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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 developments and activities and is disseminated as an aid to research in the United States.

SCIENTIFIC INFORMATION REPORT

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I. BIOLOGY

1. Common Corn Smut Studied

"News in the Biology of Common Corn Smut," by N. A. Kechek, Institute of Farming, Ministry of Agriculture, Armenian SSR; Yerevan, Izvestiya Akademii Nauk Armyanskoy SSR--Biologicheskaya Nauki, Vol 12, No 8, Aug 59, pp 51-58

The author sought an explanation of the manner in which Ustilago zeae spores reach and attack the young, growing vegetative and reproductive tissues of corn under natural conditions. This question was investigated experimentally on the basis of the suggestion that infection occurs through the sprouts and proceeds to the plant organs, as in the case of wheat smut (Tilletia tritici).

An experiment was performed at Echmiadzinskaya Experimental Base, Institute of Farming, in 1958. Half of the plants on 500 square meters were infected in the above-mentioned manner, and the other half were maintained as controls. The plants were observed from April to July; 105 out of 1,000 died of smut found in the stalk, whereas the controls remained healthy. On the basis of this experiment, the following conclusions were drawn:

"1. All the plants infected with smut through the coleoptile died early or late.

"2. Upon infection of corn through the coleoptile, mycelia can ascend only to the sixth internode, affecting the stalk exclusively."

Thus it is clear, the author states, that infection of corn organs via the growth of diffused mycelia after infection through the coleoptile does not occur.

The possibility that Ustilago spores are deposited on the plant surface with soil is considered next. Plants in various areas of the republic were observed during different stages of growth. Several illustrations and an extensive discussion of these observations are given. The results afforded a basis for concluding that Ustilago spores carried by the wind from the soil to the plant surface under natural conditions and by droplets of moisture through the vegetative conus or through the sheathing leaf penetrate to the organs, contact the young, growing tissues, and produce infection.

The effect of weather conditions on the susceptibility of corn to this disease and the possibility of primary and secondary infection are discussed. Various theories concerning stages of development at which the plants are affected are also cited.

The general conclusions derived from these studies are as follows:

> "1. Up to this time, it was known that only the young, growing tissues of corn plants can be infected with common smut, but that the tissues which have emanated from these organs are not in a condition to be infected.
>
> "This stage in the study of common corn smut leaves gaps in knowledge of the biology of the pathogen since where and how the spores penetrate to the young, growing tissues of the corn organs under natural conditions and where and how their infection occurs remain unknown.
>
> "2. Testing of a method of infecting corn with common smut did not increase our success."

Other conclusions previously given in the article are reiterated; the author states in addition that the resistance and susceptibility of varieties of corn to infection with Ustilago zeae depend on variation in the structure of the vegetative conus, the sheathing leaves, and the ligule.

2. Hungarians Produce Antibiotic to Treat Plant Diseases

"New Antibiotic for Treating Plants" (unsigned news item); Budapest, Nepszabadsag, 31 Dec 59, p 9

The Phylaxia Vaccine Production Institute has begun manufacture of a new antibiotic -- trichothecin -- which is used in the treatment of diseased plants. Laboratory tests established that trichothecin impedes the development and spread of fungi which cause 20 different kinds of plant diseases. The new preparation is especially suitable for overcoming widespread moniliasis, which has infected sour cherry trees.

3. Ichthyology Research in the USSR

"The Institute on Ulitsa 'Ber,'" by A. Kravets; Sofia, Bulgaro-Suvetska Druzhba, Vol 15, No 23, Dec 59, p 8

The author briefly describes the work of various laboratories of the Caspian Scientific Research Institute for Marine Fish Management and Oceanography (Kaspiyski nauchno-izsledovatelski institut za morsko ribno stopanstvo i okeanografiya), which is located in a two-story house at the entrance to "Ber" Ulitsa, [Street] named after the famed Russian naturalist and academician Karl Ber, not far from the center of Astrakhan. The

Institute owns more than ten seagoing vessels and river craft, several workshops, an experimental base, and a designing bureau which facilitates the scientific study of the development of the fishing industry in the Caspian Sea. The laboratories are engaged in the following activities.

Co-workers of the Laboratory for Commercial Ichthyology (Laboratoriya za promislova ikhtiologiya) study changes in the fish food content of reservoirs and marine biology. On the basis of observations and conclusions, they make recommendations to sovkhozes, fishing kolkhozes and industrial enterprises regarding the disposition of fishing boats and floating canneries, based on anticipated locations of large schools of fish.

Employees of the Laboratory for Fish Reserves (Laboratoriya za ribnite zapasi), under the direction of Mark Letichevski, laboratory director and candiate of biological sciences, in cooperation with pisciculturists, have developed and applied biotechnology for the artificial propagation of sturgeon and salmon whose periodic migrations for spawning purposes to the upper reaches of the Volga River and Kama and Belaya rivers have heretofore been hindered by numerous hydroelectric power stations and dams on the Volga River.

Co-workers of the Laboratory for Scientific Commercial Research (Laboratoriya za nauchno-promislovo izsledvane) have developed a method of studying schools of fish by means of underwater electric lighting. They have established that small fish are attracted by light, which has led to the development of a new fishing method in which electric lighting is employed.

The Laboratory for Industrial Fishing (Laboratoriya za promishlen ribolov), directed by Arkadiy Leskutkin, is primarily concerned with the aforementioned fishing method, in which fish pumps rather than conventional purse seines are used. The fish, attracted by the electric light attached to the head of a submerged 90-meter-long rubber hose, are sucked into the hose, pumped to the deck of the fishing boat, and dumped into the refrigerated hold of the vessel.

Laboratory employees are now recommending the use of batteries of 4-5 lights operating at varying light intensities between 75-150 volts, rather than the one- or two-bulb attachments used heretofore. Tests have shown that this new method has doubled or tripled the productivity of pump fishing. The method is also suitable for sardine and herring fishing. The institute is now studying the possibilities of employing electric current impulses as a fishing method.

The sharp increase in the yield of small fish has also placed new tasks before the Chemical - Bacteriological Laboratory and Technological Laboratory (Khimiko-bakteriologicheska i tekhnologicheska laboratoriy), which are headed by Candidates of Technical Sciences Margarita Kalantarova and Vladimir Podsevalov. These laboratories develop industrial methods of preparing new fish food products and study ways of intensifying technological processes through the application of high-frequency current and ultrasonics in fish processing.

For most of the year, the institute is almost empty, since the scientific personnel spend the time on the Caspian Sea and along the Volga River, where they conduct experiments, collect data, and confirm theories and conclusions.

II. CHEMISTRY

Electrochemistry

4. Polarographic Method for Determination of Niobium in Tantalum-Niobium Alloys

"Determination of Niobium in Tantalum-Niobium Alloys by the Method of Oscillographic Polarography," by Ya. P. Gokhshteyn, L. A. Genkina, and A. M. Demkin, Institute of Geochemistry and Analytical Chemistry, Academy of Sciences USSR, and the Moscow Electric Bulb Plant; Moscow, Zavodskaya Laboratoriya, Vol 25, No 9, Sep 59

Because the photo-recording Heyrovsky polarograph does not enable one to obtain on the current-potential curves clearly expressed niobium waves in sulfuric acid solutions, it was found advisable to apply oscillographic polarography for the quantitative determination of niobium in the presence of a large amount of tantalum and of an admixture of iron. The oscillographic polarography procedure which has been developed for this purpose and applied is described in detail. A review of USSR work on the analytical determination of niobium is given.

Fuels and Propellants

5. Production of Peroxides of Calcium and Barium With High Content of Peroxide

"The Problem of the Production of Calcium and Barium Peroxides of High Quality," by S. Z. Makarov and N. K. Grigor'yeva, Institute of General and Inorganic Chemistry, Academy of Sciences USSR; Leningrad, Zhurnal Prikladnoy Khimii, Vol 32, No 10 Oct 59, pp 2184-2189

The synthesis of calcium and barium peroxides can be accomplished by employing the hydrates and perhydrates of peroxides of these metals. Anhydrous peroxides of calcium and barium are not formed as a result of the direct interaction of the hydroxides and salts of these elements with hydrogen peroxide. The synthesis of calcium peroxide is best accomplished over the octahydrate of calcium peroxide at a low temperature. The synthesis of barium peroxide is best carried out over the diperhydrate of barium peroxide at room temperature. The peroxides obtained in this manner are of good quality and are produced in yields which are satisfactory from the standpoint of industrial application of the methods in question. By using the method described, barium peroxide containing up to 92-95% of Ba O_2 is obtained. The method for the production

of barium peroxide was checked under industrial conditions at the Krasnyy Khimik Plant at Leningrad and is now being applied there on an industrial scale. The barium peroxide produced by this plant formerly did not contain more than 84-88% of BaO_2.

Herbicides

6. Trichloroacetic Acid Salts Effective Herbicides in Sugar Beet Cultivation

"Characteristics of the Herbicidal Action of Salts of Trichloroacetic Acid (TCA)," by Aspirant D. I. Chkanikov; Moscow, Izvestiya Timiryazevskoy Sel'skokhozyaystvennoy Akademii, No 5, 1959, pp 113-122

Salts of trichloroacetic acid (TCA) can be used for effectively controlling grassy weeds in sugar beet cultivation even though their effectiveness depends on the moisture of the soil. Optimal dosage for use in the presprouting stage was considered to be 10-15 kg of TCA-Na or $TCA\text{-}NH_4$ per hectare.

"Penetrating into the plants through the roots, TCA kills younger tissues more easily than older tissues. Nitrogen metabolism is seriously disturbed; the leaves accumulate additional amounts of free amino acids and the roots accumulate more nitrogen amides than the amount found in normally growing plants."

Industrial Chemistry

7. Some Papers Presented at 11th All-Union Conference on High-Molecular Compounds

"Conversion and Application of Polymers," by Prof P. V. Kozlov and N. F. Bakeyev; Moscow, Vestnik Akademii Nauk SSSR, Vol 29, No 11, Nov 59, pp 115-118

The 11th All-Union Conference on High-Molecular Compounds was organized by the Department of Chemical Sciences of the Academy of Sciences USSR, the State Committee on Chemistry at the Council of Ministers USSR, the All-Union Chemical Society imeni V. I. Mendeleyev, and Moscow State University. It was held in Moscow 2-7 July 1959. The conference was concerned with the basic problems involved in the conversion and application of polymers used as materials in different fields of the national economy. About 2,000 scientists and engineers representing

600 different organizations participated. Eight reports were presented at plenary sessions of the conference and 203 reports at eight sectional meetings. In presenting the opening address at the conference, N. N. Semenov stated that the study of scientific problems involved in the conversion and application of polymers is becoming increasingly important because of the great expansion in the production of substances of this type which has been planned for the following 7 years.

The reports given at plenary sessions represented reviews of progress that has been made. They outlined the present status of development in the most important fields of the chemistry and technology of polymers.

Correlations between structure and the properties of high-molecular compounds were discussed in a report given by V. A. Kargin. After outlining the most important principles on the basis of which new polymer materials should be developed, the author of the report pointed out that production of systems which can be used in an extensive range of operational temperatures is of great importance. One of the methods of extending the temperature range in which crystalline plastics can be used is introduction of plasticizers. Extension of the temperature range within which a highly elastic state is retained by rubber can be achieved by using active fillers. The most radical method of producing active systems is grafting of polymers to solid surfaces. Particular attention in Kargin's report was paid to the application of polymers with rigid principal chains. Being essentially relatively flexible glasses, polymers of this type are stable within the extensive temperature range that is typical for solids. To develop polymers of this type, one must use not only organic, but also inorganic materials. The study of the extensive application of inorganic polymers will form a new subdivision of polymer chemistry.

In a report on new polymer materials and their applications, V. V. Korshak characterized new ways for the synthesis of polymers, paying particular attention to stereospecific polymerization, which leads to the formation of polymers with an ordered structure, and to polycondensation at the boundary between two phases formed by immiscible liquids. The methods in question involve the application of a great number of monomers which have not been used before.

The increased number of new polymers has not resulted as yet in a great increase of the number of materials utilized in practice, because the properties of the new polymers resemble closely those of polymers which are already known.

S. Ye. Bresler reviewed the principal fields of application of polymeric ion exchangers and electron exchangers. Because desalting and deionization of solutions had to be carried out in the industry, the requirement that ion exchangers absorb an extensive range of ions was emphasized originally. At present emphasis is placed on the development of selective absorbents which exhibit group or individual specificity with reference to definite elements. The requirement with regard to the greatest selectivity is imposed by applications of ion exchangers in the purification and separation of rare and dispersed elements as well as radioactive isotopes and also in connection with the production of antibiotics, vitamins, hormones, and active protein preparations. Application of ion-exchangers as catalysts in chemical reactions will make it possible to conduct these reactions under very mild conditions and also carry them out with the greatest degree of selectivity and effectiveness.

In considering methods for the modification of properties of polymers, A. A. Berlin emphasized that the first subdivision of methods of this type comprises different intramolecular transformations within the limits of one chain (this refers primarily to the splitting off of atoms or groups of atoms and cyclization reactions). By applying these methods it was possible to obtain plastics exhibiting a great mechanical strength and a high degree of thermal stability. Methods belonging to a second subdivision comprise reactions with compounds of a low molecular weight that are not capable of undergoing homopolymerization (e.g., reactions of sulfonation, phosphorylation, introduction of thiol groups, etc. which lead to the formation of analogs of the polymers modified by these reactions). Products of conversions of this type may be of great value from the practical standpoint. Vulcanization and the synthesis of analogs of inorganic polymers also belong to this group of conversions. Reactions that involve terminal groups or active centers and lead to the formation of block copolymers form a third group of methods which, as has been brought out by the author of the report, furnish convenient procedures for the synthesis not only of linear polymers but also of branched polymers and three-dimensional block copolymers. Finally, a fourth subdivision of methods comprises reactions of intramolecular groups that enter into chains formed by monomers or polymer molecules. The author of the report discussed in detail different methods and mechanisms of graft polymerization, a type of reaction which leads to the formation of diverse branches and three-dimensional copolymers.

A report by A. S. Kuz'minskiy and co-workers discussed in detail the mechanism of chain radical aging. This type of aging develops spontaneously during storage, application, and conversion of polymers. Thorough consideration was given to the present-day status and prospects of research on the principal types of aging of polymers due to the action of heat, light, and radiation, as well as to mechanical fatigue.

The most interesting papers given in one section dealt with the development of protective coating materials obtained by the conversion of different polyacrylic esters which are available and suitable for this purpose from the standpoint of economic considerations or consisting of various graft copolymers which combine superior adhesion with high stability to the action of gasoline, high chemical stability, and a high degree of resistance to combustion.

At sectional meetings which dealt with rubber and elastomers, results were reported obtained in work on plastification, vulcanization, and the recovery of used rubber. Resistance to wear, fatigue strength of rubber and rubber constructional elements reinforced with textiles, and data on the application of new polymers in rubber formulation were discussed. However, work on the development of wear-resistant elastomers (for instance, polyurethanes and stereospecific polybutadienes) and also on rubbers having great mechanical strength, exhibiting a high elasticity, and having the constitution of saturated polymers was not represented adequately.

Reports of particular interest were given on problems involved in the production of different types of synthetic and regenerated fibers. In this subdivision there were papers on high-strength viscose cord, new types of synthetic fibers such as saniv, acetochlorin, vinitron, and others, and the chemistry and technology of the continuous production of viscose fibers. Unfortunately, at the sectional meetings dealing with chemical fibers work on problems pertaining to the investigation of high-strength and superhigh-strength synthetic fibers, the development of thermally stable and fireproof fibers, and the improvement of the quality of fibers by modification of the properties of polymers or introduction of small quantities of additives into them was not represented to an adequate extent.

8. Production of Fertilizers of Nitrophoska Type by Treatment of Natural Phosphates With Nitric Acid

"Multipurpose Fertilizers" (Tass dispatch); Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Vol 4, No 149 (604), 20 Dec 59, p 1

Multipurpose fertilizers of the nitrophoska type contain nitrogen, phosphorus, and potassium in definite proportions. The combination of these three elements is required for fertilization in connection with the growing of potatoes, vegetables, sugar beets, and a number of other cultures. Ordinarily sulfuric acid is used for the production of phosphate fertilizers and multipurpose fertilizers. However, if the natural phosphates are treated with sulfuric acid, the fertilizer contains a considerable quantity of extraneous matter that is inactive.

Workers at the [All-Union] Scientific Research Institute of Fertilizers and Insectofungicides and the State Institute of the Nitrogen Industry developed and put into practice an advanced technology for the production of multipurpose fertilizers of the nitrophoska type.

The process in question is based on the conversion of apatite or phosphorite by treating it with nitric rather than sulfuric acid. Introduction of ammonia, of a potassium salt, and in a number of cases of trace elements follows.

When conversion of the raw material with nitric acid is applied, there are no by-products or inert material. After the phosphate has been decomposed, the nitric acid enters into the composition of the fertilizer and functions as one of its active components. Multipurpose fertilizers of this type contain up to 50% of elements which can be utilized by the plant. This is 2-2.5 times higher than the content of elements that can be utilized by plants insuperphosphate or ammonium sulfate.

The advantages of highly concentrated fertilizers of the nitrophoska type are ease of transportation, uniform quality, and easy resorption by the plants. These fertilizers can be spread with facility. They can be supplied in a granular state or in the form of powder.

9. Use of Liquids to Improve Heat Transfer Between Gases and Solids

"Concerning a Method for the Intensification of the Rate of Heat Transfer," by I. T. El'perin; Minsk, Inzhinerno-Fizicheskiy Zhurnal, Vol 2, No 11, Nov 59, pp 123-124

Because of the low rate of heat transfer between gases and the surface of solids, the design of many types of industrial equipment becomes more complex and the size of the equipment in question has to be greater. The methods which are being applied at present for increasing the rate of heat transfer between gases and solids have a number of shortcomings. Thus, increasing the turbulence of the gas requires a great amount of energy; dispersion of the solid cannot always be carried out; and compressing the gas which functions as a heat-transfer agent is very complex and requires a great amount of energy. At the Power Institute of the Academy of Sciences Belorussian SSR, a method has been developed whereby an intermediate liquid high-temperature heat-transfer agent is used to transfer heat between gas and a solid. The liquid is dispersed within the gas in a mixerheat-exchanger and then transfers the heat by convection to the surface of the solid which is in contact with the liquid. Because of the large heat-transfer surface between the dispersed liquid and the gas, heat transfer proceeds at a very high rate in mixers-heat-exchangers of small dimensions and simple design. When a gaseous or liquid fuel is burned, one can combine the process of combustion with that of heating of the intermediate liquid heat-transfer agent in special scrubber furnaces.

Recovery of the evaporated fraction of the liquid heat-transfer agent and utilization of the waste heat of smoke gases are accomplished by cooling with a low-temperature heat-transfer agent in a mixer-heat-exchanger or a surface heat-exchanger which is installed behind the unit in which the high-temperature heat-transfer agent is heated.

The second stage of the process, i. e., transfer of heat from the liquid to the surface of the solid, proceeds with an intensity which exceeds by several orders that of direct heat transfer between the gas heat-transfer agent and the solid. The increased rate of heat transfer is due to the high density of the liquid.

Calculations which have been conducted show that the required heating surface of heat-exchangers operating under pressure can be reduced in some cases by a factor of 50-100 when the new method is applied.

