emission by light fragments to two-neutron emission was determined on the curve. It was concluded that the structure is related to the instant of the fission act.

150. Neutron Spectrometer

"Neutron Spectrometer with a Flat Crystal," by Yu. Ya. Konakhovich and I. S. Panasyuk; Moscow, Pribory i Tekhnika Eksperimenta, No 3, May-Jun 59, pp 26-31

A neutron spectrometer with a flat crystal set on a vertical neutron beam of the RFT uranium-graphite reactor is described. During the operation of the spectrometer, a beam of monochromatic neutrons has been obtained reaching $5.3 \cdot 10^5$ neutrons/min/cm^2 at an energy of 0.1 ev. The ratio of the effect and the background of incoherent scattering is equal to 130. The spectrometer is operated by remote control. As examples of the instrument's operation, curves of cross sections of Pu-240 and Au are presented, as well as the neutron spectrum of the RFT reactor at a power of 7.96 MW.

151. Computers for Accelerators

"Computer for Studying Motion of Particles in a Linear Electron Accelerator," by I. F. Kharchenko, R. M. Nikolayev, A. M. Nekrashevich and N. M. Zeydlits, Physicotechnical Institute, Academy of Sciences of the Ukrainian SSR; Moscow, Pribory i Tekhnika Eksperimenta, No 3, May-Jun 59, pp 71-76

A mechanical computer is described for computing the axial motion of charged particles in a linear electron accelerator. The device facilitates a relatively fast computation of phase motion of particles in the accelerator at specified parameters of the accelerating system and parameters of the extracted beam with a sufficient accuracy.

152. Corona Discharge Counters

"Corona Counters of Strongly Ionizing Particles," by A. B. Dmitriyev, Yu. M. Tolchenov, A. I. Filatov, and V. G. Chaykovskiy; Moscow Pribory i Tekhnika Eksperimenta, No 3, May-Jun 59, pp 35-40

Counters are described which operate in the region of a stable corona discharge and are intended for recording of strongly ionizing particles. The pulse amplitude is proportional to ionization created by a particle in the operating part of the counter. The gaseous amplification factor in the counters reaches 10^3-10^4 and may be made independent of the voltage of the power supply. This produces a counting plateau of great length and low slope. The presence of a strong background of weakly ionizing radiation has little effect on the counter parameters in comparison with strongly ionizing particles. A short description of the operating mechanism of the counters is given.

153. Improved Focusing of Extracted Beams

"Method of Focusing of Charged Particles from Accelerators," by V. N. Danilov and O. V. Savchenko, Joint Institute of Nuclear Research; Moscow, Pribory i Tekhnika Eksperimenta, No 3, May-Jun 59, pp 17-20

A modified focusing of charged particles obtained on the synchrotron of the Laboratory of Nuclear Problems is discussed. The particles are focused by a magnetic field formed in the gap of the deflecting electromagnet by means of iron bars. It is shown that for a certain relationship the dimensions of these bars the action of the focusing device is equivalent to the action of a magnetic quadrupole lens. By means of such lenses, the density of polarized 600-Mev proton beam intensity was raised threefold, and for 300 Mev π-mesons by a factor of 2.7 times at the recording equipment.

154. Cylindrical Air-Core Coil Found Most Suitable for Jena University Betatron

"Generation of the Magnetic Fields for the Acceleration of Electrons in the Air-Core-Coil Betatron," by G. Hentze, Institute of Technical Physics, Friedrich Schiller University, Jena; Berlin, Experimentelle Technik der Physik, Vol 7, No 4, 1959, pp 145-156

This discussion of the Jena electron accelerator emphasizes the various types of air-core coils used and the results obtained. Originally, the field was produced with Helmholtz coils, the homogeneous field of which is disturbed by iron cores. The Helmholtz coils offered advantages in the contraction and expansion of the ring of accelerated electrons. The large stray field of this coil arrangement requires considerable reactive power to excite the field. For this reason, two other coil forms, a flat coil, and a cylindrical coil, were used to accelerate the electrons.

The self-induction of the flat coils, about 130 microhenrys, is much more favorable than that of the Helmholtz coils (about 200 microhenrys). The magnetic field is also more homogeneous; much fewer ampere windings are required to produce the same induction, and the stray field is much smaller, since the winding cross section and spacing are smaller. The cylindrical-core coil was found to be even more advantageous than the other two types. The small distance of about 8 millimeters from the outside circular boundary to the zero passage of the field proved to be extremely favorable for the removal of electrons; with this field arrangement, electrons could be released through a mica window into the atmosphere merely with the aid of a suitable deflection foil.

155. High-Resolution Nuclear-Resonance Spectrometer

"A High-Resolution Spectrometer for Magnetic Nuclear Resonances," by H. J. Koehler, M. Pettig and G Scheler, Physics Institute, Friedrich Schiller University, Jena; Berlin, Experimentelle Technik der Physik, Vol 7, No 4, 1959, pp 157-162

A nuclear-resonance spectrometer with a resolution of 10^7 is described. The magnetic field is produced by means of a low ohmic electromagnet with a pole-piece diameter of 20 centimeters. The 30-megacycle test frequency is obtained by multiplication from a 100-kilocycle standard frequency. The yoke, cast of dynamo steel, is about one meter square with a cross section of 34 centimeters by 10 centimeters. A few cubic millimeters of substance can be examined. The article illustrates the nuclear-resonance spectrum of the protons of ethyl alcohol, recorded with a nonrotating cylindrical specimen about 5 millimeters long and 2 millimeters in diameter and with a rotating spherical specimen 2 millimeters in diameter, the latter providing much greater resolution.

Miscellaneous

156. Electron Microscope Completed in Soviet Far East

"Universal Electron Microscope," (unsigned article); Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 26 Aug 59, p 4

Assembly of a universal electron microscope for investigation of the internal structure of matter has been completed at the Far East Affiliate of the Siberian Branch of the Academy of Sciences USSR. The microscope has a magnification range of 200 to 100,000 and is designated for studying coals, minerals, biological specimens, etc. It will be possible to operate with specimens with an area to be studied less than 0.8 mm square.

VIII. MISCELLANEOUS

157. Congress of Scientific-Technical Societies Called

"On Calling the First All-Union Congress of Scientific-Technical Societies," (unsigned article); Moscow Pravda, 19 Sep 59, p 6

"The All-Union Council of Scientific-Technical Societies wishes to inform delegates that the First All-Union Congress of Scientific-Technical Societies will be held on 20 October 59 in the city of Moscow."

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