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CENTRAL INTELLIGENCE AGENCY

SCIENTIFIC INFORMATION REPORT

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PLEASE NOTE

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

SCIENTIFIC INFORMATION REPORT

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"The Effect of Ionizing Radiation on Certain Vitamin-Containing Crops," by G. I. Shchibrya, V. A. Yazykova, L. P. Breslavets, and I. M. Berezina, Tr. Vses. N-I. Vitamin. In-t, (Works of the All-Union Scientific Research Vitamin Institute), No 6, 1959, pp 184-189 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 24, 25 Dec 59, Abstract No 32116)

"Gamma irradiation by small doses over a long period exerted a stimulating effect on the growth and development of buckwheat; the yield of green foliage increased 30-64 %, and the rutin reserve increased 15-28 %. X irradiation of dry carrot seeds by 2,000-4,000 r doses increased the carrot yield by 14-26 %, and the carotene reserve, by 34-57 %."

2. Radioactive Treatment Intensifies Plant Growth and Speeds Blooming, Fruition, and Ripening

"The Effect of Radioactive Isotopes on the Pigments of Plastids Under Various Conditions of Plant Nutrition," by P. A. Vlasyuk and O. D. Kolomiets', Vestnik Akademii Nauk UkSSR, 1959, No 6, pp 14-26 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 2, 25 Jan 60, Abstract No 1903, by V. Barun)

"The application of radioactive phosphorus (P^{32}) in doses amounting to 10-50 microcuries per bushel of tea plants increases the amount of the yellow pigmentation of the plants and (slightly) decreases the chlorophyll a and b content. The efficacy of radiophosphorus action does not depend on the type of tea plant. The age of the plant exerts a significant effect, i.e., the latent period of the P^{32} effect was greater on 5-year-old than on 2-year-old plants. The extra radical treatment of tomato plants by P^{32}, Zn^{65}, and S^{35} in doses ranging from one to 10 microcuries per plant has a positive effect on the synthesis and the ratio of the pigments and increases the size of the plastids. The ratio of carotene to xanthophyll and of chlorophyll a to chlorophyll b is increased. The presowing treatment of the seeds of tomato plants of the "Chudo rynok" type by P^{32} (5 microcuries per kg), boron, and manganese has a positive effect on the accumulation of all pigments in plastids. Under the effect of P^{32}, Zn^{65}, and S^{35} plant growth is significantly intensified, and the blooming, fruition, and ripening of tomatoes is accelerated."

3. Factors Regulating Radiostrontium Uptake and Concentration in Plants

"A Study of the Ratio of Strontium-90 and Calcium in Soil and Plants," by Prof I. V. Gulyakin, Ye V. Yudintseva, Ya. Neyberg and E. M. Levina; Moscow, Izvestiya Timiryazevskoy Sel'skokhozyaystvennoy Akademii, Vol 30, No 5, Sep/Oct 59, pp 29-46

Tests were conducted to determine the mechanisms regulating the accumulation and ratio of strontium 90 and calcium in plants (wheat, peas, red beets, and potatoes).

Results of these experiments showed that the calcium concentration differs in plants growing in different types of soil (sand, loam, and chernozem) but it is almost identical in plants growing in similar types of soil; however, the ratio of strontium to calcium in plants differs because the plant uptake of strontium 90 depends on the concentration of strontium 90 to the calcium in the soil, on the type of soil, and on other factors.

4. Oxidation-Reduction Changes Induced in Potato Plants by X Irradiation

"Change of Oxidation-Reduction Potential in Potato Plants Under the Effect of X Irradiation," by I. M. Vasil'yev and O. I. Parfenova, Dokl. AN SSSR, Vol 125, No 2, 1959, pp 401-403 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 24, 25 Dec 59, Abstract No 32117, by Udovenko)

"The Eh (oxidation reduction potential) value of potato plants, was determined in vivo following X irradiation by 3,000 r doses. It was found that the Eh value substantially rises at the beginning of irradiation, greatly fluctuates during irradiation, and steadily falls even before the termination of irradiation, thus often reaching the original level."

5. Ionizing Radiation Effects on Potato Oxidative Enzymes

"The Effect of Ionizing Radiation on Oxidative Enzymes of Potato Tubers," by B. A. Rubin and A. V. Mikheyeva, Biokhimiya Plodov i Ovoshchey (Biochemistry of Fruits and Vegetables), No 5, M., AN SSSR, 1959, pp 102-112 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 2, 25 Jan 60, Abstract No 2019, by K. Zakherman)

"Potato tubers were subjected to gamma irradiation, and the changes in the activity of oxidative enzymes isolated from mitochondria were studied. The irradiation dose was 10 kr (this dose is necessary to inhibit germination). Tests were conducted by using mitochondria of the pulp and eyes. The activity of polyphenoloxidase, peroxidase, and cytochromeoxidase was determined. It was explained that the nature of the radiation effect depends on the type of tissue and its physiological composition. The meristem was especially sensitive. First, ionizing radiation acts on the oxidative enzymes which are located in the mitochondria of the eyes. The activity of polyphenoloxidase diminished by approximately one/third. The activity of peroxidase in two of three different experiments decreased to one half, but in the third experiment it increased by a factor of 1.5. The activity of cytochrome-oxidase rose 1.5-2.0 times in two of three experiments, but in the third it decreased by a factor of 2.5. The activity of cytochromeoxidase changed in the opposite direction from the change in polyphenoloxidase and peroxidase activity, probably because ionizing radiation causes desorption of the enzymes from the structure of the mitochondria into the plasma. It is possible that the germination inhibition of the tubers and the disturbances in their vital activities are linked to structural changes in the mitochondria. This theory is substantiated by scientists investigating changes in phospholipids and nucleic acids subjected to irradiation effects."

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II. CHEMISTRY

Colloidal Chemistry

6. Review of Book by E. M. Natanson on Colloidal Metals

Kolloidnyye Metally (Colloidal Metals), by E. M. Natanson, reviewed by F. T. Ovcharenko, Corresponding Member, Academy of Sciences Ukrainian SSR; Kiev, Ukrainskiy Khimicheskiy Zhurnal, Vol 25, No 6, Dec 59, p 813

Introduction of new technical methods and automatic procedures into different fields of the national economy necessitates the production of colloidal metals. Colloidal metals are particularly important in the construction of instruments, radio engineering, radar techniques, electrical engineering, and machine building. Under the circumstances, the publication of Natanson's book by the Publishing House of the Academy of Sciences Ukrainian SSR (the book appeared in 1959) must be regarded as timely. In this book, the results of research conducted by the author during many years are reported.

The first part of the 347-page book deals with the theoretical aspects of the formation of colloidal metal particles under different conditions and subjects to a critical review the available methods for the preparation of metal sols.

The second and third parts of the book report results of original investigations carried out by the author, who conducted work on the development of new methods for the preparation of colloidal metals, investigated the properties of colloidal metals, and carried out investigations aimed at clarification of the mechanism by which the stability of colloidal metals is modified in the presence of high-molecular compounds. New methods for the preparation of colloidal metals, i.e., the electrolytic, flotation, and displacement methods, are discussed in detail.

These methods, which are distinguished by great simplicity, can be readily applied in technology on a large scale. They make it possible to produce highly concentrated metal sols. The most extensive information is given on the electrolytic method for the preparation of colloidal metals. Results of investigations of dispersed phases of organosols of metals by the electron-microscopic and X-ray diffraction methods are reported in this part of the book. New ideas regarding the mechanism of processes which affect the stability of metal sols in the presence of high-molecular compounds are developed.

The fourth part of the book discusses in detail ways of applying disperse phases formed by metal sols as catalysts in hydrogenation and reduction processes to which organic compounds are subjected in the liquid phase and in connection with the combustion of liquid fuels; the use of colloidal metals as pyrophoric, antidetonation, and antifriction materials; and their application as initial raw material in the production of materials which have magnetic as well as dielectric properties [ferrites], of permanent magnets, and of other important products manufactured by powder metallurgy methods.

Information is also given on the therapeutic properties of a number of metal sols. An extensive bibliography consisting of 450 references is contained in the book. The book is written in a popular manner so that it will be understandable to many readers who are not specialists in the field of colloidal chemistry. It has some shortcomings, among which is lack of a detailed description of methods for the preparation and concentration of some metal hydrosols. In Chapter 6, which deals with procedures for the displacement of metals from nonaqueous solutions, information is given only on the formation of copper organosols. The book reviewed is an extensive monograph which summarizes and organizes from a scientific standpoint the results of many investigations carried out by the author and other researchers in the field of colloidal metals. Natanson's work is the first book of this type that has been published; no books covering this range of subjects have appeared outside the USSR.

Fuels and Propellants

7. Hungarian Astronautics Article Mentions Rocket Fuels Containing Metals

"The Technology of Space Navigation," by Erno Nagy, mechanical engineer and secretary of the Astronautics Department of the Federation of Technical and Scientific Associations (MTESZ Asztronautikai Szakosztalya); Budapest, Technika, Jan 60, pp 6-7

Two full newspaper pages describe 13 engineering problem areas associated with current rocket experiments -- borane fuels, atomic rockets, isotope cells, magnetohydrodynamics, "minitrack" systems, etc. All photographs and the few source identifications are of Western origin. The author writes: "We do not want to talk here about Beryllium or about the metallic fuels in general because the experimental results made public so far do not give a complete picture. The dissociation relationships, primarily, are not clear; and the actual, final energy balance of a fuel mixture, which may be theoretically promising,

is determined to a significant degree by the dissociation reactions and by the losses connected with them.... An investigation of metallic boron has already begun but we cannot speak in detail about propellants consisting of boron plus oxygen for the same reasons as those given for beryllium above...." However, the author does discuss the characteristics of borane fuels (B_2H_6, B_5H_9, and $B_{10}H_{14}$) and mentions the "American HEF-2 and HEF-3 special gas turbine fuels."

[SIR Note: By referring to dissociation reactions, the author presumably wants to convey the idea that the heat of evaporation of a metal used as a fuel or the energy required for the decomposition of an organometallic compound must be considered.]

Industrial Chemistry

8. Electrochemical Characteristics of Ion-Exchange Membranes

"The Electrochemical Characteristics of Ion-Echange Membranes," by Ye. A. Materova and F. A. Belinskaya; Leningrad, Vestnik Leningradskogo Universiteta -- Seriya Fiziki i Khimii, Vol 14, No 22, Oct 59, pp 112-120

Ion-exchange membranes which are permeable only to ions with a positive or a negative charge and do not transmit ions with the opposite charge can be used as reversible electrodes, in electrodialysis (for instance, electrodialysis for the desalting of water), for the purification of sugar from electrolytes, in the concentration of radioactive impurities, in the production of some pure reagents, and for other applications. Several methods for the production of such membranes from ion-exchange resins have now been worked out. Depending on the method by which it has been prepared, a membrane can be homogeneous or nonhomogeneous. Homogenous membranes are produced by bringing to completion the synthesis of ion-exchange resins in special molds. Nonhomogeneous membranes are produced by pressing or rolling a finely powdered ion-exchange resin together with a binder (e. g., rubber, polyethylene, polvinyl chloride). To evaluate the performance of ion-exchange membranes, one must know the electrochemical characteristics (membrane potential, electrical conductivity, and transfer number for different ions) of the ion-exchange resins composing them in addition to the chemical nature of the resin and its mechanical and colloidal properties.

Cation-exchange nonhomogeneous membranes (made of SBS, SDV, RF, KM, and KMG resins) and anion-exchange nonhomogeneous membranes (containing EDE-10 or AV-16 resin) were investigated from this standpoint. It was established that the selectivity of membranes toward cations or anions depends on the type of resin used, the content of the resin in the

membrane, and the nature and concentration of the electrolyte which is in contact with the membrane. It was found that membranes made of USSR sulfonated resins are not inferior to membranes manufactured abroad (Amberplex S-1 and Amberplex A-1) as far as selectivity is concerned. It was established that membranes containing the sulfonated cation-exchangers SBS (40-70% of ion-exchange resin) and SDV (50% of resin) are ideally suited for applications requiring maximum selectivity toward cations in acid solutions (their application results in separation of the cations in question with a 100% current yield); the anion-exchange membranes containing the resins EDE-10 (50% of resin) and AV-16 (60% of resin) exhibited a somewhat lower selectivity toward anions (97-99%). The experiments which were conducted showed that membranes containing sulfonated resins and the anion-exchanger EDE-10 can be used to advantage in the electrodialytic purification of solutions from electrolytes.

9. Work on Magnetic Treatment of Water in USSR

"The Magnetic Treatment of Water," by N. Lapotyshkina, Candidate of Technical Sciences; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Vol 5, No 21 (629), 19 Feb 60, p 47

The magnetic method of treating water, which has been described before in Promyshlenno-Ekonomicheskaya Gazeta, is very simple to apply and operational costs are low. The water is passed at a definite rate of flow through a magnetic field produced by a simple device.

Investigation of the magnetic method was begun in the USSR in 1958. The VNITI (All-Union Scientific Research Heat Technology Institute) has designed two magnetic devices for the treatment of water with outputs of one and 50 cubic meters of processed water per hour, respectively. At approximately the same time, the Alma-Ata Plant of Heavy Machine Building designed an electromagnetic device which produces 11 cubic meters of processed water per hour.

Experiments have shown that the chemical composition of the water which has passed through the magnetic field of the device is almost unchanged. However, the scale derived from this water is not depósited as a solid coating on the surface being heated, but in the form of a sludge or of dispersed particles which do not adhere to the walls of the heat exchanger. [the walls through which heat transfer takes place]. The reasons for this have not been established definitely. One may assume that under the effect of the magnetic field a change in the mutual spatial arrangement of the ions of dissolved substances and the dipoles formed by water molecules takes place. As a result, the electrostatic interaction between particles is weakened and the structure of the solution changes, with the result that the scale precipitates in the form of a sludge. The new process of water treatment is still in the initial

stage of investigation. From the practical standpoint, it has been established that feed water for low-pressure boilers of the locomobile and Shukhov or Shukhov-Berlin types can be treated by this method. To feed these boilers, water containing 240-300 mg of salts per liter is used. The intensity of the magnetic field produced by the device must be no lower than 1,000 oersted and the rate of flow should be no higher than one meter per second. The devices designed by VNITI and by the Alma-Ata plant satisfy these requirements. If the devices are used for the treatment of water with a higher salt content, scale cannot be completely eliminated: only the rate of its formation is reduced.

When water treated by the magnetic method is applied in boilers, a rigid schedule of blowing out the boilers must be observed. Quantitatively, 4.5 — 5% by volume of the feed water must be blown out. If magnetically treated water is fed into a boiler contaminated with scale, the quantity of water that is blown out must be doubled. This is necessary so that the old scale be removed. The old scale which has already formed will be gradually removed from the heating surfaces as a result of the action of treated water that comes into contact with the scale.

The magnetic method of treating water is inferior to the chemical methods. However, magnetic devices can be applied to advantage in small boiler rooms, where the chemical treatment of water entails difficulties. It is obvious that after appropriate investigations have been carried out, it will be possible to apply the magnetic method for the prevention of scaling in different types of water preheaters and also for the elimination of scale in the tubes of steam turbine condensers.

Inorganic Chemistry

10. Vapor Tension of Beryllium Fluoride

"The Tension of Saturated Vapor of Beryllium Fluoride," by N. E. Khandamirova, A. M. Yevseyev, G. V. Pozharskaya, Ya. A. Borisov, A. N. Nesmeyanov, and Ya. I. Gersimov, Moscow State University; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 10, Oct 59, pp 2192-2195

The vapor tensions of beryllium fluoride were determined at the temperatures of 846-949.5°K. The heat of sublimation of this salt at 0°K was calculated and found to be equal to 56.64 kilocalories per mol.

11. Vapor Tension of Aluminum Fluoride

"The Vapor Tension of Aluminum Fluoride," by A. M. Yevseyev, G. V. Pozharskaya, A. N. Nesmeyanov, and Ya. I. Gersimov; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 10, Oct 59, pp 2196-2197

The vapor tension of aluminum fluoride at the temperatures of 980-1,123° absolute was determined by Knudsen's method. The dependence of the vapor tension on the temperature was determined and plotted in the coordinate system log P- 1/T. The heat of sublimation of aluminum fluoride at absolute zero was calculated and found to be equal to 73.46 kilocalories per mol.

12. Vapor Tension of Lithium Fluoride

"The Vapor Pressure of Lithium Fluoride," by A. N. Yevseyev, G. V. Pozharskaya, A. N. Nesmeyanov, and Ya. I. Gerasimov, Moscow State University; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 10, Oct 59, pp 2189-2191

The vapor tension of saturated vapor of lithium fluoride in equilibrium with solid lithium fluoride was determined at temperatures in the range of 926-1,052.5 degrees K. From the results obtained, the dependence of vapor tension of free lithium fluoride on the temperature was determined. By extrapolating to absolute zero, the heat of sublimation of lithium fluoride at absolute zero was calculated. This heat of sublimation was found to be 60.74 ± 0.17 kilocalories per mol.

13. Coordination Compounds of Rhenium With Organic Amines

"Compounds of $HReCl_4$ With Some Organic Amines and Thermal Decomposition of These Compounds," by Miao Ch'ing-sheng and V. G. Tronev; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 12, Dec 59, pp 2834-2836

The compounds $Am.HReCl_4$ were synthesized, where Am = Py, $C_2H_5NH_2$, $(C_2H_5)_2NH$, or $(C_2H_5)_3N$. Their thermal stability was compared with that of compounds of the formula $MeReCl_4$, where Me = NH_4, Rb, or Cs. It was established that the two classes of compounds are similar in structure and thermal stability, which indicates that the amines are present in the form of cations and do not enter into the inner sphere of the complex.

14. Books on Refractory Compounds and High-Melting Metals Announced by Publishing House of Academy of Sciences Ukrainian SSR

"Publications in the Field of Chemical Sciences To Be Issued by the Publishing House of the Academy of Sciences Ukrainian SSR in 1960," by R. L. Imas; Kiev, Ukrainskiy Khimicheskiy Zhurnal Vol 25, No 6, Dec 59, pp 814-815

Trudy Seminara po Zharostoykim Materialam (Works of the Seminar on Refractory Materials), a collection of articles published by members of the Institute of Powder Metallurgy, Cermets, and Special Alloys of the Academy of Sciences Ukrainian SSR, deals with the physical properties of and technology of the production of high-melting metals and metal-like compounds formed by these metals with boron, carbon, nitrogen, and silicon. The information published in this book on the absorption and emission spectra of niobium and chromium compounds, the processes of simultaneous diffusion of two elements into metals, and results obtained in the phenomenological investigation of physical properties of metal-like phases can be used by persons who specialize in work on high-melting metals and their compounds and in the fields of powder metallurgy, electronics, machine building, and the science of metals. The collection of articles also gives information on fundamentals of the production of metal powders and products made of rare metals as well as high-melting compounds for applications in different fields of present-day technology. Individual problems of the powder metallurgy of common metals and alloys are also discussed.

The book Khimicheskaya Stoykost' i Metody Analiza Tugoplavkikh Soyevineniy (The Chemical Stability of High-Melting Compounds and Methods for Their Analysis), which has been compiled by workers at the Institute of Powder Metallurgy, Cermets, and Special Alloys of the Academy of Sciences Ukrainian SSR, systematically treats a considerable volume of data pertaining to the investigation of the chemical stability of and methods for the analysis of different high-melting compounds, such as nitrides, borides, carbides, and silicides. Results are reported which were obtained in investigations of the chemical stability and work on methods for the analysis of the compounds in question. The information in question is of particular value to persons active at analytical chemical laboratories of scientific research institutes and industrial plants.

15. Determination of Boron in Metal Borides

"Determination of Boron in the Borides of Some Metals," by A. T. Pilipenko and L. N. Kugay, Institute of Powder Metallurgy, Cermets, and Special Alloys of the Academy of Sciences Ukrainian SSR; Kiev, Ukrainskiy Khimicheskiy Zhurnal, Vol 25, No 6, Nov/Dec 59, pp 786-788

A method has been developed for the determination of boron in the borides of titanium, zirconium, niobium, tantalum, chromium, tungsten, molybdenum, nickel, and vanadium. Nickel boride is dissolved in nitric acid. The other borides are decomposed and made soluble by melting them with caustic alkali in iron or nickel crucibles. To separate titanium, zirconium, niobium, tantalum, chromium, and tungsten from the boron, these metals are precipitated with barium carbonate. To separate nickel, molybdenum, and vanadium from boron, extraction of the diethyl dithiocarbonate complexes of these metals with chloroform is applied. After the metals have been separated from the boron, the latter is determined alkalimetrically in the presence of invert sugar or mannitol, which convert boric acid into a stronger acid that can be titrated more conveniently.

16. Derivative of Aluminum Hydride Containing Chlorine

"Conditions Under Which a Derivative of Aluminum Hydride Containing Chlorine Is Formed," by V. I. Mikheyeva, M. S. Selivokhina, and V. V. Leonova; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 11, Nov 59, pp 2436-2442

It was established that the reaction of lithium hydride with the ether adduct of aluminum chloride in an ethereal solution is very sensitive to temperature changes and proceeds either in the direction of the formation of lithium aluminum hydride or that of a chloroderivative of aluminum hydride depending on the temperature. By separation of products from ether solutions and plotting of curves showing the dependence of the composition on the concentration of the reaction product, it was confirmed that there is formation of a chlorine-containing derivative of aluminum hydride that is unstable in the presence of an excess of lithium hydride. The compound in question accumulates in the ether solution in the temperature range of 4-12° when an effective excess of aluminum chloride is established by adding this compound rapidly to the ether suspension of lithium hydride present in the form of large particles. The composition of the solid compound containing chlorine corresponds roughly to the formula $Al\ H_n\ Cl_{3-n}\ Et_2O$. However, there is a considerable fluctuation in the ratio of H:Cl and the sum of

hydrogen and chlorine is somewhat lower than that which would correspond to the formula. If the temperature is kept in the vicinity of 0° and the reaction is carried out in a suitable manner, lithium aluminum hydride can be synthesized.

17. Method for Synthesis of Lithium Aluminum Hydride

"Concerning the Synthesis of Lithium Aluminum Hydride," by V. I. Mikheyeva, M. S. Selivokhina, and V. V. Leonova; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 12, Dec 59, pp 2705-2712

It was established in work done by the authors that when lithium hydride is reacted with a solution of aluminum chloride in ether at temperatures of 0-4°, lithium aluminum hydride is obtained with a good yield. The reaction proceeds without an induction period and prolonged agitation of the reaction mixture after introduction of the total quantity of aluminum chloride is not necessary (cf. Zhurnal Neorganicheskoy Khimii, Vol 4, No 11, Nov 59, pp 2436-2442). The investigation described in this instance confirmed this result and established the most favorable temperature within the range from minus 12° C to plus 30° C for the synthesis of lithium aluminum hydride. Investigation of the reaction of lithium hydride with the ether adduct of aluminum chloride in ethereal solution in the temperature range of minus 13° to plus 30° by a method involving the plotting of curves which express the compositon of the liquid and solid phases at different stages of the experiment indicated that the optimum conditions for the synthesis of lithium aluminum hydride exist at temperatures between zero and plus 4°.

The reaction then takes place without any induction period and there is no blackening of the reaction mixture. An accelerated rate of the addition of aluminum chloride, a low degree of dispersion of lithium hydride, and employment of temperatures in the range of 5-12 degrees contribute to the accumulation in the ethereal solution of a chlorine-containing derivative of aluminum hydride. Further raising of the temperature accelerates decomposition of this chloro-compound with the separation of metallic aluminum. The results obtained confirm that it is best to carry out the synthesis at temperatures in the range of 0-4°.