In order that it be suitable for the process which has been described, the intermediate liquid heat-transfer agent must possess a number of characteristics, including a wide range of temperatures at which it can be applied (200-1,600° C), a high chemical and high thermal stability, and a low viscosity combined with a high heat capacity. A number of known inorganic liquid heat-transfer agents have the required properties. This applies specifically to some fused salts (e.g., aluminum hexachloride).

At the Power Institute of the Academy of Sciences Belorussian SSR the following installations have been designed by using the method described which can be applied in the principal branches of industry: (a) a steam generator in which an intermediate heat-transfer agent is used; (b) an installation for heating metals and other materials; (c) an air heater. The method in question and the types of equipment mentioned above will be described more fully in issue No 11 of Trudy Instituta Energetiki AN BSSR.

Inorganic Chemistry

10. Beryllium Fluoride Glasses

"Vitreous Beryllium Fluoride and Some Glasses Based on It," by L. R. Batsanova and A. V. Novoselova, Chair of Inorganic Chemistry, Moscow State University; Ivanovo, Izvestiya Vysshikh Uchebnykh Zavedeniy-Khimiya i Khimicheskaya Tekhnologiya, Vol 2, No 5, Oct 59, pp 751-754

Several kinds of glass based on beryllium fluoride were prepared with the purpose of investigating their optical properties. Pure vitreous beryllium fluoride was also prepared in order to compare its chemical and optical properties with those of glasses containing other components in addition to BeF_2. The indexes of refraction and transmission of the glasses in the ultraviolet and infrared regions of the spectrum were measured.

Nuclear Fuels and Reactor Construction Materials

11. Method for Electrolytic Separation of Radioactive Isotopes of Rare-Earth Elements

"Electrolytic Separation of Radioactive Isotopes of Rare-Earth Elements," by A. G. Samartseva; Moscow, Atomnaya Energiya, Vol 7, No 5, Nov 59, pp 468-470

A method had been developed by the author earlier for the quantitative separation of elements of the actinide group (thorium, uranium, neptunium, plutonium, and americium) by electrolytic deposition from weakly acidic aqueous solutions. By applying this method, the electrolytic separation of rare-earth elements was investigated on the examples of Ce^{144} in equilibrium with Pr^{144} and of Ho^{166}. On the basis of the results obtained, which are described in detail, it is concluded that the method of electrolytic deposition in question can be applied in the analytical chemistry of rare-earth elements and also for the preparation of thin films to be used in the investigation of the isotope composition.

12. Types of Uranium Deposits

"Morphological Types of Workable Uranium Deposits and Methods of Surveying Them," by D. Ya. Surazhskiy; Moscow, Atomnaya Energiya, Vol 7, No 6, Dec 59, pp 539-543

A method is proposed for classifying uranium deposits on the basis of all morphological characteristics exhibited by them. Five types of deposits have been differentiated. For each of these types of deposit the methods of surveying, the most advisable interrelations of mining and drilling tests, the density of the survey network, and the method of estimating the available amount of ore are indicated.

13. New Procedures for Preparation of Thorium Salts

"New Procedures for the Preparation of Some Thorium Salts," by B. D. Stepin, G. M. Gulyayev, and A. I. Chernyak; Moscow, Khimicheskaya Nauka i Promyshlennost', Vol 4, No 5, Oct 59, pp 681-682

Thorium oxalate which has been in contact with moisture and has been stored for a long time undergoes a polymorphous transformation. The new modification of thorium oxalate cannot be converted into thorium dioxide that is soluble in acids. To convert this thorium oxalate into active thorium meta-oxide, it is best to treat it with caustic. A procedure for this conversion has been developed by the authors. A method for the preparation of octahydrate of thorium chloride by a procedure which differs from that described in the literature has also been developed. The possibility of preparing thorium sulfate from thorium hydroxide without first converting the hydroxide into the nitrate was investigated. A procedure by which thorium sulfate can be prepared in this manner with a good yield has been developed. This procedure is described.

14. Burn-Up of Natural Uranium in Homogeneous Reactor

"The Burn-Up of Natural Uranium in a Homogeneous Reactor," by V. Bartosek, Institute of Nuclear Research at Prague; Moscow, Atomnaya Energiya, Vol 7, No 6, Dec 59, pp 524-530

One of the principal advantages of homogeneous reactors as compared with heterogeneous reactors is elimination of the problem of stability of fuel elements. For this reason, the permissible degree of burn-up of uranium and consequently also the economic indexes can be increased to a significant extent when homogeneous reactors are used. The article develops a method for the calculation of the magnitude of

burn-up of uranium depending on the initial parameters of the system. The conditions are given which determine the probability of the capture of neutrons in U 238 when the reactor is operated with a degree of moderation at which the maximum degree of burn-up is achieved and the fuel is regenerated (i.e., new fuel is bred).

15. Behavior of Reactor Construction Materials Regarding Stability to Action of Lithium Used as Heat Transfer Agent

"Determination of the Solubility of Metals in Lithium," by Yu. F. Bychkov, A. N. Rozanov, and V. B. Yakovleva; Moscow, Atomnaya Energiya, Vol 7, No 6, Dec 59, pp 531-536

To evaluate the stability of metals toward lithium and to clarify the mechanism of the corrosion of these metals, the solubility of uranium, zirconium, iron, nickel, titanium, molybdenum, niobium, and beryllium in lithium at temperatures of 700-1,000° C was determined. It was established that nickel and beryllium have the greatest solubility (of the order of 0.1%), that iron, zirconium, titanium, and uranium have a low solubility (from thousandths to hundredths parts of 1%), and that niobium and molybdenum have a very low solubility (less than 10^{-4}%). Crucibles made of the metal being investigated were filled with lithium distilled into them in a special apparatus. The crucibles filled with lithium were placed in special containers made of stainless steel. The containers were sealed hermetically in an argon atmosphere. The solubility in lithium of the metal at any temperature was determined by the chemical analysis of rapidly cooled lithium alloys after the container had been kept for 50-100 hours at the temperature in question.

It was established that there is isothermal transfer of aluminum, beryllium, zirconium, and silicon by lithium onto steel and iron. Under conditions existing when this transfer took place, the maximum solubility of the metal in lithium was reached at a considerably slower rate than in the absence of transfer. Lithium can be purified by employing "getters," i.e., uranium and zirconium, which dissolve in lithium to only a small extent.

Because the thermophysical properties of lithium are superior to those of other metal coolants, it is of great importance to find materials which are stable to the action of lithium at elevated temperatures.

16. Separation of Lithium Isotopes by Ion Exchange

"The Single-Stage Enrichment Factor in the Separation of Lithium Isotopes By Ion Exchange," by G. M. Panchenkov, Ye. M. Kuznetsova, and O. N. Kaznadzey; Moscow, Atomnaya Energiya, Vol 7, No 6, Dec 59, pp 556-557

In the work described the single-stage enrichment factor in the separation of lithium isotopes on a USSR cation-exchange agent (sulfonated coal in its hydrogen form) was determined. The effects on this factor of the anion of the lithium compound in solution and of the concentration of this solution were investigated. The separation was carried out on solutions of the carbonate, benzoate, chloride, and hydroxide of lithium. In all cases there was enrichment of the light lithium isotope (Li^6) in solution, with the exception of experiments on lithium chloride. The degree of enrichment was highest when lithium hydroxide was used (the enrichment factor amounted to 1.009 for a 0.1 N solution and to 1.021 for a 5 N solution). When alumosilicates were used as ion exchangers, the degree of enrichment was approximately the same as on sulfonated coal. The effect of the coefficient of ion activity (and of conditions which change this activity) on the single-s .ge enrichment factor is considered.

17. Method for Colorimetric Determination of Zirconium in Ores Containing Phosphates

"Colorimetric Determination of Zirconium in Ores Containing Phosphates," by L. I. Kononenko and N. S. Poluektov, Institute of General and Inorganic Chemistry, Academy of Sciences Ukrainian SSR; Moscow, Zavodskaya Laboratoriya, Vol 25, No 9, Sep 59, pp 1051-1053

A colorimetric method has been developed for the analysis of zirconium ores which contain phosphates. The zirconium is first separated in the form of its phosphate. The phosphate is filtered off. To convert zirconium into the hydroxide, the phosphate is dissolved in oxalic acid. Precipitation with sodium hydroxide follows. The precipitate of zirconium hydroxide is dissolved in hydrochloric acid and a colorimetric determination is carried out by using arsenazo or alizarin red as a reagent. The completeness of the separation of zirconium was checked by using Hf^{181} as a radioactive tracer. It was established that zirconium is separated to the extent of 95-98%. When this analytical method is used, niobium is separated from zirconium completely, but a part of the tantalum gets into the final solution. The method makes it possible to determine a content of $Zr\,O_2$ in the sample ranging from hundredth parts of 1% to 2%.

18. Developments in Fields of Nuclear Energy in Poland and Exhibits Illustrating These Developments at Polish Industrial Exhibition in Moscow

"The Division of Nuclear Energy at the Polish Industrial Exhibition in Moscow," by Yu. Koryakin; Moscow, Atomnaya Energiya, Vol 7, No 6, Dec 59, pp 567-569

At the Polish Industrial Exhibition held in Moscow in September 1959, the achievements of Poland in the field of nuclear energy were represented extensively. The atomic energy exhibits consisted of three subdivisions, that of scientific work conducted at the Institutes of Nuclear Research in Warsaw and Cracow, that of radiochemical equipment, and that of electronic devices and equipment for measurements.

In the first subdivision, exhibits illustrating the following research at the institutes were shown:

(1) Research in nuclear physics, the physics of elementary particles, and high energy physics (cosmic ray physics). Research in these fields is conducted with the aid of a USSR cyclotron having an energy of α-particles amounting to 25 Mev (this cyclotron is installed at the Cracow Institute). At the Warsaw Institute, a linear proton accelerator with an energy of 10 Mev is being constructed (it is possible to increase the energy of this accelerator) and also an accelerator with an energy of 4 Mev. The construction of these accelerators will be completed in 1-2 years.

(2) Design and construction of electron devices. The Division of Electronics of the Warsaw Institute of Nuclear Research supplies electronic equipment to the laboratories of this institute. Several devices have been constructed there for the Joint Institute of Nuclear Research at Dubna.

(3) Chemical research. Research in this field is conducted with the aim of developing technological methods for the production of reactor materials. Deposits of uranium are available in Poland. Specialists in that country study problems pertaining to the utilization of these deposits. At the Warsaw Institute of Nuclear Research, a pilot plant installation for the treatment of uranium ores found in Poland has been constructed.

(4) Research in the field of analytical chemistry. Work in this field is concerned with the determination of traces of impurities in reactor materials.

(5) Research in the field of radiation chemistry and the chemistry and practical applications of isotopes. Technological processes are being developed involving the use of isotopes in extraction and absorption

processes. Polish scientists are of the opinion that it is best to utilize nuclear energy in Poland by applying nuclear radiation in polymerization processes, for the treatment of foodstuffs, and for other similar purposes.

(6) Investigations in the fields of radiobiology and protection from radiation. Problems are being studied which are related to the action of radiation on organisms and methods are being developed for the production of the most effective protective materials. Research in this field will comprise determination of radioactive fallout over the territory of Poland.

(7) Production of isotopes. After the first research reactor of a swimming-pool type with a capacity of 2,000 kilowatts had been started (the USSR assisted in the construction of this reactor), production of isotopes was begun in Poland. These isotopes (e.g., I^{131}, S^{35}, p^{32}, Co^{60}, Tu^{169}, and Ir^{191}) are being produced at this stage in only small quantities and only for domestic use. A laboratory for the production of isotopes is being built.

In the second and third subdivisions of the exhibition, numerous devices, instruments, and other types of equipment are shown that are used in research in the field of nuclear energy. The majority of the models shown are not merely experimental prototypes: the equipment in question is being produced on a continuous ["series"] basis and exported to the GDR, Czechoslovakia, and Yugoslavia. Poland offers the equipment in question to all countries desirous of purchasing it.

In the subdivision of radiochemical equipment different types of containers and hot laboratory equipment are shown.

In the subdivision of electronic and measurement devices, equipment is shown for measuring the intensity of radiation emitted by sources or samples of radioactive materials. Dosimeters, radiation sources for instruments, computers (of the decade type and having a resolution time from 1.40 to 50 microseconds), and a wide-band amplifier are also exhibited. Of interest are two reliably operating installations, one for the automatic control of liquid level and another for indication of the level of liquids. Both installations are in use at a chemical plant in the town of Kedezyn.

Personnel for the rapidly growing nuclear industry of Poland is being trained in special departments of a number of Polish higher educational institutions.

Reflecting Polish progress in the field of nuclear energy, the Polish periodical Nukleonika (Nucleonics) published many original papers and reviews by Polish scientists. Furthermore, the Biuletyn

Polskiej Akademji Nauk (Bulletin of the Polish Academy of Sciences) publishes a considerable number of articles on nuclear energy. Special monographs and a great number of popular publications in this field are also being issued.

19. Czechoslovak Research on Liquid Metal Reactor Coolants

"Research on Liquid Metals at the Institute of Nuclear Research from 1956 to 1958," by Miroslav Pasek; Prague, Jaderna Energie, No 11, Nov 59, pp 373-377

The article describes research in the field of liquid metal heat transfer agents conducted from 1956 to 1958 at the Institute of Nuclear Research of the Czechoslovak Academy of Sciences in Prague. The article states that in 1956, the institute began a program of studies and experiments designed to investigate the basic problems involved in the use of liquid metal coolants for fast neutron reactors, including questions of safe application of liquid metals in cooling systems, pumping and circulation, electromagnetic flow measurements, problems of heat exchange, and viscosity measurements.

The article is illustrated with diagrams, charts, and photographs of equipment. It mentions that following experimental work with mercury, research work at the institute concentrated on the utilization of sodium beginning with 1957.

The text of the article implies that although two western sources and one Soviet source were used for background information, the institute designed, built, and developed its own experimental equipment.

Organic Chemistry

20. Investigation by Infrared Spectroscopy of Structure of Products Obtained by Telomerization of Diene Hydrocarbons With Halides

"Infrared Spectra and the Structure of Products Obtained by the Telomerization of Dienic Hydrocarbons With Halides," by A. A. Petrov and T. V. Yakovleva; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 23, No 10, Oct 59, pp 1217-1218

It was established that dienic hydrocarbons readily interact with halogen derivatives, particularly those of the allyl type, in the presence of chlorides of Sn, Ti, Zn, Fe, and other metals, forming mixtures of "telomers" having the composition $R-(C_n-H_{2n-2})_x-Cl$. By employing this

method of synthesis, one can produce from isoprene and the products of the reaction of isoprene with hydrogen chloride a mixture of substances containing a considerable quantity of geranyl chloride, which is an important intermediate in the production of citral for the vitamin and essential oils industries. It is intended to use this synthesis for the production of citral on a large scale in the USSR. Infrared spectroscopy was used to determine the structure of products obtained in syntheses of this type and to establish the content of geranyl chloride in the products. The results of the investigation conducted are described.

[SIR Note: This paper was presented at the 12th All-Union Conference on Spectroscopy, Moscow, 19-26 November 1958.]

21. Condensation of Several Unsaturated Compounds With Hexachlorocyclopentadiene Described

"From the Field of Organic Insectofungicides. XLIX. The Condensation of Several Unsaturated Compounds With Hexachlorocyclopentadiene," by N. A. Belikova, L. G. Vol'fson, K. V. Kuznetsova, N. N. Meknikov, and A. F. Plate, Scientific Institute for Fertilizers and Insectofungicides and the Institute of Organic Chemistry of the Academy of Sciences USSR; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 11, Nov 59, pp 3589-3593

In the search for new effective insecticides in recent years, considerable attention has been given to the study of the reaction of polyhalocyclopentadiens with different olefins and cycloolefins. A number of insecticides and substances suitable for the production of high-molecular compounds have been found in the course of these investigations.

Starting on the basis of results obtained earlier, the authors investigated condensation of hexachlorocyclopentadiene with 1-vinylcyclohexene-3, tetahydroindene, 2-vinylbicyclo-(2,2,1)-heptene-5, 2-vinyl-1, 4-endomethylene-1,2,3,4,5,5a,8,8a-octahydronaphthalene, (2,3-cyclopenteno)-1,4-endomethylene-1,2,3,-4,5,5a,8,8a-octahydronaphthalene and 1,4,5,8-diendomethylene-1,4,4a,5,8,8a-hexahydronaphthalene. The reaction occurs after long heating (30 hours) at 100-130° C. Eight new compounds and their properties are listed in a table.

The authors state that the new compounds did not possess insecticidal activity.

22. Synthesis of Some Aromatic Esters of Halophenoxyacetic Acids Possessing Fungicidal Activity

"From the Field of Organic Insectofungicides. XLVIII. Synthesis of Some Aromatic Esters of Halophenoxyacetic Acids," by N. N. Mel'nikov and I. L. Vladimirova, Scientific Institute for Fertilizers and Insectofungicides; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 11, Nov 59, pp 3587-3589

Halophenoxyacetic acids are known to be fungicides as well as herbicides. Several aryloxyacetylhydroxylamines also possess considerable fungicidal activity. On this basis the authors have undertaken the study of the fungicidal activity of aromatic esters of 2,4-dichlorophenoxy- and 2,4,5-trichlorophenoxyacetic acids which are the most active and readily available herbicides. They synthesized a number of previously unknown esters of 2,4-dichlorophenoxy-, 2,4,5-trichlorophenoxy- and pentachlorophenoxyacetic acids with different phenols.

The synthesis was accomplished by reacting the corresponding acid chlorides with alkali phenolates in aqueous solution. The 13 new compounds and their properties are listed in a table. Among the compounds studied, the most active fungicide appeared to the pentachlorophenyl ester of 2,4,5-trichlorophenoxyacetic acid, which approached the organomercury compounds in effectiveness. The rest of the esters had a comparatively low activity.

23. Quaternary Phosphonium Compounds Possessing High Bacteriostatic Activity Synthesized

"Concerning the Reactions of Phenol Ethers With Phosphorus Trichloride," by I. S. Protopopov and M. Ya. Kraft, All-Union Scientific Research Chemicopharmaceutical Institute imeni S. Ordzhonikidze; Moscow, Meditsinskaya Promyshlennost' SSSR, No 12, Dec 59, pp 5-10

Ethers of phenols react with phosphorus trichloride to form either aryldichlorophosphines or the corresponding tertiary phosphines. The direction of the reaction to a great degree depends on the nature of the phenol ether. Thus, the trimethyl ether of the trifunctional phenol phloroglucinol yields only the tertiary phosphine, whereas the ether of the difunctional phenol resorcinol, depending on the reaction conditions, can yield either tertiary phosphine or the aryldichlorophosphine. The monofunctional phenol ethers (anisole, phenetole, etc.) react to form only aryldichlorophosphines.

In a number of cases the studied reaction gave good yields both of tertiary phosphines and aryldichlorophosphines, so that the methods in question can be recommended for the preparation of tri-(2,4,6,-trimethoxyphenyl) phosphine (yield, 80%) and 2,4,-dimethoxyphenyl-dichlorophosphine (yield, 86%).

The authors found that aryloxychlorophosphines can be very easily prepared with high yields by the action of sulfuryl chloride on aryldichlorophosphines. This method can be especially recommended for the preparation 2,4-dimethoxyphenyloxychlorophosphine and analogous compounds.

As a result of this research a number of quaternary phosphonium compounds was obtained which possess high bacteriostatic activity in vitro against Mycobacteria, Actinomyces and fungi, and which also arrested the growth of influenza ["grippe"] virus in vitro and in tests on chick embryos. The tests were performed by N. S. Bogdanova, S. N. Milovanova, and A. L. Mikerina.

Physical constants of the obtained products are listed in six tables.

24. New Improved Method of Separating Lagochyline

"On the Question of Separating Lagochyline," by M. M. Abramov, Nauchn. Tr. Samarkandsk. In-t Sov. Torgovli (Scientific Works of the Samarkand Institute of Soviet Trade), 1957, 8, 247-250 (from Referativnyy Zhurnal -- Khimiya, No 21, 10 Nov 59, Abstract No 75776 by A. Vavilova)

"A method was developed for separating lagochyline, a strongly acting styptic agent, by extraction of the air-dried leaves and stalks of the plant Lagochilus inebrians Bge with hot dichlorethane for 3 hours. After this the extract is filtered and cooled. The precipitated crystals of lagochyline are additionally washed with cold dichloroethane for removal of impurities and the product obtained is recrystallized from hot water or solvent. The proposed method is simpler than the one used earlier and results in a higher yield of lagochyline -- 3% (in relation to the weight of the dried plant) instead of 0.5% obtainable by the known acid method."

25. Esters of Phosphorous Acid Prepared From Alkylphenols

"Preparation of Esters of Phosphorous Acid from Alkylphenols," by Ye. M. Kuliyev and K. G. Veliyev, Sb. tr. Azerb. N.-I. In-t po pererabotke nefti (Collection of Works of the Azerbaydzhan Scientific Research Institute for the Conversion of Petroleum), 1958, Issue 3, pp 249-255 (from Referativnyy Zhurnal -- Khimiya, No 21, 10 Nov 59, Abstract No 74998 by S. Guseyn-Zade)

"Compounds of the composition $(n\text{-}RC_6H_4O)_3P$ (I) were synthesized by reacting solutions of $n\text{-}RC_6H_4OH$ with PCl_3 in C_6H_6 at 75-80° C; after the liberation of HCl ceased, benzene and the surplus of PCl_3 were removed and I were distilled. Below are listed the radicals represented by R in I, the yield in %, boiling point in °C/mm, $n^{20}D$, d_4^{20}: C_4H_9, 85, 250-260/10, 1.5469, 1.0570; $n\text{-}C_5H_{11}$, 82, 280-285/10, 1.5415, 1.0388; $n\text{-}C_7H_{15}$, 74.6, 280-290/2, 1.5266, 0.9950. Analogously by the action of $(2\text{-}NaO\text{-}5\text{-}RC_6H_3S)_2$ with PCl_3 the corresponding phosphites were synthesized. Listed are the R and the yields in %: $n\text{-}C_4H_9$, 94.8; $n\text{-}C_5H_{11}$, 97.2; C_7H_{15}, 97."

26. Alkylenebis (dialkyldithiophosphates) Reported to Be Weak Insecticides

"From the Field of Organic Insectofungicides. XL. Synthesis of Several Mixed Esters of Dithiophosphoric Acid," by K. D. Shvetsova-Shilovskaya, N.N. Mel'nikov, and V.A. Glushenkov, Scientific Institute for Fertilizers and Insectofungicides; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 11, Nov 59, pp 3593-94

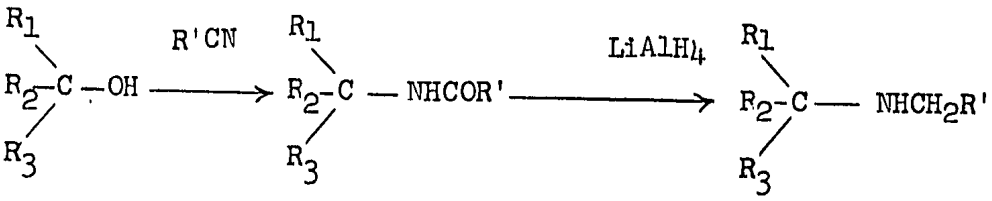
A number of alkylenebis(dialkyldithiophosphates) with the general formula $(ROPSS)_2(CH_2)_n$, where n = 1-4, were synthesized by reacting the salts of dialkyldithiophosphoric acid with the corresponding halo-derivatives of hydrocarbons (dihaloalkanes). Twelve compounds were prepared and characterized, their properties being listed in a table. With the exception of methylenebis(diethyldithiophosphate), none of them had previously been reported.

The insecticidal properties of the newly synthesized compounds were studied by P. V. Popov and N. S. Ukrainets, who found that a majority of the compounds had a relatively weak activity as insecticides.

27. Research on Gangliolytic Substances Reported

"Amines With Gangliolytic Activity. II. Aliphatic Amines With Tertiary Radicals," by N. K. Kochetkov, A. Ya. Khorlin, L. A. Vorotnikova, and K. I. Lopatina, Institute of Pharmacology and Chemotherapy of the Academy of Medical Sciences USSR; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 11, Nov 59, pp 3616-3619

A new class of active gangliolytic substances was synthesized by condensing tertiary alcohols with acetonitrile and hydrocyanic acid with subsequent reduction of the obtained amides with lithium-aluminum hydride. This synthesis can be represented by the scheme:



(I) (II) (III)

All of the secondary amines (III) were subjected to pharmacological tests (conducted by D. A. Kharkevich) and showed considerable ganglion-blocking activity: in doses of 2-4 mg/kg they caused blocking of ganglia from 30 minutes to 2.5 hours. The most effective substance appeared to be ethyl-(3-ethylpentyl-3)-amine [(III), $R_1 = R_2 = R_3 = R' = C_2H_5$] which approached hexonium in activity and had approximately the same toxicity.

28. Physiological Activity Exhibited by Esters of Isomeric Fluorochloroethanephosphinic Acids

"Complete Esters of Isomeric Fluorochloroethanephosphinic Acids," by Yu. M. Zinov'yev, T. G. Spiridonova, and L.Z. Soborovskiy; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 11, Nov 59, pp 3594-3597

The article describes the synthesis and properties of esters obtained from isomeric acid chlorides of fluorochloroethanephosphinic acid, $C_2H_3FClP(O)Cl_2$.

The methyl, ethyl, and isobutyl esters of isomeric flurochloroethanephosphinic acids and the ethyl esters of 2-fluoroethenephosphinic and 1-fluoro-2-chloroethanephosphinic acids were synthesized. Their physical constants are presented in a table.

The dehydrochlorination of the synthesized alkyl esters of fluorochloroethanephosphinic acids with triethylamine was studied.

The synthesized esters were tested for insecticidal activity. Several of them exhibited physiological activity. The authors urge others to be cautious when handling them or similar compounds.

29. Improvement of Heat Stability of Polyethylene Insulation by Exposure to Ionizing Radiation

"Augmentation of the Heat Stability of Polyethylene Insulation of Conductors by Irradiation With Ionizing Radiation," by V. I. Karpov, Yu. M. Malinskiy, L. V. Mitrofanova, S. T. Sinitsyn, E.E. Finkel', A. S. Fridman, and S. M. Cherntsov; Moscow, Khimicheskaya Promyshlennost', No 6, Sep 59, pp 468-474

It was established that irradiation of polyethylene insulation with gamma rays emitted by Co^{60} or with fast electrons makes it possible to increase the maximum temperature at which the insulated conductors are used. Optimum mechanical characteristics of the insulation were obtained when doses of gamma radiation amounting to 100-150 megarads were applied in vacuum or electron radiation was applied in air for 2-4 minutes at a potential of 1 megavolt or for 8 minutes at a potential of 0.6 megavolt and a current density of ~ 15 microamperes per centimeter square. Insulated conductors that have been irradiated with the optimum dose can be used for several hours at temperatures reaching 230-250°, several tens of hours at 130°, and several hundreds of hours at 110°C. Irradiation of insulated conductors makes them more reliable in application at ordinary temperatures. Use of appropriate stabilizers may increase considerably the length of time during which irradiated polyethylene insulation can be used and may also make it possible to increase the maximum temperature to which it is exposed. The stability of the irradiated insulation at low temperatures did not pass the minus 65° point and was not inferior to that of polyethylene that had not been irradiated.

30. Production of Semiconductors by Irradiation of Polymers

"Radiation Chemistry" (unsigned article); Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Vol 4, No 153 (608), 30 Dec 59, p 4

During an interview by a member of the staff of Promyshlenno-Ekonomicheskaya Gazeta, I. S. Polak, Doctor of Physicomathematical Sciences, Head of the Laboratory of Radiation-Chemical Processes, Institute of Petrochemical Synthesis, Academy of Sciences USSR, gave the following information.

One of the first institutions to begin work in the field of radiation chemistry was the Institute of Petrochemical Synthesis, Academy of Sciences USSR. This institute is directed by Academician A. V. Topchiyev.

Work in radiation chemistry has not yet passed the stage of laboratory experiments. However, some of the results which were obtained are of definite practical interest.

The petrochemical processes applied in the industry at present made it possible to produce only the initial materials for subsequent synthesis. It is possible that by applying radiation chemistry, petroleum will be converted directly into synthetic products, such as plastics, drugs, alcohols, synthetic rubber, etc., with the elimination of the many intermediate stages which are necessary at present. The possibility exists that many new polymers not known at present will be synthesized from petroleum by the application of radiation chemistry. Furthermore, application of radiation chemistry will enable one to produce in a controlled manner materials with predetermined properties.

Certain things have already been accomplished along this line. For instance, it was held hitherto that polymers are insulators and that they have nothing in common with semiconductors. Investigations carried out at the Institute of Petrochemical Synthesis under the direction of Academicians A. V. Topchiyev and V. A. Kargin and also of L. S. Polak have shown that this assumption is incorrect. Under the action of high-intensity radiation, some polymers acquire the properties of semiconductors after they have been subjected to supplementary thermal treatment. One of the substances which develops these properties is polyacrylonitrile, a material from which the artificial fibers orlon, vinon, and nitron (a wool substitute) are made. This is only the first step in the development of a new field of chemistry, that of the synthesis of polymer semiconductors. The prospects of developing this field of chemistry are quite real at present. It will be possible to synthesize semiconductors from petroleum gas. Scientists in many countries have investigated for a long time the problem of accomplishing a controlled synthesis of polymer semiconductors which would replace natural semiconductors such as germanium, silicon, and selenium. However, all attempts to synthesize such semiconductors have been unsuccessful.

At the Laboratory of Radiation-Chemical Processes, a small sample of white material was shown to the correspondent of the newspaper. This was a sample of a polymer semiconductor. It is assumed that a semiconductor of this type will have more constant characteristics than germanium, for instance. It can be shaped more easily than germanium and can be applied in a more convenient manner. The first technical test of the new semiconductor material will be conducted by using it in thermocouples ["thermoelements"] for an infrared spectrometer.

The Laboratory of Radiation-Chemical Processes is the most recently organized unit at the Institute of Petrochemical Synthesis; it was opened only several weeks ago. In addition to research on semiconductor polymers, work on radiation-thermal cracking is being conducted at this

laboratory. Ordinary petrochemical cracking is carried out at high temperatures and catalysts must often be applied in the cracking process. Radiation-thermal cracking can be carried out at a temperature that is much lower. This in itself is of great advantage. Another advantage of radiation-thermal cracking is that the yield of products at the same temperature is 4-5 times higher than that obtained by ordinary cracking. No catalysts are required. The products obtained constitute excellent raw material from petrochemical synthesis. The high velocity of conversion by the action of radiation makes the new method very promising. A complicated problem, that of developing an efficient method for the separation of products obtained as a result of radiation-thermal cracking, remains to be solved. It is certain that such a method will be found, and that a raw material which can be separated more perfectly than that obtained by other types of cracking will be made available to the chemical industry.

Radiochemistry

31. Investigation of Radiolysis of Alkanes by Methods of Ultraviolet and Infrared Spectroscopy

"Investigation of the Radiolysis of Alkanes by Means of Ultraviolet and Infrared Spectroscopy," by I. Ya. Kachkurova, L. S. Polak, A. V. Topchiyev, and N. Ya. Chernyak, Institute Of Petrochemical Synthesis of the Academy of Sciences USSR and Institute of Electron Optics and Spectroscopy (INEOS), Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 23, No 10 Oct 59, pp 1253-1255

The radiolysis of normal alkanes (e. g., heptane and cetane) was investigated. Samples of the hydrocarbons were irradiated with γ-rays emitted by Co^{60}. During the irradiation, the hydrocarbons were kept in evacuated, oxygen-free, and sealed glass tubes. Ultraviolet and infrared absorption spectra of the hydrocarbons irradiated were taken. It was established that the number of double bonds that are formed is directly proportional to the dose of radiation. There was hardly any difference between the spectrum of cetane irradiated at 0° and cetane irradiated at 24°. Lowering the temperature of irradiation to minus 80° resulted in a much greater increase of absorption by dienes as compared with absorption by polyenes. There was very little change in the ultraviolet spectrum when the temperature at which cetane had been irradiated was lowered from minus 80° to minus 200°. This is due to the fact, demonstrated in experiments with a number of hydrocarbons, that lowering the temperature by 60-70° below the melting point of a hydrocarbon (the solidification point of cetane is 16°) is sufficient to increase the probability of the rearrangement of a molecule excited by irradiation, with the result that

formation of dienes becomes considerably greater, to such an extent that it outweighs the probability of dissipation of the energy of excitation. For this reason, further lowering of the temperature to minus 200° does not produce any additional effect that can be observed.

[SIR note: This paper was presented at the 12th All-Union Conference on Spectroscopy, Moscow, 19-26 November 1958.]

32. Identification of Antimony Isotopes and Isolation of New Antimony Isotopes

"The New Isotopes Sb^{112} and Sb^{114} and Identification of Sb^{113} and Sb^{115}," by I.P. Selinov, Yu. A. Grits, Yu. P. Kushakevich, Yu. A. Bliodze, S. S. Vasil'yev, and T. N. Mikhaleva; Moscow, Atomnaya Energiya, Vol 7, No 6, Dec 59, pp 547-549

To identify the antimony isotopes with times of activity amounting to 7 and 31 minutes and to isolate new antimony isotopes, the activities were investigated which resulted when irradiation of sufficiently thin targets enriched with tin isotopes having the mass numbers 112 and 114-118 was carried out. Irradiation was carried out by protons accelerated on the 120-centimeter phasotron [synchro-cyclotron] of the Scientific Research Institute of Nuclear Physics, Moscow State University. It was established that the 7-minute activity is that of Sb^{113} and the 31-minute activity that of Sb^{115}. These isotopes are produced by the reactions Sn^{114} (p, 2n) Sb^{113} and Sn^{116} (p, 2n) Sb^{115}. Two new isotopes, Sb^{112} with a half-life of 0.9 ± 0.1 minutes and Sb^{114} with a half-life of 3.3 ± 0.3 minutes, were isolated. These isotopes were formed by the reactions Sn^{112} (p, n) Sb^{112} and Sn^{114} (p, n) Sb^{114}. The chemical isolation of the antimony isotopes was carried out by a method described in an earlier publication by the authors (Atomnaya Energiya, Vol 5, No 6, 1958, p 660). The β- and γ- radiations emitted by the newly discovered isotopes were investigated and compared with the radiation emitted by antimony isotopes which are already known.

33. Isotope Demonstration and Showroom in Moscow

"A Unique Commercial Enterprise," by Yu. Koryakin; Moscow, Atomnaya Energiya, Vol 7, No 6, Dec 59, pp 569-570

To demonstrate and advertise applications of isotopes, the special store and showroom "Isotopy" [Isotopes] has been opened in Moscow. Periodic exhibitions and lectures will be held there to enable scientific research organizations to demonstrate new results achieved by them. Technically qualified consultants and demonstrators will answer inquiries by visitors and literature will be distributed.

The combined store and showroom consists of five subdivisions: (1) Division of Radioactive Isotopes and Tracer Compounds; (2) Division of Radiation Sources; (3) Division of Equipment for the Irradiation of Parts and Materials; (4) Division of Stable Isotopes; and (5) Division of Protective Procedures. The last-mentioned division contains subdivisions of distant manipulation and of special clothing.

Isotopes and tagged compounds (B^{10}, Ne^{20}, Ne^{22}, $C^{13}H_4$, $B^{10}F_3$, D_2O, etc.) and also equipment will be sold to organizations only on the basis of special preliminary orders and only after presentation of certificates issued by the State Sanitary Inspection which give permission to the organization in question to conduct work with isotopes and tagged compounds. Because the USSR exports isotopes to many countries, foreign organizations will be given facilities to acquire the necessary isotopes and equipment.

[SIR Note: An inscription on the electric sign shown on the accompanying illustration, which gives a partial view of the building housing the combined store and showroom, indicates that the sales organization is run by the Soyuzreaktiv (Union Reagent) Trust.]

34. Review of Book on Automatic Controllers Utilizing Radioactive Isotopes

"Osnovy Teorii Ustroystv Avtomaticheskogo Kontrolya s Ispol'zovanieym Radioaktivnykh Isotopov (Principles of the Theory of Automatic Control Appliances Using Radioactive Isotopes), by N. N. Shumilovskiy and L. V. Mel'tser, Publishing House of the Academy of Sciences USSR, Moscow, 1959, 144 pp, reviewed by L. P.; Moscow, Atomnaya Energiya, Vol 7, No 5, Nov 59, p 500

This book represents the first attempt to summarize results obtained by different scientific research organizations as far as the development of devices is concerned the operation of which is based on the use of radioactive isotopes and nuclear radiation and which are applied for the control and automation of industrial production processes. The book consists of an introduction and ten chapters. Eight chapters of

the book are concerned with problems of the theory of measuring thickness (density), devices of the relay type, methods of measuring the level of liquids and the rate of discharge of liquids and gasses indication and control of gas pressures, and control of the composition of materials.

The book would be of greater value if it indicated what ranges of the thickness of materials, density, concentration, etc. can be measured by means of radiation emitted by radioactive substances, and listed coefficients of absorption for various types of radiation in different substances, etc.

Individual subdivisions, as for instance that automatic spectroscopy, does not cover completely work done in the field in question. Thus, the results obtained by I. Fakidov at the Ural Affiliate of the Academy of Sciences USSR in the field of automation of γ-defectoscopy with the application of scintillation counters are not mentioned, although the methods in question are of considerable interest. Nevertheless, the book is of value, because it summarizes for the first time experience acquired in 10 years of work on the development of the devices in question. An extensive bibliography is given in the book.