18. Effect of Hexachlorane on Crops

"Hygienic Evaluation of Food Crops Grown in Soil Treated With Large Doses of Hexachlorane Used for the Control of the Colorado Beetle," by N. M. Rusin, G. P. Andronova, O. I. Vasil'yeva, and I. N. Sapronova, Inform. Bul. Mosk. n-i In-t Sanitarii i Gigiyeny (Information Bulletin of the Moscow Scientific Research Institute of Sanitation and Hygiene), 1958, No 21, 68-69 (from Referativnyy Zhurnal -- Biologiya, No 21, 10 Nov 59, Abstract No 95462, by A. A. Kasparov)

"The toxic and organoleptic properties of potatoes and wheat grown on different soils which were treated with large quantities of hexachlorane before planting were studied. No pathophormological changes in the internal organs and no modifications in the blood picture and cholinesterase activity were noted in mice, rats, and rabbits which were fed the investigated products for a period of 10 months. The potatoes acquired an unpleasant taste and could have been declared unfit for consumption on sanitary inspection. The grain crops (wheat and rye) acquired no foreign taste. Following the treatment of the soil with hexachlorane grain crops may be planted; the planting of potatoes, however, should be delayed for the next 3-4 years."

Isotopes

19. New Method for Concentration of Heavy Oxygen by Carbon Dioxide-Bicarbonate Exchange Method

"New Results in the Application of Isotope Exchange Between CO_2 and CO_3^{2-} for the Separation of Carbon and Oxygen Isotopes," by I. A. Semiokhin, G. N. Panchenkov, and Yu. A. Zhurov, Moscow State University; Moscow, Zhurnal Fizicheskoy Khimii, Vol 33, No 11, Nov 59, pp 2633-2635

It is known from the literature that separation of carbon isotopes by the bicarbonate method at atmospheric pressure is not very effective because of the low solubility of carbon dioxide in aqueous solutions of salts. The solubility of carbon dioxide can be increased by adding organic solvents to the aqueous solutions. In the experiments described, 5% of methyl alcohol and 5% of acetone by volume were added to a 20% solution of potassium bicarbonate. When this solution was used, a higher degree of enrichment of heavy oxygen was obtained with a suitable filling of the column. Four different types of filling were investigated. Among them activated carbon of the BAU grade was found to be best.

Nuclear Fuels and Reactor Construction Materials

20. Solubilities of Uranyl Nitrate in Organic Solvents

Concerning the Problem of the Solubility of Uranyl Nitrate in Organic Solvents," by V. M. Vdovenko, T. G. Suglobova, and D. N. Suglobov; Leningrad, Radiokhimiya, Vol 1, No 6, Dec 59, p 637-644

The mutual solubilities in the ternary systems uranyl nitrate- water- β, β' - dichlorodiethyl ether and uranyl nitrate - water- ethyl ether were determined in the region of low water concentrations at 25°. The relationships involved in the dissolution of uranyl nitrate and its hydrates in organic solvents of different types are discussed. The effects of the properties of the molecules of the solvent and of the type of solvation of uranyl nitrate in solution on its solubility are considered.

21. Difficultly Soluble Uranium Hypophosphite

"Investigation of Difficultly Soluble Compounds Formed by Uranium With Low-Valency Phosphorus Acids," by V. G. Knyaginina and O. G. Nemkova; Leningrad, Radiokhimiya, Vol 1, No 6, Dec 59, pp 665-667

The conditions were established under which hypophosphites of hexavalent and tetravalent uranium are formed. Some properties of these hypophosphites were investigated. It was established that a solution of sodium hypophosphite obtained by the slow oxidation of yellow phosphorus can be used for the reduction and precipitation of uranium salts.

22. Uranates of Bivalent Metals

"An Investigation in the Field of the Chemistry of Uranates of Some Bivalent Elements," by Ye. A. Ippolitova, Yu. P. Simanov, L. M. Kovba, G. P. Polunina, and I. A. Bereznikova; Leningrad, Radiokhimiya, Vol 1, No 6, Dec 59, pp 660-664

By applying the methods of thermographic and X-ray phase analysis, the composition of uranates formed by elements of the II group of the periodic system was investigated. These uranates were prepared by heating U_3O_8 with oxides or carbonates of the elements in question. Some properties of the uranates investigated (those of cadmium, zinc, beryllium, strontium, calcium, and barium) are listed.

23. Investigation of Creep in Hot-Rolled Uranium

"Creep in Hot-Rolled Uranium," by G. Ya. Sergeyev and A. M. Kaptel'tsev; Moscow, Atomnaya Energiya, Vol 7, No 6, Dec 59, pp 558-560

On the basis of the results obtained in the investigation described, the creep of uranium was plotted as a function of the stress at different temperatures. By using the curves in question, one can determine the limits of creep at different temperatures. It was established that in the lower range of the temperatures investigated, the α-phase of hot-rolled uranium exhibits a noticeable rate of creep beginning with 400°. This rate increases sharply with the temperature. The rate of creep of uranium at 400° C is approximately ten times greater than that of common steel and at 500° C, approximately 100-400 times greater.

24. Photocolorimetric Determination of Uranium

"Rapid Photometric Determination of Uranium With the Reagent Arsenazo II," by V. I. Kuznetsov and S. B. Savvin; Leningrad, Radiokhimiya, Vol 1, No 5, Oct 59, pp 589-595

A method is described for the photocolorimetric determination of uranium with the new reagent Arsenazo II. It is proposed that the masking complex-forming agents Trilon B. sulfosalicylic acid, tartaric acid, and aluminum fluoride be used for suppressing the reactions of other elements. For the preliminary separation of uranium, extraction procedures were used which involve the application of so-called low-melting extraction agents (a mixture of paraffin wax and cyclohexanone was employed in this instant). By using the procedures described, the time required for the analysis could be shortened to a considerable extent.

25. New Volumetric Method for Determination of Uranium

"A New Volumetric Method for the Determination of Uranium," V. G. Goryushina and T. A. Archakova, State Scientific Research Institute of Rare and Minor Metals; Moscow, Zavodskaya Laboratoriya, No 7, July 59, pp 789-790

For all practical purposes, the only feasible way of determining uranium volumetrically is by oxidimetry. However, many elements which exhibit several valencies interfere with the determination of uranium in this manner. After it had been established by R. Pribyl that uranium does not form stable chelates with trilon B, this sequestering agent was used for increasing the degree of selectivity in procedures for the determination of uranium. Thus, gravimetric determination methods have been described which are based on the precipitation of uranium with ammonia in the presence of trilon B or precipitation of uranium with hydroxyquincline or phosphate in the presence of the same sequestering agent. The masking effect of trilon is also being utilized in the separation of uranium from other elements by precipitation or extraction methods. On the basis of the results described, it is recommended to employ the masking effect produced by trilon for the determination of uranium by a volumetric method. The principle is similar to that involved in a method that has been proposed for the determination of beryllium and has been described earlier (cf. V. G. Goryushina and T. A. Archakova, Zavodskaya Laboratoriya, Vol 22, 1956, p 532). After trilon B has been added, uranium is precipitated with arsenate. Iodometric titration of the AsO_4^{3-} bound to the uranium follows.

26. Extraction of Metal Salts With Solutions of Benzoylacetone in Benzene

"Investigation of the Extraction of Metal Salts With Solutions of Benzoylacetone in Benzene," by I. Stary, Laboratory of Radiochemistry, Scientific Research Institute of Nuclear Physics, Moscow State University; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 10, Oct 59, pp 2412-2413

The extraction of lanthanum, europium, scandium, and iron with solutions of benzoylacetone in benzene was investigated. The metals in question were tagged with the radioactive isotopes La^{140}, Eu^{152}, Sc^{46}, and Fe^{59}.

27. Preparation and Properties of Potassium Lanthanum Selenate

"The Preparation and Some Properties of Potassium Lanthanum Selenate," by V. P. Shvedov, S. G. Strizhov, and Chin Tse-hou; Leningrad, Radiokhimiya, Vol 1, No 5, Oct 59, pp 622-623

A crystalline compound formed by lanthanum selenate with potassium selenate was prepared. It was established that the composition of this compound corresponds to the formula $KLa(SeO_4)_2 \cdot xH_2O$. The solubility of potassium lanthanum selenate was determined and found to be 1.524 grams per liter by the volumetric method and 1.553 grams per liter by the radiometric method. It was established that potassium lanthanum tellurate does not form under analogous conditions. It was furthermore established that Pu^{4+} and Ce^{4+} are almost completely coprecipitated with potassium lanthanum selenate.

28. Determination of Association Constants of Complexes Formed by Some Lanthanides With Citric Acid

"The Electric Mobility Method for the Determination of Dissociation Constants of Complex Compounds of Elements Present at Low Concentrations. Part 2. Determination of Constants of the Formation of Complexes With Citric Acid by Some Lanthanides," by A. V. Stepanov and V. P. Shvedov; Leningrad, Radiokhimiya, Vol 1, No 6, Dec 59, pp 668-673

It was found that on the basis of the mobilities of ions in an electric field, one may determine the successive constants of formation of complexes by elements present in a state of high dilution. Formation of complexes by La, Ce, Nd, Pm, and Eu in citric acid solutions was studied. The data obtained confirmed that the complexes $[MCit_2]^{3-}$ $[HMCit_2]^{2-}$, $[H_2MCit_2]^{-}$, and $[H_3MCit_2]^{0}$ are formed in citric acid solutions in the pH range of 2-3. The association constants of these complexes were determined.

29. Significance of Work on Coordination Compounds From Standpoint of Progress of Seven-Year Plan

"The Eighth All-Union Conference on the Chemistry of Complex Compounds," by Z. A. Sheka; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 11, Nov 59, pp 2647-2654

The Eighth All-Union Conference on the Chemistry of Complex Compounds was held in May 1959 at Kiev. Six hundred chemists participated in the conference, among them 300 from 27 cities of the USSR, and also from Czechoslovakia and Poland. Ninety-seven reports were presented and discussed

at the conference. The tasks of research on coordination compounds in connection with chemical problems involved in the current Seven-Year Plan were discussed by V. I. Spitsyn, who pointed out the role played by complex compounds in the production of semiconductors (ferromagnetics and seignettoelectrics), radiochemistry, the production of pure metals (extraction methods and chromatography), hydroelectrometallurgy, the production of binders and cements, the preparation of catalysts for the production of high polymers, and the application of sequestering (chelate-forming) compounds for different purposes, including the softening of water and the concentration of useful elements from ores,

The conference was subdivided into three sections. At the sectional meetings papers were presented on the formation and behavior of complex compounds in solutions, the structure and stability of complex compounds, the preparation and properties of complexes formed by a number of metals of the platinum group, cobalt, and rare and rare-earth elements, hetero-polyacids, and the constitution and structure of crystalline coordination compounds.

It is planned to hold the Ninth Conference on the Chemistry of Complex Compounds in 1962.

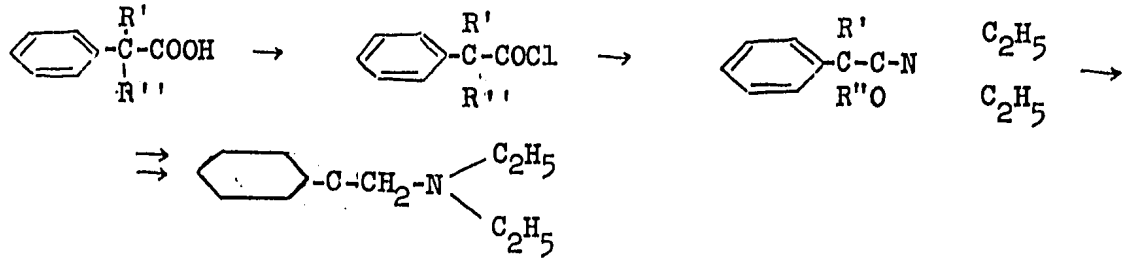
[For additional information on nuclear fuels and reactor construction materials, see Inorganic Chemistry.]

Organic Chemistry

30. Synthesis of N, N-diethyl-β,β-dialkyl-β-phenylethylamines

"Investigation of Amines and Their Derivatives. Report 10. Synthesis of N,N-diethyl-β-β-dialkyl-β-phenylethylamines," by A. L. Mndzhoyan and S. G. Agbalyan, Institute of Fine Organic Chemistry, Academy of Sciences Armenian SSR; Yerevan, Izvestiya Akademii Nauk Armyanskoy SSR -Khimicheskiye Nauki, Vol 12, No 5, 1959, pp 369-374.

The purpose of this work was to study the effects of substitutents at the β -carbon and nitrogen on the biological activity of β -phenylethylamines. The synthesis of N,N-diethyl-β,β-dialkylphenylethylamines, previously not described, and also of the intermediate N,N-diethylamides of dialkylphenylacetic acids, was accomplished according to the scheme:



R' and R" = CH_3; C_2H_5; C_3H_7; C_4H_9.

The procedure used to obtain the amines can also be used to synthesize any primary, secondary, and tertiary β,β-dialkyl-β-phenylamine.

Preliminary pharmacological testing of the hydrochlorides of the amines, performed by I. S. Safrazbekyan, attests to their hypotensive activity, according to the report. However, no pharmacological data are presented.

Radiation Chemistry

31. Radiation-Chemical Method of Making Teflon Adhesive

"How to Make Teflon Adhere," by V. Chibrikin, Associate of Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Znaniye - Sila, Vol 35, No 1, Jan 60, p 21

Teflon is so stable chemically that it cannot be cemented to anything; no adhesive forms a stable bond to it. To make teflon adhere, one must replace some of its fluorine atoms with atoms capable of forming a union between the adhesive and the carbon skeleton of teflon. There are many atoms which can replace fluorine; however, some of these atoms will not form a stable bond with teflon. Whether they will or will not can be established by using the method of electronic paramagnetic resonance. The atoms of fluorine can be split off by exposing teflon to the action of radioactive particles. Together with the fluorine atom, one of the electrons forming the electron pair of the bond that attaches the fluorine to the polymer is removed. Investigation of the state of the remaining, unpaired electron will indicate whether or not the newly introduced atom replacing fluorine has formed a stable and lasting bond. What remains to be done is to select a substituent atom which will make teflon compatible with the adhesive that has been chosen.

32. Graft Polymerization on Irradiated Teflon

"Investigation of Graft Polymerization on Irradiated Teflon," by Z. A. Sinitsyna, Yu. D. Tsvetkov, Kh. S. Bagdasar'yan, and V. V. Voyevodskiy, Corresponding Member of Academy of Sciences USSR, Institute of Chemical Physics, Academy of Sciences USSR, and Institute of Physical Chemistry imeni L. Ya. Karpov; Moscow, Doklady Akademii Nauk SSSR, Vol 129, No 3, 21 Nov 59, pp 631-634

By using the method of electronic paramagnetic resonance, it was established at the Institute of Chemical Physics that radicals formed as a result of irradiation of teflon with gamma rays in vacuum at low temperatures (e. g., that achieved by cooling with liquid nitrogen) have a very long half-life. Under the action of oxygen of the air they are transformed into the peroxide radicals

$$-CF_2 - \underset{}{\overset{O - O\cdot}{\overset{|}{CF}}} - CF_2 -$$

which remain unchanged for several months at room temperature. In the work described in this instance, graft polymerization of methylmethacrylate onto films consisting of irradiated teflon was carried out and the resulting films were investigated.

It was established that the thickness of the films has no effect on the rate of polymerization. It follows from this that the rate of polymerization is not determined by the velocity of diffusion of the monomer through the teflon gel. Investigation by the method of electronic paramagnetic resonance of the dependence of the ratio I/I_0 on time (where I_0 and I are intensities of the lines of absorption by the peroxide radical before the beginning of polymerization and at the time of the measurement) indicated that the reaction is one that can be described by an equation of the first order with a constant of 2×10^{-2} seconds^{-1}. As the concentration of the peroxide radical decreases with time in the course of the polymerization process, the spectrum of another radical becomes more pronounced. The newly formed radical is apparently derived from polymethylmethacrylate. Calculations which have been carried out indicated that under the experimental conditions in question, not only polymethylmethacrylate radicals grafted to the initial polymer, but also free polymethylmethacrylate radicals, have a long half-life. The free polymethylmethacrylate radicals bring about formation of a homopolymer. Homopolymerization apparently takes place within the teflon film.

33. Tables for Identification of Radioactive Isotopes on Basis of the α- and β- Radiation Emitted by Them

"Tables for the Identification of Analyzed α- and β- Activities," by A. A. Lbov and L. I. Sel'chenkov; Moscow, Atomnaya Energiya, Vol 7, No 6, Dec 59, pp 537-538 (four tables appended)

To facilitate the identification of the radioactivities of isotopes on the basis of data published until 1958, tables have been compiled which list all known β- and α- radiation-emitting isotopes on the basis of their half-lifes, the limiting energies of the β-spectra, and the energies of α- particles. These tables make it easy to locate isotopes with a given half-life and given energy of the radiation emitted by them. To identify isotopes and activities, it is also advisable to use schemes of radioactive decay.

34. Some Properties of Lanthanum and Bismuth Radioisotopes

"Some Properties of Carrier-Free Radioactive Isotopes of Lanthanum and Bismuth in Aqueous Dioxane Solutions," by B. Z. Iofa, L. V. Bobrov, and A. N. Ratov; Leningrad, Radiokhimiya, Vol 1, No 6, Dec 59, pp 674-678

In an investigation of the state in which the radioisotopes La^{140} and Bi^{210} are present in the absence of carriers in aqueous dioxane solutions, it was demonstrated that the reduction of the dielectric constant of acidic or alkaline solutions increases the relative content of colloidal radiolanthanum. In neutral solutions, reduction of the dielectric constant of the solution reduces the relative content of colloidal radiobismuth.

35. Isolation of Strontium From Soil and Determination of Sr^{90}

"A Method for the Separation of Strontium From Soil and the Determination of Sr^{90}" by V. K. Zinov'yeva, M. I. Zhilkina, V. P. Shvedov, and G. V. Yakovleva; Leningrad, Radiokhimiya Vol 1, No 5, Oct 59, pp 613-615

The optimum conditions have been established for taking samples of soil and isolating strontium from soils. A method was developed for the separation, purification, and determination of Sr^{90}.

This paper was presented at the All-Union Methods Conference on the Determination of Small Quantities of Radioactive Substances in the Environment, held 11-14 February 1958 at Leningrad under the auspices of the Ministry of Health RFSFR and the Institute of Radiation Hygiene.

36. Determination of Radioactive Strontium in Water

"Determination of Radioactive Strontium in Water Samples," by V. P. Shvedov, T. P. Makarova, L. M. Ivanova, and N. A. Pavlova; Leningrad, Radiokhimiya, Vol 1, No 5, Oct 59, pp 616-618

A method is described for the determination of radioactive strontium (Sr^{89} and Sr^{90}) present as fallout in rain and snow.

This paper was presented at the All-Union Methods Conference on the Determination of Small quantities of Radioactive Substances in the Environment held 11-14 February 1958 at Leningrad.

37. Method for Depositing Thin Layers of Radioactive Substances on Organic Films

"An Electrocapillary Method for the Deposition of Thin Layers of Radioactive Substances on Organic Films," by V. A. Gorodyskiy, Yu. F. Romanov, A. V. Sorokina, and M. I. Yakunin, Radium Institute, Academy of Sciences USSR; Moscow, Pribory i Tekhnika Eksperimenta, No 5, Sep/Oct 59, pp 128-130

A method is described for obtaining thin and sufficiently uniform layers of radioactive substances on organic films. The method is based on sputtering of a solution from a capillary under the action of an electric field. By using the method described, one can prepare by deposition on films radiation sources with a diameter up to 3 centimeters and with a thickness of the deposited layer corresponding to one microgram per square centimeter and higher. Deposition of thin and uniform layers of radioactive substances on organic films is very important for applications in research in the fields of nuclear physics and radiochemistry.

[For additional information on radiochemistry see Nuclear Fuels and Reactor Construction Materials.]

Miscellaneous

38. Conference on Distillation To Be Held in October

"Announcement" (unsigned), Izvestiya Vysshikh Uchebnykh Zavedeniy -- Khimiya i Khimicheskaya Tekhnologiya, Vol II, No 6, 1959, p 978

"An Inter-Vuz (Higher Educational Institution) All-Union Conference on the Theory and Practice of Distillation in the Chemical and Food Industry will be held in October 1960 in the Kiev Technological Institute of the Food Industry.

"A broad discussion of the present status of the theory of distillation, its application to various chemical and food industries, and problems of design, construction, and automation of distillation equipment is proposed.

"The conference will note the trends for future development of the distillation process in the chemical and food industry.

"The address for information is: Kiev-17, Vladimirskaya, 68, Technological Institute of the Food Industry, Organizational Committee of the Conference on Distillation."

III. ELECTRONICS

Acoustics and Audio Frequency

39. Ultrasonic and Infrasonic Waves

"1,000-g Acceleration," by L. M. Brekhovskikh; Moscow, Izobretatel' i Ratsionalizator, No 1, Jan 60, pp 19-20

Infrasonic waves are capable of traveling many thousand miles in the atmosphere or under water and, for this reason, are utilized in detection of nuclear explosions at great distances.

In the field of ultrasonics, oscillations of the order of 10 billion per sec were recently attained. At the Laboratory of Ultrasonics of the Institute of Acoustics, Academy of Sciences USSR, under the direction of G. M. Sirotyuk, the world's most powerful ultrasonic "concentrator" was designed; at its focus the pressure changes from +500 to -500 atmospheres at a rate of 500,000 times per sec. Here the particles acquire a reciprocal motion with a maximum acceleration of about 1,000 g. Under these conditions any living organisms are destroyed.

Ultrasonic installations will be capable in the future of purifing the air of smoke, dust, and moisture. Ultrasonic waves can also be utilized for detection of minute quantities of impurities in semiconductor materials.

40. Ultrasonic Inspection

"Ultrasonic Visual Examination," by Sh. Achkinadze; Moscow, Yunyy Tekhnik, No 1, Jan 60, pp 52-53

In Prof S. Ya. Sokolov's ultrasonic inspection device, an illuminated surface of a liquid is utilized as a sonic-optical transducer. The sonic energy forms a visible relief image of any possible defects in the examined object on the surface of the liquid. Such a relief on the liquid surface can be made more distinct by proper slanting illumination.

The students of S. Ya. Sokolov recently completed an ultrasonic device with several hundred ultrasonic radiators, which is intended for inspection of heavy plate in the process of rolling.

A very promising future is predicted for ultrasonic inspection and "ultrasonic-vision."

Communications

41. Method for Matching Antenna With Transmission Line

"A Method for Matching an Antenna With the Feeder of a Multitrunk Radio-Relay Line," by V. I. Krutikov; Moscow, Radiotekhnika, No 11, Nov 59, pp 5-12

Accurate matching of the feeder wave guide with the antenna is essential for efficient operation of a multitrunk radio-relay line. According to the Soviet technical specifications, the reflection factor should not exceed 2.5% of the energy at the frequency designated for each trunk.

A new matching method, as originally suggested by G. Z. Ayzenberg and A. M. Model', which dispenses with the use of ferrite valves, was tested experimentally. The matching system was tried on a three-trunk line composed of a directional coupler and auxiliary wave-guide line with attenuators and rejection filters. Each rejection filter is tuned to reject fully the energy at frequencies of the specific trunk and to pass the energy at the frequencies of the other trunks. As a consequence of this study, new rejection filters, directional couplers, attenuators, and matching components were developed incorporating 25 x 28-mm rectangular wave guides. Each rejection filter consists of three sections each 3/4 wave-length (or multiple), which is capable of reflecting fully the energy at the frequency of the corresponding trunk.