35. Zirconium Ion-Exchange Agents

"Ion-Exchange Agents Derived from Zirconium," by S. Ye. Bresler, Yu. D. Sinochkin, A. I. Yegorov, and D. A. Perumov; Leningrad, Radiokhimiya, Vol 1, No 5, Oct 59, pp 507-513

Zirconium salts have the property of forming three-dimensional gels. When these gels contain ion-exchange groups, the zirconium compounds are capable of acting as ion-exchangers. The ion-exchange properties of zirconyl phosphate were originally discovered in 1956 in work done in the US. Further work on this compound and its ion-exchange properties was published in 1958 in the US. There are brief communications describing similar characteristics exhibited by precipitates of zirconium molybdate and zirconium tungstate. In the work reported in this instance, inorganic ion-exchange agents derived from zirconium were prepared which contained the following ion-exchange groups: S^{2-}, $(COO)_2^{2-}$, CrO_4^{2-}, AsO_4^{3-}, and CO_3^{2-}. The general method of the preparation of inorganic absorbents derived from zirconium consists in carrying out a sufficiently rapid precipitation of a zirconium salt by an appropriate reagent at a definite pH. The precipitate is washed, pressed out on a filter, and dried at 60-70°. Experiments on the separation of Cu^{2+} from Ca^{2+} on zirconyl sulfide, of Sr^{2+} from Ca^{2+} on zirconyl chromate, of Co^{2+} from Ca^{2+} on zirconyl arsenate, of La^{3+} from Ca^{2+} on zirconyl oxalate, and of Ca^{2+} from Mg^{2+} on zirconyl carbonate were carried out. The results obtained indicate that some amorphous precipitates of zirconium compounds can be used as ion-exchange

agents for the separation of inorganic ions. The presence of selectively acting acidic groups makes it possible to achieve considerable enrichment by frontal adsorption procedures.

(This paper was presented at the All-Union Symposium on Radiochemistry held 3-5 March 1959 in Leningrad.)

36. Hungarian Isotope Laboratory Opened

"Veszprem Isotope Laboratory" (unsigned news item); Budapest, Magyar Nemzet, 23 Dec 59, p 5

Experts of the Atomic Energy Committee, the Ministry of Health, and the Labor Health Institute took over one of Hungary's most modern isotope laboratories at the Analytical Faculty of the Veszprem Chemical Industry University. The University staff has begun significant research work in the laboratory, which was equipped at a cost of more than one million forints. Cobalt-60 is the isotope used primarily.

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

37. Subterranean Sea in Altay

"Altay Subterranean Sea" (unsigned article); Moscow, Izvestiya, 5 Jan 60, p 1

A brief news article from Ust'-Kamenogorsk states that geologists have struck a large subterranean sea in the mountains of Altay. Water from this sea is interfering with mining operations. The first dredge is being assembled on the surface of this sea to draw off the thick layer of water and loose soil covering mineral deposits.

Components

38. Hungarians Urged to Use Foreign Help in Semiconductor-Research

"From the Life of the Hungarian Academy of Sciences" (unsigned); Budapest, Magyar Tudomany, Nov 59, p 595.

At its 24 September 1959 meeting, the Physics Committee of the Hungarian Academy of Sciences discussed the experiences of a trip made to the Experimental Physics Institute of the Szeged Science University. In the committee's opinion, the scientific program of the institute is well defined, and the work of the research groups is going well. The committee recommended that the group at the institute working with semiconductors solve some problems through cooperation with foreign institutes.

Instruments and Equipment

39. Energy Distribution of Electrons in Klystron

"Integral Energy Distribution of Electrons Beyond the Catcher of a Transit Klystron," by Ya. Ya. Akmentyn'sh, I. M. Bleyvas, and I. R. Gekker; Moscow, Radiotekhnika i Elektronika, No 12, Dec 59, pp 2047-2050

Determination of energy distribution of electrons in a klystron is important from the standpoint of proper evaluation of collector heating and biological protection from X-rays, as well as for increasing the efficiency of the klystron through retardation of electrons in the collector. The method for increasing the efficiency of VHF electron beam devices, which utilize multistage retardation of electrons in the collector, was first suggested in 1953 by S. A. Zusmanovskiy. For the above-indicated method, the collector should be made in the form of a series of electrodes having a uniformly changing potential with respect to the cathode, i.e., all the way to negative values. The desired distribution of electrons with various velocities between the electrodes in the collector can be realized with the aid of electric and magnetic fields or a combination of them. The indicated method permits, for an ideal case when an infinitely large number of retarding electrodes are present in the collector, an increase in the efficiency of electronbeam devices (klystrons, traveling-wave tubes, backward-wave tubes, etc.) to almost 100%.

The article gives a calculation method for determination of integral energy distribution of electrons beyond the catcher of a transit klystron with due consideration to the transit angle in the output gap.

40. Two-Input Functional Generators

"Design Method for a Two-Input Functional Generator," by V. B. Smolov; Moscow, Avtomatika i Telemekhanika, No 10, Oct 59, pp 1374-1380

The article examines one of the possible methods of functional generator construction which are suitable for simulating a series of specific functions with sufficient speed and reliability. These functional generators incorporate in their circuit standard components of digital computers which perform the switching of input and the feedback circuit of the operational amplifier. Such electronic functional generators with two inputs generally incorporate one operational amplifier and several standard units of modern digital computers, such as linear code converters, counters, or logic cells. The circuit of such a functional generator can be considerably simplified if one of the arguments is expressed in the form of voltage and the other by a numerical equivalent. This method permits combining the units of digital and analog computers without the aid of intermediate coding and decoding converters, thus considerably simplifying the system.

The described method is the only feasible way of simulating nonlinear, integral-differential relationships when one of the arguments is expressed by numerical equivalent.

41. Improving Performance of High-Voltage Pulse Generator

"On a High-Voltage Square Pulse Generator," by G. A. Martynov; Moscow, Pribory i Tekhnika Eksperimenta, No 5, Sep/Oct 59, pp 139-140

Certain changes in a high-voltage pulse generator circuit (originally described by V. A. Zamkov in Pribory i Tekhnika Eksperimenta, No 3, 1957) are recommended for improving operation and increasing the amplitude of the output pulse. Two TG12-325/16 thyratrons are used, and a special compensation tube 6P3C has been added to protect the thyratron from premature firing.

A circuit diagram is given for a generator having an output pulse amplitude of 6.0 kv for a high-voltage source of 12 kv.

42. Simple A-C Circuit for Taking Saturation Characteristics

"Measurement of Transistor Characteristics in the Saturation Region," by G. N. Berestovskiy, Physics Faculty of Moscow State University; Moscow, Pribory i Tekhnika Eksperimenta, No 5, Sep/Oct 59, p 141-142

Certain minor changes are suggested in the circuit of a cathode-ray curve tracer to facilitate measurement of transitor characteristics in the saturation region (U_c, $U_e = f(i_e)$, $i_c = \text{const}$, etc.).

43. Transistorized Circuit for Current Stabilization

"An Effective Method for Stabilizing Filament Current," by A. N. Tkachenko, Leningrad Electrical Measuring Instrument Plant "Vibrator"; Moscow, Pribory i Tekhnika Eksperimenta, No 5, Sep/Oct 59, p 145

The principal circuit and characteristics of a stabilizer for filament current are described. Main components of the circuit are a power germanium diode (D302) and a semiconductor triode (P4U). The triode has a current amplification factor with grounded emitter of $\beta \cong 20$, and for a base current of 10-40 ma, stabilization of current up to 1 a is possible. The voltage stabilization factor is 15-30.

Tests of the circuit showed a load current drift after 30 minutes of heating of not more than 0.2% per hour.

44. New Two-Gun Oscillograph

"Two-Gun Cathode Oscillograph 2KM With Mechanical Scanning" (unsigned article); Moscow, Pribory i Tekhnika Eksperimenta, No 5, Sep/Oct 59, p 146

A portable two-gun oscillograph 2KM with mechanical scanning has been developed by the laboratory of high-voltage measurements of the high voltage branch of the All-Union Electrical Engineering Institute imeni V. I. Lenin.

The oscillograph is designed for photographic recording of noncyclic or steady-state processes in various electrical systems and may be used for the measurement of nonelectrical values. Two single-beam 13L037A tubes make possible the simultaneous recording of two separate processes.

Sensitivity of the oscillograph tubes to dc current signals is 0.35-0.54 mm/v; frequency of calibrated time markers is 1,000 cycles; supply voltage is 220v at 50 cycles; and power consumption is 200 w.

45. Test Instrument for Standard Signal Generators

"Type UGSS-3 Device for Checking Output Voltage (Power) of Standard Signal Generators in a Frequency Band of 16-1000 Mc" (unsigned article); Moscow, Pribory i Tekhnika Eksperimenta, No 5, Sep/Oct 59, p 146

A device for checking and calibrating standard signal generators and self-contained attenuators has been developed in the All-Union Scientific Research Metrology Institute imeni D. I. Mendeleyev.

Voltage reference values of signal generators for frequencies up to 300 Mc are measured with a standard compensation diode voltmeter OKV-2, and for frequencies up to 1000 Mc, an improved type IMM-6 bridge is used. The OKV-2 voltmeter measures reference voltages greater than 25 mv in a frequency band of 30 cycles to 30 Mc. A test receiver, IP-2, is capable of measuring attenuation up to 80 db below a level of 0.1 v in a frequency range of 16-800 Mc and up to 70 db in a range of 800-1000 Mc.

46. Versatile Pulse Generator Developed

"U-195 Generator for Special Pulse Shapes" (unsigned article); Moscow, Pribory i Tekhnika Eksperimenta, No 5, Sep/Oct 59, p 147

A pulse generator, U-195, has been designed as a source of periodically recurring video pulses having a square, sawtooth, or second or third degree paraboloid shape for positive as well as negative polarity.

The generator has a pulse repetition rate of 0.1-100 cycles with an error of ± 10%. Sinusoidal voltage frequency is 30-3000 cycles, and pulse duration is 1-1000 msec ± 10%. Output impedance is 500 ohms, and power requirement is 100 va.

47. Multichannel Commutator for Oscillographs

"Five-Channel Commutator MK-5 for Electron Oscillographs" (unsigned article); Moscow, Pribory i Tekhnika Eksperimenta, No 5, Sep/Oct 59, p 148

A five-channel commutator, MK-5, designed for the simultaneous observation of five electrical processes on the screen of a single-beam electron oscillograph, has been developed in the instrument-building laboratory of the Institute of Electromechanics of the Academy of Sciences USSR.

The commutator has five input amplifiers, a ring-type switching device, a shaping amplifier, a sawtooth voltage generator, and a power supply.

The test frequency range of the commutator is 0-200 kc, input voltage is 5 mv-500 v, and amplification factor of the input amplifier is 5.

When testing frequencies between 100 and 20,000 cycles, the switching frequency is provided by the scanning generator of the oscillograph, thus automatically synchronizing the switching frequency with the frequency of the process being studied.

48. New Instrument for Measuring Pulse Duration

"U-177 Instrument for Measuring Duration of Pulses of Arbitrary Shape" (unsigned article); Moscow, Pribory i Tekhnika Eksperimenta, No 5, Sep/Oct 59, p 147

The U-177 is an instrument using sinusoidal scanning for measuring the duration of pulses of arbitrary shape and consists of an amplifier-limiter, a frequency scaling circuit, a pulse triggering circuit, a phase inverter, and power supply. The instrument provides short trigger pulses having a duration of approximately 20 μsec, synchronized by a master audio-frequency oscillator.

Duration of test pulses is in the range of 50 μsec-100 msec with an amplitude of 0-60 v. Pulse repetition rate is 0.3-3000 cycles. Accuracy of measurement (using a type EO-7 oscillograph) is not worse than 1% plus the accuracy of the audio frequency oscillator unit.

49. Investigation of Pressed Thermocathodes

"Electron Microscope Investigation of Pressed Thermocathode Emission," by K. A. Michurina, Ye. M. Dubinina, G. V. Spivak, N. F. Nedel'skiy, and M. A. Bruk, Moscow State University; Moscow, Radiotekhnika i Elektronika, No 12, Dec 59, pp 2072-2076

With the aid of a combined secondary and thermal emission electron microscope, the changes in surface condition and distribution of local emission for a wide temperature range were studied in pressed cathodes from binary and tertiary mixtures of carbonates ($BaCO_3$, $SrCO_3$, $CaCO_3$) with nickel powder. Presence of metal in the emitter cathode decreases sparking, increases the cathode life, lowers the cathode contamination, and improves the conductivity. The percent-weight ratio of nickel to carbonates in the examined cathodes was 70% to 30%. The carbonyl nickel used in the cathodes varied in grain size from one to 100 microns. The pressure used in making cathodes varied from 6 to 15 tons/cm^2.

The observed contrast of the secondary-emission image for smooth surfaces was due to variation of the secondary-emission coefficient. The effect of change in the technology of cathode preparation was investigated by examining the emission pattern. At a magnification of 2,500, the distribution of thermoemission on the surface of the nickel grain was observed. Examinations at various low pressures up to 10^{-6} mm Hg have revealed changes in the emission pattern due to the change in pressure. The investigated temperature range was from 20° to 600°C.

Wave Propagation

50. Wide-Band Matching at VHF

"Problems of Wide Band Matching for Some Type of Impedance at VHF," by A. L. Fel'dsheyn and L. R. Yavich; Moscow, Radiotekhnika i Elektronika, No 12, Dec 59, pp 2031-2039

A simplified method for wide-band matching based on application of the Chebyshev theory of band-pass filters is described. The terminating circuit of such a filter is a narrow-band matched impedance.

For the case of an odd number of sections, the system becomes symmetrical and, therefore, can be realized without transformers. For the case of an even number of sections, a convenient method for practical realization of the ideal transformer at VHF is introduced. The impedance matching is interpreted here as a process of impedance transformation into a real resistance for the specified frequency range with the aid of a corrective quadripole network.

51. Wave Diffraction by a Paraboloid

"Diffraction of Electromagnetic Waves by a Paraboloid Screen of Finite Dimensions (Axisymmetrical Fields)," by Yu. N. Kuzmin, Physicotechnical Institute, Academy of Sciences USSR; Leningrad, Zhurnal Teknicheskoy Fiziki, Vol 29, No 11, Nov 59, pp 1304-1311

Problems of electromagnetic wave diffraction on a thing, ideally conducting paraboloidal segment are analyzed. Two types of axisymmetrical exciting fields are analyzed. In both cases, the solution is reduced to a series of consecutive electrostatic problems and is expressed in an expansion according to powers of a small parameter $\delta = kR$.

[For information on electronics materials, see Chemistry, Radiation Chemistry.]

V. ENGINEERING

52. Electromagnetic Induction Pumps

"Thermal Processes in Electromagnetic Induction Pumps," by Ya. Liyelpeter, Physics Institute, Academy of Sciences Latvian SSR; Riga, Izvestiya Akademii Nauk, Latviyskoy SSR, No 9, 1959, pp 91-100

This work is devoted to the analysis of thermal processes in an induction pump of plano-linear construction. These calculation results, however, may be applied to cylindrical and helical type induction pumps. Induction pumps for handling molten metal at relatively high temperatures require some kind of forced cooling.

At the Physics Institute, a very efficient cooling system for induction pumping of molten zinc at 500°C was developed, in which the coolant is circulated between the electric winding and the conduit carrying the molten metal. This cooling system consists of a helical tube placed in the inductor slots above the winding. Water is used as the coolant, and it circulates inside the helical tube.

An induction pump without forced cooling was also developed at the Physics Institute for handling molten sodium at 400°C, in which asbestos insulation was used for the electric winding.

53. Very-High Voltage Power Transformers

"500,000-Volt Transformer" (unsigned article); Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 6 Jan 1960

It is claimed that the giant 500,000-volt, 135,000-kva single-phase transformer built at the Zaporozh'ye Transformer Plant and designated ODTsG-135,000/500 has no precedent in the transformer building industry anywhere in the world. The transformer has two windings and is intended for a hook-up into a three-phase group of 405,000 kva capacity. The low-voltage winding (13,800 v) and the high-voltage winding (520,000 v) are of disk-coil construction, concentrically mounted on the magnetic cores. The 500,000-volt inlet bushing is of the oil-filled type and is mounted at an angle of 15° to the vertical. Notwithstanding its tremendous weight (235 tons), the ODTsG-135,000/500 transformer is well designed for

transporting. Because of a very clever design of the individual components, the assembly time is only one eighth of that required by the 400,000 v, OTsG-123,000/400 model. The tank design is such that it permits examination of the transformer interior without actually lifting the windings out of the tank.

This new 500,000-volt transformer model will be installed on newly constructed high-voltage power lines.

54. Tracking Failure Probability in Automatic Control Systems

"Analysis of Tracking Failure in Automatic Control Systems Due to the Influence of Fluctuating Noise," by I. A. Bol'shakov; Moscow, Avtomatika i Telemekhanika, No 12, Dec 59, pp 1611-1622

"The Fokker-Planck equation is used to study tracking failure in automatic control systems due to the effect of intensive fluctuating noise. The boundary problem, where the failure is caused by an increase in mismatching in the system above a fixed value, is solved by the Ritz-Galerkin method. For systems using an integrator as the smoothing network, formulas are derived for the probability of failure as a function of system parameters, noise level and time. The results are used for an analysis of the noise-stability of an automatic frequency control system of a continuous signal receiver."

55. Circuits With Magnetic Logic Elements Compared

"Magnetic Logic Elements for Automatic Control Circuits," by N. P. Vasil'yeva and N. L. Prokhorov; Moscow, Avtomatika i Telemekhanika, No 12, Dec 59, pp 1647-1658

A comparative examination is made of basic circuits containing magnetic logic elements. Only those elements using rectifiers and cores with rectangular hysteresis loops are considered.

56. Precision Calibration of Profile Meters

"Design and Experimental Testing of an Electromechanical Equivalent of Surface Finish," by A. S. Kruglov; Moscow, Nauchnyye Doklady Vysshey Shkoly, Mashinostroyeniye i Priborostroyeniye, No 1, 1959, pp 236-241

Descriptions are given of the experimental equipment and method developed by Kruglov (Authorship Certificate, "Equivalent of Surface Finish for Calibrating Profile Meters," No 583778/25, 1957) for calibrating and checking profile meters. Method is based on the use of an electromechanical equivalent of surface finish and has a maximum error of calibration not exceeding ± 1.8 to 2.7%. This article appears to be based on two previous articles by Kruglov, entitled "Comparative Characteristic of Methods of Calibrating Profile Meters" and "Electromechanical Equivalent of Surface Finish Applied for Absolute Calibration of Profile Meters," which appeared in Trudy Leningradskogo Instituta Aviatsionnogo Priborostroyeniya (Works of the Leningrad Institute of Aviation Instrument Building), No 27, 1958, as cited in the bibliography.

57. Millimicrosecond Detonation Wave Process Reduced to Stationary State and Photographed

"A Stationary Detonation," by B. V. Voytsekhovskiy, Institute of Hydrodynamics, Siberian Branch of the Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 129, No 6, Dec 59, pp 1254-1256

The article gives a description of an apparatus in which a stationary detonation wave was produced and photographed. The operating principle is that, if, in an arbitrary channel, conditions are created under which the initial gas mixture is continuously replenished at a sufficient rate in front of the leading edge of a detonation wave, the phenomenon can be reduced to a stationary state. The initiation of the mixture at one of the points of the periphery inside an annular channel was synchronized with the opening of a camera shutter. After one complete revolution of the film in the camera, the shutter was closed to prevent double exposure. A special feed nozzle and proper pressure control were employed to prevent backfiring of the detonation into the feed tank containing the mixture components. A partial deflector baffle was used to eliminate spurious fronts and to direct the detonation process in one direction only. An ideally stable propagation of fronts in one direction also required a mechanical shutter which overlaps the entire transverse cross section of

the annular channel. The explosive mixture is initiated near one of the walls of the shutter. At the moment of initiation, the shutter begins to open the channel, and, at the moment the detonation front arrives from the other side, the entire cross section of the channel is completely open. The process of stationary detonation was photographed on motion-picture film, with the camera arranged so that the optical axis of the object coincided with the axis of the annular channel.