42. Computers in Power Engineering

"Computers for Economical Distribution of Electric Power," by O. R. Terno, O. M. Pikkov, and Kh. M. Lelumees, Tallin Polytechnic Institute; Moscow, Elektrichestvo, No 9, Sep 59, pp 5-8

The Chair of Electrical Stations, Networks, and Systems of Tallin Polytechnic Institute has developed and built a computer for automatic control of economical distribution of the effective load among the generating stations of the Estonenergo System. In the Estonenergo System, the number of actually possible combinations of generating units with different performance characteristics does not exceed ten. Therefore, each simulating unit has ten required characteristic settings. The changing characteristics of the station during the summer and winter period are compensated by interchangeable nonlinear control units.

The computer estimates the power generated by each station with an accuracy better than 4%.

43. Recent Soviet Patents in Field of Communications

"Authorship Certificates" (unsigned article); Moscow, Elektrosvyaz', No 1, Jan 60, p 80

Class $21a^4$, 15. No 118189. S. I. Tetal'baum. A Device for Feeding the Plate Circuits of Radio Transmitters with Short-Duration Voltage Pulses.

Class $21a^4$, 46_{01}. No 74660. B. V. Braude. Dielectric Plane Antenna.

Class $21a^4$, 46_{01}. No 118193. V. M. Ginzburg. A Method for Swinging the Antenna Directivity Pattern.

Class $21a^4$, 46_{86}. No 118191. V. I. Peysikov and V. M. Ginzburg. Wave Guide for Channeling of Fairly Short-Wave Energy.

Class $21a^4$, 48_{03}. No 118444. G. B. Il'in. Device for Error Determination of Indicators in Radio Engineering Systems.

Class $21a^4$, 48_{05}. No 79629. V. A. Krasil'nikov and K. L. Gurdin. Phantastron Microsecond Meter.

Class $21a^4$, 48_{05}. No 118186. S. I. Tetel'baum. Radio Receiver for Radar Stations.

Class $21a^4$, 48_{05}. No 118196. V. M. Ginzburg. A Method for Wave-Length Stabilization in a Waveguide.

Class $21a^4$, 48_{65}. No 118187. S. I. Tetel'baum and S. I. Katayev. A Method for Short-Period Change in Sensitivity of a Superheterodyne Receiver of a Radar Station.

Class $21a^4$, 48_{65}. No 118188. S. I. Tetel'baum and S. I. Katayev. Radio Receiver for Radar Installations.

Class $21a^4$, 48_{68}. No 118314. I. A. Gak, M. Ye. Gertsenshteyn and A. M. Pokras. A Coaxial Splitter With Controlled Coupling.

Class $21a^4$, 48_{70}. No 118190. S. I. Tetel'baum and M. V. Laufer. Radar Indicating Device.

Class $21a^4$, 48_{75}. No 118192. S. I. Teletl'baum. A Device for Commutation of Several Electrical Circuits With Currents of Different Frequencies.

Class 21a^4, 49. No 70178. V. I. Zhitomirskiy. A Device for Multiplex Communication.

Class 21a^4, 49. No 118528. A. M. Polykovskiy. A Method for Synchronous Multiplex Communication.

Class 21a^4, 60. No 118195. S. I. Tetel'baum. A Device for Amplifying a Quasiplanar Wave.

Class 21a^4, 71. No 118081. V. S. Ablyazov. Measuring Receiver for Superhigh Frequencies.

Class 21a^4, 71. No 118426. A. A. Vasil'yev. A Method for Measuring Instantaneous Values of Frequency of Frequency-Modulated Oscillations.

Class 21a^4, 71. No 118529. B. B. Lagov'yer. A Device for Measuring the Recovery Time of a Transmit-Receive Switch.

Class 21c, 46_{03}, No 118072. Ya. G. Koblents and D. A. Yakovenko. Time Relay.

Class 21c, 47_{01}, No 118345. B. N. Sokolov, G. B. Davydov, and I. S. Bakhtov. A Deivce for Transmitting Control Signals in a Facsimile System.

Computers

44. Soviet Computer Teaches Foreign Languages

"Foreign Language Instruction" (unsigned article); Budapest, Nepszabadsag, 18 Feb 60, p 10

An electronic machine designed in the Gor'kiy Foreign Language College (gorkiji idegennyelvu foiskola) gives foreign language instruction and supervision. The principle by which the machine operates is identical with that for program controlled electronic computers.

Instruments and Equipment

45. Results of Experiments With Ferrite Mixers

"Mixing Superhigh Frequencies With the Aid of Ferrites," by A. L. Mikaelyan and V. Ya. Anton'yants; Moscow, Radiotekhnika i Elektronika, Vol V, No 1, Jan 60, pp 90-104

This report was presented at the Conference on Electronic Instruments in Mexico on 23 June 1959.

The effect of electromagnetic oscillations of two nearby frequencies on small samples of magnetized ferrite is examined.

The basic experimental apparatus, used to measure absorption of oscillations in ferrite and voltage of the difference frequency, consists of two klystrons connected to a common channel which terminates in a short-circuited section containing the ferrite sample. Power is reflected from the section through a high-directivity (40 db) coupler and detector to a microammeter.

The voltage amplitude of the difference frequency, equal to 30 Mc in the load circuit, is computed, and results are given of measurements of this value for spheres of single crystal and polycrystalline ferrites having diameters of 0.5 — 3.0 mm. Measured and computed values of voltage of the difference frequency for single crystal samples are in good agreement, but large discrepancies exist between measured and computed values for polycrystalline samples. An attempt is made to explain the causes of these discrepancies.

Also, results are given of investigations of different makes of cylindrical ferrite samples. The smallest conversion losses obtained in the experiments were 58 db for a heterodyne power of 50 milliwatts.

46. Results of Study of Parametrically Coupled Circuits

"Some Problems of the Theory of Parametric Amplifiers," by V. I. Zubkov and Ya. A. Monosov; Moscow, Radiotekhnika i Elektronika, Vol V, No 1, Jan 60, pp 75-89

Development of the theory of ferrite amplifiers has established certain similarities between the phenomena occurring in ferrite under the influence of a pumping field and phenomena in parametrically coupled circuits. An analysis of parametrically coupled oscillatory systems,

therefore, enables one to evaluate the feasibility of parametric excitation of parasitic types of oscillations in a ferrite amplifier. Another problem examined by the authors is the study of impedance introduced into the pumping circuit; results of such a study may be used to compute the characteristics of nonlinear phenomena in ferrite at a high power level and superhigh frequency.

A characteristic equation is derived for determining the frequencies of parametrically coupled circuits, coupled through a periodically changing inductive reactance. Curves are computed for changing frequencies of parametric coupling during retuning of the frequency of one of the coupled circuits, and the retuning zone in which parametric excitation of oscillations occurs is determined.

The authors express their thanks to A. A. Pistol'kors and A. L. Mikaelyan for assistance in the work

47. Millimicrosecond Pulse Generator

"Millimicrosecond Pulse Generator GMI-23," by V. S. Chilikin; Moscow, Elektrosvyaz', No 1, Jan 60, pp 40-44

The author points out that the existing Soviet millimicrosecond video-pulse generators are limited in their pulse repetition rate to less than 10 kc (GI-4). The description of construction of a millimicrosecond pulse generator capable of producing pulses of 20, 50, and 100 millimicrosecond duration with a pulse-repetition rate from 10 kc to 1.5 Mc is given in some detail. This millimicrosecond pulse generator is designated as GMI-23 and is built on the principle of a blocking-oscillator operating in a retarded regime with subsequent pulse shaping by shock-excitation circuits.

The GMI-23 pulse generator comprises the following units: a wide-band input stage incorporating tube 6PIP, converter of sinusoidal voltage into square pulses as a preliminary stage of pulse shaping, a pulse forming stage built on the principle of a blocking-oscillator with a 6N6P tube and operating in a retarded regime, several stages for forming of millimicrosecond video pulses with the aid of type 6N6P tubes, an intermediate separating stage built similarly to the video-pulse forming stage, a monitoring-display device built on the principle of peak voltmeter with a 6N5P tube, and a power-supply unit. Triggering of the pulse forming circuit is accomplished with the aid of an external source. The device has an indicator for visual monitoring of the pulse shape.

Since Soviet industry does not produce instruments for measuring the amplitude of millimicrosecond pulses for a wide range of pulse repetition rates, a special indicator was built to check the performance of the GMI-23 millimicrosecond pulse generator.

Materials

48. Experimental Study of Increased Absorption in Ferrites

"Experimental Investigation of Nonlinear Phenomena in Ferrites at Superhigh Frequencies," by Ya. A. Monosov and A. V. Vashkovskiy; Moscow, Radiotekhnika i Elektronika, Vol V, No 1, Jan 60, pp 105-116

Results are given of an experimental study of increased absorption in ferrites at high power levels in the 3-cm band, and the results are compared with theory. Relationships are established between threshold levels of superhigh frequency fields at which the nonlinear characteristics originate and magnetic saturation, shape, and dimensions of the ferrite sample.

From results of the experiment it is concluded that:

1. The threshold value of amplitude of the magnetic field h_{kr} at which expansion of the resonance line begins is in good agreement with computed values only for very small samples of ferrite (spheres with a diameter of approximately 0.5 mm). As the diameter of the sphere increases, the value h_{kr} decreases.

2. Threshold values of amplitude of the magnetic field h_{por} at which increased absorption occurs approximately agree with computed values.

3. The existence of separate peaks in the region of increased absorption is vertified by the experiment.

4. Threshold values of amplitude of the magnetic field h_{por} strongly depend on the shape of the sample and magnetic saturation of the ferrite but depend only slightly on dimensions of the sample.

Investigations were carried out at the Institute of Radio Engineering and Electronics of the Academy of Sciences with single crystals of ferrite provided by the Institute of Crystallography of the Academy of Sciences USSR.

The authors express their appreciation to A. A. Pistol'kors and V. M. Mikhaylov for their assistance.

49. Purification of Tellurium From Lead by Vacuum Distillation

"Determination of the Vapor Pressure of Solid Lead Telluride," by A. S. Pushinkin and A. V. Novoselova, Moscow State University; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 12, Dec 59, pp 2657-2660

Lead is one of the impurities contained in tellurium. Its contents are of the order of tenth parts of one percent; the lead is apparently present in the form of lead telluride. The vapor tensions of lead telluride were determined at low pressures to establish the possibilities of purifying tellurium from lead by vacuum sublimation or distillation. Information on the volatility of lead telluride is also of interest because this substance exhibits photosensitivity in the infrared region; knowledge of the temperature dependence of its vapor pressure would be useful from the standpoint of establishing the best conditions for depositing lead telluride films by evaporation. The vapor pressure of lead telluride was determined in the temperature range of 511-679°. It was found that between 500-600° lead telluride is a relatively volatile substance so that during the process of sublimation, and particularly during the distillation of tellurium in vacuum, it is capable of evaporating and contaminating the condensed tellurium.

50. Investigation of Binary Oxide Systems by the Method of Specific Electric Resistance

"The Specific Electric Resistance in Binary Oxide Systems," by V. N. Yermenko and V. Ye. Listovnichiy, Institute of Powder Metallurgy, Cermets, and Special Alloys, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 11, No 59, pp 2544-2550

By using the bridge method, the specific electric resistance at temperatures up to 1,000° was measured in air in the systems MgO-NiO and MgO-Ti O_2. It was measured by the probe method in the system CuO-F_2O_3.

The changes of the thermal EMF with the composition and temperature were determined in the case of the system $CuO-Fe_2O_3$. On the basis of the results obtained in the work described and work done by other investigators it is concluded that the method of measuring electric resistance at high temperatures (i. e., in the region of internal conduction), when applied to oxide systems, can be used only to establish the formation of chemical compounds. It is not a sensitive method for determining phase boundaries.

51. Annual Report of Secretary of Department of Chemical Science, Academy of Sciences USSR

"New Research and Discoveries" (unsigned article); Moscow, Izvestiya, Vol 43, No 46, 24 Feb 60, p 4

In the annual report presented by Academician A. P. Vinogradov, Acting Academician-Secretary of the Department of Chemical Science, it was pointed out that among problems with which the institutes of the department are now concerned, the problem of the chemistry of polymers, which is of primary importance from the economic standpoint, still retains its predominance. During 1959 a certain amount of progress was made in the field of polymers. Primary attention in the research conducted was paid to the development of high-molecular compounds exhibiting superior thermal stability, mechanical strength, and elasticity.

New heat-resistant plastics and adhesives were synthesized at the Institute of Organoelemental Compounds. At the Institutes of Chemical Physics and of Petrochemical Synthesis, procedures for the production of polypropylene and polyformaldehyde were brought to the stage of pilot-plant experimental production.

Progress was made during 1959 in the synthesis of polymers exhibiting semiconductor properties and the synthesis of inorganic polymers. Interesting and promising work dealing with the role played by free radicals in biological processes is being conducted at the Institute of Chemical Physics. New drugs and chemicals have been synthesized at the Institute of Organoelemental Compounds.

52. New Method of Applying Insulating Varnish

"High Quality," by V. Meshcheryakov; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Vol 5, No 19 (627), 14 Feb 60, p 4

Millions of meters of enameled copper and aluminum wire are used annually in the USSR industry. To apply insulating enamel (varnish) to the wire at cable plants, complicated technological processes must be

employed and cumbersome and expensive equipment is used. Installations equipped with resistance furnaces for drying the insulation enamel use a large amount of power but there is no assurance of a high quality of the product when drying is done by this method. After the solvent has evaporated during the drying of the varnish, it must pass through the varnish film, with the result that the latter becomes porous. This lowers the dielectric strength of the insulation.

A group consisting of Prof G. Babat and the Engineers A. Gurevich and Yu. Bur'yan developed an improved method for drying the varnish coating. This method is based on the induction principle. If a high-frequency current is passed through two copper tubes (inductors) and the wire is placed between the two tubes, heating of the wire takes place because of the eddy currents induced in it. By controlling the strength and frequency of the current, the wire may be heated to any desired temperature.

At the Enamel Department of the Moskabel' (Moscow Cable) Plant, there is already an experimental installation which operates on this principle. The varnish is dried by the heat which is evolved in the coated copper wire when this wire passes between the two inductor tubes. The design of the installation is such that one can observe visually the moving wire. The motion of the wire can be stopped at any moment, which could not be done in installations of the old type because overheating of the varnish film took place.

The quality of the product is greatly improved by applying the new method, because the heat is supplied to the film from inside, i.e., it flows outwardly in a radial direction from the heated conductor. For this reason, the solvent evaporates without having to pass through any barrier and no pores develop in the coating. It has been established that the dielectric strength of the insulating coating is increased by a factor of 1 1/2 when the new method is applied. There is also a considerable saving of copper per year per installation and an economy is achieved because of a lower rate of use of electric power.

53. Characteristics of a Ferromagnetic

"Variation Principles in Determining the Main Characteristics of a Ferromagnetic by the Calculation of Its Hysteresis Loop," by V. I. Skobeltsyn, Moscow State University; Moscow, Doklady Akademii Nauk SSR, Vol 130, No 5, Feb 60, pp 1012-1014

The mechanism of hysteresis is sufficiently studied by Ye. I. Kondorskiy (ZhETF, 10, 420 (1940)), particularly in its starting region of shifting of domain limits. A further development of the theory facilitates a quantitative computation of the configuration of the whole hysteresis loop and relates various characteristics of the ferromagnetic to the shape of the loop.

54. Analysis of Processes in Ferrite Cores

"Analytical Investigation of Processes in Ferrite Components," by Ye. I. Klepfer and G. M. Tikhomirov; Novocherkassk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Elektrotekhnika, No 12, Dec 59, pp 12-17

A theoretical method is presented for calculation of time required for magnetic-polarity reversal in ferrite cores. To check the correctness of this method of calculation, an experimental determination of the magnetic-polarity reversal time of the K-65 (7 X 4 X 2.1 mm) ferrite core was carried out. In this experiment, the magnetic-polarity reversal was induced with the aid of the pulse generator type 26-I.

The magnetic-polarity reversal time, as determined for ten selected ferrite cores, was of the order of 1.9-2.0 microseconds. The experimental results differed from the calculated values by only 5-10%.

Thus it was concluded that the new calculation method is quite reliable in mathematical analysis of circuits with ferrite components which are so often used in automation, telemechanics, and computer technology.

55. Absorption of Ultrasound

"Absorption of Ultrasound in Metals in a Magnetic Field," by V. I. Gurevich, Institute of Semiconductors, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 29, No 6, Dec 59, pp 1680-1691

Absorption of ultrasound in a metal located in a strong magnetic field is considered, the Larmor radius of the conductivity electrons being much smaller than the wave length of the sound. Various limiting cases corresponding to various relationships between these two lengths and the mean free path are investigated. The absorption coefficient is calculated by simultaneously solving the kinetic equation and Maxwell equations. It has been found that there are two absorption mechanisms in a magnetic field. One of these, a deformation mechanism, leads to absorption also in the absence of a magnetic field. The absorption coefficient in this case can be expressed in terms of the deformation potential, that is, in terms of functions which determine the change in the electron energy caused by the deformation. At experimentally attainable ultrasound frequencies and in a strong magnetic field this relation is found to be quite simple in a number of cases. With satisfactory accuracy the magnitude of the deformation potential can be estimated on the basis of the absorption data.

Induction absorption is due to electric fields which arise when the conductor deformed by the sound wave crosses the magnetic lines of force. Absorption is determined by the Joule heat generated by the currents created by these fields. The induction absorption coefficient can be expressed in terms of certain combinations of the conductivity tensor components, account in general being made of their time and spatial dispersion and the dependence on H. The asymptotic value of the conductivity tensor in a strong magnetic field with account of spatial dispersion has been determined.

56. Anomalous Conductivity Changes of Copper Suboxide Films at Low Temperature

"Conductivity Change of Thin Copper Suboxide Films in the Presence of Electrostatic Charge," by A. Deubner and F. Schultz, First Physics Institute, Humboldt University, Berlin; Leipzig, Annalen der Physik, Vol 5, No 3/4, 1960, pp 113-128

A description is given of investigations of the change of conductivity of thin copper suboxide films in the presence of electrostatic charge (field effect). Conductivity and field effect were measured in relation to the conditions of production (oxygen pressure, temperature, cooling). Whereas there is evidence of a previously reported relationship between conductivity and the oxygen pressure of the preceding tempering, because of the great divergence of individual samples, no proof can be given of an influence on the field effect. The effect shows a strong dependence on the ambient gas atmosphere. As expected, the entire film is strongly influenced by the adsorption of various inpurity gases.

The field effect was studied under vacuum in the temperature range of minus 56 to plus 30 degrees centigrade. At room temperature, the results agree satisfactorily with those of Zueckler (Z. Physik, 136, 40, 1953); at low temperatures, however, the application of an electrical field is followed by an as yet unexplained behavior. Zueckler's "freezing" of the aftereffect and presumed ionic migration at low temperatures are discounted here; it was noticed that, at low temperatures, a peculiar symmetry of the aftereffect (lack of dependence on the sign of the charge) and an out of proportion growth with increasing field strength occur.

[For additional information on materials, see Chemistry, Colloidal Chemistry, Inorganic Chemistry, Nuclear Fuels and Reactor Construction Materials, and Radiation Chemistry.]

Wave Propagation

57. Nonlinear Theory in Study of Parametric Oscillations

"Nonlinear Theory of Ferrite Oscillators," by A. L. Mikaelyan; Moscow, Radiotekhnika i Elektronika, Vol V, No 1, 1960, pp 46-58

The operation of superhigh frequency ferrite oscillators is based on parametric phenomena -- the parameters of the ferrite, under the influence of a strong magnetic field, periodically change and create oscillations. The problems of nonlinear theory, which may be use not only to establish the conditions of excitation of parametric oscillations but also to compute the amplitude of such oscillations under steady-state conditions, are examined in this work. Resonance characteristics are computed for an electromagnetic-type oscillator and an analogy is made between ferrite oscillators and related parametric systems in mechanics and radio engineering.

This report was presented at the Jubilee Session of the Scientific-Technical Society of Radio Engineering and Electrical Communications imeni A. S. Popov on 12 June 1959.

58. Wave Diffraction on Ferrite Sphere

"Diffraction of Electromagnetic Waves on a Gyrotropic Sphere in a Rectangular Wave Guide," by Hsu Yen-sheng; Moscow, Radiotekhnika i Elektronika, Vol V, No 1, 1960, pp 15-26

The author examines the problem of diffraction of electromagnetic waves on a gyrotropic ferrite sphere located in a rectangular wave guide in which only H_{10} waves are propagated. An expression is obtained first for a plane wave propagated in an arbitrary direction through Debye potentials, and, from this, an expression is derived for normal H_{10}-type

waves for cases where the direction of the permanent magnetic field is parallel to the wide and to the narrow wall of the wave guide. Amplitudes of waves reflected from the sphere are calculated and the problem of excitation of a wave guide by a reflected wave is solved.

The author expresses his gratitude to A. A. Pistol'kors and A. L. Mikaelyan for their advice and guidance.

59. Electrostatic Energy of Space Charge

"The Electrostatic Energy of a Space Charge," by O. Emersleban, Greifswald; Leipzig, Hochfrequenztechnik und Elektroakustik, Vol 68, No 4, Nov 59, pp 111-118

The electrostatic potential energy $\mathcal{G}$ of a space charge consisting of N homologous charges e, arranged as in a region of a lattice with lattice constant a, amounts asymptotically, for large N, to $\mathcal{G} = U \times (e^2/a) N^{5/3}$, where the constant $U \doteq 1$ is negligibly dependent on the lattice type and the configuration of the space-charge cloud. If $E = N \times e$ is the total charge and d is a diameter of the space charge region, then $\mathcal{G} = E^2/(\vartheta \times d)$, where the form factor ϑ is somewhat smaller than unity. Spherical, cubic, and tetrahedral regions of cubic and tetrahedral-rhombohedral lattice types were computed. More exact formulas are also derived.

60. Secondary Flows in Convergent Nozzle

"Investigation of the Secondary Flows in a Convergent-Nozzle Grid," by A. N. Rakhmanovich, Tr. Ufimsk. aviats. in-ta (Works of the Ufa Aviation Institute), No 4, 1958, pp 21-41 (from Referativnyy Zhurnal -- Mashinostroyeniye, No 22, 25 Nov 59, Abstract No 94471)

The article considers a physical model of the expansion of a boundary layer, based on the idea of tapered lines of flow in a three-dimensional boundary layer, and examines the nature of the velocity field. Criteria are introduced for the flow stability in a curvilinear duct, with secondary flows and the functional dependence of the velocity of secondary fields taken into account. The model applies for elastic blades, and flow is visualized by stroboscope and flakes. The grid comprises a combination of micronozzles.

61. Nonsymmetrical Correction Moments in Directional Gyroscope

"On the Influence of Nonsymmetrical Correction Moments and of Friction Forces in the Bearings of the Suspension of a Directional Gyroscope on Its Accuracy," by A. I. Korolev, Tr. Leningr. in-t aviats. priborstr. (Works of the Leningrad Institute of Aviation Instrument Building), No 19, 1958, pp 18-32 (from Referativnyy Zhurnal -- Mashinostroyeniye, No 22, 25 Nov 59, Abstract No 92906)

The study considers a directional gyroscope with hysteretic horizontal correction and nonsymmetrical moments of friction in the suspension bearings. The general formula is derived for the mean rate of departure of the gyroscope in the azimuthal plane, and the mean rate of departure is computed for four individual cases. Experimentally obtained curves are given for the change of the moments of friction and the mean rate of departure of the gyroscope in the azimuthal plane.

62. MRB 21/1818 Aerial Mapping Camera Developed by Zeiss, Jena

"The Aerial Mapping Camera MRB 21/1818 With High-Power Objective Pinatar 4/210, a New Aerophotographic Apparatus From VEB Carl Zeiss Jena," by H. Schoelar, Jena; Berlin, Vermessungstechnik, No 2, Feb 60, pp 27-32

A description, photographs, and drawings are given of the new aerial mapping camera.

The modern computers available in Jena were used to speed the development of the Pinatar 4/210 objective, an optical system consisting of ten lenses, with a relative aperture ratio of 1:4, a focal length of 210 millimeters, and almost free of distortion. The four shutter disks are driven by an electric motor at a maximum rate of 9,000 revolutions per minute; the shutter speeds are continuously variable between 1/50 and 1/500 second with a 90-percent light efficiency, and between 1/100 and 1/1,000 second at over 80-percent light efficiency. The film used in the cassette is unperforated, 20 centimeters wide and 120 meters long, and has a square image format of 180 millimeters by 180 millimeters.

The MRB-S monitor is illustrated and described, and a performance diagram is given for the MRB 21/1818 aerial mapping camera.

63. 1,500-Degree Tubular Furnace for Calibrating Thermocouples

"A Horizontal Furnace for Attaining Temperatures up to 1,500° in an Air Combustion Space," by A. N. Gordov, G. A. Krakhmal'nikova, and N. N. Ergardt, Tr. Vses. n.-i. in-ta metrol. (Works of the All-Union Scientific Research Institute of Metrology), No 35 (95), 1958, pp 92-94 (from Referativnyy Zhurnal -- Mashinostroyeniye, No 22, 25 Nov 59, Abstract No 93246)

The described furnace is intended for the calibration of platinum-verses-platinum-rhodium thermocouples which operate up to 1,500 degrees centigrade and for various studies at high temperatures. It is made up of two coaxially positioned tubes of refractory material. The inside tube, which constitutes the working chamber, is made of aluminum oxide; the outside beryllium oxide tube is covered with a heating coil made of molybdenum wire of about 2 square millimeters cross section. To guard

against oxidation, the molybdenum heating coil is placed in a hermetically sealed container and operates in a purified argon atmosphere under an excess pressure of 0.02 atmosphere (gauge). The heater capacity is 5 kilowatts. The furnace is supplied with 220 volts AC from the mains by means of a controller which provides a smooth change of temperature in the working space. A temperature of 1,500 degrees centigrade is reached in 2 hours. The furnace, together with its air operating space, which heats up to 1,500 degrees centigrade, satisfies the requirements for the testing of thermocouples in accordance with Instruction 163-54.

64. Ultrasonics for Measuring Depth of Surface Hardening

"On the Prospect of Using the Ultrasonic Method of Checking Certain Technological Processes in Machine Building," by N. N. Yegorov, Ul'trazvyk. pribory TsNIITMASh (Ultrasonic Devices of the Central Scientific Research Institute of Technology and Machine Building), Moscow, 1958, pp 30-40 (from Referativnyy Zhurnal -- Mashinostroyeniye, No 22, 25 Nov 59, Abstract No 92410)

A description is given of an ultrasonic method of determining the depth of surface hardened layers of metals. It is shown that it is possible to measure a hardened layer of steel during heating with a high-frequency current with a frequency of 2,500 cycles per second, as well as during hardening by other methods. The ultrasonic method can be used for measuring the depth of nitrided and cemented layers. In cast irons with perlitic, perlitic-ferritic, and ferritic structure, it is possible to determine the depth of the hardened zone and the distribution of hardness with depth.

65. Twin-Chamber Dosimeter

"Instrument for Individual Dosimetric Control," by A. A. Pavlov, I. M. Rozman, and K. G. Tsimmer, Sb: Issled. v obl. dozimetrii ioniziruyushchikh izlucheniy (Collection of Articles: Research in the Area of the Dosimetry of Ionizing Radiation), Moscow, 1957, pp 115-120 (from Referativnyy Zhurnal -- Mashinostroyeniye, No 22, 25 Nov 59, Abstract No 92968)

A description is given of an instrument devised by the authors for dosimetric control, based on the operational principle of the cathode follower, and consisting of twin condensation chambers and an electrometer tube as a measuring device. The instrument provides measurements

in two ranges of 0-350 milliroentgens and 0-5 roentgens. It is of satisfactory mechanical stability, and the hermetically sealed chambers considerably reduce the influence of climatic conditions at the time of use. The measuring device guarantees the registration of small charges. Sensitivity tests conducted on the instrument with Co^{60}, and hermeticity tests involving the measurement of the rate of leakage of charge in the chambers of 95-percent relative humidity and 15 degrees centigrade, showed an accuracy of plus-minus 10 milliroentgens for the first chamber and plus-minus 200 milliroentgens for the second chamber; the rate of leakage was found to be one and two microamperes per 24-hours for the first and second chamber, respectively.

66. Unipolar Pulse Generator

"Commutator-Type Unipolar Pulse Generator," by I. S. Rogachev; Novocherkassk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Elektromekhanika, No 12, Dec 59, pp 88-95

The rotary generator of unipolar electric pulses is a new type of electric machinery which came to prominence with the advent of electric-spark machining of metals. A commutator-type unipolar pulse generator, as originally suggested by I. S. Rogachev, A. L. Livshits, L. D. Perchik, and N. I. Borisenko, was developed at the Khar'kov Polytechnic Institute and consists of an alternating-pole magnetic circuit with narrow pole pieces located either on the stator or rotor, and an armature with a single-phase winding placed over narrow sections along the circumference of the rotor or stator. The generated reverse-polarity pulses are rectified with the aid of a commutator placed on the stator shaft; thus, the whole unit becomes in reality a full-wave mechanical rectifier. The pulse repetition rate for such a machine can be varied from 150 to 1,000 pulses per sec with a pulse current of from 10 to 600 a. The pulse shape generated by this machine is close to a square form. The efficiency of the commutator-type pulse generator is high, varying from 65 to 75%.

The simplicity of generator construction and its high efficiency make this machine especially suitable for operation in the pulse-repetition range of 150—1,000 pulses per sec.

67. Electromagnetic Peak-Pulse Generators

"Electromagnetic Peak-Pulse Generators for Grid-Controlled Ionic Devices," by O. A. Mayevskiy and V. P. Bondarenko; Novocherkassk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Elektomekhanika, No 12, Dec 59, pp 118-126

Peak-pulse generators, which convert the sinusoidal control waveform into a peaked-pulse with steep leading edge of the order of 30-40 v per electrical degree, are now often used in modern grid-controlled systems of ionic power rectifiers. The description of an electromagnetic peak-pulse generator (authorship certificate No 119239, 9 April 1958), in which the functions of a transformer and pulse-shaping device are combined in one single electromagnetic apparatus, are given in this article. The apparent power consumption of the peak-pulse experimental model was about 89 volt-amp. It is believed that the device can be further improved and the power consumption lowered by 10-15 volt-amp.

Wide application of this type of peak-pulse generators in grid-controlled modern rectifiers is anticipated in the near future. A complete calculation schedule for such peak-pulse generators is given.

68. Growth of Mixed Problem

"Concerning the Growth of a Mixed Problem in the Case of Incompleteness of the Eigen Functions " by K. V. Brushlinskiy; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Matematicheskaya, Vol 23, No 6, Nov/Dec 59, pp 893-912

The mixed problem for the system of equations

$$\frac{\partial u}{\partial t} = A(x) \frac{\partial u}{\partial x} + B(x) u$$

is considered with disintegrating boundary conditions. The solution is found with the help of the Laplace transformation in terms of t. It is proved that the growth of the solution as t approaches infinity is determined by the right boundaries of the spectrum of the operator

$A \frac{d}{dx} + B$ in spite of whether it has a complete system of eigen functions or not.

69. Integrals Associated With Additive Problems

"Estimation of Certain Integrals Associated With Additive Problems," by A. F. Lavrik; Leningrad, Vestnik Leningradskogo Universiteta, seriya Matematiki, Mekhaniki i Astronomii, Vol 19, No 4, Oct/Dec 59, pp 5-12

During solution of additive problems by the method of trigonometric sums, the segment [0, 1] is split into two sets of intervals, called the fundamental intervals and the auxiliary intervals. Thereafter, the integrals of the appropriate trigonometric sums, distributed on each of the indicated sets, are investigated (see I. M. Vinogradov, "Selected Works," Izd. AN SSSR, 1952).

However, the general method for estimating the integral by the product of the auxiliary integrals (see Yu. V. Linnik, "Prime Numbers and Powers of Two," Tr. Matem. in-ta im. V. A. Steklova, Vol 38, 1951, pp 152-169) for nonbinary additive problems is proved inconvenient when applied to the solution of problems of the binary additive type.

In connection with this, it is interesting to study that kind of integral which is immediate for each integration of the range [0, 1]. That is the purpose of the present work.

The following generalization of the prime-number law was obtained:

Let $S(\vartheta, N) = \sum_{P \le N} e^{2\pi i \nu \beta}$; $1 \succ \delta \succ \gamma > 0$.

then $\int |S(\vartheta, N)|^2 \, d\vartheta = (\delta - \gamma) \frac{N}{\ln N} + O\left(\frac{N \ln (\ln N)^2}{\ln^2 N}\right)$.

The method used in the proof is a combination of the Vinogradov and Viggo Brun methods.

70. Spectrum of Differential Operators

"Concerning the Spectrum of a Certain Class of Non-Self-Conjugate Singular Differential Operators," by F. G. Maksudov; Baku, Izvestiya Akademii Nauk Azerbaydzhanskoy SSR, Seriya Fiziko-Matematicheskikh i Tekhnicheskikh Nauk, No 4, Oct/Dec 59, pp 3-10

The spectrum of the operator L is invested which is encountered in the following manner:

The differential expression

$$j(y) = (-1)^n (p_0(x)\, y^{(n)})^{(n)} + (-1)^{n-1} (p_1(x)\, y^{(n-1)})^{(n-1)} + \ldots + p_n y$$

is investigated where $p^{-1}(x)$, $p_1(x)$, ... , $p_{n-1}(x)$ are assumed to be measurable, locally summable real functions, and $p_n(x)$ is assumed to be a measurable locally summable complex function.

The set of functions of y on $L_2(-\infty, +\infty)$, for which the derivatives up to the 2n-1 th order are absolutely continuous in each finite interval and $j(y) \in L_2(-\infty, +\infty)$ is designated by D and the set of finite functions from D will be designated by D'. The operator L' is introduced by the equation $L'y \equiv j(y)$ for $y \in D'$. The operator L is defined as the closure of the operator L'.

It is assumed that $p_0(x)$, $p_1(x)$, ... , $p_{n-1}(x)$ exist and are bounded on the entire real axis and that $p_0(x) > 0$, $p_1(x) \ge 0$, ... , $p_{n-2} \ge 0$, $p_{n-1} \ge 1$. It is also assumed that $p_n(x) = p(x) + q(x)$, where $p(x)$ is a real function bounded from below, and $q(x)$ is a locally bounded and summable complex function satisfying the condition

$$\lim_{|x| \to \infty} q(x) = 0.$$

The operator generated by the differential equation $y = R_\lambda^o f$ is designated by L_o.

It is also assumed that L_o is a self-adjoint operator.

Then $Ly = L_o y + q(x)y$.

The following theorem is then proved:

Theorem 1. The spectrum of the operator L consists of a certain set of points on the positive half-axis and not more than a countable set of complex points no limit of which lie on the positive half-axis.

It is further assumed that $p_n(x) = p(x) + iq(x)$, where $p(x)$ real function bounded from below, and that $q(x)$ is a locally bounded and summable real function such that the following conditions are satisfied:

$$\lim_{x \to \infty} \frac{q(x)}{p(x)} \leq C.$$

Also, $p_o(x), p_1(x), \ldots, p_n(x)$ and L_o are to satisfy the previous conditions. The following two theorems are then proved:

Theorem 2. If the operator L_o has a discrete spectrum, then the operator L also has a discrete spectrum.

Theorem 3. The necessary and sufficient conditions that an operator L has a discrete spectrum are that for any sequence of nonintersecting integrals $\{ D_k \}$ the length $\int_{D_k} p(x)\, dx \to \infty$ when the interval containing the length, D_k, approaches infinity.

71. Simple Markov Processes Imated

"On the Imatation of the Simplest Markov Processes," by Yu. N. Shakhov; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Matematicheskaya, Vol 23, No 6, Nov/Dec 59, pp 815-822

A finite sequence of numbers is constructed which imitates a finite homogeneous Markov chain in a certain sense. The Markov chain is assumed to have stationary probability distributions with rational numbers as probabilities.

With the help of this sequence a construction is given for the Markov normal to the sequence of numbers.

72. Distribution of Remainders for Calculation Systems

"Concerning a General Property of Calculation Systems," by A. O. Gel'fond; Moscow, Isvestiya Akademii Nauk SSSR, Seriya Matematicheskaya, Vol 23, No 6, Nov/Dec 59, pp 809-814

The distribution law of the remainders $x_n(\alpha)$, for almost all α, $0 < \alpha < 1$, is established for the expression

$$\alpha = \sum_{1}^{n} \frac{\lambda_k}{\theta^k} + \frac{x_{n+1}}{\theta^n}, \quad 0 \leq \lambda_n < \theta \quad , \text{ where the } \lambda_n \text{ are}$$

whole numbers, $1 < \theta$, θ not a whole number.

In addition, other problems for the x_n are considered.

73. Periodic Solutions for Class of Nonlinear Integral-Differential Equations

"Conditions for the Existence of Periodic Solutions for One Class of Systems of Nonlinear Integral-Differential Equations," by G. F. Yakovleva and V. P. Misnik, Kirgizskiy Gosuniversitet; Tashkent, Izvestiya Akademii Nauk UzSSR, Seriya Fiziko-Matematicheskikh Nauk, No 4, Oct/Dec 59, pp 16-25

Let there be given a system of integral-differential equations of the form

$$\frac{dx_s}{dt} \sum_{i=1}^{n} \alpha_{si} x_i + f_s (x_1, \ldots, x_n) + \mu \int_a^b K_s (t, \tau, x_1, \ldots, x_n)\, d\tau \qquad (1)$$

$$(s = 1, 2, \ldots, n),$$

where α_{si} are certain constants, $|\alpha_{si}| \leq \alpha^*$ $(i, s = 1, 2, \ldots, n)$,

$$f_s(x_1, \ldots, x_n) = \sum_{\nu_1 + \ldots + \nu_2 = 0}^{\infty} P_s(\nu_1, \ldots, \nu_n)\, x_1^{\nu_1} (t) \ldots x_n^{\nu_n}(t), \qquad (2)$$

$$K_s(t, \tau, x_1, \ldots, x_n) = \sum_{\nu_1 + \ldots + \nu_n = 0}^{\infty} Q_s(\nu_1, \ldots, \nu_n)(t, \tau)\, x_1^{\nu_1}(\tau) \ldots x_n^{\nu_n}(\tau), \qquad (3)$$

and the functions K_s are continuous with respect to t and periodic of period ω. The functions K_s are expanded into a Fourier series which converge uniformly for all $\tau \in [a, b]$ relative to which the functions are also continuous.

Let $\bar{r}$ be such a positive number that the series (2) and (3) converge for $|x_s(t)| \leq \bar{r}$. A solution for system (1) is found satisfying the initial conditions.

$$x_s(t, \beta_1, \cdots, \beta_n, \mu)_{t=0} = \beta_s$$

and which is analytic with respect to $\beta_1, \beta_2, \cdots, \beta_n, \mu$.

VI. MEDICINE

Aviation Medicine

74. Development of Cosmic Microbiology

"Routes of Development of Cosmic Microbiology," by Prof N. Zhukov-Verezhnikov, Active Member of Academy of Medical Sciences USSR, V. Yakovlev, and Professor Mayskiy; Moscow, Meditsinskiy Rabotnik, No 90 (1838), 10 Nov 59, pp 2-3

The authors of this article state that the Soviet launching of three artificial earth satellites and three cosmic rockets has created a background for continued progress in all branches of scientific knowledge. New problems have arisen for biology and medicine which have brought about the emergence of new specialties.

Cosmic microbiology, one of the new specialties, consists of a study of microscopic forms of life found on planets and heavenly bodies and the utilization of microorganisms to ascertain the conditions existing in cosmic space. Information about the effect of cosmic space on physiological functions can be obtained by sending highly developed animals into outer space; the time-range limitations of cellular vitality and genetic changes can be ascertained by sending microorganisms into the celestial cosmos and keeping them there for a long time before returning them to earth. The rapid replacement of one generation of microorganisms by another makes it possible to determine the genetic effect of various factors present in outer space.

Engles discussed cosmic space and the propagation of life in the cosmos in his book, The Dialectics of Nature. The panspermian theory, developed by S. Arrhenius was widely discussed at that time. According to this theory, spores of microorganisms may be transferred from one planet to another. This, it was claimed, provides unity of the origin and structure of a living organism in the entire cosmos. Discussions of whether cosmic space presents a favorable climate for the propagation of life did not lead to anything definite at that time. It was theorized that the presence of ultraviolet rays beyond the limits of the earth's atmosphere and radiation in outer space do not present favorable conditions for spores of microorganisms to remain alive for a long time. The majority of scientists thought that outer space was sterile. This concept should be reconsidered in the light of new information obtained as a result of planned research.

Recent preliminary data confirm the hypothesis that it is impossible for spores of microorganisms to exist in cosmic space for a long period. Without experimental verification it is premature to accept that data as conclusive. It is known that the short-wave portion of ultraviolet radiation of the sun can destroy vegetative forms of bacteria and spores very quickly if they are not protected. The thin membrane surrounding the spores possibly protects them properly from ultraviolet rays. Spores were obtained from samples gathered at high altitudes with the aid of probing balloons; however, the data are not sufficient to justify conjecture that spores of microorganisms could escape the effects of ultraviolet and cosmic rays.

Data obtained with the aid of artificial earth satellites show that in the area beyond the limits of the earth's atmosphere, one or two cosmic particles fall per second per square centimeter. These cosmic particles have energy between 10^9 and 10^{18} ev per second per square centimeter. There are two zones of rising radiation above the earth. One zone contains 10,000 particles with energy of 10^6 ev (due mainly to protons); the other zone contains from 10,000 to 100,000 particles per second per square centimeter with energy between 10 Kev and 100 Kev (due mainly to protons). Above these two zones, within the area of cosmic space surveyed, the level of radiation is generally not very great.

The primary task is to obtain material from cosmic space, beyond the limits of the earth's atmosphere, to subject it to chemical and biological analysis.

It is generally recognized that conditions present on Mars and Venus justify the assumption that microorganisms exist there. The situation on the moon is different. A. I. Oparin and V. G. Fesenkov state in their book, Zhizn' vo Vselennoy, (Life in the Universe), that no sufficient evidence has been found to indicate the possibility of the presence of some kind of life on the moon. The absence of an atmosphere and sharp fluctuations in temperature on the moon seem to exclude the possibility of life thereon. However, attempts should be made at some future time to investigate the moon's surface and the lunar strata. It is hypothesized that because of the absence of an atmosphere on the moon, particles from cosmic space are continually deposited on its surface. This lunar dust is of considerable interest to biologists inasmuch as its strata may characterize the proximate history of chemical compounds in the solar system in the same way as geological formations characterize the history of the earth. Chemical examination of lunar dust for the purpose of isolating organic substances and direct attempts to find spores may contribute greatly to the study of life in cosmic space.

It is known that certain bacteria may exist in water at a temperature near the boiling point. In addition, many of them survive deep freezing as well as extensive changes in pressure. The protoplasm of some species of bacteria (anaurobes) is formed of the minimum amount of material; these do not need oxygen for respiration. Further study of the extreme conditions under which microorganisms live is very important. It should be noted that data bout the resistance of microorganisms to high and low temperatures, high pressure, etc. were obtained mainly by accident during searches for something else. No doubt, special experiments will result in the discovery of more resistant varieties of microorganisms.

The question of whether life evolved in conformity with an established rule or on the basis of chance phenomena has been widely discussed. Two clear lines of demarcation have been drawn. According to Michurin, organisms develop on the basis of definite laws, and chance plays the same part as in other forms of the development of matter. The other theory is that proposed by Weisman and Morgan, according to which modern species originated exclusively as a result of chance mutations with subsequent natural selection.

Experimental investigation of the question of the existence of life on other planets may produce new data to aid the solution of this old controversy. If the theory of Weisman and Morgan were followed, recognition of the fact that the chemical composition of microorganisms on other planets must be radically different from the chemical composition of the protein and nucleic acid of microorganisms on earth would be necessary because unity of structure could not have been achieved as a result of chance mutations. From the Michurin viewpoint, the chemical structure of the protein and nucleic acid of extraterrestrial and terrestrial microorganisms must be basically the same, because the laws of the development of living matter are the same on earth as on other planets.

D. Lederberg, a well-known American bacteriologist, stated that investigations of life on various planets will solve the question of whether evolution is divergent or convergent, i.e., whether or not unity in structure of organisms is secured by actual community of origin. The exploration of the cosmic space will provide new data to enrich our knowledge of the nature of the evolutionary process.

The reasons for sterilization of the second Soviet cosmic rocket were well publicized. The entry of terrestrial microorganisms would have caused doubt in later investigations about the origin of forms of life which may exist on the moon. It is doubtful that terrestrial microorganisms can displace the local forms, because local forms are better adapted to their environmental habitat than those brought from outside. A. A. Imshenetskiy pointed out that such a possibility should not be excluded.

Consideration must be given not only to avoiding the infliction of damage to probable inhabitants of other planets, but also to preventing alien microorganisms from invading the earth. Future experiments must consider the automatic disinfection of instruments and other equipment returning to earth from other planets.

To solve the problem of whether man's sojourn in outer space will cause organic changes which might reflect on his progeny, an index of genetic pathogenicity of secondary radiation present in various areas of cosmic space must be found. This cannot be accomplished by measuring radiation alone or by using physical devices and interpreting data recorded by them. Science does not have at its disposal devices which function continually and which accumulate information about all cosmic particles.

It is possible that living cells will be able to play the unique role of a "counter of particles." Information about the origin of particles will accumulate within this "counter" and may consequently be detected by computation of the number of cells changed through inheritance in comparison with those cells which have not been exposed to radiation. This peculiarity of living cells and the capacity of microbial cells to replace one generation with another within a comparatively short time make microorganisms irreplaceable in the effort to clarify the genetic hazards of cosmic rays.

It is entirely feasible to have microorganisms sent up in an artificial earth satellite. Species of microorganisms which can be used most conveniently as "bioelements" must be selected, special instruments must be devised, etc. Scientists of various specialties must take part in this work.

The problem of cosmic rays that reach the earth remains unsolved. The question of fluctuations in the level of radiation on the surface of the earth is significant in the study of the origin of hereditary diseases and other forms of genetic changes: microorganisms are also useful here as genetic indicators.

75. Moscow Space Biology Institute Experiments Reported, "Liquid Envelope" Suggested

"Marsnik or Venusnik?" (unsigned article); Bratislava Szabad Foldmuves, 21 and 24 Feb 60, p 2

The first installment describes space biology problems in general and states: "We already reported in our paper that they have been experimenting for years at the Moscow Space Biology Institute (Moszkvai

Uralettani Intezet), under the leadership of Prof Modest Vakar, on overcoming the damaging effects of the low pressures found at great altitudes. The task has been solved by constructing a suitable protective suit."

The second installment cites the "egg experiment" of K. E. Tsiolkovskiy (1891) as a clue to solving the problems of sudden acceleration or deceleration. An egg in a liquid medium can be dropped from great heights without breaking. The article continues: "Experiments now in progress will soon give an answer to this problem. The power of the new Soviet rockets will make it possible to increase the payload enough to provide the first brave astronauts with a liquid envelope." The article also reports on experiments and training programs being carried out in the Moscow Space Biology Institute in which a centrifuge is used to test human reactions to increasing gravity. However, the article concludes by noting that a 70-day trip to Mars would require an initial speed of 16.7 kilometers per second and that this would require an acceleration too great to be borne, regardless of training or protective clothing.