It was found that the velocity of a stationary detonation increases with an impairment of the conditions of its flow and varies only very slightly from the velocity of sound in the particular combustion products.

58. City Planning Conference To Be Held in April

"Conference on City Construction" (unsigned article); Moscow, Izvestiya, 8 Jan 60, p 1

"In the Central Committee CPSU and the Council of Ministers USSR.

"The Central Committee CPSU and the Council of Ministers USSR have adopted a resolution on the convention of the All-Union Conference on City Construction in the first half of April 1960 in the Great Kremlin Palace in Moscow.

"The following reports on the present position and methods for improving city construction will be read and discussed at the conference: the present status and problems of city planning and the introduction of progressive methods for the planning of populated areas; city planning in consideration of the future industrialization of construction; and public welfare, tree and shrub planting, and improving sanitation conditions of cities.

"Participants in the work of the conference will include chief city architects; workers of local organizations on construction and architectural affairs; workers of design, scientific research, and construction organizations in city planning and health; leading workers of the Council of Ministers of the union republics, regions, oblast, and city executive committees; representatives of the ministries and departments; and party, professional trade union, and Komsomol workers."

59. Approximation of Differential Equations by Polynomials

"Some Remarks on the Best Approximation of Differential Equations by Polynomials," by S. I. Zukhovitskiy and G. I. Eskin; Moscow, Doklady Akademii Nauk SSSR, Vol 127, No 6, Aug 59, pp 1158-1160

"Let the solution of a system of differential equations

$$Lu = f \quad (u = (u_1, \ldots, u_n); \quad f = (f_1, \ldots, f_n)), \qquad (1)$$

satisfying certain boundary conditions $\ell u|_\Gamma = \psi$, be sought in the region G.

"We will seek an approximate solution to system (1) in the form of a polynomial

$$u_m = \sum_{k=1}^{m} \xi_k \varphi_k$$

for which

$$\rho_m = \inf_{\xi} \max \left\{ \max_{G} \left| \sum_{k=1}^{m} \xi_k L\varphi_k - f \right| , \max_{\Gamma} \left| \sum_{k=1}^{m} \xi_k \ell \varphi_k - \psi \right| \right\} \text{ is attained,}$$

where the sequence $\left\{ \varphi_k = (\varphi_{1k}, \ldots, \varphi_{nk}) \right\}$ belongs to the given class and $|\varphi_k| = \max_i |\varphi_{ik}|$.

"We arrive in this manner at the problem of a Tschebycheff approximation by a polynomial of a continuous function on a compactum.

"We note that instead of the polynomials $u_m = \left(\sum_{k=1}^{m} \xi_k \varphi_{1k}, \ldots, \sum_{k=1}^{m} \xi_k \varphi_{nk}\right)$,

it is possible to employ polynomials of the form $u_m = \left(\sum_{k=1}^{m_1} \xi_{1k} \varphi_{1k}, \ldots, \sum_{k=1}^{m_n} \xi_{nk} \varphi_{nk}\right)$ for the approximation.

"Selecting sufficiently fine grids on G and on Γ, we reduce the latter problem to the best approximation of a system of incompatible linear algebraic equations, to which we employ, for example, the algorithm of the author discussed in Matem. Sborn. Vol 33 (75), No 2, 1953, and programmed by S. I. Zukhovitskiy and V. B. Leonova in Nauk. zap. Luts'kogo ped. inst. Vol 6, No 3, 21, 1958.

"For an estimate of the error arising during transition to the grid, it is possible to employ the inequality

$$\rho'_m \leq \rho_m \leq \rho''_m,$$

where ρ'_m is the value of the least deviation on the grid and ρ''_m is the maximum modulous of the constructed approximation polynomial on $\overline{G}$ and Γ.

"In the presentation of the problem, the question concerns the finding of polynomials of a fixed degree minimizing the maximum deviation of the left sides from the right sides in system (1); however, at the same time, for a sufficiently wide choice of the sequence $\{\varphi_k\}$, the uniform convergence of these approximating solutions to the exact solution is easily obtained with an increase of the degree of approximating polynomials."

60. Asymptotic Determination of Characteristic Numbers and Matrix of Certain Equations

"On the Rigorousness of Solutions of a System of Linear Homogeneous Differential Equations With Periodic (and Other) Coefficients," by N. P. Yerugin, Minsk; Moscow, Prikladnaya Matematika i Mekhanika, Vol 23, No 5, Sep/Oct 59, pp 818-825

The article develops an asymptotic method of finding the characteristic numbers of certain systems of linear homogeneous differential equations and procedures for locating the characteristic matrix. The radius of the convergence of the series which represent invariants of the characteristic matrix is denoted.

61. Existence Conditions of Limiting Cycles

"On the Conditions of the Existence of Limiting Cycles," by Ye. A. Barbashin and V. A. Tabuyeva, Sverdlovsk; Moscow, Prikladnaya Matematika i Mekhanika, Vol 23, No 5, Sep/Oct 59, pp 826-835.

A qualitative study is made of a nonlinear differential equation of the second order, which, in particular, describes the motion of a material point on a certain closed curve, assuming that an actuating force is exerted

on the motion of the point. (A pendulum subjected to an actuating force is a simple example.) The presence of the actuating force guarantees the existence of at least one stable limiting cycle, when certain supplementary conditions are satisfied.

62. Theory of Oscillations of Quasilinear Systems With Retardation

"On the Theory of Oscillations of Quasilinear Systems With Retardation," by S. N. Shimanov, Sverdlovsk; Moscow, Prikladnaya Matematika i Mekhanika, Vol 23, No 5, Sep/Oct 59, pp 836-844

The theory of oscillations of quasilinear systems, the motion of which is described by an ordinary differential equation, is generalized for systems involving retardation with respect to time. The case of resonance in quasilinear nonautonomous systems with retardation is examined.

63. Reduction of Equations to Canonical Variable for Automatic Control Systems

"The Application of the Theory of Deductions to the Reduction of Equations to the Canonical Variable for Automatic Control Systems," by O. I. Komarnitskaya, Leningrad; Moscow, Prikladnaya Matematika, i Mekhanika, Vol 23, No 5, Sep/Oct 59, pp 845-850

In the study of the stability of systems of automatic control, canonical variables are often used when it is necessary, not only to reduce the equations to canonical variables but also to know the matrix of the transformation. A. I. Lur'ye (Nekotoryye nelineynyye zadachi teorii avtomatickheskogo regulirovaniya /Certain Nonlinear Problems of the Theory of Automatic Control/, Gostekhizdat, 1951) supplied the formulas of the transformation of the variables into the case of simple roots of the characteristic equation, the application of which is found in the work of A. M. Letov (Ustoychivost' nelineynykh reguliruyemykh sistem /The Stability of Nonlinear Regulated Systems/, Gostekhizdat, 1955).

This article presents a method of constructing the matrix of the transformation which is based on the theory of deductions and affords the possibility of finding the coefficients of the transformation with arbitrary structure of the roots of the characteristic equation.

64. Periodic Solutions of Nonautonomous Systems

"Oscillations of Quasilinear Nonautonomous Systems With One Degree of Freedom in the Vicinity of Resonance," by A. P. Proskuryakov, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 23, No 5, Sep/Oct 59, pp 851-861

A method of constructing the periodic solutions of nonautonomous systems with one degree of freedom has already been worked out for the case of simple roots of the equations of the fundamental amplitudes (Malkin, I. G., Nekotoryye zadachi teorii nelineynykh kolebaniy /Some Problems of the Theory of Nonlinear Oscillations/, Gostekhizdat, 1956).

This article considers the general case when the roots of these equations may also by multiples. The solution, containing secular terms, is constructed for the case of resonance with unbounded amplitude of the oscillations.

VII. Medicine

Antibiotics

65. Soviet Bloc Antibiotic Developments

"New Antibiotics" (unsigned article); Prague, Veda A Zivot, No 11, Nov 59, p 702

This article discusses the various antibiotics which were described at the May 1959 symposium sponsored in Prague by the Biological Section of the Czechoslovak Academy of Sciences. At the symposium, speakers from various Soviet Bloc countries described antibiotics developments in their countries. Among the new developments discussed were the Polish antibiotics "Totain," "Edein," and W 3/17; the first is a broad-spectrum antibiotic, the second is effective even against tuberculosis bacilli, and the third combats diseases caused by fungi.

Another development described included the Hungarian antibiotic Primycine, which acts against many infectious diseases when given in small doses. The Hungarians have also developed an antibiotic referred to as "Flavofungin," which is effective against skin diseases caused by molds.

The Soviet delegates reported on Soviet clinical use of Mycerin, an antibiotic which is said to be highly effective against a wide variety of organisms, including stubborn staphylococci. Soviet scientists have also synthesized "Violarin," M-P, and #719, which showed promise in experimental work on the influenza virus in which animals were used.

According to the article, the symposium showed that antibiotics may also play a promising role in the battle against cancer. For example, the Bulgarians have developed EL and BE 51, and the Soviets have developed 6270. However, each of these substances is only effective against a definite type of rapid cellular growth, and experiments involving these substances have thus far not passed the laboratory stage.

Aviation Medicine

66. Progress in Space Research

"A Significant Stage in the Exploration of Outer Space," by V. Malkin, Candidate of Medical Sciences; Moscow, Sovetskaya Aviatsiya, No 259 (3429), 3 Nov 59, p 4

This article, published on the second anniversary of the successful launching of the artificial earth satellite which contained Layka, states that the next step in space exploration will consist of attempts to probe the space around the sun.

Special equipment aboard the second artificial earth satellite relayed reliable information to earth concerning the main physiological reactions taking place in Laka's body. Telemetric recordings were also made of the atmosphere in the cabin.

Air in the cabin was regenerated with the aid of highly active chemical compounds which absorbed carbon dioxide and water vapors emitted by Layka and enriched the air in the cabin with oxygen. Miniature electric motors porduced ventilation, and a special shield regulated the temperature. The animal's food consisted of a jellylike mass containing a sufficient amount of essential food ingredients. Water was also supplied to the animal in suitable containers.

Layka, weighing 6 kilograms, was not the only animal that was subjected to a period of conditioning for flight in an artificial earth satellite. Layka was subjected to the simultaneous action of acceleration, vibration, and noise during the take-off when the motors were operating and the speed of the rocket was increasing steadily. The animal was situated in the cabin in such a way that acceleration acted from chest to back. Although the dog was pressed against the floor of the cabin during the entire period of acceleration, it did not show any noticeable uneasiness. The pulse frequency increased immediately after take-off, possibly due to the effects of such powerful irritants as intense noise and vibration. The frequency of the pulse beats subsequently decreased; the electrocardiogram showed that the heart activity remained normal despite the acceleration.

In evaluating the animal's condition, physiologists concluded that the experimental animal tolerated the adverse factors satisfactorily from the moment of take-off to the time the satellite entered the prescribed orbit. After that, the dog was in a state of weightlessness and could shift its position. Results of medical and biological examinations of the recordings of Layka's behavior, transmitted by instruments, are important in preparing a human being for flight into outer space.

A third artificial earth satellite was also successfully launched. Three lunar rockets were subsequently sent in the direction of the moon. The second lunar rocket left Soviet emblems on the moon. The third lunar photographed the far side of the moon and transmitted the photograph to earth.

Two photographs of a dog wearing equipment for space flight are included.

Bacteriology

67. Newcastle Virus in Hemagglutination-Inhibition Reaction

"The Effect of Normal Rabbit Serum on Hemagglutination Caused by Newcastle Disease," by M. Lolin and G. Majstorovic, Epizootiological Institute and Clinic, Belgrade; Belgrade, Acta Veterinaria, Vol 9, No 2, 1959, pp 57-63

The authors used the Weybridge method of hemagglutination-inhibition, which is used in general diagnostics. The Newcastle virus was used in the chorioallantoic fluid without a preservative. The chicken erythrocytes were obtained by puncture of the heart and suspended in a 0.75-percent physiological sodium chloride solution. The sera of 50 healthy rabbits were used fresh and unheated, as well as heated to 56°C and 65°C. The test was conducted on the day blood was taken, or within 48 hours after drawing the blood; in the intervening period, the sera were stored at 4°C in the refrigerator.

On the basis of the results obtained, the authors came to the following conclusions: (1) fresh serum of healthy rabbits produces hemolysis of chicken erythrocytes; (2) the normal sera heated to 65°C or 56°C inhibit virus hemagglutination in vitro; and (3) in their determinations of the maximum serum dilution required to inhibit four hemagglutinating units of the Newcastle virus, the inhibition takes place down to dilutions of 1:400.

Contagious Diseases

68. Diseases With Natural Foci in Western Siberia

"Results of Research on Diseases With Natural Foci," by S. P. Karpov, Tr. Tomskogo N.-I. In-ta Vaktsin i Syvorotok (Works of the Tomsk Scientific Research Institute of Vaccines and Sera), No 9, 1958, pp 5-14 (from Referativnyy Zhurnal -- Geografiya, No 10, Oct 59. Abstract No 20969)

"A number of diseases with natural foci have been observed in Western Siberia: tularemia, tick-borne encephalitis, tick-borne rickettsiosis, leptospirosis, listeriosis, hemorrhagic fever, and Q fever. This list is not exhaustive. In particular, research on lymphocytic choriomeningitis, which has been observed in Tomsk, has been initiated."

Epidemiology

69. Rare Forms of Anthrax Studied

"The Epidemiology of a Rarely Encountered Clinical Form of Anthrax." by A. Ya. Zaporozhchenko, Central Scientific Research Laboratory of Hygiene and Epidemiology, Ministry of Railways; Kiev, Vrachebnoye Delo, No 11, Nov 59, p 1205

In introducing this brief article, the author states: "We have at our disposal data on the epidemiology of rarely encountered clinical forms of anthrax, collected between 1932 and 1956. Among all cases of the disease, the cutaneous form constitutes 93.75%, and primary cutaneous and secondary intestinal, 2.65%. All the cases were verified by bacteriological investigation and pathological anatomical dissection and by data from epidemiological observations."

Histories of several fatal cases are given. All of these patients had been in contact with infected animals; several had not observed ordinary sanitary precautions (washing the hands) after handling animals or material from them.

70. Ticks in Kazakhstan

"The Question of the Distribution and Biology of the Steppe Tick Under Conditions Found in Central Kazakhstan," by V. K. Yashkul', Tr. Karagandinsk. Med. In-ta (Works of the Karaganda Medical Institute), Vol 1, No 5, 1957, pp 313-317 (from Referativnyy Zhurnal -- Geografiya, No 7, Jul 59, Abstract No 20970)

"According to data from 1954-1955 observations, the Dermacentor marginatus tick is distributed over all 11 rayons of Karagandinskaya Oblast and constitutes a single, mass ixodid species here. Agricultural animals, on which the maximum numbers of the ticks are seen in May, provide the principal nourishment for the imaginal stage. The ticks are not abundant during the second half of July and the first half of August, and the autumn wave of infestation has its maximum increase in September-October.

Immunology and Therapy

71. Antibiotics Effective Against Ornithosis Virus

"The Comparative Action of Certain Antibiotics on the Ornithosis Virus in Experiments on Animals," by V. M. Bolotovskiy and L. S. Ratushina, Institute of Virology imeni D. I. Ivanovskiy; Moscow, Voprosy Virusologii, Vol 4, No 6, Nov/Dec 59, pp 710-713

To assist a search for antibiotics which will afford prolonged protection against ornithosis relapses, the authors compared the effectiveness of the dibenzylethylenediamine salt of biomycin with that of tetracycline and terramycin, which are considered to be the best therapeutic and prophylactic agents against this disease.

In the experiments, white mice were infected with an ornithosis virus aerosol in an I. V. K-1 chamber. It is pointed out that the method of infection selected differs essentially from those ordinarily used for studies of this nature in that the incubation period corresponds to that of ornithosis in the human. A suspension of lung tissue from mice infected intranasally with strain B (Terskikh, 1948) was employed as virus-containing material. A 1,000 LD_{50} dose of virus (the LD_{50} was 10^{-7}) was used. The above-mentioned biomycin salt was obtained from Ye. N. Lazareva, Institute of Antibiotics; commercial tetracycline and terramycin were used in powder form. The same doses of these antibiotics were tested following aerosol and oral infection; the biomycin preparation was also tested by intranasal (instillation) and intramuscular introduction. Results of the experiments are shown in tables and discussed in the text. The following conclusions are presented:

"1. The aerosol method of administering tetracycline antibiotics in ornithosis was found ineffectual.

"2. In the comparative study of the prophylactic and therapeutic action of tetracycline, terramycin, and the dibenzylethylenediamine salt of biomycin, the best results were obtained with the biomycin; it was most successful when administered intramuscularly.

"3. Both orally and intramuscularly administered biomycin had a prophylactic and therapeutic effect even after a single introduction, completely eliminating the pathogen from the animal."

Oncology

72. Soviets Discover New Cancer Medicine

"New Soviet Medicine for Treating Cancer"; Bratislava, Uj Szo, 8 Jan 60, p 1

This article on a new cancer institute in Moscow quotes Prof Leon Shabad, Corresponding Member of the Academy Medical Sciences, USSR, as stating that a material with an anticancer effect was recently prepared from the bark of the broom willow ("rekettyefuz," apparently a shrub of genus Genista). The material has been successfully tested on animals and preparations for clinical tests will be made soon.

Pharmacology and Toxicology

73. Relationship Between Chemical Structure and Toxicity of Some Aromatic Hydrocarbons and Their Chlorine Derivatives

"The Relationship Between Chemical Structure and Toxicity of Some Aromatic Hydrocarbons and Their Chlorine Derivatives," by V. Ya. Rusin, Tr. Nauchn. Sessii Leningr. N.-I. Instituta Gigiyeny Truda i Profzabolevaniy, Posvyashch. Itogam Raboty za 1956 g. (Works of Scientific Session of the Leningrad Scientific Research Institute of Work Hygiene and Occupational Diseases, Didicated to the Results of Work in 1956), Leningrad, 1958, 217-221 (from Referativnyy Zhurnal -- Khimiya, No 21, 10 Nov 59, Abstract No 75348, by G. Tayeva)

"It was established that the introduction of a double bond in the molecule of some aromatic compounds (ethylbenzene → styrene) decreases the toxic action, but the introduction of a side chain (benzene → ethylbenzene),

and also of Cl (benzene → chlorobenzene → dichlorobenzene; styrene → chlorostyrene → dichlorostyrene) increases toxic action, judging by the lethal and narcotic effects. The irritating property of vapors increases with the appearance of the double bond and on the introduction of chlorine into the molecule. It is believed that benzene, chlorobenzene, dichlorobenzene, and compounds similar to them mainly cause leucopenia whereas styrene, monochlorostyrene, dichlorostyrene, and xylene more generally cause leucocytosis. The phenomenon cited is linked with considerable differences in the transformations which these substances undergo in the organism."