Bacteriology

76. High-Frequency Radio Wave Effects on Bacteria

"The Effect of High-Frequency Radio Waves on the Intestinal Bacillus," by P. I. Schastnaya, Tr. Khar'kovsk. Med. In-ta (Works of Khar'kov Medical Institute), No 46, 1958, pp 359-363 (from Referativnyy Zhurnal--Biologiya, No 23, 10 Dec 59, Abstract No 100395, by V. V. Vlodavets)

"The bactericidal effect of centimeter and millimeter waves produced by high-frequency continuous-wave and pulse generators is well expressed with respect to B. coli at a bacterial concentration of 1,000 and 100,000 per ml. A screening layer of bacteria which absorbs the electromagnetic waves and prevents their action on other bacteria is formed in a dense mixture containing 100 million microbial cells per ml. The author explains the bactericidal and bacteriostatic action of radio waves by the thermoselective effect of the high-frequency field, which leads to an increase in the temperature inside the bacteria as a result of dissimilar electrical properties of the microorganisms and the medium. A bactericidal effect is not observed when the temperature of the medium is lower than optimum, so that as a result of the transfer of heat into the surrounding medium, the inside of the bacterial cells does not reach a temperature which is disastrous for them."

77. Production of Toxin in Animals Infected With Clostridium botulinum

"Observations on the Production of Toxin in the Digestive Tract of Animals Infected Perorally With a Culture of the Pathogen of Type A. Botulism," by L. M. Shvedov; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 31, No 1, Jan 60, pp 106-111

The experiments described in this report were carried out to substantiate the additional formation of botulinus toxin in the digestive tract of the botulism patient and to study the dynamics of this process; the action of toxin containing microorganisms and an equal amount of toxin without microorganisms was compared.

The toxin was prepared by the filtration of a 9-day type A Cl. botulinum (strain 98) culture in glucose Martenovskiy bouillon with liver through a Seitz filter. The culture had been centrifuged to precipitate the principal mass of microorganisms. Toxicoinfection was produced in rabbits, guinea pigs, and white mice by the injection of a suspension of the precipitated microorganisms in filtered toxin. The mixture obtained was calculated to contain one billion microbial cells per milliliter.

In analysis of the results, the intensity of symptoms, the mortality rate, and the presence of toxin in the blood and certain internal organs, chiefly the digestive tract, were noted.

The authors' observations of a human patient with the pulmonary form of botulism is reported; a toxigenic culture of specific type B pathogen was isolated from his feces. Toxin was not detected in his blood by the use of biological tests but was readily observed by the phagocytic test.

A comparative study of the sensitivity of the biological test and the phagocytic test was made on rabbits; results are shown in a table. The phagocytosis method was used in the subsequent experiments. Three additional tables are entitled: "The Comparative Determination of the Action of Toxin and Cultures; Comparative Study of the Blood and Organs of Poisoned and Infected Animals With the Help of the Phagocytic Test; and Comparative Results of Investigation of Toxin in the Blood of Poisoned and Infected Animals."

The following conclusions are given:

"1. The introduction of 'pure' toxin to animals, not depending on the outcome of the disease, caused brief intoxication--the toxin was rapidly eliminated from the digestive tract and blood.

"2. Toxicoinfection proceeded more severely in the animals than intoxication. The additional production of toxin in the small intestine, which sometimes recorded within 27-48 hours and which lasted for a long time (up to 15-30 days) is the basis of this phenomenon.

"3. The data obtained show conclusively that during the course of the disease the botulism pathogen plays the part of a saprophyte, which is not harmless, and of an additional toxigenic factor.

"4. Inasmuch as the additional production of toxin is noted in the digestive tract of all infected animals, it is possible to assume that all cases of naturally occurring botulism in humans, even those with a short incubation period, should be regarded as toxicoinfection.

"5. The possibility of neutralization with specific anti-toxin directly in the digestive tract has shown that, judging by our data, the effectiveness of serum therapy of botulism can be significantly increased.

78. Detection of Pathogenic Bacteria

"The Phage Titer Increase Reaction as a Method of Diagnosing Infectious Diseases and Indicating Pathogenic Bacteria," by V. D. Timakov and D. M. Gol'dfarb; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 31, No 1, Jan 60, pp 5-10

This article is a summary of the results of an evaluation of the phage titer increase reaction as a method of identifying pathogenic bacteria in various materials. Laboratory studies of bacteriophage performed at the Institute of Epidemiology and Microbiology imeni Gamaleya provided the basis for the authors' experiments on this reaction, the methodology of which is given.

During investigations of the mechanisms of the interaction between phages and cells, the authors formulated the concept of an "indicator phage" and determined its qualitative characteristics. An indicator phage, according to their observations, must be a virulent phage with a definite, precisely limited range of action; it must have a pronounced adsorption capacity with a short latent period and high productivity; and it must have a high index of effective multiplicity.

An extensive discussion of the authors' experimental study of the method is presented, after which the following conclusions are given:

"1. The phage titer increase reaction is based on an increase in the number of corpuscles of the indicator phages added in definite concentrations to the material being examined. It permits detection of the presence of the microorganisms sought without the isolation of a pure culture and in the presence of extraneous microflora.

"2. The phage titer increase reaction was studied as a method of diagnosing dysentery and typhoid, and also of indicating the pathogens of plague, cholera, and brucellosis on environmental objects and in certain food products.

"3. The use of the phage titer increase reaction for the diagnosis of dysentery demonstrated that this method is more sensitive than the bacteriological method, particularly in chronic forms of disease.

"4. The high sensitivity of the method and the rapidity of obtaining a response (10-11 hours after the beginning of analysis) characterize the reaction as an accelerated method of microbiological diagnosis.

"5. The process of eliminating pathogens from the organism is explained with the aid of the phage titer increase reaction.

"6. The reaction is a highly sensitive method of observing the pathogens of enteric infections and of plague and cholera in various food products, in water, and on environmental objects.

"7. The high sensitivity of the method permits us to recommend it for controlling the effectiveness of disinfection measures.

"8. The use of the phage titer increase reaction in foci of acute and chronic dysentery and in analysis of outbreaks of dysentery and typhoid with a water origin substantiates the efficacy of using this reaction with other methods in epidemiological investigations."

79. Sensitivity of Dysentery Bacteria to Temperature and Antiseptics

"Effect of High Temperature and Some Antiseptics on Sonne Dysentery Bacteria Resistant to Levomycetin and Chlorotetracycline," by Shen Yu-ju, V Sb.: Vopr. Bacteriol. Immunol., i Khimoterapii pri Kishechn. Infektsiakh (Problems of the Bacteriology, Immunology, and Chemotherapy of Intestinal Infections), L., 1958, 47-52 (from Referativny Zhurnal--Khimiya, Biologicheskaya Khimiya, No 23, 10 Dec 59, Abstract No 30790, by the author)

"The acquisition of resistance to levomycetin and chlorotetracycline by Sonne dysentery bacteria is accompanied by an increase in the sensitivity of the bacteria to high temperature, phenol, formaldehyde, and potassium permanganate."

Contagious Diseases

80. Hearing Impaired in Brucellosis

"Changes in Hearing and Vestibular Function During Brucellosis," by Yu. P. Tolstov, Clinic for Ear, Nose and Throat Diseases, Orenburg Medical Institute; Moscow, Vestnik Otorinolaringologii, No 6, Nov/Dec 59, pp 24-29

The author of this article states that the results of the clinical examination of 54 men and 49 women with brucellosis led to the observation that severe hearing impairment and deafness are leading symptoms of brucellosis. It was observed that the auditory analysor was impaired in 29 of 103 patients examined; the outer and the middle ears were affected in 3 cases, and the internal ear, in 25 cases. Inflammation of the middle ear, developing as a result of brucellosis, seems to cause an intercranial complication that may lead to an error in diagnosis. Impairment of hearing was of a transitory nature in one brucellosis patient. The most severe pathological condition seems to consist of impairment of the internal ear: this was found in 25 patients. Otosclerosis was found to be present in 6, and bilateral deafness, in 4 out of 25 patients.

Impairment in hearing may occur suddenly, usually during the chronic stage of brucellosis.

Some degree of inhibition of vestibular function was the principal disturbance noted in eight patients.

Hematology

81. Synthetic Plasma Substitute

"Synthetic Plasma Replacing Preparation -- Polyvinylpyrollidone," by M. F. Shostakovskiy, P. S. Vasil'yev, F. P. Sidel'kovskaya, Ye. S. Morgunova, and M. G. Zelenskaya, V sb.: Sovrem. Probl. Gematol. i Prelivaniya Krovi (Contemporary Problems of Hematology and Blood Transfusion), No 34, M., Medgiz, 1959, 91-97 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 20, 25 Oct 59, Abstract No 27746, by G. Vigdorovich)

"The block polymerization of vinyl pyrrolidone produced an unsatisfactory plasma substitute (I) because of its low molecular weight. When polymerized in an aqueous solution with 1.8 percent of 30 percent H_2O_2, polymers are obtained which serve as catalyzers which in the form of 3.5 percent salt solutions are effective plasma substitutes. Various kinds of application of plasma substitutes are being studied."

82. Slovaks Report First Bone Marrow Transplant

"The Fight for Human Life" (unsigned article); Prague, Obrana Lidu, 11 Feb 60, p 2

According to this article, the Research Institute of Oncology (Vyzhumny ustav onkologicky) in Bratislava, Slovakia, has made its first successful bone marrow transplant to save the life of a woman patient suffering from leukemia. Bone marrow was taken from the donor, who was then hospitalized for 4 days. The patient receiving the bone marrow was a 23-year-old mother of one child.

Oncology

83. Effect of Tumors on Cholinesterase Activity

"Clinical Significance of the Indexes of Cholinesterase Activity in the Blood Serum of Patients Suffering From Tumors," by S. I. Korkhov, T. A. Kadoshchuk, and A. A. Stolyarchuk, Chair of Faculty Surgery and Chair of Pharmacology, Vinnitsa Medical Institute; Kiev, Vrachebnoye Delo, No 11, 1959, pp 1153-1156

Observations of 138 patients (70 males and 68 females) to determine the changes in cholinesterase activity in the blood serum as a result of the development of tumors have been conducted. It was established

that: cholinesterase activity is depressed in the course of the development of the tumors; the degree of the depression depends on the type of the tumor which develops; the degree of the depression of cholinesterase activity depends on the severity and duration of the pathological process; and there is definite relationship between the increase in the number of granulocytes and the decrease in the activity of the enzyme. The authors came to the conclusion that the indexes of cholinesterase activity in the blood serum when used with other clinical and laboratory data may serve as a means for the diagnosis of tumors.

84. Myelosan in Therapy of Myeloid Leukosis

"Therapy of Patients Suffering From Chronic Myeloid Leukosis," by Prof G. Kh. Dovgyallo, A. A. Ratikyanskaya, and Z. N. Atrakhovich, Chair of Hospital Therapy, Moscow State Medical Institute, and Belorussian Institute of Blood Transfusion; Minsk, Zdravookhraneniye Belorussii, Vol V, No 11, Nov 59, pp 9-11

Myelosan, a preparation synthesized by Soviet scientists and an analogue of mileran, was administered to 12 patients suffering from myeloid leukosis. Observations of the patients established that myelosan was the most effect of all chemicotherapeutic preparations used in the therapy of chronic myeloid leukosis. It is, however, only slightly effective when used in the acute stages of the disease. Myelosan has been found to be effective also when used on outpatients under strict observation of the physician. Outpatient therapy is highly beneficial because of its psychological effect on the patient.

85. Experimental Therapy of Malignant Tumors

"On the Investigation of the Experimentatl Therapy of Malignant Tumors (Rat Sarcoma) and Its Pathophysiological Bases," by N. V. Kolpikov, Tr. Kishinevsk. Med. In-ta (Works of the Kishinev Medical Institute), 1957, 6, 107-110 (from Referativnyy Zhurnal -- Biologiya, No 21, 10 Nov 59, Abstract No 95024, by L. A. Men'shikova)

"During the slow decomposition of a tumor implanted in the organism for a considerable time, products of the decomposition are formed to which the organism reacts with the development of an active immunity, according to a working hypothesis of the author. Experiments were carried out on mice which were inoculated with sarcomas 45 and M-1. The tumors were treated with the anode of a galvanic current (10 milliamperes for a period of 10 minutes). The complete resorption of the tumors was noted in 60 percent of the animals. When this method of treatment

was combined with other factors -- injection of ground spleen tissue, the administration of calcium chloride, general cooling of the organism, injection of novocain into the tumor tissue, ligation and excision of the tumor -- the number of cured animals increased. Some of the recovered rats have now been living for more than 2 years. Repeated implantations of the same tumor 1-2 months after therapy was terminated established the presence of a temporary immunity in a considerable number of the rats. The introduction of bee venom or of toad venom into the tumor tissue, or the injection of vegetable extracts containing phytoncydes into the tumorous animals also produced the gradual resorption of the tumors and the development of an unstable immunity."

86. Antitumor Vaccination With Ultrasound-Irradiated Tumor Tissue Suspension

"On the Question of Antitumor Vaccination," by K. P. Balitskiy and M. I. Gurevich, Institute of Physiology imeni A. A. Bogomolets, Academy of Sciences Ukrainian SSR, Laboratory of Compensatory and Defense Functions, and Laboratory of Circulatory and Respiratory Physiology; Kiev, Fiziologichniy Zhurnal, Vol 5, No 5, Sep/Oct 59, pp 650-655

Results of experiments on a tumor tissue suspension irradiated for 25 minutes by ultrasound waves, then used to vaccinate animals intravenously, intraperitoneally, and subcutaneously show that this suspension definitely inhibited the growth of the inoculated tumor tissue, bud did not produce stable or pronounced antitumor resistance.

87. Tumor Therapy With Di- and Trioxymethyleneglycol

"Results of the Therapy of Transplanted Tumors in Animals with Di- and Trioxymethyleneglycol," by Gyula Putnoky, Orv. Hetilap (Hungary), 1958, 99, No 24, 807-809 (from Referativnyy Zhurnal -- Biologiya, No 21, 10 Nov 59, Abstract No 95015, by A. N. Ivanov)

"The effect of Merapid (a mixture of di- and trioxymethyleneglycols, proposed by Vaida) on different strains of tumors implanted in mice and rats (622 animals in all) was studied. The mice were given 0.1-0.3 milliliters of a 0.05-0.1-percent solution of Merapid either subcutaneously or intraperitoneally; the rats were given 0.3 milliliter of a one-percent solution of Merapid intravenously or intraperitoneally. No caracinomatous ascites of Ehrlich's cancer developed in 38 percent of the animals. In the cases of solid Ehrlich's cancer, 19 of the 28 animals which were treated died. The tumors in the animals which were treated developed at a considerably slower rate and id not reach the size of those in the control animals. Of 37 rats with Geren's carcinoma treated with Merapid, only 27 developed tumors. The average weight of the tumors in the experimental animals was 37 grams, and of those in the control animals, 52 grams."

88. Mammary Gland Cancer Induced by Testosterone-Propionate

"Effect of Testosterone-Propionate on the Growth and Development of Cancer of the Mammary Gland," by M. D. Podil'chik, Candidate of Medical Sciences, Chair of Hospital Surgery, L-vov Medical Institute; Kiev, Vrachebnoye Delo, No 11, 1959, pp 1143-1148

Experiments carried out on mice of line C_3HA revealed that testosterone-propionate when administered to virgin mice 2-2 1/2 months old reduced the incidence of mammary gland cancer; when tumors did develop, they appeared at considerably older ages than in the control animals; testosterone-propionate administered to reproducing mice had no effect on the frequency with which cancer developed, although the period of its development was considerably delayed; the inhibiting action of testosterone-propionate on the development of tumors was noted when the preparations was administered to castrated mice.

89. Effect of Thermal Skin Injuries on Development of Tumors

"On the Effect of Thermal Injuries of the Tissues on the Development of Tumors Induced by Shale Oils," by Kh. T. Vakhter, Chair of Pathological Anatomy and Chair of Infectious Diseases and Dermatology of Medical Faculty, Tartu State University; Moscow Leningrad, Voprosy Onkologii, Vol V, No 12, 1959, pp 668-672

Rabbits were used in experiments carried out to determine the effect of thermal injuries to the skin and different parts of the nervous system on the development of tumors induced by the application of shale oils. The experiments established that thermal injuries to the skin and parts of the nervous system produced changes in the development of tumors induced by shale oils; thermal injuries to the skin and parts of the nervous system inflicted before the application of the shale oils hastened the development of tumors; injuries to the peripheral nerves inflicted during the period of the growth of papilloma has a retarding effect on the growth of the tumors; and no changes in the development of tumors induced by the application of shale oils occurred in the animals which received bromides and small doses of caffeine.

90. Ditilin and Gangleron -- Two New Compounds

"Research Work by Chemists in the Service of Medicine," by Prof S. Mirzoyan (Yerevan); Moscow, Meditsinskiy Rabotnik, No 16 (1868), 23 Feb 60, p 3

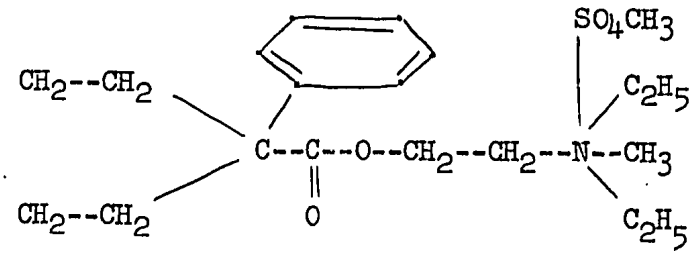
Ditilin and gangleron are two new compounds which were synthesized at the Institute of Fine Organic Chemistry of the Academy of Sciences Armenian SSR and are now being clinically tested in many cities of the country. Ditilin is the diidomethylate of the bis-dimethylaminoethyl ester of succinic acid, and has a curarelike action when introduced into the organism. It is considered one of the best muscular relaxant drugs and it almost indispensible in the intubation of the trachea.

Gangleron is the hydrochloride of the alpha-, beta-dimethyl-gamma-diethylaminopropylic ester of p-isobutoxybenzoic acid and has cholinolytic properties with an expressed effect on the cholinoreactive systems of the central and automatic nervous systems. The preparation is particularly effective in counteracting the nicotinelike action of acetylcholine and blocks the transmission of stimuli in the interneural synapses of the sympathetic and parasympathetic ganglia. Other preparations which were synthesized at the institute are "corconiy," "quateleron," "arpenal," "mesphenal," "fubromegan," and others. These are now being experimentally tested for the therapy of bronchial asthma, vascular spasms of the cerebrum, kidneys, and liver, Parkinsonism and other diseases connected with disturbed functions of the central and peripheral nervous systems.

91. Cholinolytic Drug

"Merpanit," by K. D. Sedova; Moscow, Annotatsii o Lekarstvennykh Sredstvakh (Notes on Medicinal Substances), No 9, 1959, pp 47-49

Merpanit was synthesized at the First Leningrad Medical Institute imeni I. P. Pavlov and is the methylsulfomethylate of the diethylamine ester of phenylcyclopentacarboxylic acid it has the following structural formula:

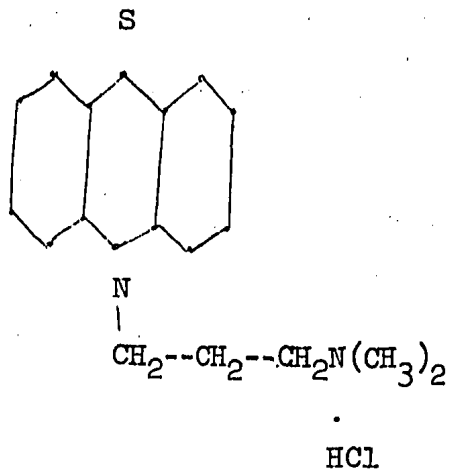


Merpanit is a white crystalline powder, bitter in taste, and is readily soluble in water. It has cholinolytic action and inhibits the transmission of nervous impulses in the sympathetic ganglia. It is recommended for the relief of spastic conditions of the smooth muscles caused by an increase in the tonus of the parasympathetic nerves.

92. Propazine -- New Tranquilizer

"Propazine," by T. G. Soldatova, Academy of Medical Sciences USSR; Moscow, Meditsinskaya Promyshlennost' SSSR, Vol XIV, No 1, Jan 60, pp 53-54

Propazine was synthesized at the All-Union Scientific Research Chemicopharmaceutical Institute imeni S. Ordzhonikidze. In its action, it is similar to aminazine. Propazine is the hydrochloride of 10-(gamma-dimethylaminopropyl)-phenothiazine, and has the following structural formula:



Propazine stops vomiting, reduces motor activity, and prolongs and intensifies the action of sommifacient, narcotic, and anesthesizing drugs. It is recommended for use in cases of schizophrenia, various psychoses, and vascular diseases. It is tolerated by the patients better than aminazine and produces fewer side reactions.

93. New Hypnotic Drugs

"Synthesis of New Hypnotic Drugs -- Tetridine and Dimerine," by I. T. Strukov, O. A. Kolganova, and V. G. Potapova, All-Union Scientific Research Chemicopharmaceutical Institute imeni S. Ordzhonikidze; Moscow, Meditsinskaya Promyshlennost' SSSR, Vol XIII, No 9, Sep 59, pp 9-12

The article describes the synthesis of tetridine and dimerine, derivatives of hydrogenated pyridine. Tetridine and dimerine are colorless crystalline compounds, readily soluble in water and alcohol. Tetridine has a melting point of 92 degrees, and dimerine 75-76 degrees. Both are hypnotic drugs and unlike barbiturates, produce no undesirable side reactions.

94. Therapy of Fluorine Intoxication

"Magnesium Sulfate as an Antidote in Fluorine Intoxication," by V. G. Loshchilova, Kirov Agricultural Institute; Moscow, Veterinariya, Vol XXXVI, No 12, Dec 59, pp 48-49

The author suggests the use of magnesium sulfate instead of calcium chloride as an antidote in fluorine intoxications. The advantage of the former over the latter is that it is readily available; when introduced into the gastrointestinal tract, it is poorly absorbed and therefore is in contact with the poison for a longer period; it is a laxative and is instrumental in the removal of the poison from the gastrointestinal tract; it is nontoxic and may be freely administered. In cases of acute intoxications, the simultaneous administration of 10-percent solution of calcium chloride is advisable.

95. Effect of Fluorine Intoxication on Blood

"Modification of Some Biochemical Blood Indexes in Fluorine Intoxication and the Antidote Action of Magnesium Sulfate. Report 2," by V. G. Loshchilova, Tr. Kirovskovo S-Kh. In-ta (Works of the Kirov Agricultural Institute), 1958, 13, No 25, 189-200 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 20, 25 Oct 59, Abstract No 27762)

"Experiments carried out on dogs established that toxic doses of NaF and therapeutic doses of $MgSO_4$ (into the vein) increased the content of sugar and decreased the content of calcium in the blood. NaF caused an increase (because of the restored form) and $MgSO_4$ a decrease in the concentration of glutathione. NaF slightly increased the activity of catalase, while $MgSO_4$ decreased the activity of catalase. NaF reduced

the activity of cholinesterase. A double oral administration of $MgSO_4$ in therapeutic doses to sheep on a background of NaF intoxication contributed to the development of moderate hyperglykemia, a slight decrease in calcemia, a unique and not fully determined character in glutathione fluctuations, and an increase in the activity of catalase one hour after the intoxication."

96. Effect of Chlorinated Hydrocarbons on Organism

"Assimilation of Glucose, the Protein Spectrum, and the Precipitation Reaction in Sheep Following the Administration of Chlorinated Hydrocarbons," by Ye. Kona, Sb. Ceskosl Akadm. Zemed. Ved. Veterin. Med (Slovakia), 1959, 4, No 5, 351-360 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 23, 10 Dec 59, Abstract No 31594, by I. El'man)

"Sheep were subcutaneously administered CCl_4 in a dose of 0.25 milliliter per kilogram of body weight, or CCl_4 in the same dose in combination with C_2Cl_6 in a dose of 0.94 gram per kilogram of body weight per os. A decrease in the assimilation of glucose within 2 days after the simultaneous administration of CCl_4 and C_2Cl_6 was noted in the animals. The protein picture of the blood, as well as the bilirubin content, showed no significant change. The precipitation reaction in the experimental animals did not deviate from its norm. Chlorinated hydrocarbons were more toxic to young sheep than to older animals."