74. High Yields of Field-Grown Ergot Reported

"Field Culture of Ergot in the USSR," by N. I. Ostrovskiy and M. A. Kryukova, All-Union Scientific Research Institute of Medicinal and Aromatic Plants; Moscow, Meditsinskaya Promyshlennost' SSSR, No 12, Dec 59, pp 11-15

The authors state that "by observing the rules of cultivation, an average yield of rye ergot at experimental stations of VILAR /The All-Union Scientific Research Institute of Medicinal and Aromatic Plants/ in Moscow Oblast amounting to 269 kg/ha in 1958 and up to 467 kg/ha for individual strains was reached. At the Moshkov State Farm (Novosibirskaya Oblast), the biological yield of rye ergot was 232 kg/ha in 1958."

The alkaloid content of rye ergot grown in Moskovskaya Oblast ranged from 0.33 % to 0.53%; the alkaloid content of the Moshkov State Farm grown rye ergot was given as 0.49%.

The above institute initiated in 1959 the distribution of single-alkaloid strains of ergot, i.e., strains of ergot which produce only one alkaloid of the ergotamine or ergotoxine group.

Physiology

75. Cortical Biocurrents in Respiratory Conditions

"Biocurrents of the Cerebrum in Various Functional Conditions of the Respiratory Center," by V. S. Rayevskiy, Ye. I. Kuznets, V. V. Antipov, and S. V. Tolova, Academy of Medical Sciences USSR, Physiological Group; Leningrad, Fiziologicheskiy Zhurnal SSSR, Vol 45, No 10, Oct 59, pp 1192-1200

Results of experiments on 16 dogs showed that excitation of the respiratory center results in irradiation toward the cerebral cortex. This exerts a dual effect on the electroencephalogram: (1) the general level of cortical

electric activity may be affected by volleys from the respiratory center; (2) electroencephalogram rhythms of greater amplitude, induced by volleys from the respiratory center, may appear regularly at the height of inspiration.

The dogs were kept under morphine-evipal narcosis, and artificial respiration was employed to maintain gases in the blood at a constant level in various functional conditions of the respiratory center (during its rhythmical activity and during its inhibition). Biocurrents of the cerebral cortex, action currents of the phrenic nerve and diaphragmatic muscle, and the rhythm of artificial pulmonary respiration were recorded by means of a four-channel oscillograph.

76. Glucose Absorption Affected by Uranium Fission Products

"Impaired Intestinal Glucose Absorption in Dogs Affected by Products of the Nuclear Fission of Uranium," by S. R. Perepelkin, Scientific Research Institute of Sanitation and Hygiene imeni F. F. Erisman; Leningrad, Fiziologicheskiy Zhurnal, Vol 45, No 10, Oct 59, pp 1272-1278

The author of this article states that results of experiments on dogs showed that intestinal glucose absorption following injury by nuclear fission products of uranium was intermittent or wavelike in character. It was noted that retardation in the process of absorption reached the greatest intensity when digestion was at its maximum (one hour after the dogs were fed meat). The experiments were conducted on three dogs between 4 and 6 years of age. The dogs were subjected to peroral poisoning by nuclear fission products of uranium in doses of 1-2 millicuries per kilogram of weight.

77. Effect of Largactil on Hypoxia

"The Action of Largactil on the Survival of Young Rats Affected With Acute Hypoxia, Depending on Their Age and Environmental Temperature," by Joseph Laitl, Institute for the Care of Mothers and Children, Prague-Podoli; Prague, Ceskoslovenska Gynekologie, Oct 59, pp 654-659

This article states that the results of experiments on 626 young white rats showed that largactil (chlorpromazine) increases their resistance to acute hypoxia. The extent of the action of largactil depends on the stage of development of individual rats and on the environmental temperature. The optimum effect of largactil was observed in older rats which had better developed thermoregulation. The protective action of the preparation was also observed in animals in which the thermoregulatory function was not well developed; however, it proved to be far less effective than in older animals.

78. Evolution of Analysors Discussed

"Problems of the Evolutionary Morphology of Analysors," by Ya. A. Vinnikov, Laboratory of Evolutionary Morphology, Institute of Evolutionary Physiology imeni I. M. Sechenov, Academy of Sciences USSR; Leningrad, Arkhiv Anatomii, Gistologii i Embriologii, Vol 37, No 8, Aug 59, pp 3-11

The author of this article discusses the significance of a historical method of determining the ontogenetic and phylogenetic origin of analysors and of investigating their evolutionary histophysiological, cytophysiological, histochemical, and cytochemical characteristics.

The peripheral portions of visual and olfactory analysors develop directly from the neural plate or embryonic medulla; however, the peripheral portions of the analysors which are based on secondary perceptive cells develop ontogenetically from placodes.

Despite various sources of development, the differentiation of peripheral parts in all analysors becomes possible only when a synaptic contact is established between them and the central parts, and vice versa.

The historical method of investigation helps to explain the complex nature of the localization and distribution of chemically active substances in both the primary and the secondary perceptive receptor cells.

Despite the similarity of chemically active substances which supply energy for impulses, the nature of their distribution varies in receptor elements which have had a different course of development.

The specificity of impulses of the receptor cells of each analysor is evidently determined by the spatial distribution of chemically active substances which became established during the process of evolution.

79. Effect of High Temperature Exertion

"The Effect of High Temperature Combined With Physical Exertion on Gastric and Pancreatic Secretion With Various Types of Diet," by N. I. Putilin and L. N. Staritskaya, Physiological Laboratory of Ukrainian Scientific Research Institute of Nutrition; Moscow, Voprosy Pitaniya, Vol 18, No 5, Sep/Oct 59, pp 24-30

The authors of this article state that the Ukrainian Scientific Research Institute of Nutrition and the Kiev Institute of Industrial Hygiene and Occupational Diseases have kept records of results of physical examinations of people employed in workshops where the temperature is rather high. On the

basis of these data, it was established that loss of appetite is the most obvious result of physical exertion under such conditions. A search for the physiological background of a rational diet for workers in shops where the temperature is high was begun.

The first stage of the search consisted of observations of gastric and pancreatic secretion in six dogs. Results of investigations showed that the nature of gastric and pancreatic secretion becomes altered during physical exertion when the temperature of the immediate environment is high. The most clearly pronounced changes were observed when the animals were fed immediately before or immediately after physical exertion. The effect of physical stress and high temperature on gastric and pancreatic secretion was less pronounced when the animals were fed an hour before or an hour after exertion.

80. Physiological Research in Seven-Year Plan

"New Goals and Prospects for Physiological Research Seen in the Light of Decisions of the June Plenum of the Central Committee CPSU," by D. A. Biryukov; Leningrad, Fiziologicheskiy Zhurnal SSSR imeni I. M. Sachenov, Vol 45, No 10, Oct 59, pp 1173-1175

This article notes that scientific research in the USSR is not confronted so much with the task of perfecting the old methods, but of replacing them with new, drastically different methods. The present level of research in physics and chemistry and the greater role played by automatics, electronics, cybernetics, and mathematics in scientific research has radically changed the methods and standards used in physiological investigations. Research in the physiology of work and play, of nutrition, of aging, and of children and adolescents must be intensified. Space physiology and aviation physiology have gained great importance. More effective ties must be established between the physical sciences and the applied sciences such as medicine, agriculture, and pedagogy; a closer relationship must also be promoted between physiology and the theoretical sciences such as philosophy, psychology, physics, chemistry, and mathematics.

In his report to the 21st Congress of the CPSU, N. S. Khrushchev stated that necessary conditions will be created for further progress in all scientific fields during the next 7 years (1959-1965).

81. Physiological Society Convenes

"Discussion of Problems in Physiology," by Prof L. G. Voronin, Vestnik Akademii Nauk SSSR; Moscow, Vol 29, No 9, Sep 59, pp 105-106

The author of this article states that about 1,400 physiologists, pharmacologists, biochemists, and other representatives of physiological sciences gathered in Minsk to attend the Ninth Congress of the All-Union Society of Physiologists imeni I. P. Pavlov, held 10-18 June 1959. About 450 scientific papers were read. The fields covered by these papers included: the physiology and pathology of the higher nervous activity of animals and humans; the physiology and pharmacology of coronary circulation; electrophysiology; the physiology of digestion, excretion, and the endocrine system; corticovisceral physiology; the autonomic nervous system; the physiology of work and play; metabolism in tissues and organs; the biosynthesis of protein and nucleic acids; biophysics; radiology; etc.

The delegates decided to change the name of the society to the All-Union Society of Physiologists, Biochemists, and Pharmacologists because the development of the physiological sciences has reached a sufficiently high level to justify the admission of biophysicists, histologists, cytologists, biochemists, pharmacologists, and representatives of other professions investigating various functions of the organism.

New members were elected to the Central Council of the society. These new members chose Prof P. S. Kupalov, Member of the Academy of Medical Sciences, as its chairman. The Central Council of the society carries on the work of the society between congresses. It was reported that membership in the society has increased from 2,700 to 3,500.

It was noted that although scientific research has expanded and a significant contribution has been made to Soviet medicine, physiologists, pharmacologists, and biochemists must try to solve many theoretical and practical problems as the country enters a new period in building a Communist society. Research must be directed toward solving the problems of proper balance between mental and physical work, proper nutrition, the prevention and treatment of the most important diseases, the indoctrination and development of children and adolescents, and the preservation of the efficiency of elderly people.

A number of problems were listed by various speakers. It was stated that these problems must be solved within the next few years. The more important research problems include: the study of the mechanisms of coronary and cerebral circulation, respiration, digestion, excretion, and hormonal and other functions, the physiology and biochemistry of the cell, the mechanism of the formation and conversion of biochemically active substances; and the effect of external environment on the physiological functions of an organism. Answers must be found to problems connected with the industrial growth of the country, and to problems related to aviation and space medicine.

The delegates to the congress directed the new members of the Central Council of the society to bring to the attention of the Ministry of Health, Ministry of Higher Education, Ministry of Agriculture, Academy of Sciences USSR, Academy of Medical Sciences USSR, and Academy of Pedagogical Sciences RSFSR the need for intensifying scientific research and training.

82. Physiologists Confer

"Conference on Problems of Clinical Physiology," by I. I. Likhnitskaya; Leningrad, Fiziologicheskiy Zhurnal, Vol 45, No 10, Oct 59, pp 1288-1290

According to this article, a conference was held in Moscow 18-21 May 1959, on the problems of clinical physiology.

V. V. Parin gave the keynote of the conference with his report on the relationship between physiology and clinical practice. Imparting great significance to the extensive use of radiotelemetry, electrokymography, rheography, and other processes, V. V. Parin stressed the existing lag in the application of electrophysiological methods in medical practice. He also pointed out that in surgery, clinical physiology is not confined to the utilization of new methods of diagnosis of pathological processes, but consists of finding new methods of treatment. In this respect, successful cooperation between clinical physiology and surgery is of special significance. Clinical physiology, he said, is now emerging as an independent branch of science with its own objectives and methods. The Pavlovian principles of the unity of an organism and its environment, of the concept of a disease as an adaptive reaction to an "extraordinary" irritant, and of the transformation of physiological reactions into pathological ones, must now be considered the fundamental principles of physiology.

In the discussion that followed, Yu. M. Uflyand and G. N. Kassil' insisted that the term "clinical physiology" is not very convenient because a clinical examination is not confined to the study only of the sick but also includes a study of healthy people. The proper term to use, therefore, would be "human physiology." G. N. Kassil' and others insisted that there is a fundamental difference between the clinicophysiological investigation of functional impairments and so-called "functional diagnosis."

S. A. Palatnik, L. L. Shik, L. I. Fogel'son, and A. D. Dinaburg discussed the importance of physiological investigations in clinical practice from the standpoint of the possibility of evaluating the level, mechanism, and stability of compensation for functions endangered by morbid conditions.

Two meetings were devoted to the question of the clinical physiology of circulation. Reports were read on peripheral resistance; on average, minimum, lateral, and maximum pressure; and on the methods of their quantitative evaluation to determine the characteristics of changes in circulation. L. G. Antonova, V. L. Karpman, M. A. Abrikosova, N. N. Savitskiy, K. A. Morozov, and V. P. Nikitin participated in discussions on this subject.

A. M. Fedoseyeva of the Central Institute for the Advanced Training of Physicians and L. Ya. Balanova of the Institute of Evolutionary Physiology imeni I. M. Sechenov reported their use of electrocardiography to determine the main pathophysiological mechanisms involved in the development of coronary insufficiency.

B. M. Tsukerman of the Physiological Laboratory, Institute of Surgery imeni A. V. Vishnevskiy, read a report on successful attempts at electric auricular defibrillation in clinical practice and experimentally. After 145 experiments on 15 dogs in which he used a 750-2,000-volt capacitor discharge, B. M. Tsukerman applied the method to three patients; he succeeded

in alleviating the symptoms of cardiac fibrillation for a period of 1½ to 13½ days, which considerably improved the condition of patients during the postoperative period.

The next two meetings were devoted to a discussion of the physiology of respiration. L. L. Shik spoke on the subject of mechanisms of the regulation of external respiration in man. A report read by A. S. Perel'mutr illustrated Shik's remarks. A. S. Perl'mutr reported the successful development of instruments for the study of the clinical physiology of respiration.

Morphological changes in a human organism do not determine the extent of functional disturbances, according to reports read by S. S. Slavina and G. A. Myamlina of the Central Scientific Research Laboratory imeni Vishnevskiy, G. P. Konradi and L. G. Okhnyanskaya of the Institute of Labor and Occupational Diseases of the Academy of Medical Sciences USSR, A. O. Navakatikyan, V. V. Lebedeva, and Shneyder of the Donets Institute of Labor Physiology, L. N. Chernova and S. N. Sorinson of the Gor'kiy Institute of Industrial Hygiene and Occupational Diseases, and A. M. Kulik of the Institute of Normal and Pathological Physiology of the Academy of Medical Sciences USSR.

L. I Fogel'son and V. A. Patreyeva of the Central Institute of Information on Economics and Technology, L. S. Romanova of the Institute of Surgery imeni Vishnevskiy, and M. I. Vinogradova of the Institute of Evolutionary Morphology imeni A. N. Severtsev described the results of studies of afferent and efferent volleys in nerve conductors and thoracic muscles.

S. G. Geshelin of the Odessa State University imeni I. I. Mechnikov and Odessa City Hospital read a report on the mechanism of the impairment of respiration and circulation during high cerebrospinal anesthesia.

The next two meetings were devoted to reports on the clinical physiology of digestion. Reports on mechanoreception in the gastrointestinal tract attracted the greatest attention.

A. N. Bakuradze, A. I. Abesadze, and A. I. Sakharylidze of the Tbilisi Medical Institute reported that when the stomach is greatly irritated, the conditioned and unconditioned secretion of saliva and gastric juice becomes greatly inhibited.

Ye. S. Myasoyedova of the Ivanovskiy Medical Institute discussed tactile sensitivity of the mucous membrane of the stomach.

I. T. Kurtsin and V. N. Zvorikin showed that the reaction of the gastrointestinal tract to irritation of the higher branches of the central nervous system depends on the functional condition of the secretory and motor apparatus of the stomach. G. F. Markova of the Institute of Nutrition, Academy of Medical Sciences USSR, discussed reflex effects from interoceptors of the gastrointestinal tract on circulation.

The last day of the conference was devoted to a discussion of clinical physiology of the diencephalic area. N. I. Grashchenko, G. N. Kissiliya, I. L. Vaysfel'd, G. V. Ordynets, A. D. Solov'yeva of the Laboratory of Clinical Neurophysiology of the Academy of Sciences USSR, A. S. Mel'kumova of the Institute imeni F. F. Erisman, and L. A. Blagovidova of the Leningrad Hospital imeni Kuybyshev discussed the diagnosis of various forms of impairment of the diencephalic area in humans.

Delegates to the conference voted in favor of bringing together periodically people working in the field of clinical physiology to discuss problems that arise in this field.

83. Czechs Discuss Basic Electronic Equipment for Electrophysiological Laboratories

"Basic Electronic Equipment for an Electrophysiological Laboratory," by R. Beranek, Physiological Institute of Czechoslovak Academy of Sciences; Prague, Ceskoslovenska Fysiologie, Vol VIII, No 4, Jul 59, p 290-299

The author reviews world literature dealing with basic electronic equipment suitable for installation and use in electrophysiological laboratories and describes the functions of various instruments he tested. All his tests were based on available literature and in general were confined to verifying data previously presented by other authors in this field.

Occasionally, the author lists and discusses available Czechoslovak instruments, but in conclusion he states that because of the low life expectancy of Czechoslovak electronic tubes, the use of these materials in equipping electrophysiological laboratories presents serious problems. The Czechoslovaks, according to the author, are hoping to overcome this defect soon through the use of semiconductors.

Public Health, Hygiene, and Sanitation

84. Czechoslovak Medical Service Described

"Organization of Medical Service in the Czechoslovak Republic," by E. Skrbkova; Moscow Sovetskoye Zdravookhraneniye, Vol 18, No 8, Aug 59, pp 10-19

According to this article, the economic and sociopolitical changes that have taken place in Czechoslovakia since 1948 have created the necessary prerequisites for a rapid increase in the number of medical establishments and personnel and an improvement in medical service to the population. Health

service in this republic is the product of a continuous process of reorganization and improvement which is still continuing. Scientific medical research conducted in various establishments of the republic is now being stressed. Emphasis is being placed on improving specialized medical aid and on preventive medicine. The observance of the socialist concept in health service has been found the best method for continuously improving medical aid and sanitary epidemiological service to the population.

The organization of the health service in Czechoslovakia is similar to the organization of health service in other People's Democracies. The principles of socialist health service were first developed in the USSR, and Czechoslovakia has been adhering strictly to these principles, taking into account conditions peculiar to Czechoslovakia, which have been determined by the economic structure of the country, its geographic position, and local traditions.

The Czechoslovak Republic is a highly industrialized country and has been highly industrialized since World War I. Under the leadership of the Communist Party of Czechoslovakia, the entire national economy has been reorganized and industrial production doubled. The socialization of agriculture is also proceeding in a satisfactory manner. The material and cultural level of the Czechoslovak population is high. The country is thickly populated and has an excellent transportation system and roads which connect cities and rural areas.

The present regime inherited a very good network of hospitals. The compact arrangement of the population and the efficient transportation system have made it possible to concentrate medical aid in large medical establishments which can be well supplied with modern diagnostic equipment and therapeutic preparations. Hospitalization can, therefore, be concentrated in large city rayon hospitals and is easily accessible to people living in rural areas. No need exists to establish separate rural hospitals and maternity homes.

The distinct feature of the Czechoslovak health service is its uniform and centralized organization. Czechoslovakia does not have independent networks of hospitals and outpatient clinics for children, or specialized hospitals. There is no independent network of city hospitals or independent network of rural hospitals. All medical establishments that render medical service to the urban and rural population, workers in plants and factories, women and children, and those needing special care are part of a single, unified, united organization. This single organization is divided into administrative units.

A territorial medical district embracing a population of approximately 4,000 is the principal organizational unit of medical aid to both the urban and rural population. The main organizational unit in industrial establishments is the industrial medical district, which serves a population of 800-1,600 workers, depending on the type of industry.

The medical district outpatient clinic renders service in four fields of specialization: therapeutics, pediatrics, obstetrics and gynecology, and stomatology. Medical district personnel carry on sanitary epidemic control and supervise sanitation education. The following personnel are assigned to a medical district: a physician and a nurse, a pediatrician, a pediatric nurse, a gynecologist, a midwife, and a stomatologist or a dentist and his assistant. The medical district physician is responsible for the health of people in his district and for the education of the population in hygiene and sanitation.

Medical aid in an industrial medical district consists of therapeutic and stomatological service and, depending on the type of industrial establishment and the working force, also a gynecological, dermatological and venereal, and surgical service. An industrial medical district is headed by a physician.

The rayon is a more highly organized unit: it embraces a population of about 40,000. A city rayon has a hospital with an outpatient clinic, a sanitary epidemic control station, an office for sanitation education, a blood-collecting station, a home for mothers and infants, a home for children, a tuberculosis hospital, and a home for incurables. Rayon hospitals have a 300-400 bed capacity. Some rayon hospitals have a capacity of 500-700 beds, and some have more than 1,000 beds.

Rayon hospitals have at least four sections: therapeutic, surgical, obstetric and gynecological, and pediatric. There are no hospitals exclusively for children in Czechoslovakia. (Exceptions are hospitals for children in Prague, Brno, and Bratislava which serve as a base for pediatrics faculties.) Czechoslovak hospitals are well equipped with modern diagnostic instruments and medical preparations. They all have a central roentgenology section, an electrocardiograph, a biochemical laboratory, a place for physiotherapy and therapeutic gymnastics, a room for dissection, and a histological laboratory.

City rayon hospitals serve not only the city population, but also the rural population since there are no rural district hospitals in Czechoslovakia. There is one ambulance available per 4,000 persons. Rayon hospitals also serve industrial workers, since only the larger industrial establishments have their own hospitals.

Rayon outpatient clinics have at least seven special sections: therapeutic, surgical, gynecological, pediatric, stomatological (including orthodontia and prosthesis), tuberculosis, and dermatological and venereal. Rayon outpatient clinics are well supplied with modern diagnostic equipment and medical preparations.

All medical establishments within the geographic limits of a rayon belong to a single administrative unit. Apothecaries are at present under the jurisdiction of oblast health administration, but are expected to be placed under the jurisdiction of rayon health authorities.

The director of a city rayon hospital is a medical specialist responsible to the executive committee of the Rayon National Committee. He has three deputies; the first deputy is the rayon sanitation inspector, who is in charge of the sanitary epidemic control station and the entire sanitary-epidemiological service within the territorial limits of the rayon. The second deputy is a physician in charge of therapeutic and preventive medical service and is usually the chief hospital physician. The third deputy is in charge of administration, management, and technical operations for all united medical establishments of the rayon. The rayon physician for sanitation education, the physician-statistician, and the director of training within the rayon are subordinate to the director of the united therapeutic and preventive medical service of the rayon.

The chief nurse of a rayon is in charge of the subprofessional medical personnel. This chief nurse and the rayon physician on expertise of labor capacity are subordinate to the deputy, who is the physician in charge of the united therapeutic and preventive medical service.

The director of the united rayon therapeutic and preventive service of a rayon is assisted by an advisory council which consists of his three deputies, the rayon physician in charge of sanitation education, qualified specialists in various fields, representatives of the rayon executive committee of the National Committee, and party and trade union organization.

The oblast is a higher organizational unit. It embraces a population of approximately 500,000. Oblast medical establishments are highly specialised units; they are very well equipped in all respects, and their medical personnel are highly qualified. Oblast medical establishments supervise the work of rayon medical establishments.

The oblast hospital with its outpatient clinic usually has a 1,000-bed capacity. It is subdivided into therapeutic, surgical, obstetric and gynecological, pediatric, tuberculosis, communicable disease, stomatological orthopedic, traumatological, urological, oncological, neurological, and psychiatric sections. These sections are further subdivided into specialized units. It exercises control over the oblast sanitary-epidemiological station. The oblast center of sanitation education, the oblast blood-collection station, a tuberculosis hospital for patients requiring prolonged treatment, a psychiatric hospital for treatment of the mentally ill and alcoholics and drug addicts, a hospital for treating asthma and diseases of the circulatory system, sanatoriums for adults, adolescents, and children, an oblast department for supervising the training of subprofessional medical personnel, and the oblast administration of apothecaries.

A medical specialist acts as the director of all medical establishments at the oblast level. The director is responsible both to the oblast Department of Health and to the executive committee of the oblast National Committee. He has three deputies: one is in charge of sanitary epidemic control, the second is in charge of therapeutic and preventive medical service, and the third is in charge of administration and management. The oblast physician for sanitation education, the oblast pharmacist in charge of drug distribution, and the director of the oblast medical school are responsible to the director. The deputy in charge of sanitary epidemic control also acts as chief medical officer of the oblast sanitary-epidemiological station.

The oblast department of health is a branch of the oblast National Committee and of the Czechoslovak Ministry of Health. Its job is to assist in preserving the health of all productive forces of the country and to keep pace with economic development.

It should be noted that all rayon departments of social welfare were merged in 1958 into the departments of health of their respective rayons. The director of the united therapeutic and preventive medical service of a rayon is also in charge of social welfare.

85. Hungarian Public Health Facilities Reviewed

"The Significance of Public Health in a Socialist Society," by Dr Frigyes Doleschall, Minister of Health; Budapest, Belpolitikai Szemle, Dec 59, pp 22-27

After a general review of the history and functions of public health, Dr Doleschall lists the following Hungarian institutions and their functions.

The chief task of the National Public Health Institute (Orszagos Kozegeszsegugyi Intezet) is scientific research directed toward the development of public health matters. This includes immunobiology (including the study of disease microbes and animal and plant parasites harmful to man); prevention of epidemics; a study of health conditions in populated areas and their improvement; development of methods; and supervision of the production of medicines and serobacteriological preparations.

The National Labor Health Institute (Orszagos Munkaegeszsegugyi Intezet) studies problems of labor health to protect workers in connection with their work; it helps train physicians dealing with labor health matters; and it makes periodic medical examinations and treatment of workers suffering from occupational diseases.

The National Food and Nutrition Sciences Institute (Orszagos Elelmezes es Taplalkozastudomanyi Intezet) does scientific research connected with human nutrition and research aimed at improving health conditions in foodstuffs

production, catering service, food industries, and the food trade. It develops principles for feeding the sick; it gives advice in nutrition questions; supervises food supplements, dietetic preparations, enriched foods, protective foods, and drinks; participates in training nutrition specialists; and detects harmful or poisonous substances.

Dr Doleschall adds that, in 1951, a state public health control organization was set up to coordinate public health services. This organization also realized public health requirements connected with construction. In 1954, public health epidemic stations were organized in Budapest and in each megye and city of megye size.

Dr Doleschall then lists future tasks for the development of public health: increasing equipment inventories and the number of personnel at public health epidemic stations; expanding the public health epidemic station network; and guaranteeing that the Ministry of Health plays a guiding role in solving health tasks appearing in the jurisdictions of other ministries. He adds that no new decrees are needed, but existing regulations must be enforced effectively.

86. Hungarian Ministry of Health Organization Guides Research

"Scientific Council for Health Affairs Guides and Supervises the Work of Researchers," by Rozsa Feher; Budapest; Magyar Nemzet, 23 Dec 59; p 5

The Scientific Council for Health Affairs (Egeszsegugyi Tudomanyos Tanacs) is an advisory organ of the Ministry of Health. Its 28 members are leading representatives of various branches of science. It meets once a month and, in 1959, dealt with 3,687 individual matters. In this article, Dr Jozsef Sos, Kossuth Prize-winning professor and chairman of the council, and Dr Zoltan Alfoldy, secretary of the council, tell of their work.

The council cooperates with the Academy of Sciences in developing health research plans and guides and supervises researchers doing work in this field. It also discusses proposed laws with the Ministry of Health and advises it on health matters such as the recent introduction of the Sabin vaccine. In 1959, the council aided 700 research projects and now spends 2 million forints per year on research. The Judicial Affairs Committee of the council makes final evaluations of medical matters which come before the courts.

Radiology

87. Sodium Carbonate Used Against Uranium Acetate Poisoning

"On the Problem of the Toxicity of the Complex Acetate Uranium Compound," by Ye. I. Ivanyuk-Beluga and B. A. Roytrul', Institute of Physiology imeni A. A. Bogomolets, Academy of Sciences Ukrainian SSR, Division of Experimental and Clinical Neurology; Kiev, Fiziologichniy Zhurnal, Vol 5, No 6, Nov/Dec 59, pp 803-805.

One method of protecting an organism from uranium poisoning may be the administration of sodium carbonate.

In this research, the animals (white rats) received subcutaneous injections of 4 ml of a one-percent sodium carbonate solution for a period of 6 days before and 17 days after the administration of a single dose of 12 mg of uranium acetate per kg of body weight.

Six of the 12 experimental animals died and six survived during a 48-day experimental period.

88. Collection of Radioactive Aerosols

"The Problem of Natural Radioactivity in the Air (Preliminary Information)," by Yu. A. Tatsiy. Sb. Nauchn. Rabot po Radiol. i Rentgenol. (Collection of Scientific Works on Radiology and Roentgenology), Kiev Institute for Advanced Training of Physicians, 1959, pp 213-215 from Referativnyy Zhurnal -- Geografiya, No 10, Oct 59, Abstract No 29864)

"A description of the methodology and apparatus employed by the author for collecting radioactive aerosols and for measuring alpha and beta activity is given."

89. Research on Radiation Pharmacology

"Development of Research on Radiation Pharmacology," by Prof S. Arbuzov, Department of Radiobiology, Institute of Experimental Medicine, Academy of Medical Sciences USSR; Moscow, Meditsinskiy Rabotnik, 12 Jan 60, p 3

The author reviews the significance of the treatment and prevention of radiation injuries, then criticizes the paucity of research in the important fields of radiation pharmacology and in the purposeful

synthesis of pharmacological preparations which affect the course and outcome of radiation injuries; he also criticizes the level of modern technology in this field of science.

Among the substances which either alleviate or prevent damages due to ionizing radiation and are already in the hands of physicians and radiobiologists, the following are briefly discussed: beta-mercaptoethylamine, or becaptan (Soviet merkamine) and its hydrochloride, salicylate, ascorbate, and nicotinate; the use of phenatine and other drugs in combination with mercamine; unithiol; organophosphorus cholinesterase inhibitors, including phosphoric acid amide and octaethyltetramidopyrophosphate; the combined use of aminazine and phenatine; sodium chlorophyllin; and beta-cytosterol.

The author emphasizes that it is necessary to study the pharmacodynamics of these agents and to explain the mechanisms of their protective and pharmacotherapeutic effects.

The significance of the role of the autonomic and sympathetic nervous systems in the pathogenesis of radiation injuries is also emphasized since it affects the course and outcome of radiation sickness.

All these facts indicate that not only in the development of radiation sickness, but also in the protective, compensatory, and restoration reactions during ionizing radiation, the autonomic and above all the sympathetic nervous system and the subcortical centers play an important role. It is only through the combined efforts of synthetic chemists, pharmacologists, and radiobiologists that success in research along this line will be assured.

90. Treatment of Radiation Sickness

"Concerning the Treatment of Radiation Sickness," by A. A. Gorodetskiy and Ye. Ye. Chebotarev, Institute of Physiology imeni A. A. Bogomolets, Academy of Sciences Ukrainian SSR, and the Laboratory of Biophysics; Moscow, Novyy Khirurgicheskiy Arkhiv, No 4 (220), Jul/Aug 59, pp 3-12

Research conducted by various authors on the following subjects is reviewed: blood transfusion, various blood components and substitutes (especially bone marrow), leukocyte mass, and the properdin fraction of proteins; the use of antibiotics and vitamins; and the relationship between the severity of radiation injuries and the availability of oxygen.

The authors state that a significant amount of both clinical and experimental material indicates that effective results in the treatment of radiation sickness can be obtained not by using specific drugs but by following a rationally organized system of therapeutic measures.

91. Local Irradiation of Eyes by Lethal Doses

"The Effect of Ionizing Radiation on the Eyes," by G. G. Kanbay; Baku, Azerbaydzhanskiy Meditsinskiy Zhurnal, No 12, Dec 59, pp 64-66

The effect of a single local dose of ionizing radiation (450 r) from a "Burevestnik" apparatus on the eyes of six rabbits was investigated.

After the irradiation of one eye by 450 r while the rest of the body was shielded, there were no deaths for one month. A certain amount of immobility was noted immediately after irradiation by such a dose, but this soon disappeared and the experimental irradiated animals did not differ from the unirradiated ones.

During the fourth week, changes in the sesitivity of the cornea began to appear. Clinically, no other changes could be detected during this month.

The author's results agree with the results reported in literature which state that the same dose which is lethal to animals when focused on the general abdominal region, or the pelvic region, is not lethal if only the head or the rest of the body is subjected to it. It is apparent that with X rays or other types of ionizing radiations, not only the dose but the site subjected to radiation effects makes a difference.

92. Soviet Therapeutic Uses of Radioactivity Discussed at Budapest Conference

"Radioactivity in the Service of Therapy" by Dr. A. Sz.; Budapest, Nepszabadsag, 22 Dec 59, p 6

The article reports on three papers read at the Eighth Hungarian-Soviet Physicians Conference in Budapest.

At the X-Ray and Radiology Research Institute in Moscow, Prof Z. F. Lopatnikova had irradiated 180 patients with inoperable esophageal cancer using a rotating cobalt source and radiating material placed in the esophagus. The treatment was ineffective in only five cases.

Prof M. N. Fatyeyeva reported on use of radioactive isotopes to study blood circulation and on a cardioradiographic method using simultaneous administration of human serum protein tagged with radioactive iodine, radioactive colloidal gold, and methyliodide tagged with radioactive iodine.

Prof A. V. Kozlova reported on use of radioactive iodine to treat thyroid gland hypertrophy. Symptoms disappeared in almost all of the 3,000 serious cases treated in recent years. The experiences with thyroid gland tumors were not so favorable. She also reported on use of colloidal radioactive istotopes in "radiosurgery."

Surgery

93. Hemostatic Preparations From Muscle Tissue of Human Fetus

"Hemostatic Properties of Preserved Muscle Tissue of Human Fetuses," by T. L. Svarovskaya, Chair of Hospital Surgery, Omsk Medical Institute; Moscow, Ortopediya Travmatologiya i Protezirovaniye, No 10, Oct 59, pp 34-38

The Hospital Surgical Clinic of Omsk Medical Institute, which for a number of years has been studying the problem of the therapeutic use of preserved human fetal tissues (skin, bone, and muscles) in surgery, has established that the homoplastic transplantations of these tissues, which possess great life-giving capacity and good regeneration and stimulation properties, is safe for humans.

This article describes the method of preparing the tissues and their extracts and preserving them at 2 and 4°C.

The author presents the following conclusions:

Preserved, chilled muscles of the human fetus possess hemostatic properties which speed blood coagulation by a factor of two to three, as compared with controls.

The hemostatic properties of preserved, chilled muscle tissue of the human fetus are retained until the onset of decay processes (3 - 4 weeks in these experiments).

Muscles of the human fetus, when dessicated in a thermostat and pulverized, are well preserved and do not lose their hemostatic properties for 6-8 months.

During the processing of the hemostatic preparation, the temperature of the dessicated muscles from which the preparation is made must not exceed 60°C. At higher temperatures the hemostatic property of the muscle tissue disappears.

The preparation and use of hemostatic preparations from human fetal muscle tissue is simple and easily available.

94. Use of Cadaver Skin in Homotransplantation

"The Successful Use of Cadaver Skin in Homotransplantation in a Case of Extensive Burns," by V. M. Nechiporuk, Chair of General Surgery, Ternopol' Medical Institute, Ternopol' Oblast Hospital; Kiev, Novyy Khirurgicheskiy Arkhiv, No 4 (220), Jul/Aug 59, pp 103-104

A case is reported of a 29-year old girl who was admitted to the hospital in serious condition with extensive second and third degree burns. In addition to the usual treatment by antibiotics and the transfusion of sufficient quantities of protein preparations, the patient received skin homotransplants taken 2 hours after the death of an infant who lived only 5 hours.

This case merits mention in view of the extreme rarity of the stability of homotransplants from cadaver skin.

Miscellaneous

95. Work of the Central Scientific Medical Library

"A Treasure House of Medical Thought," by J. Artamonov; Moscow, Meditsinskiy Rabotnik, No 1 (1853), 1 Jan 60, p 4

According to this article, the Central Scientific Medical Library in Moscow is one of the largest in the world. Its address is Ploshchad' Vosstaniya Dom No 1/2. Trucks deliver mailbags of books and current periodical literature daily. These books and periodicals are sorted and channeled to various divisions and sections of the library.

Shelves of reading and periodical rooms are filled with current periodical literature, open and available to the public. The loan division of the library serves more than 700 medical libraries of the Soviet Union. The library has a reference room and a bibliographic

register room where scientific medical works are catalogued for the benefit of scientific and practical workers. The loan section of the library allocates books to medical libraries in the USSR.

The Division for the Network of Medical Libraries of the USSR advises more than 4,000 medical libraries in organization and methodology, and offers courses and conducts seminars, meetings, and conferences for library workers. The library also has a medical literature reference bureau and an international loan and exchange section which does business with 1,150 foreign scientific organizations and establishments.

Yuliya Mikhaylovna Nazarova is head of the international loan and exchange section of the library; her assistant is Kim Adyrkayev. They receive letters of appreciation from many people of various countries and various autonomous republics and oblasts of the USSR. Many periodicals are piled up on the floor and on the shelves as well as on the tables of employees of this section. The library receives 1,546 different kinds of publications from 78 countries: from America, France, Italy, Poland, Rumania, Bulgaria, Hungary, Algiers, the Belgian Congo, Brazil, Kenya, Lebanon, Mexico Nigeria, Syria, Chili, Jamaica, Portugal, etc.

During the past 4 years, the library has received over 95,000 copies of foreign medical publications. About 100,000 medical periodicals, 60 individual library collections and microfilms, and photostatic copies of pages of books and periodicals were sent abroad by the library.

Organizations in 286 cities throughout the world receive Soviet medical literature by mail. Organizations usually interested in Soviet medical literature are academies of sciences, scientific research institutes, universities, associations, and medical societies. Some countries which receive or indicate interest in receiving Soviet medical literature are the US, (including Hawaii), England, Italy, France, New Zealand, the Union of South Africa, Costa Rica, Burma, Iran, and Iraq.

The library holds about a million books, periodicals, brochures, and dissertations in 54 languages spoken by various peoples living in the USSR. Antiquated and unique publications of such authors as Harvey, Hippocrates, Galen, and Avicenna can also be found in the library.