97. Effect of Insulin Intoxication on Blood Cholesterine

"Dynamics of the Level of Blood Cholesterine in Healthy Rabbits Under the Influence of Insulin Intoxication," by F. F. Mirolyubova, Sb. Tr. Kafedra Patol. Fiziol. Leningr. Pediatr. Med In-ta (Collection of Works of the Chair of Pathological Physiology, Leningrad Pediatrical Medical Institute), L., 1958, 49-54 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 22, 25 Nov 59, Abstract No 29470, by I. El'man)

"A single administration of insulin to rabbits in a dose of 40 international units per kilogram of body weight decreased the cholesterine content in the blood on an average of 16.2 percent, with the decrease being more pronounced in the female than in the male animals. The blood content of cholesterine varied in the male and female animals when three to five administrations of insulin at intervals of one week were given to the animals. The decrease reached its maximum during the height of the insulin intoxication and was more pronounced in the females."

98. Effect of Antibiotics on Dysentery Bacteria

"Comparative Investigation of the Effect of Different Antibiotics on Dysentery Bacteria in a Clinical Experimental Application," by V. N. Kosmodamianskiy, T. G. Starkova, Ye. P. Shuvalova, N. S. Bartashevich, M. A. Bashmakova, M. P. Zykov, N. G. Bagdayeva, N. A. Pustovalova, A. F. Kopylova, and V. M. Shubik, V sb: Vopr. Bacteriol, Immunol. i Khimoterapii pri Kishechn. Infektsiakh (Problems of Bacteriology, Immunology, and Chemotheraphy of Intestinal Infections), L, 1958, 5-11 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 23, 10 Dec 59, Abstract No 30789)

"The effect of levomycetin, synthomycin, biomycin, and streptomycin, administered separately and in combinations, on dysentery bacteria in vitro, in the organism of experimental animals, and in clinical application was studied."

99. Use of Thiamine in Experimental Hepatitis

"The Effect of Thiamine Preparations on Cholesterinemia in Experimental Hepatitis," by A. Malachovskis and A. Majauskaite, Tr. In-ta Eksperim. Med., AN LitSSR (Works of the Institute of Experimental Medicine, Academy of Sciences Lithuanian SSR), 1958, 4-5, 81-87 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 23, 10 Dec 59, Abstract No 30626, by V. Barun)

"Hepatitis was induced in rats by the intramuscular administration of CCl_4. Hypocholesterinemia of considerable duration and a slight loss of body weight were noted in the experimental animals. The administration of thiamine or diphosphothiamine to the animals (2 milligrams per kilogram of body weight daily for a period of 4 days) restored the investigated indexes to normal. Thiamine and diphosphothiamine were administered to the animals by mouth (ten administrations of the same dose) in those cases in which hepatitis was induced by the oral administration of CCl_4. Body weight was restored and hypercholesterinemia developed; the latter, however, did not exceed the limits of the physiological norm."

100. Pharmacology of Flavofungin

"On the Pharmacology of Flavofungin," by B. Kelentey, J. Uri and T. Valyi-Nagy, Pharmacological Institute of Medical University, Debrecen; Budapest, Acta Physiologica Academiae Scientiarum Hungaricae, Supplement Volume 16, 1959, p 81

The full text of the summary of this paper, delivered at the 25th Congress of the Hungarian Physiological Society in Szeged, 1-3 July 1959, is as follows:

"Flavofungin (Uri and Bekesi, is a new antifungus antibiotic which exerts an influence on human and animal pathogenic and apathogenic fungi. It is unsoluble in water. When dissolved in 1-2-propylene glycol, the DL_{50} of various types of animals was found generally to be: intravenously = 2-4 mg/kg; intraperitoneally = 40-50 mg/kg; subcutaneously = 300-400 mg/kg; and per os = 500-750 mg/kg.

"When administered intravenously, it can be determined in fungistatic concentration from the blood. When administered perorally (25 mg/kg), it is absorbed and is detected in the blood for a period of 10-12 hours. It is also absorbed rectally. The absorbed antibiotic adheres primarily to the formative elements of the blood. In the organism, the substance is stored in the lungs, liver, spleen, and adrenal glands. It is excreted in high concentration along with the bile. Fluid, aqueous humor, and pericardial fluid show a low level of concentration.

"Whereas the substance reduces the amount (volume) of respiration, the rate of respiration of cats and rabbits is not influenced, even by subtoxic amounts. It causes a slight increase of blood pressure and synergizes the adrenalin effect which increases tension. This effect is absent following adrenalectomy. In the isolated frog heart, it causes bradycardia and shows a positive inotropic effect. Electrocardiographic experiments showed a reduction of the formation and transmission of stimulation. Local application causes hyperemia and a pronounced irritating effect on the tissues."

101. New Antibiotic Similar to Trichothecin

"Production and Testing of a New Antifungal Antibiotic," by E. Glaz, J. Gyimesi, E. Scheiber, T. Kakosy, and K. Jarfas, Pharmacological Institute of Medical University, Budapest, and Research Institute of Drug Industry, Budapest; Budapest, Acta Physiologica Academiae Scientiarum Hungaricae, Supplement Volume 16, 1959, pp 79-80

The test of the summary of this paper delivered at the 25th Congress of the Hungarian Physiological Society in Szeged, 1-3 July 1959, is as follows:

"From a fungus strain culture which had been allowed to stand and then shaken, we produced an antifungal antibiotic in crystalline form. It dissolves very poorly in water (100 micrograms per milliliter); the solution remains stable for 2 months at 37 degrees C and is not destroyed after boiling. In vitro and in concentrations of 2.5-10.0 micrograms per milliliter, the antibiotic inhibits yeastlike fungi for 2 days, and pathogenic hyphomycetes for 8 days in concentrations of 2.5-9.0 micrograms per milliliter. Its effect is fungistatic; it has no effect on bacteria. The LD_{50} for mice after intraperitoneal injection in a gum arabic suspension is 810 mg/kg, per os>1,000 mg/kg. Temporary dyspnea, ataxia, and collapse were observed in some of the animals when the injection exceeded 400 mg/kg. An intravenous concentration of 20 mg/kg in an alcohol-aqueous solution in cats caused only a slight drop in blood pressure; a solution with higher concentration could not be prepared. No blood level determination could be made in rats and mice following subcutaneous, intraperitoneal, intravenous, and per os administration.

"Following a 24-48-hour incubation at 37 degrees, the antibiotic is inactivated by the blood; this inactivation is not inhibited by Prostigmin and DPF. If mice are administered per os 250 mg/kg, the substance destroys the yeast cells in their feces; 50 mg/kg is without effect. A 0.0-1.0-percent oil and propylene-glycol solution on the skin of guinea pigs, rabbits, and humans causes dermatitis. On the basis of its properties, the substance seemed quite similar to trichothecin. This hypothesis was further confirmed by the chemical analysis and infrared spectroscopy: the new antibiotic differed from trichothecin only by the absence of one carbonyl group. The new antibiotic contains an alcohol radical and isocrotonic acid. The alcohol obtained through hydrolysis was combined with acetic acid. This acetyl derivative is more readily soluble in water than the parent derivative, and is not destroyed by the blood; it is, however, only one fifth as potent against Candida as the new antibiotic. Through the preparation of other esters we hope to obtain more effective compounds."

Physiology

102. Effect of Pressure Changes on ENT Organs

"The Effect of Great and Rapid Changes in Atmospheric Pressure on Some Functions of the Otorhinolaryngological Organs," by I. Ya. Borshchevskiy; Moscow, Vestnik Otorinolaringologii, No 6, Nov/Dec 59, pp 19-24

The author of this article discusses the results of histomorphological experiments on guinea pigs subjected to rapid changes in atmospheric pressure. He discusses information found in the literature concerning the effects of changes in atmospheric pressure and the rate of these changes on the physiological mechanisms in the middle ear and accessory nasal sinuses of humans.

Results of the investigation of a number of complaints of pain in the ear made it possible to determine what rates of atmospheric pressure changes are permissible for humans. Since this pain disappears gradually, it can be concluded that a human organism can be trained effectively to withstand various rates of change in atmospheric pressure.

103. Chamber for Higher Nervous Activity Studies Improved

"Conditioned Reflex Chamber for Studying Higher Nervous Activity in Rats by Defense Methodology," by V. G. Filimonov, Chair of Pathological Physiology, First Moscow Order of Lenin Medical Institute imeni I. M. Sechenov; Moscow, Patologicheskaya Fiziologiya i Eksperimental'naya Terapiya, Vol 3, No 6, Nov/Dec 59, pp 64-65

An improved model of a conditioned reflex chamber for studying higher nervous activity in rats is described. This chamber provides maximum comfort during experimental work and automatically makes precise recordings of defense reactions.

The new chamber has been used in scientific work conducted by the Chair of Pathophysiology, First Moscow Order of Lenin Medical Institute imeni I. M. Sechenov (MOLMI). The main electric circuit of the chamber is shown.

104. Complex Electroencephalograph Developed

"Complex Electronic Apparatus" (unsigned article); Moscow, Meditsinskiy Rabotnik, No 90 (1838), 10 Nov 59, p 3

"A unique apparatus has been constructed in fulfillment of an order from the Electrophysiological Laboratory of the Scientific Research Institute of Neurosurgery imeni N. N. Burdenko, Academy of Medical Sciences USSR. The apparatus consists of a multichannel recording electroencephalograph with a wave analyzer and an electron integrator, each in turn having several channels.

"Encephalogram curves, recorded on paper tape, are analyzed automatically by an electron wave analyzer. Each channel of this device records any rhythm selected by the researcher which forms the electoencephalogram (alpha, beta, gamma, delta, and other rhythms). An analyzer makes it possible to observe changes in these rhythms in time and to guage their significance on the basis of the frequency and amplitude of biocurrents. This analyzer differs from those used abroad not only because it is multichanneled, but also because its structural features make possible a physiological evaluation of the rhythms analyzed.

"The electron integrator represents a special kind of electronic computer. Its job is to find the over-all activity of bioelectric potentials in microvolt seconds. Results of computations are recorded on a second paper tape simultaneously with recordings made by the wave analyzer.

"Besides the usual electroencephalogram recordings, the researcher also obtains the curves of each of the rhythms as well as readings which show changes in time and the over-all bioelectric activity.

"The new electronic apparatus is already being used in the Institute of Neurosurgery. It makes diagnosis of brain diseases easier, helps locate the source of the pathological process, and makes possible a more thorough physiological investigation of the functions of the brain. A model of the new apparatus was approved by the Scientific-Technical Council of the Academy of Medical Sciences USSR."

105. Improved Hemobarostat Designed

"The Hemobarostat, an Apparatus for Maintaining Arterial Pressure at a Constant Level," by Z. T. Samoylova and M. Ye. Ryabkina, Laboratory of Pathological Physiology, Institute of Therapy, Academy of Medical Sciences USSR, and Chair of Pathophysiology, Central Institute for Advanced Training of Physicians; Moscow, Patologicheskaya Fiziologiya i Eksperimental'naya Terapiya, Vol 3, No 6, Nov/Dec 59, pp 65-68

The authors of this article describe an apparatus used in conducting experiments in which it is necessary to maintain arterial pressure at a constant level. This apparatus, an improved version of the hemobarostat proposed by J. W. Pearce and C. W. Gowdey, takes into consideration the difference in the arterial pressure of each experimental subject and can be used when hypotensive and hypertensive influences act on the organism.

The apparatus was used by M. Ye. Ryaskina and Z. T. Samoylova in their experiments on dogs in which the reinforcing nerve of the heart was stimulated and in experiments conducted by Z. T. Samoylova on dogs and cats in which the vagus nerve was stimulated.

A schematic diagram of the hemobarostat is shown.

106. Pathophysiologists Confer

"First Ukrainian Conference of Pathophysiologists," by T. V. Mitina; Moscow, Patologicheskaya Fiziologiya i Eksperimental'naya Terapiya, Vol 3, No 6, Nov/Dec 59, p 88

The First Ukrainian Conference of Pathophysiologists, held 3-6 July, 1959 in L'vov, is reported. The plenum of the board of the All-Union Scientific Medical Society of Pathophysiologists also met on that date in L'vov. More than 200 people from Moscow, Leningrad, Kiev, Odessa, Khar'kov, Chernovtsy, Vinnitsa, Stalino, Stanislav, Uzhgorod, Yerevan, Tbilisi, Kuybyshev, Arkhangel'sk, Chita, Krasnodar, Dnepropetrovsk, and other cities attended the conference.

Introductory remarks were made by R. Ye. Kavetskiy, Active Member of the Academy of Sciences Ukrainian SSR. Altogether, 105 reports were read on the following subjects: "Compensation and Recovery," "Changes in Metabolism in the Course of Pathological Processes," "Pathophysiology of Impairment Caused by Physical Forces," and "Experimental Therapy." Ukrainian pathophysiologists read 40 of the reports.

The following people presented reports at the conference: N. N. Sirotinin read a report on "The Evolution of Adaptation and Compensation of Impaired Functions in a Morbid Organism; D. Ye. Al'pern read a report on "The Role of Nervous System in the Restoration of Impaired Function in a Morbid Organism"; P. Ye. Kavetskiy reported on "The Influence of the Type of Nervous System on Characteristics of Compensatory Reactions"; N. N. Gorev, V. A. Losev, and L. P. Cherkasskiy reported on "Some Experimental Data on Characteristics of the Process of Compensation of Impaired Functions of the Organism After Removal of a Lung or Part of a Lung"; and Ya. M. Britvan spoke on "The Significance of the Functional Condition of the Central Nervous System in the Mechanism of Restoration Vital Functions of an Organism."

Radiology

107. Ionizing Radiation Effects on Enzyme Systems

"Ribonucleic Acid in the Liver of Rats Subjected to Internal Irradiation by the Radioisotope Fe^{59}," by Z. S. Tepikina, Dokl. AN TadzhSSR, Vol 1, No 3, 1958, pp 49-53 (from Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 2, 25 Jan 60, Abstract No 2213, by M. Tiotrovskiy)

"Rats were subjected to the daily administration of Fe^{59} with their food in doses equal to 24-45 microcuries for a period of 5-6 days. The radioisotope administration increased the RNA content by a factor of 1.4 and decreased the RNA specific activity by a factor of 1.16. This internal irradiation disturbed the activity of the enzymes which participate in RNA metabolism. The author suggests that the activity of RNase which splits RNA is inhibited to a lesser degree than the activity of the enzymes which participated in the synthesis of RNA, and consequently, the RNA content is higher in the livers of irradiated animals than in those of the controls. The decrease in RNA specific activity is explained, evidently, by the significant inhibition of other enzymes, especially of the RNA phosphorylating systems."

108. Beta-Irradiation Effects on Glycogen-Glucose Metabolism

"The Effect of Beta-Irradiation on the Glycogen Fraction of the Liver," by G. Ye. Adunts, Izvestiya Akademii Nauk ArmSSR, Biol. N., Vol 12, No 4, 1959, pp 49-54 (from Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 2, 25 Jan 60, Abstract No 2220, By M. Piotrovskiy)

"Radioactive phosphorus (P^{32}) was administered subcutaneously to rabbits of various ages, in amounts ranging from 20 to 30 microcuries per kg of body weight; the glycogen content in the liver and the glucose level in the blood were then determined after one, 2, 4, 6, and 12 hours. Some of the experimental animals were sacrificed 24 and 48 hours after the irradiation. It was found that the glycogen and phosphorus concentration was approximately twice as high in the liver of adult as in the liver of young animals. The distribution of glycogen and phosphorus differed in the various sections of the liver lobes. Highest glycogen and phosphorus concentration was noted in portions far from the portal system, the next highest in the portions next to the portal system, and the lowest in the intermediate portions. A sharp decrease in the glycogen content (by a factor of 20-50 as compared with the controls) was noted 24 hours after the administration of P^{32}. Toward the 48-hour period, the glycogen content had gradually increased and approached the normal level. A decrease in the liver glycogen level was not accompanied by a rise in the blood glycogen level. It was noted that the simultaneous administration of P^{32} and insulin lead to a comparatively smaller decrease in liver glycogen than the administration of P^{32} alone."

109. Blood Heparin Content During Radiation Sickness

"Blood Heparin Level in Experimental Radiation Sickness," by G. G. Bazaz'yan, Vestn. Mosk. Un-ta. Ser. Biol., Pochveved., Geol. Geogr. (Herald of Moscow University, Biology, Soil Science, Geology, and Geography Series), No 1, 1959, pp 39-44 (from Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 24, 25 Dec 59, p 99, Abstract No 32325, authors's resume)

"The author conducted experiments on white rats to study the effect of irradiation on the free blood heparin centent. It was shown that during radiation sickness, the blood heparin level remained at the usual physiological level during all the stages of radiation injury."

110. Radiation Protection by Thiourea Derivatives

"The Protective Effect of Certain Thiourea Derivatives Against Radiation Injury," by G. V. Andreyenko, V. M. Fedoseyev, and N. I. Sytina, Vestn. Mosk. Un-ta, Ser. Biol., Pochvoved., Geol. Geogr. (Herald of Moscow University, Biology, Soil Science, Geology, and Geography Series), No 4, 1958, pp 39-42 (from Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 24, 25 Dec 59, p 157, Abstract No 32814, by I. El'man)

"Tests were conducted on white rats in an effort to study the protective effect of methylisothiourea, ethylisothiourea, n-propylisothiourea, and n-butylisothiourea against radiation injury. After X irradiation by 650 r doses, a certain amount of protection (which was manifested by greater number of surviving animals, and a more rapid restoration of blood thromboplastic activity) was evident in the animals which had recieved, before their irradiation, a 10-mg intramuscular dose of the first three compounds mentioned above."

[For additional information on radiology, see Chemistry, Radiochemistry.]

Surgery

111. Book on Treatment of Penetrating Gunshot Wounds Reviewed

Operativnoye Lecheniye Ognestrel'nykh Pronikayushchikh Raneniy Zhivota v Voyskovom Rayone (Surgical Treatment of Penetrating Abdominal Gunshot Wounds in a Military Rayon), by V. I. Parmenov, (on the Basis of Data of a Medical Battalion and the Field Surgical Mobile Hospital During the Great Patriotic War of 1941-1945), reviewed by Prof V. I. Kolesov (Leningrad); Moscow-Leningrad, Vestnik Khirurgii, Vol 84, No 1, Jan 60, pp 147-148

The author treats fully and with knowledge the clinical picture, course, and methods of therapy of penetrating abdominal gunshot wounds. On the basis of personal experience and data he gathered, he stresses the importance of the proper diagnosis of the different symptoms of penetrating gunshot wounds. He is critical of the tendency to treat a patient with a penetrating gunshot wound initially for shock. Shock and internal hemorrhage in cases of abdominal gunshot wounds occur simultaneously, and too much time spent on shock treatment before surgical interference is performed may cause the death of the patient. Shock treatment and blood transfusion should be carried out on the operating table, simultaneously with surgical treatment, or a short time before surgery begins.

He cites a number of cases which confirm the validity of his assertions. The book is written on the basis of experience gained in observations of 1,463 patients with penetrating abdominal gunshot wounds. One shortcoming of the book, the reviewer writes, is the overemphasis on the use of sulfanilamides, a viewpoint which reflects the period of the Great Patriotic War, and is somewhat out of date at present. The reviewer also feels that little attention is given to the problem of pain relief, a problem which, according to the reviewer, deserves more comprehensive treatment than is given in the book. Notwithstanding these defects, the book will be highly useful to clinicists, says the reviewer.

Veterinary Medicine

112. Standard Foot-and-Mouth Disease Virus A Adapted to Mouse Brain

"On the Problem of the Adaptation of the Foot-and-Mouth Disease Standard A Virus to the Central Nervous System of the Mouse. Report I: A Genetic Interpretation of Symptom Changes," by Anneliese Veckenstedt, Friedrich Loeffler Institute, Riems; Leipzig, Archiv fuer Experimentelle Veterinaermedizin, Vol 13, No 6, 1959, pp 1019-1053

In systematic investigations of the adaptation of the Standard A virus of foot-and-mouth disease to the central nervous system of the mouse, a study was made of the gradual transformation of the original virus into a neurotropic virus.

The adaptation takes place in three phases: In contrast to previously held concepts, the intracranial inoculation of 3-7-week-old mice with standard A guinea pig virus leads to the development of clinical phenomena resembling myositis which are specific for foot-and-mouth disease. The initial phase is characterized essentially by the appearance of the myositic form of the symptoms of foot-and-mouth disease. Also characteristic is the fact that the infection titer does not increase immediately, i.e., directly with the beginning of the mouse-brain passages. In the logarithmic phase, the clinical picture is established by unequivocally cerebral symptoms which follow the appearance of temporary mixed symptoms. There is a rapid increase of the neurotropic properties of the passage virus and an exponential increase of the infection titer for the mouse. At the same time, a continuous decrease of the ephitheliotropic and myotropic properties of the mouse-brain passage virus for the guinea pig can be observed. In the linear phase, the incubation period, the mortality rate, and infection titer remain constant. Furthermore, the absence of the manifestation of ephitheliotropy and myotropy is characteristic for the adult guinea pig. In this stage of adaptation, the strain of the foot-and-mouth disease virus can be considered neurotropic, since it displays the same behavior

after extraneural application. In reverse adaptation experiments it was shown that the adaptation process in this stage is not yet complete. With an increasing number of mouse-brain passages, the stability of the neurotropic properties becomes more firmly established.

The work includes a discussion of the possibilities of a theoretical explanation of the genetic mechanism on which the adaptation of the standard A virus to the central nervous system of the mouse is based. The development of neurotropy cannot be explained on the basis of the selection hypothesis presented, since a heterogeneity of the virus population with respect to the occurrence of "e" and "n" particles cannot be proved, either in the initial material or in the various stages of adaptation. The mechanism of transformation of the standard A virus cannot be traced back to the hypothesis of adaptation, since a change of hereditary characteristics of the standard A virus cannot be established in any stage of the adaptation. It is assumed that the standard A strain used here genotypically possesses the power of pathogenicity for the central nervous system of the mouse. This potential property is not revealed, however, until the mouse-brain passages have begun. The gradual decrease and ultimate absence of the manifestation of the epitheliotropic and myotropic characteristics of the passage virus for the mouse and guinea pig, which occur during adaptation to the central nervous system, can be traced back to the absence of conditions necessary for the manifestation of these properties.

113. Therapy of Thermal and Chemical Burns

"Therapy of Thermal and Chemical Burns in Animals by the Closed Method," by A. F. Rusinov, Candidate of Veterinary Sciences, Khar'kov Veterinary Institute; Moscow, Veterinariya, Vol 36, No 12, Dec 59, pp 49-52

The following closed method of therapy of thermal or chemical burns suffered by animals was used by the author: the section affected by the burn was excised, converting the burned area into a postoperational wound; the wound was then filled with a film of conserved blood, thus creating favorable conditions for the healing of the injured tissue; finally, the film of blood was saturated with novocain and biomycin to alleviate pain and prevent infection. It was found that this method of closed therapy reduced the healing period by half. This method of burn therapy can be used under any clinical conditions.

114. Role of Aluminum Hydroxide in Adsorbed Vaccines Against Foot-and-Mouth Disease

"Research on the Dependence of the Effectiveness of Adsorbed Vaccines Against Foot-and-Mouth Disease on the Properties of Aluminum Hydroxide. Report II. Immunizing Property of the Adsorbates," by A. F. Olechnowitz, Friedrich Loeffler Institute, Riems; Leipzig, Archiv fuer Experimentelle Veterinaermedizin, Vol 13, No 6, 1959, pp 944-952

A study was made of the influence of various aluminum hydroxides on the immunizing properties of foot-and-mouth disease adsorbed vaccines with guinea pig standard type A and type O virus. Hydroxide preparation precipitated with ammonium hydroxide with a pH of over 7.0 are of equal value. Aluminum hydroxides which have been precipitated below a pH of 7.0 should be excluded from the vaccine production, since they can cause a reduction of effectiveness. The aluminum hydroxide, however, is only one of many factors which influence the activity of a foot-and-mouth disease vaccine. The most important role will always be played by the manner of production and preparation of the immunizing antigen.

115. Polish Anti-Biological-Warfare Measures

"Military Veterinary [Service] Motorized," by Capt A. Smirski; Warsaw, Zolnierz Wolnosci, 16 Oct 59, p 4

This article gives a brief description of the research activity conducted at the Central Military Veterinary Center (Wojskowy Centralny Osrodek Weterynarii). The report is accompanied by photographs showing a mobile veterinary laboratory (rear view), pH meter, personnel operating on an animal, and personnel doing histological studies.

The article report that the Experimental Research Section of the center has progressed in combating various contagious diseases among animals. Its well-equipped laboratory also conducts experiments for the current requirements of the army, including experiments on the preservation of meat under field condition.

Referring to the danger of ABC warfare and the existence of installations engaged in biological warfare research, such as Camp Detrick, the article points up the need for this type of research to be prepared "for any eventuality." Protection against various types of epizootic diseases is consequently of concern to the center. The center is reported to have discovered rapid and effective methods of detecting and combating various types of contagious diseases among animals, including leptospirosis and tularemia. New methods being prepared by the center are aimed at establishing a "powerful barrier" between the animal kingdom and human beings. The center is also concentrating its efforts on the protection of animals against radiation and the effects of chemical weapons.

Among the personnel at the center, the article cites Wladyslaw Jonczy, a veteran of 30 years in the military veterinary service, and Anatola Sienkiewicza and Mieczyslaw Chaykowski, apparently laboratory technicians.

Miscellaneous

116. Journal Announces Program for 1960

"Toward New Achievements in the New Year" (editorial); Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 31, No 1, Jan 60, pp 3-4

After recognition of Soviet scientific achievements in 1959 and mention of Khrushchev's visit to the US, the editors of this journal cite advances in medical fields, such as surgery of the heart and major vessels, control of hypertension, etc. Aerosol immunization is considered a very prospective improvement in immunization methods. Improvements in the therapy of tuberculosis, dysentery, and poliomyelitis are also pointed out. Broader knowledge has also been accumulated through the study of "new diseases"--Q fever, hemorrhagic viral fevers, diseases caused by adenoviruses and intestinal viruses, etc.

The eradication of several infectious diseases and a sharp decrease in the incidence of others occupy a primary position in the Seven-Year Plan. A program of technological progress developed at the June Plenum of the Central Committee CPSU includes better equipping of medical institutions and expansion of the network of bacteriological laboratories in city and rayon sanitary-epidemiological stations. The provision of sufficient supplies of diagnosticums, agglutinating sera, and other diagnostic preparations is emphasized, and more extensive use of physical and chemical methods by scientific institutions is urged.

The following subjects for 1960 issues of this journal are listed:

No 1. The epidemiology, etiology, diagnosis, and prophylaxis of enteric infections.

No 2. The problem of diseases with natural foci and systemic infections.

No 3. Questions of microbiology and methods of laboratory diagnosis and indication.

No 4. Questions of immunity and inoculation prophylaxis; anaerobic infections.

No 5. The epidemiology, etiology, diagnosis, and prophylaxis of infections of the respiratory tract.

No 6. The epidemiology, etiology, diagnosis, and prophylaxis of enteric infections.

No 7. Problems of chemotherapy and chemoprophylaxis of infectious diseases. Problems of disinfection, disinsection and deratization.

No 8. Problems of immunity and inoculation prophylaxis.

No 9. Problems of the training and advanced training of cadres. Instruction in epidemiology, microbiology, and infectious diseases. The problem of diseases with natural foci.

No 10. The epidemiology, etiology, diagnosis, and prophylaxis of respiratory tract infections.

No 11. The 43d anniversary of the Great October Socialist Revolution. Problems of microbiology and methods of laboratory diagnosis and indication.

No 12. Experience in the eradication and prophylaxis of infectious diseases. Problems of general epidemiology.

117. Lenin Prizes

"Contest for Lenin Prizes" (unsigned article); Moscow, Meditsinskiy Rabotnik, No 16 (1868), 23 Feb 60, p 1

An announcement of the Committee of Lenin Prizes in the Fields of Science and Technology, Council of Ministers USSR, is given. Among the works admitted to participate in the contest are the following; "Development of New Surgical Procedures on the Heart and Large Blood Vessels," by A. A. Vishnevskiy, P. A. Kupriyanov, Ye. N. Meshalkin, and B. V. Petrovskiy (the work was presented by the Institute of Thoracic Surgery, Academy of Medical Sciences USSR); "Investigations in the Field of the Synthesis of Physiologically Active Compounds," by A. L. Mndzhoyan (presented by the Presidium of the Academy of Sciences Armenian SSR); "Local Protoplasm Reaction and Propagating Stimulation," by D. N. Nasonov (presented by the Institute of Cytology, Academy of Sciences USSR, and the Leningrad State University imeni A. A. Zhdanov); "Marine Microbiology (Deep Water)," by A. Ye. Kriss (presented by the Section of Biological Sciences of the Committee of Lenin Prizes in the Fields of Science and Technology, Council of Ministers USSR);

The committee asked Soviet public opinion to report its feelings in regard to the content of the works submitted, and the make-up of the authors' collectives. All remarks and replies should be sent to "Neglinnaya Ulitsa 29/14, Moscow I-51."

118. Commendations for Contributions to Peace

"A High Award" (unsigned article); Moscow, Meditsinskiy Rabotnik, No 97 (1845), 4 Dec 59, p 4

"The Academy of Medical Sciences USSR held a special meeting with the president of the academy, Academician A. N. Bakulev, presiding. Yu. A. Zavadskiy, member of the Soviet Committee for the Defense of Peace and people's artist of the USSR, congratulated Soviet scientific medical workers on the tenth anniversary of the world peace partisan movement. Z. A. Lebedeva, deputy chairman of the Soviet Committee for the Defense of Peace, distributed high awards.

"The following people received a Honorary Certificates from the World Peace Council for their outstanding contributions to peace and friendship among nations: S. V. Kurashov, Minister of Health USSR; Academician A. N. Bakulev, president of the Academy of Medical Sciences USSR; I. G. Kochergin, Deputy Minister of Health USSR; M. D. Kovrigina, director of the Central Institute for the Advanced Training of Physicians; and Professors Ye. A. Vasyukova, A. A. Vishnevskiy, A. V. Kozlova, A. L. Myasnikov, S. A. Sarkisov, and A. N. Shabanov.

"Somewhat earlier, the World Peace Council awarded a silver medal to N. N. Zhukov-Verezhnikov, Active Member of the Academy of Medical Sciences USSR, for a very important contribution to the defense of peace and friendship among nations. The Soviet Committee for the Defense of Peace awarded Honorary Certificates to the following people for their active participation in the defense of peace among nations: N. A. Vinogradova, Minister of Health RSFSR; Ye. D. Ashurkova, director of the Institute of the Organization of the Health Service and the History of Medicine, Ministry of Health USSR; and Professors L. S. Bogolepov, V. M. Zhdanova, F. G. Krotkova, A. A. Letaveta, and others."

119. Urology Institute Established in Georgian SSR

"Institute of Urology" (unsigned article); Moscow, Meditsinskiy Rabotnik, No 93 (1841), 20 Nov 59, p 4

According to this announcement, a new medical scientific research institution, the Institute of Urology, Academy of Sciences Georgian SSR, has been established in Tbilisi. It is headed by Prof A. P. Tsulukidze, Member of the Academy of Sciences Georgian SSR and Corresponding Member of the Academy of Medical Sciences USSR.

The first scientific establishment of its kind in the Georgian SSR, this institute fulfills a need voiced at the Third All-Union Conference of Urologists.

The institute will begin its activity by investigating urolithic disease and tumors of the urogential system. The newest scientific achievements, including atomic energy, will be utilized. A search for tissue substitutes for surgery on the urogential organs has been given a major place in the institute's plans.

120. New Antibiotic Manufacturing Plant in Rumania

"Antibiotic Plant," (unsigned article); Moscow, Meditsinskiy Rabotnik, No 103, (1851), 25 Dec 59, p 4

"The Iasy antibiotic plant is one of the largest enterprises of the chemicopharmaceutical industry of Rumania. This enterprise was founded in 1956, and at first was only engaged in the production of penicillin. At present, the plant is manufacturing such antibiotics as, aureocyclin and tetracycline. Vitamin B_{12} is also being produced. A special division is manufacturing streptomycin. The output of the plant in 1959 has increased 203 percent over that in 1956."

VII. METALLURGY

121. Inhibition of Corrosion of Aluminum in Alkali Solutions

"The Effect of Certain Additives on the Corrosion of Aluminum in Alkali Solutions," by S. D. Dionis'yev and L. I. Antropov, Sb. Kom-t po korrozii i zashchite metallov Vses. sov. nauchno--tekhn. o-v (Collection of Articles of the All-Union Society of Scientific and Technical Societies) (from Referativnyy Zhurnal -- Mashinostroyeniye, No 22, 25 Nov 59, Abstract No 92587)

In alkali, the corrosion potential of aluminum is shifted 0.8 volt in the negative direction in relation to its null point; this excludes the possibility of specific adsorption of surface active substances. An inhibition of the cathodic process is ineffective because of the reduced probability of adsorption of surface active impurities, resulting from the preferential adsorption of sodium ions and the impossibility of an electrostatic adsorption of anionic impurities at the negative surface of aluminum in alkali solutions. During the addition of high molecular substances (albumin, casein, sulfidic alkalis in solution of chemically pure sodium hydroxide), an inhibition of the corrosion of the aluminum was demonstrated (by the polarization-curve and gravimetric methods); this inhibition resulted from an inhibition of the anodic process, which apparently was connected with a formation of polymolecular layers. As shown by the polarization curves, in the mechanism of inhibition, an essential role is played by the process of diffusion. Apparently, the reaction is slowed down by the formation of aluminum hydroxide. Additions of high molecular substances may be used as a corrosion inhibitor in tanks for degreasing aluminum parts and assemblies containing steel and aluminum parts, and during the etching aluminum surfaces prior to working them.

122. Reactions of Lithium Silicate and Calcium Oxide at Sintering Temperatures

"Concerning the Reaction Between Li_2O, Al_2O_3, SiO_2, and CaO at Sintering Temperatures. Report 4. Concerning the Reaction of Lithium Silicate With Calcium Oxide at Sintering Temperatures," by Ye. I. Maslova and I S. Lileyev, Chemical-Metallurgical Institute of Siberian Branch of Academy of Sciences USSR; Novosibirsk, Izvestiya Sibirskogo Otdeleniye Akademii Nauk SSSR, No 6, 1959, pp 78-82

Investigations of the behavior of lithium silicate and calcium oxide at sintering temperatures indicated that the reaction begins at approximately 800°C and is most intense at 900 — 920°C. At higher temperatures a ternary compound consisting of a lithium-calcium silicate forms. The compound forming at about 900°C has a $Li_2O \cdot CaO \cdot SiO_2$ composition and has the following optical constants: $N_g = 1.690 \pm 0.004$. $N_p = 1.670 \pm 0.004$. At temperatures above 900°C a new phase appears which consists of a dicalcium silicate. Increasing the quantity of calcium oxide (doubled) in the mixture shows no effect on the compounds formed.

123. Grinding-Polishing of Hard Alloys With Electric Conducting Abrasive Wheels

"Grinding-Polishing Hard Alloys With Electric Conducting Abrasives," by I. K. Trushin; Elektricheskiye i Ul'trazvukovyye Metody Obrabotki Materialov, Sbornik (Electric and Ultrasonic Methods of Working Materials, A Collection of Articles); Leningrad, Lenizdat, 1958, pp 17-25 (from Referativnyy Zhurnal -- Mashinostroyeniye, No 22, 25 Nov 59, Abstract No 92381)

Metal removal in a process employing electric conducting abrasive wheels is effected by the electrochemical action of an electric current. Protrusions of abrasive grains in the electric conducting binder of the wheel form a gap between the binder and worked surface which is filled with a layer of working fluid. Electric current passing through the liquid layer dissolves metal from the worked surface. Metal decomposition products are removed from the working zone by abrasive grains in the wheel during rotation. Portions of the working fluid are removed simultaneously, thereby renewing the composition of the fluid in the anode gap. An aqueous solution of soluble glass with a specific gravity of 1.22 to 1.24 g/cm^3 serves as the working fluid. Best results were obtained with electrocorundum wheels with a graphite filler on a bakelite binder with grain size of 60 — 80. Highest precision (shape and dimensional tolerances of 0.001 mm and 0.003 mm, respectively, and surface finish in the 10 — 12 class) is achieved by preliminary working with a voltage of 30 — 32 v, current density of 25 — 30 $amps/cm^2$, and final working with a voltage of 12 — 15 v and current density of 5 $amps/cm^2$. An optimum pressure of 2 — 2.5 kg/cm^2 and optimum wheel speed of 15 — 30 m/sec are recommended for both phases of grinding-polishing.

124. Production of Pierced Titanium Tube Billets

"Production of Thick-Walled Titanium Tube Billets," by V. V. Shveykin, A. G. Stukach, and V. D. Bykov, Ural Polytechnic Institute; Ordzhonikidze, Izvestiya Vysshikh Uchebnykh Zavedeniy, Tsvetnaya Metallurgiya, No 6, 1959, pp 178-184

Laboratory and plant experiments on producing pierced tube billets made of titanium alloys VT-1 and OT-4 are described. Satisfactory billets were obtained for subsequent sectioning and pressing into thin-walled tubing with minimum loss of metal. Data from experiments were used in designing a special piercing mill at one of the plants (not specified) for working nonferrous metals.

125. Ball Bearing Steels for Operation at 400°C

"Steels for Races and Rolling Bodies of High-Temperature Bearings, Their Properties and Heat Treatment," by A. S. Sheyn, A. A. Tsareva, V. D. Fedotova, and Z. V. Pavlova, Tekhnologiya Podshipnikostroyeniya - Sbornik (Bearing Manufacture Technology -- A Collection of Articles), No 17, 1958, pp 68-88 (from Referativnyy Zhurnal -- Mashinostroyeniye, No 22, 25 Nov 59, Abstract No 91450)

Standard high-speed steels R9, R18, RK10, EI-347, and EI-161 were investigated for possible application in components of bearings for operation at temperatures of 300—400°C and above. Steel EI-347 was selected as the most promising and was further tested for application in ball bearings. Results showed EI-347 to be unsatisfactory due to considerable carbide heterogeneity (although less than in steels R9 and R18) manifesting itself as a coarse lattice which weakened strength. Two new steels designated V4Kh4MF and V7Kh4F having 4.5 and 7% W, respectively, were selected from a number of experimental steels containing 1.3— 7% W and up to one percent Si for components of ball bearings for operation at 400°C. Hot hardness of the new steels is equal to that of higher alloyed high-speed steels. Carbide heterogeneity is minimum and heat and wear resistances are high.

126. Thermodynamic Properties of Potassium Fluorotitanate

"Certain Thermodynamic Data on Potassium Fluorotitanate," by N. M. Volkova and G. V. Gaydukov, Ural Affiliate of Academy of Sciences USSR; Novosibirsk, Izvestiya Sibirskogo Otdeleniya Akademii Nauk SSSR, No 6, 1959, pp 70-77

Enthalpy to temperature relationships for potassium fluorotitanate in the range from 298—1,098°K were determined experimentally. Equations are derived for the ratio of the true heat capacities to temperature based on changes of enthalpy and calculated according to the method of Landiya (N. A. Landiya, "Several Examples of Practical Applications of the Entropy Method of Calculating the Heat Capacity of Crystalline Inorganic Substances at High Temperatures," Trudy Gruzinskogo Politekhnicheskogo Instituta, No 6, 1954). Calculations of changes of enthalpy, isobaric potential, and entropy are presented.

/For additional information on Metallurgy, see Chemistry, Colloidal Chemistry Inorganic Chemistry, and Nuclear Fuels and Reactor Construction Materials./

VIII. PHYSICS

Low Temperature Physics

127. Study of Solid Hydrogen

"The Structure of Solid Hydrogen," by A. A. Galkin and I. V. Matyash, Institute of Radiophysics and Electronics, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 29, No 6, Dec 59, pp 1831-1832

Experimental results of nuclear magnetic resonance are presented, carried out on mono- and polycrystals of hydrogen at a temperature of 4.2° K. Because the anisotropy of the line width of the nuclear magnetic resonance depends on the angle between the axis of the monocrystal of higher order and the direction of the constant magnetic field, it is necessary to obtain monocrystals with an orientation known in advance. The experiments were carried out on cylindrical samples connected into an oscillatory circuit. They could be rotated around an axis perpendicular to the vector of the constant magnetic field. It has been found that an anisotropy of second order of the nuclear magnetic resonance was missing. The width and shape of lines on monocrystalline samples practically coincided accurately with the width and shape of polycrystalline hydrogen. But some anisotropy may be obtained at 1.5° K. when the molecular rotation is slowed down and a fine structure of lines can be detected.

128. Superfluidity of He^3

"On Superfluidity of Liquid He^3," by L. P. Pitayevskiy, Institute of Terrestrial Magnetism, Ionosphere, and Radiowave Propagation, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 29, No 6, Dec 59, pp 1784-1807

A strict investigation is made of the interaction between elementary excitations in a Fermi Fluid for large values of the angular momentum relative to the excitation motion. It is shown that this interaction is of the nature of an attractive force so that the suggestion that He^3 is superfluid seems to be justified. Expressions in terms of observable quantities are derived for the asymptotic values of the excitation scattering amplitudes for large values of i. A formula is deduced for the effective mass of an excitation in a Fermi Fluid by quantum field theory methods.

129. Thermal Properties of Superconductors

"Study of Thermal Properties of Superconductors. III. Anisotropy of the Thermal Conductivity of Gallium." by N. V. Zavaritskiy, Institute of Physical Problems, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 6, Dec 59, pp 1506-1516

The thermal conductivity of gallium in the normal and superconducting states has been measured along different crystallographic directions. The anisotropy detected in the temperature dependence of the electron thermal electrical conductivity in the superconducting state is related to the anisotropy in the gap width in the excitation energy spectrum. Results of measurement of the critical magnetic field are presented.

130. Intermediate State in Superconductors

"The Intermediate State in Ferromagnetic Superconductors," by G. F. Zharkov, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 29, No 6, Dec 59, pp 1784-1788

An interval of external magnetic field strength values has been found for which the single domain ferromagnetic ellipsoid may exist in the intermediate state. The structure of the intermediate state has been studied within the framework of the unbranched model for a superconducting ferromagnetic plate.

Nuclear Physics

131. Particles With 6 and 25 Electron Masses

Search for Particles With Masses Between 6 and 25 Electron Masses," by A. S. Belousov, S. V. Rusakov, Ye. I. Tamm, and P. A. Cherenkov; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 29, No 6, Dec 59, pp 1613-1618

Experiments are described which were performed with the view of elucidating whether γ-quanta generate particles with masses lying between 6 and 25 electron masses, in accord with the production cross sections predicted by the electromagnetic theory of pair production. For this purpose, fast coincidence circuits were employed to measure the time of flight of particles with a given momentum between two scintillation counters. The particles were generated in a lead target placed in the bremsstrahlung beam from a synchrotron.

The theoretical coincidence counting rate was compared with the experimental rate obtained for parameters of the experimental arrangement corresponding to registration of particles with the expected mass. In each set of experiments the ratio of the electron counting rate to the background rate was also measured. The results obtained show that the cross sections for production of particles with unit charge, spin 1/2 and masses lying between 6 and 25 m_e are not those predicted by electromagnetic theory.

132. Collisions of Nucleons

"Collision of Nucleons With Large Orbital Momenta," by A. D. Galanin, A. F. Grashin, B. L. Ioffe, and I. Ya. Pomeranchuk; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 29, No 6, Dec 59, pp 1663-1678

That part of the nucleon-nucleon scattering amplitude for large orbital momenta $l \gg 1$ which is due to exchange between two mesons is calculated. The connection between this amplitude and scattering of real mesons by nucleons is established with aid of the dispersion equations. The method is valid when besides the condition $l \gg 1$ the inequality $l\mu/p \gg 1$ is also satisfied (μ is the meson mass, p - the nucleon momentum in the c.m.s.).

133. Meso-Molecules in Hydrogen

"μ - Mesic Molecular Processes in Hydrogen," by V. B. Belayev, S. S. Gershteyn, B. N. Zakhariev, and S. P. Lomnev, Joint Institute for Nuclear Research; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 29, No 6, Dec 59, pp 1652-1662

A number of mesic atomic and mesic molecular processes in a medium of hydrogen isotopes (formation of mesic molecules, $H_\mu^{(1)} + H^{(2)} \rightarrow (H^{(1)}H^{(2)})_\mu$, elastic collisions, and charge exchange of mesic atoms $H_\mu^{(1)} + H^{(2)} \rightarrow H_\mu^{(1)} + H^{(2)}$, $H_\mu^{(1)} + H^{(2)} \rightarrow H^{(1)} + H_\mu^{(2)}$) are considered. The levels of the mesic molecules are determined. The computations were performed on the BESM electronic machine with corrections of the order of m_μ/M taken into account for motion of the nuclei.

134. Scattering of Gamma-Quanta

"Dispersion Relations for Scattering of Gamma-Quanta on Nucleons," by L. I. Lapidus and Chou Kuang-chao, Joint Institute for Nuclear Research; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fizki, Vol 29, No 6, Dec 59, pp 1714-1721

Dispersion relations for scattering of γ-quanta by nucleons with one subtraction are considered. For forward scattering, six relations have been obtained which do not contain unknown constants or infrared divergences.

135. Clustering of Nucleons

"The Clustering of Nucleons in Light Nuclei," by V. G. Neudachin, Yu. F. Smirnov, and N. P. Yudin, Institute of Nuclear Physics, Moscow State University, Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 29, No 6, Dec 59, pp 1781-1783

Equivalence of wave functions of the shell theory with LS-coupling for states with higher symmetry of the orbital part and the antisymmetrized wave functions composed of wave functions of nucleon clusters is demonstrated by help of the theory of the permutation groups. Some simple examples are considered.

136. K-Meson Decay

"On K_{e4} Decay," by L. B. Okun and Ye. P. Shabalin; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 29, No 6, Dec 59, pp 1775-1780

The probabilities for K_{e4} decays are computed. The selection rules for the decays and the isotopic relations between various K_{e4} decays are determined on basis of the Sakata model.

137. Scattering of Scalar Mesons

"Analyticity and Unitarity in the Scattering of Scalar Mesons on a Static Nucleon," by B. L. Ioffe; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 29, No 6, Dec 59, pp 1764-1769

The uniqueness of the determination of the scattering amplitude from the analyticity and unitarity conditions is considered for the problem of scattering of scalar neutral and charged mesons on a static nucleon in the one-meson approximation. The analysis is carried out by prescribing the analytic properties of the scattering amplitude over the complete Riemann multisheeted surface. As a result, it is found that the nonuniqueness of the solution may be of the nature of virtual or Breit-Wigner levels.

138. Neutron Beta-Decay

"The Theory of Beta-Decay of the Neutron," by S. M. Bilenkiy, R. M. Ryndin, Ya. A Smorodinskiy, and Ho Tso-hsiu, Joint Institute for Nuclear Research; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 29, No 6, Dec 59, pp 1758-1763

Calculations are performed for corrections to various effects in beta-decay of the neutron originated by terms $\sim$ m/M (m and M are the electron and nucleon masses) which are due to the "weak Gell-Mann magnetism" and proton recoil. It is shown that for electron-neutrino correlation and the up-down asymmetry of electrons, these corrections may reach several percent.

139. Neutrinos

"Electron and Muon Neutrinos," by B. Pontecorvo, Joint Institute for Nuclear Research, Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 29, No 6, Dec 59, pp 1751-1757

Some processes due to free neutrinos which heretofore had not been considered are discussed. Special attention is payed to those processes which, in principle, may help to solve the problem concerning the existence of two neutral lepton pairs (electron pair (ν_e and $\bar{\nu}_e$) and muon pair (ν_μ and $\bar{\nu}_\mu$)).

To solve the fundamental question whether ν_μ and ν_e are identical particles, a method is proposed which in essence is analogous to the method employed for solving the problem of the distinguishability of the neutrino and antineutrino or K^0 and $\bar{K}^0$ -mesons. In principle, the problem can be solved if it is demonstrated experimentally that a ν_μ beam is capable of inducing transitions which $\bar{\nu}_e$ particles can certainly induce (e.g., the $\bar{\nu}_\mu + p \longrightarrow e^+ + n$ reaction).

The experiment suggested above, although difficult, should be feasible with accelerators capable of producing more intense beams than those produced by present-day accelerators.

140. Electron Polarization

"Polarization Phenomena in Radiative Collisions of Two Electrons," by V. L. Lyuboshits, Voronezh State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fizki, Vol 29, No 6, Dec 59, pp 1727-1740

Two-row matrix formalism is used for the description of polarization phenomena in the collision of two Dirac particles of arbitrary energy. The radiative collision of two polarized electrons is considered. The structure

of the general formulas for the polarization parameters after the collision is investigated and concrete calculations are carried out in the ultrarelativistic and nonrelativistic limits, taking into consideration polarization of the target electrons.

141. Particle Production by Pions

"Production of Multicharged Particles on Photographic Emulsion Nuclei by 280 Mev π^+ Mesons," by N. S. Ivanova V. I. Ostroumov, and Yu. V. Pavlov, Radium Institute, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 29, No 6, Dec 59, pp 1604-1612

The production of fragments in nuclear disintegrations induced by 280 Mev π^+-mesons is studied by aid of photographic emulsions. The angular, charge, and energy distributions of the emitted fragments are measured. An analysis of the experimental data and comparison with the results of theoretical calculations show that in the case under consideration the particles responsible for formation of the fragments are protons produced in the absorption of π^+-mesons by quasi-deuteron pairs and also recoil nucleons produced in scattering of π-mesons on separate nucleons of the nucleus. Some suggestions regarding the mechanism of formation of such fragments are made on the basis of an analysis of the energy spectra of fragments produced by particles of various energy.

142. Elastic Scattering of Neutrons

"Elastic Scattering of 630 Mev Neutrons by Protons," by N. S. Amaglobeli and Yu. M. Kazarinov, Joint Institute for Nuclear Research and Physics Institute, Academy of Sciences Georgian SSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 29, No 6, Dec 59, pp 1587-1593

Differential elastic (n - p) - scattering cross sections $\sigma_{np}(\vartheta)$ are measured in the angle range $\vartheta = 11^\circ - 180^\circ$ (c.m.s.) for neutrons with a mean energy of 630 Mev. Within the errors of the experiments, the data thus obtained are identical to the results of measurements carried out previously with 580 Mev mean energy neutrons. The dependence $\sigma_{np}(\vartheta)$ near the angle $\vartheta = 180^\circ$ was employed to determine the π-meson-nucleon coupling constant by Chew's method (G. F. Chew, Phys Rev, 112, 1380 (1958)). The value $f^2 = 0.06 \pm 0.02$ was obtained in this manner.

143. Elastic Scattering of Pions

"Elastic Scattering of 390 Mev π^+ Mesons by Protons," Ye. L. Grigor'yev and N. A. Mitin, Joint Institute for Nuclear Research, Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 29, No 6, Dec 59, pp 1583-1586

The angular distribution of (390 ± 25) MeV π^+ -mesons elastically scattered on hydrogen was measured with the help of nuclear photographic emulsions. The differential scattering cross section can be expressed by formula (1). Phase shifts of the Fermi solution obtained by assuming that only S- and P- states participate in scattering are $\alpha_3 = -34^\circ$, $\alpha_{33} = 151^\circ$ and $\alpha_{31} = -16^\circ$.

144. Fermium Isotope

"Experiments in the Production of a New Fermium Isotope," V. P. Perelygin, F. D. Donets, and G. N. Flerov; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 29, No 6, Dec 59, pp 1558-1563

The α -active products of interaction between accelerated oxygen O^{16} ions and uranium U^{238} nuclei were studied. Some proof has been obtained of the existence of a new fermium isotope Fm^{249} which possesses a half-life of about 150 sec and an α -particle energy of (7.9 ± 0,3) Mev. Excitation curves are presented for reactions involving the emission of four and five neutrons; the oxygen ion energies lie between 84 and 98 Mev. A procedure for identification of transuranium isotopes is described which is based on the registration in photographic emulsions of their successive α -decays.

145. Coulomb Excitation of Nuclei

"Coulomb Excitation of Odd A Nuclei by Heavy Ions," by D. G. Alkhazov, A. P. Grinberg, G. M. Gusinski, K. I. Yerokhina, and I. Kh. Lemberg, Leningrad Physicotechnical Institute, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 29, No 6, Dec 59, pp 1530-1542

High-lying levels in some light nuclei (Al^{27}, Sc^{45}, V^{51}, Nb^{93}) which previously could not be observed because of background when protons or α-particles were used, have now been excited by using "heavy" ions as bombarding particles. It is established that some of the γ -lines observed in previous investigation, in which chromium was irradiated with protons or α -particles, are not due to coulomb excitation of the corresponding levels in chromium. By using ions heavier than α -particles, it could be verified that lines associated with nuclear levels excited previously with α -particles

(Rb^{87}, Sn^{117}, Sn^{119}) are actually emitted as a result of coulomb excitation. The partial lifetimes τ (E2) of excited levels have been determined for the electric quadrupole transition. (The measured values of τ (E2) lie between 10^{-7} and 10^{-12} sec.)

146. Fast Photoneutrons

"Fast Photoneutrons From Be^9, C^{12}, and Al^{27}," by L. A. Kulchitskiy and V. Tresperin, Leningrad Physicotechnical Institute, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 6, Dec 59, pp 1524-1529

An investigation was carried out of the angular distributions of photoneutrons with energies above 10 Mev emitted by Be^9, C^{12}, and Al^{27} targets under the irradiation by 88 Mev peak energy bremsstrahlung. The energy spectrum of photoneutrons emitted at an angle of 75^0 from C^{12} was also investigated, and from the data thus obtained a comparison is made of the photoneutron and photoproton yields in the same energy intervals. The angular distribution results are compared with the quasideuteron model and direct resonance nuclear photoeffect. Qualitative agreement with the quasideuteron model has been obtained.

147. Polarization of μ^- -Mesons

"Investigation of the Effect of the Hyperfine Structure on Polarization of μ^- Mesons in Mesic Atoms," by L. B. Yegorov, A. Ye. Ignatenko, and D. Chultem, Joint Institute for Nuclear Problems; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 6, Dec 59, pp 1517-1523

The angular distributions of μ-meson decay electrons from aluminium, phosphorus, and carbon mesic atoms were studied with scintillation counters. It is shown that because of interaction of the hyperfine structure there is a decrease of the μ-meson polarization. The results of the measurements do not contradict the theoretical predictions if depolarization exclusively on the K orbit of the mesic atom is taken into account. Comparison of the results of measurement for phosphorus with the results previously obtained for liquid hydrogen shows that the complete depolarization of μ-mesons observed in hydrogen cannot be explained solely by the interaction between the fine and hyperfine structures. To do this, an additional mechanism must be assumed (such as the "jumping" of a μ-meson from proton to another one with concurrent transition of the hyperfine structure to the ground state). All experimental data on depolarization of μ-mesons in various substances can be explained theoretically if it is assumed that in mesic atoms of metals the electron shell does not affect the depolarization of μ-mesons. The presence of a fine and hyperfine structure in mesic atoms is confirmed

and this again indicates that the electromagnetic properties of mesons and electrons are similar. The observed (in experiments with phosphorus) reduction of precession frequency of the mesic nucleus spin by a factor of 2, as compared with precession frequency of the free μ-meson spin, indicates directly that the spin of a negative μ-meson is equal to one half.

148. Study of Ag^{110} Isomer

"Radioactive Decay of Ag^{110m}," by N. M. Anton'yeva, A. A. Bashilov, and Ye. K. Kulakovskiy, Leningrad State University, Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 37, No 6, Dec 59, pp 1497-1506

A magnetic spectrometer study was made of the photoelectron spectrum produced by the γ-rays of Ag^{110m}, and also of the β-ray spectrum up to an energy of 530 Kev and the spectrum of conversion electrons corresponding to n clear transitions with energies of 116 and 656 Kev. The internal conversion coefficients for 14 nuclear transitions in Cd^{110} and the multipolarity of the radiation were determined on the basis of the relative line intensities found in the present work and the data presented in a previous paper. The decay scheme is discussed.

149. Angular Distribution in Explosive Showers

"Angular Distribution of Shower Particles in Explosive Showers Produced by High Energy Cosmic Ray Particles," by A.P. Mishakova and B. A. Nikolskiy; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 29, No 6, Dec 59, pp 1594-1603

The angular distribution of shower particles in showers with an energy of 10^{10} - 10^{13} ev was investigated in the c.m.s. Experimental and calculated results are presented for the dependence of the number of show particle pairs on the angle between them. It is concluded that a collision of the primary particle and nucleus leads to a symmetric angular distribution of the shower particles in the c.m.s. and that there is no correlation between the angles of shower particle pairs.

150. Plasma Stability

"Stability of a Plane Poiseuille Flow of a Finite Conductivity Plasma in a Magnetic Field," by Yu. A. Tarasov; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 29, No 6, Dec 59, pp 1708-1712

The flow stability of a longitudinal plasma in a magnetic field with respect to infinitely small perturbations is considered for Reynolds numbers $R_m \leq 1$.

151. Plasma Oscillations

"Oscillations of Electron-Ion Plasma," by L. M. Kovrizhnikh, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 29, No 6, Dec 59, pp 1692-1696

The spectrum of longitudinal oscillations of an electron-ion plasma is considered for the case of high temperatures (Maxwell distribution) and low temperatures (Fermi distribution). It is shown that for small values of the wave vector k the dispersion equation yields two branches which differ in their properties: an optical one for which the ion motion is not important and an acoustical one. For large values of k only the acoustic branch remains, its properties being determined by the parameters of the ion component of the plasma.

152. Plasma Stability

Stability of a Low Pressure Plasma," by B. B. Kadomtsev; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 29, No 6, Dec 59, pp 1646-1651

Mathematical conditions of stability for an arbitrary toroidal system are derived. The stability problem of low pressure plasma in such systems is analyzed.

153. Elastic Scattering of Protons

"Angular Distribution of 5.45 Mev Protons Scattered Elastically by Nickel, Copper, and Cobalt Isotopes," by N. Ya. Rutkevich, V. Ya. Golovnya, A. K. Val'ter, and A. P. Klyucharev, Physico-technical Institute, Academy of Sciences Ukrainian SSR; Moscow, Doklady Akademii Nauk SSSR, Vol 130, No 5, Feb 60, pp 1008-1011

A preliminary measurement was made of the angular distribution of protons elastically scattered by Cu-63. The qualitative behavior of the distribution is similar to that of Cu-65. The Cu-63 nucleus is obtained by adding one proton to Ni-62, and the Co nucleus may be obtained by taking one proton off Ni-60. The observed difference in the angular distribution of protons, scattered by these nuclei, exhibits variation of form of the nuclear potential when the number of protons in the nucleus varies by one. The same results should be expected by varying by one the number of neutrons. For confirmation of this assumption, an investigation of elastic proton scattering is intended on isotopes Cr-52 and Cr-53.

154. Quadrupole Nuclear Resonance in Crystals

"Intensity Variations of the Quadrupole Nuclear Resonance in a Molecular Crystal Bombarded by Fast Electrons," by A. I. Kitaygorodskiy and E. I. Fedin, Institute of Organoelemental Compounds, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 130, No 5, Feb 60, pp 1005-1008

Nuclear quadrupole resonance was used as an indicator of radiative defects of a polycrystalline sample of n-dichlorobenzene subject to various doses of electron irradiation at 750 Kev energy. The resonance was observed at a frequency modulated quadrupole radiospectrometer with synchronous detection of a self-recording millivoltmeter (E. I. Fedin and Yu. S. Konstantinov, Pribory i Tekhnika Eksperimenta, No 2, 27 (1959)). It was concluded that a monocrystal with a lattice close to ideal has higher stability to ionizing gamma and beta irradiation than a polycrystal.

155. Phase Oscillations in Synchrotron

"Excitation of Phase Oscillations of Particles in an Electron Synchrotron by the Noises of the Magnetic Field, the Frequency, and the Potential of the Accelerating Field," by S. A. Kheyfets, Physics Institute, Academy of Sciences Armenian SSR; Yerevan, Izvestiya Akademii Nauk Armyanskoy SSR. Vol 12, No 5, 1959, pp 105-113

The increment in the amplitude of phase oscillations effected by the action of various perturbations is computed with allowance for adiabatic and radiative decay. The results are obtained in the form of general one parameter functions.

156. Hungarian Physics Dissertations

"Reports of the Scientific Qualifications Committee" (unsigned article; Budapest, Magyar Tudomany, Dec 59, p 665

The following excerpts refer to committee action taken in October 1959.

The Scientific Qualifications Committee has announced the qualification of Tibor Fenyes as Candidate in Physical Sciences on the basis of his dissertation titled"Alpha Decay and the Alpha Spectrum of Po ^{210};" his opponents were Laszlo Bozoki, Candidate in Physical Sciences, and Dezso Kiss, Candidate in Physical Sciences.

The Scientific Qualifications Committee has announced the qualification of Antal Somogyi as Candidate in physical Sciences on the basis of his dissertation titled "An Examination of the Electron-Photon Components of Wide Atmospheric Showers"; his opponents were Gyorgy Marx, Doctor of Physical Sciences, and Dezso Kiss, Candidate in Physical Sciences.

157. Czechoslovak Cyclotron To Be Activated

"The Cyclotron in Rez Prior to Starting Up" (unsigned article); Prague, Obrana Lidu, 11 Feb 60, p 2

A brief announcement says that the Institute of Nuclear Research (Ustav jadernych vyzkumu) of the Czechoslovak Academy of Sciences, located at Rez near Prague, is about to begin test operation of the new cyclotron which Czechoslovakia received from the USSR as part of Soviet scientific assistance in the field of nuclear research.

In describing the operation of the cyclotron which was built by Soviet and Czechoslovak specialists (the latter, after being trained in the Soviet Union), the article states that it will be possible to accelerate deuterons to an energy equivalent of 12.5 Mev and alpha particles to 25 Mev. The magnet of the cyclotron has a pole diameter of 120 centimeters and the acceleration electrodes operate on a voltage of 150,000 volts. The cyclotron will be able to accelerate even heavy particles, up to and including neon.

In conclusion, the article says that, as in the case of atomic reactors, all workers associated with the cyclotron will be protected against harmful radiation by a heavy wall.

158. Death of Atomic Physicist, Academician I. V. Kurchatov

"Academician Igor Vasil'yevich Kurchatov", (editorial obituary); Moscow, Atomnaya Energiya, Vol 8, No 2, Feb 60, pp 97-98

"The greatest Soviet physicist, Communist, thrice Hero of Socialist Labor, deputy to the Supreme Soviet of the USSR, member of the Presidium of the Academy of Sciences USSR, director of the Institute of Atomic Energy of the Academy of Sciences USSR, Academician Igor' Vasil'yevich Kurchatov, 58, died unexpectedly in Moscow on 7 February 1960.

"I. V. Kurchatov was born on 12 January 1903. In 1923 he completed the physicomathematical faculty of Crimea University. In 1925 he began working at the Leningrad Physicotechnical Institute. His early research was concerned with dielectric materials and Seignettoelectries.

"He later turned to research in atomic physics, and in 1935, he discovered the important phenomenon of nuclear isomerism. In 1940, on his initiative and under his direction, research was completed which led to the discovery of the spontaneous fission of uranium nuclei. In 1943 he was elected an Active Member of the Academy of Sciences USSR.

"In his last years, all of his activity was devoted to problems dealing with the utilization of nuclear energy. He was instrumental in advancing work in the field of controlled thermonuclear reactions."

The obituary of which excerpts are given above was published in the name of the Presidium of the Academy of Sciences USSR; the Main Administration for the Use of Atomic Energy under the Council of Ministers USSR; the Department of Physicomathematical Sciences, Academy of Sciences USSR; the Department of Technical Sciences, Academy of Sciences USSR; the Institute of Atomic Energy, Academy of Sciences USSR; and the Leningrad Physicotechnical Institute, Academy of Sciences USSR.

/For additional information on nuclear physics, see Chemistry, Radiochemistry-/

Theoretical and Experimental Physics

159. Renormalization Group in Electrodynamics

"The Two-Charge Renormalization Group in Scalar Quantum Electrodynamics," by V. A. Shakhbazyan, Mathematical Institute, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 29, No 6, Dec 29, pp 1789-1793

The behavior in the high momentum region of single-particle Green's functions and of some asymptotic values of the vertex part and four-vertex diagram in the quantum electrodynamics of zero spin particles is investigated by the renormalization group procedure.

160. Study of Paramagnetic Resonance

"Paramagnetic Resonance in Magnetically Dilute Systems," by N. S. Garif'yanov, Physicotechnical Institute, Kazan Affiliate, Academy of Sciences USSR; Moscow, Zhurnal Ekperimental'noy i Teoreticheskoy Fizki, Vol 29, No 6, Dec 59, pp 1551-1557

The dependence of the ratio of the constants b/c on the degree of dipole-dipole magnetic interactions has been investigated by the paramagnetic resonance method in parallel fields. The measurements were carried out in the frequency range from 300 to 1.6 MHz at T = 90°K in samples containing Cr^{+++}, Fe^{+++}, Cu^{++}, and VO^{++}.

161. Study of Paramagnetic Resonance

"Paramagnetic Resonance and Paramagnetic Relaxation in Electrolyte Solutions," by V. I. Avakumov, N. S. Garif'yanov, B. M. Kozyrev, and P. G. Tishov, Physicotechnical Institute, Kazan Affiliate Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 29, No 6, Dec 59, pp 1564-1569

Results of experiments on paramagnetic resonance and paramagnetic relaxation in liquid solutions of salts of the iron group are compared with existing theories.

162. Conductivity of Shock Wave

"Electric Conductivity of Explosion Products of Condensed Explosives," by A. A. Brish, M. S. Tarasov, and V. A. Tsukerman; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 29, No 6, Dec 59, pp 1543-1550

The electrical conductivity of the explosion products of various condensed explosives was investigated by the electrical contact and electromagnetic methods. Near the wave front, the conductivity of the investigated explosives lies between 0.1 and 6 Ω^{-1} cm^{-1}. With increase of the distance from the front, the conductivity of the explosion products drops. The electrical conductivity of the explosion products increases with growth of the density of the explosives and intensity of the detonation wave.

It is suggested that besides thermal ionization the high values of the electrical conductivity of the explosion products may be related to the large densities and pressures appearing on the front of the detonation wave.

163. Vapor Condensation in Vacuum

"Condensation of a Cloud of Vaporous Matter Expanding into Vacuum," by Yu. P. Rayzer; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 29, No 6, Dec 59, pp 1741-1750

The kinetics of condensation of a cloud of vaporous matter expanding into vacuum is considered. It is shown that for a large variety of initial conditions, at infinity the matter expands partly as a gas and partly in the form of very small particles of the condensate, the number and size of these particles being dependent on the evaporated mass and on its initial temperature. It is suggested that when large meteorites strike the surface of planets without atmosphere the ground of the planets and body of the meteorite may evaporate and subsequently condense and that this process may be one source of cosmic dust. The possibilities of laboratory investigation of condensation of metallic vapors and of the properties of the small particles involved are discussed.

164. Raman Spectrum of Oxygen

"Effect of Pressure on the Combination Spectrum of Oxygen," by G. V. Mikhylov, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 29, No 6, Dec 59, pp 1570-1574

The combination spectrum of oxygen has been studied at pressures between 7 and 125 atm. Broadening of lines in the rotation band of O_2 is of a collision nature at these pressures, the effective collision broadening parameter being $p_w = 4.43$ Å. The parameters characterizing the width of the combination rotation lines are identical to those for O_2 measured on the basis of absorption in the microwave region. In distinction to the lines of the rotation band, the Q branch of the vibrational transition of O_2 does not broaden with variation of the pressure. The observed width of the Q branch is explained by splitting of the Q branch with respect to J due to interaction between vibrations and rotations.

165. Microscopic Characteristics of Metals

"The Relation Between the Optical Constants of Metals and Their Micro-Characteristics," by G. P. Motulevich, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 29, No 6, Dec 59, pp 1770-1774

The relation between the optical characteristics of metals and their microscopic characteristics is considered. It is shown that measurement of the optical constants of metals in the infrared region over a large wavelength range in conjunction with measurements of the static conductivity of the same samples at various temperatures should permit one to determine the density of conductivity electrons, electron velocity on the Fermi surface, and frequency of interelectronic collisions. A procedure for treatment of the experimental data is suggested which takes into account recent theoretical results.

166. Electromagnetic-Gravitational Wave Propagation

"Propagation of a Strong Electromagnetic-Gravitational Wave in Vacuum," by A. S. Kompaneyets, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Tecreticheskoy Fiziki, Vol 29, No 6, Dec 59, pp 1722-1726

It is shown that a strong electromagnetic-gravitational wave possesses a system of rectilinear and parallel characteristics, and hence, the velocity of propagation of any small additional perturbation will always be equal to that of light. It therefore cannot be expected that there exist solutions with an Euclidean metric at infinity which are qualitatively different from the ordinary electromagnetic waves in finite spatial regions.

167. Hungarians Building Three New Research Institutes

"Three Scientific Research Institutes Being Built in Budapest" (unsigned article); Budapest, Nepszabadsag, 30 Jan 60, p 6

Construction of the Experimental Medical Sciences Research Institute building in Budapest on the corner of Ulloi-ut and Szigony-utca will begin in the spring of 1960. The ten-story building will be 42 meters high. The ninth floor will be an animal laboratory in which studies can be done on 12,000 animals yearly.

Work has already begun on the Central Chemical Research Institute being built on the corner of Pusztaszeri-ut and Ferenchegyi-ut. It will consist of four pavilions and will have a 15,000-volume library, with an additional 10,000 volumes placed in the laboratories.

A Pharmaceutical Industry Research Institute is being built near the Chinoin Factory which will consist of three laboratories and an administration building. One of the laboratories will be finished in 1960.

168. French Scientists Appointed to Academy of Sciences USSR

"Louis de Broglie, Member of the Academy of Sciences USSR" (unsigned article); Paris, L'Humanite, 5 Mar 60, p 1

During a ceremony which took place on 4 March at the Soviet Embassy in Paris, Sergey Vinogradov, Soviet Ambassador to France, presented diplomas designating the following French scientists as foreign members of the Academy of Sciences USSR: Louis de Broglie, life secretary of the French Academy of Sciences; Jaques Hadamard, mathematician, member of the Academy of Sciences; Louis Massignon, historian and expert on the Orient; Louis Neel, director of the Ecole Nationale d'Electrotechnique (National Electrotechnical School) of Grenoble; and Andre Mazon, professor of Slavic language and literature.

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