96. Medals Presented to Soviet Officials

"Presentation of Medals 'For Work Well-Done'" (unsigned article); Moscow, Meditsinskiy Rabotnik, No 1 (1853), 1 Jan 60, p 1

"On 31 December, the Kremlin was the scene of the presentation of medals by K. Ye. Voroshilov, Chairman of the Supreme Soviet USSR. Each of the following was presented a medal for work well done: N. S. Khrushchev, member of the Presidium of the Central Committee CPSU, Chairman of the Council of Ministers USSR, and chairman of the Bureau of the Central Committee CPSU for the RSFSR; N. G. Ignatov, member of the Presidium of the Central Committee CPSU and Secretary of the Central Committee CPSU; A. B. Aristov, member of the Presidium of the Central Committee CPSU; Secretary of the Central Committee CPSU, and deputy chairman of the Bureau of the Central Committee CPSU for the RSFSR; V. V. Matskevich, Chairman of the Council of Ministers RSFSR; D. S. Polyanskiy, Minister of Agriculture USSR; T. D. Lysenko, director of the Scientific Research Institute of Genetics of the Academy of Sciences USSR; G. A. Denisov, head of the Department of Agriculture of the Central Committee CPSU for Union Republics; G. I. Vorob'yev, head of the Department of Agriculture of the Central Committee CPSU for the RSFSR; M. T. Yefremov, head of the Department of Party Organs of the Central Committee CPSU for the RSFSR; A. S. Shevchenko, Deputy Secretary of the Central Committee CPSU; P. N. Denichev, first secretary of the Moscow Oblast Party Committee; V. I. Kpnotop, chairman of the Executive Committee of the Moscow Oblast Council Workers Deputies; and V. I. Edel'shteyn, Honored Academician of the All-Union Academy of Agricultural Sciences imeni V. I. Lenin (VASKhnil) and head, Chair of Vegetable Farming of the Agricultural Academy imeni Timiryazev.

"The award decree was read by M. P. Georgadze, secretary of the Presidium of the Supreme Soviet USSR.

"In presenting a medal for work well done to comrade N. S. Khrushchev, K. Ye. Voroshilov warmly and cordially congratulated him for earning such a high award.

"Accepting the medal, Nikita Sergeyevich Khrushchev expressed his whole-hearted thanks to the Communist Party and the Presidium of the Supreme Soviet USSR for the honor bestowed on him and he said that he would wear the medal with great pride. N. S. Khrushchev further stated that he would channel all his energy, as before, toward serving the Soviet people and toward continuing the great work of building Communism in the Soviet Union.

"In congratulating N. G. Ignativ, A. B. Aristov, and D. S. Polyanskiy, K. Ye. Voroshilov noted their great work in organizing and mobilizing the country's manpower to improve agricultural production.

"K. Ye. Voroshilov warmly congratulated comrades V. V. Matskevich, T. D. Lysenko, G. A. Denisov, G. I Vorob'yev, M. T. Yefremov, A. S. Shevchenko, P. N. Demichev, V. I. Konotop, and V. I Edel'shteyn when he presented their medals, and he wished them new success in their work for the good of the country and the Soviet people.

"In expressing their profound appreciation to the CPSU, the Presidium of the Supreme Soviet USSR, and the Soviet government for placing such a high value on their small contributions, winners of the awards promised to strive even more to carry out the historical decisions of the 21st Party Congress and to work harder toward fulfillment of the Seven-Year Plan for the development of the national economy.

"In conclusion, K Ye. Voroshilov once more congratulated all those who received awards and wished them good health and further success in their great work during 1960."

97. Hungarian Symposium Reviews Bloc Protein Research

"A Report on the Budapest Protein Symposium" by Mrs. Laszlo Szabolcsi; Budapest Magyar Tudomany, Oct 59, pp 551-552

This article notes first that a committee was formed in 1956 to coordinate the protein biochemistry research of the socialist countries. The committee decided to organize regular symposiums; the first was held in Moscow in 1958 and the second was held in Budapest in August 1959. The Biology Group of the Hungarian Academy of Sciences was host for the Budapest symposium. Among the participants were: Professor Afanasyev, Moscow; Dr. B. Keil and Dr. I. Rychlik, Prague; Professor Segal; Berlin; Dr. Bottger and Dr. Schultz, Halle; and Dr. Kaladzief, Sofia.

Dr. F. Bruno Straub, in his introduction, stressed the importance of cooperation between "friendly countries." Mrs Laszlo Szabolcsi read a paper entitled "Concerning the Question of the Connection Between the Chemical Structure and the Biological Function of Proteins," by the staff of the Biochemistry Institute of the Hungarian Academy. Among other things, this paper dealt with the role of the spatial structure of phosphoglycerinealdehyde dehydrogenase in biological activity.

Dr B. Keil reported on the work of the First Biochemistry Department of the Chemistry Institute of the Czechoslovak Academy of Sciences; his paper was entitled "A Study of the Structure of the Pancreatic Proteases." He mentioned "an interesting methodological development" -- the use of tritium protein analysis. This method has been used to begin a structure analysis of the very complex tryptophan peptides.

Professor Afanasyev, representing the Biochemistry Institute of the Academy of Sciences USSR, read a paper on his enzyme kinetics investigations Citing special cases of enzyme reaction kinetics, he criticized the classical Michaelis-Menten theory and presented a new theory pertaining to the enzyme substrate complex which develops during the reaction.

F. Bruno Straub reported on the present status of research in protein synthesis and on the work being done at the Medical Chemistry Institute of the Budapest Medical Sciences University.

Dr I. Rychlik reported on work being done in the Second Biochemistry Department of the Chemistry Institute of the Czechoslovak Academy in connection with the inactivation of oxytocin.

Summarizing lectures were given in Tihany, on Lake Balaton, and were followed by 2 days of unlimited debate. Dr Elek Woinarovics, director, reported on the work of the Tihany Biological Institute. There was much debate at Tihany about the Segal-Kaladizief-Dornberg protein structure hypothesis developed during the course of German-Bulgarian collaboration. "There can be no doubt," writes Mrs Szabolcsi, "that the ambition of the authors is correct; but, as a number of the participants in the debate emphasized, the hypothesis is built only on physical results of protein research and does not take into consideration the recent results, of crucial importance, in chemical structural analysis."

Prof Ilona Banga reported on her most recent investigations connected with the albuminoids of vein walls. Laszlo Benei reported on his analysis of an amino acid which can be compared to amylase. Maria Szekely and Sandor Manyai reported on problems of protein synthesis. Laszlo Boross, of the Biochemistry Institute of the Hungarian Academy, reported on his achievements with ion exchange chromatography of phosphoglycerinealdehyde dehydrogenase.

90. Hungary to Build Central Medical Research Institute

"Central Medical Sciences Research Institute To Be Built," by Klari R. Farkas; Budapest Magyar Nemzet, 20 Dec 59, p 7

This article is based on a conversation with Antal Babics, Kossuth Prize-winning professor and secretary of the Biological and Medical Sciences Department of the Hungarian Academy of Sciences, concerning the future plans of his department.

He says, "We are preparing to educate researchers in brain neurology, biochemistry, and morphology, thus forming a medical base for psychological research in addition to already established training programs." He emphasizes that virus research will include research into the genetics of

microbes, "which also has a role in agriculture." A nationwide, detailed work plan for tumor research has also been prepared. Finally, he says that withing 2 years a Central Medical Sciences Research Institute will be built and basic research will be concentrated there.

99. Hungarian Scientists Review 1959 Achievements

"Scientists Speak About Their Outstanding Achievements of 1959" (unsigned article); Budapest, Magyar Nemzet, 25 Dec 59 p 4

This review is based on interviews with a number of scientists, most of whom were featured in stories made public during the year.

Janos Mocsi, Kossuth Prize-winning academician, reported that the most important scientific achievement in veterinary medicine, "an achievement of world-wide importance," was the work on immunity in cases of parasite infection. On a more local scale, he continued, important work had been done in bacteriology with microorganisms belonging to the "so-called PPLO group... Manniger is continuing this work in his institute."

Imre Toro, Kossuth Prize-winning academician, reported that in 1959 all four Hungarian medical universities had been equipped with electron microscopes and are doing "very illustrative experiments" on the mutual interactions of cell nuclei and cell protoplasm."

100. Strength and Corrosion Stability of Certain Welded Titanium Alloys

"Mechanical Properties and Corrosion Stability in Nitric Acid of Weld Joints of Certain Titanium Alloys," by S. M. Gurevich and L. N. Yagupol'skaya, Institute of Electric Welding imeni Ye. O. Paton; Kiev, Avtomaticheskaya Svarka, No 10, Sep 59 pp 19-30

Results are presented of tests of mechanical properties and corrosion stability in 99% HNO_3 of weld joints of titanium base alloys VT3-1 (3.55% Al, 1.67% Cr, 1.27% Mo), VT4 (4.58% Al, 1.43% Mn), OT4 (2.5% Al, 1.1% Mn), VT5 (4.6% Al), and VT5-1 (3.5% Al, 2.82% Sn). Specimens were welded by the submerged-arc method in flux AN-T1 with wire electrodes of industrial titanium VT1 at a current of 200-250 amps, arc voltage of 30-32 v, and speed of 50 m/hr. Highest strength at room and elevated temperatures was exhibited by weld metal of VT3-1 weldments. Weld joints of the single-phase alloy VT5-1 and the two-phase alloy OT4 possessed maximum ductility. Impact strengths of joints of all the alloys studied were practically equal at room temperature. A greater drop in impact strength of welds of VT5 and VT5-1 was noted at low temperatures than for those of OT4 and VT4, indicating decreased sensitivity of the latter two-phase alloys to hydrogen. High corrosion stability was exhibited by both the parent metal and weld joint metal of all alloy weldments in the liquid phase of concentrated HNO_3. Stress corrosion developed in all alloys and weld joints tested in a gaseous phase of this acid. Further studies of the effect of alloying elements on the corrosion stability of titanium in concentrated HNO_3 are considered necessary.

101. Crack Formation in Forging Low-Ductility Alloys

"On the Problem of the Formation of Cracks During Sectional Forging of Low-Ductility Alloys," by M. V. Rastegayev; Moscow, Kuznechno-Shtampovochnoye Proizvodstvo, No 11, Nov 59, pp 8-12

Investigations of the formation of cracks propagating along lines of extension and spreading during sectional forging of strip made from the low-ductility alloy Kh18N25S2 showed that the breakdown mechanism consists of shear and rupture, independent of the sharpness of angles of a forging die. In the shear stage, strong displacement occurs along the forging crest under the action of restricted deformation, resulting in high temperatures, whereby the regions of shift become saturated with

the second phase and fuse. In the second stage, rupture occurs under the effect of tensile stresses appearing due to the greater flow of metal in regions remote from the contact surfaces than in zones adjoining the contact surfaces. Breakdown along forging crests in low-ductility metals may be prevented by forging processes consisting of triaxial reduction with limited spreading.

102. New Low-Alloy Steel for High Parameter Boilers

"New Low-Alloy Steel for Boiler Drums of High Parameters," by T. M. Slutskaya; Kiev, Avtomaticheskaya Svarka, No 10, Sep 59, pp 94-95

Basic data are presented on the new low-carbon, low-alloy steel, 15GKhNF, designated for use in manufacturing welded boiler drums of high parameters and which may be recommended as a high-strength steel for components fabricated by the electroslag welding method. Chemical composition of steel 15GKhNF is as follows: 0.12-0.18% C; 0.3-0.6% Si; 1.25-1.65% Mn; 0.8-1.1% Cr; 0.4-0.8% Ni (when melting steel from pig iron prepared from Orsk-Khalilovo ore the nicket content is residual); 0.05-0.2% V; and not more than 0.3% Cu, 0.04% S, and 0.035% P. Creep resistance of 16.5 kg/mm^2 at 400°C is 3 kg/mm^2 higher than that of steel 22K. Resistance to corrosion cracking is three times better than that of carbon steel (comparison tests with steel 20K). Recommended specifications for welding 90-mm-thick sheets with two 3-mm-diameter 10G2 wires are as follows: wire feed rate, 700 m/hr; welding current, 1,300 amps; and welding speed, 2.2 m/hr. Work was performed jointly by the Institute of Electric Welding imeni Ye. O. Paton and the "Krasnyy Kotel'shchik" plants in the cities of Taganrog and Zhdanov. Tests on creep and corrosion cracking were conducted by the Central Scientific Research Institute for Boilers and Turbines imeni Polzunov in Leningrad.

103. New Design for Test Specimens

"Study of the Sensitivity of a Metal to the Action of Concentration of Stresses on Specimens of New Design," by S. A. Dovnar; Minsk, Doklady Akademii Nauk BSSR, No 11, Nov 59, pp 449-541

Specimens consisted of flat disks made of the material to be tested with a V-shaped circular groove on each face positioned concentrically. Diameter of grooves were the same for shear test specimens and varied in tensile test specimens. Crumbling and plastic deformation characteristic

in specimens of ordinary design during shear tests are practically eliminated with the use of disc specimens. Results are given of tests with disk specimens of quenched and unquenched steel and cast iron which indicate the high sensitivity of this method for registering the ability of a metal to endure concentration of stresses.

104. Liquefied Gas for Forming Sheet

"On the Possibility of Forming Sheet With the Aid of Liquefied Gas," by A. P. Barsukov; Moscow, Kuznechno-Shtampovochnoye Proizvodstvo, No 11, Nov 59, pp 23-24

Working pressures for forming sheet are generated by the transition of nitrogen from a liquid to a gaseous state. Components may be produced singularly or in duplicate by using single or double female die arrangements. Tests with sheet made of AMTsA-M, V-95, L62, 1Kh18N9T, and other materials indicated that the quality of the seal between the pressure chamber and blank is of little importance due to the rapid transformation of the liquefied gas. The liquefied nitrogen method was developed by A. P. Barsukov (Authorship Certificate No 118162, 17 Jul 1958) and is an adaptation of the process developed by R. V. Pikhtovnikov (Authorship Certificate No 11630, 3 Sep 1950), together with the Khar'kov Aviation Institute and the Scientific Research Institute of Technology and Organization of Production of the Aviation Industry.

105. Strip and Intricate Profiles Directly From Molten Metal

"Once Again on the Discovery of Professor Stepanov" (unsigned article); Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 30 Dec 59, p 3

Increased attention is being shown to Professor Stepanov and his process of producing strip and intricate profiles directly from molten metal. As of now, it is claimed that provisions are being made to increase the electric power supply to Stepanov's laboratory and construct special equipment. The State Institute of Rare Metals has been instructed by the Branch of Nonferrous Metallurgy of Gosplan USSR to build the necessary experimental equipment and conduct tests at the "Krasnyy Vyborzhets" Plant by 1 May 60 on the production of strip and tubing from heavy nonferrous metal alloys. Reference is made to an earlier article in this newspaper ("Once Again on the Discovery of Professor Stepanov," by Ye. Temchin; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 21 Oct 59, p 3), in which the author discussed the difficulties experienced by Professor Stepanov in obtaining material support to develop his process.

106. Prevention of Internal Defects in High-Alloy Steel Forgings

"Appearance of Local Overheating and Internal Defects During Forging of High-Alloy Steels," by M. Ya. Dzugutov and B. F. Vakhtanov; Moscow, Kuznechno-Shtampovochnoye Proizvodstvo, No 11, Nov 59, pp 5-8

Forging tests on the high-alloys EI696, EI787, and KhN80T (with boron) indicated that defects appeared in the axial zone of specimens under the action of shear and tensile stresses in zones of local overheating during intense forging. Local overheating of these steels may be avoided by maintaining deformation below 40% for each forging step and reduction at no greater than 4% for each impact. Decreasing heating temperatures before forging is not satisfactory due to the narrow forging temperature interval of these steels.

107. Experimental Press for Hot Extrusion and Rolling of Blades

"Hot Extrusion of Intricate Blanks for Compressor Blade Forgings on an Experimental 200-Ton Hydraulic Press," by B. N. Batagov and V. S. Povarov; Moscow, Kuznechno-Shtampovochnoye Proizvodstvo, No 11, Nov 59, pp 19-23

Descriptions are given of the design and operation of an experimental 200-ton hydraulic press developed jointly by the Central Scientific Research Institute of Technology and Machine Building and the Scientific Research Institute of Technology and Organization of Production of the Aviation Industry. Blades of steel 19KhNVA with tolerances of 0.1 mm along the blade feather were produced by three deformation steps consisting of billet flattening, hot extrusion, and two hot rolling passes followed by calibration. A 35% savings in metal is claimed for this method as compared to the ordinary forging and grinding method of producing third stage compressor blades.

108. Rich Diamond Placer in Severnyy Ural

"Ural Diamonds" (unsigned article); Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 30 Dec 59, p 2

A brief announcement is made of the discovery of a rich diamond placer in Severnyy Ural on the upper reaches of the Vishera River, a tributary of the Kama River. On the basis of reserves already explored, it is claimed that diamond production in the Urals will be increased tenfold. The discovery was made by geologists of the Ural Geological Administration.

Experimental and Theoretical Physics

109. Study of a Spark Channel

"Widening of a Powerful Spark Channel in a Liquid," by V. S. Komelkov and Yu. V. Skvortsov; Moscow, Doklady Akademii Nauk USSR, Vol 129, No 6, Dec 59, pp 1273-1276

The first stages of the spark channel in a liquid during the first period of current flow have been investigated. The obtained pictures of the discharge showed that the spark channel widens much slower than the shock wave front. A characteristic peculiarity of the shock waves is their constant velocity during the observation time. This peculiarity pertains also to the speed of widening of the channel.

110. Testing of Materials With X-Rays

"Influence of Surface Relief on the Intensity of the X-Ray Diffraction Maxima," by A. S. Kagan, B. T. Polyak, and S. Sh. Shilshteyn, Moscow Institute of Steel imeni Stalin; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 29, No 9, Sep 59, pp 1142-1145

The occurrence of a weakening of intensity of diffraction maxima with reflection indexes low in comparison with theoretical values is demonstrated in the case of powder samples with a high μR. From analysis of the surface geometry, the absorption factor is found, the introduction of which leads to satisfactory agreement with experiments.

111. Dielectric Permeability at High Frequencies

"Use of Slow Surface Waves for Measurement of Dielectric Permeabilities of a Substance at Super-High-Frequencies. II," by V. P. Shestopalov and K. P. Yatsuk, Kharkov State University imeni Gor'kiy; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 29, No 9, Sep 59, pp 1090-1099

A new method of measuring dielectric permeabilities of solid dielectrics using surface waves of the delaying system helix-dielectric has been pointed out by the authors in this periodical (Vol 29, No 7, p 521 (1959)). The results of this work are expanded for the case of liquid dielectrics. Formulas for ε have been derived for the case in which

the helix is entirely immersed in the liquid and also for the case in which the liquid is located in the dielectric tube on which the helix is wound. Allowance is made for the effect of periodic properties of the helix on the accuracy of ε measurements. The resulting measurements confirm the correctness of the theoretical analysis.

112. Measurement of Dielectric Permeability

"Use of Slow Surface Waves for Measuring the Dielectric Permeability of a Substance at Super-High Frequencies. III," by V. P. Shestopalov, K. P. Yashchuk, and I. P. Yakimenko, Kharkov State University imeni Gor'kiy; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 29, No 11, Nov 59, pp 1330-1338

The method of measuring the permeability of a substance by means of a helical waveguide is extended to dielectrics having losses. For the case of small losses, formulas are obtained permitting the determination of tan δ of solid samples of cylindrical shape and tan δ of fluids filling a cylindrical tube with wound-on helix. The experiments confirmed the correctness of the theoretical assumption.

113. Calculation of Fields of Electron Optic Lenses

"Method of Solution of a Class of Axisymmetrical Problems of Potential Theory and Its Application in Calculating the Fields of Electron Optic Lenses," by G. A. Grinberg and I. A. Shukeylo, Physicotechnical Institute, Academy of Sciences USSR; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 29, No 11, Nov 59, pp 1293-1304

The solution of a certain class of electrostatic and affiliated problems for fields with rotational symmetry is analyzed. It is demonstrated that if the corresponding systems satisfy specified conditions of geometric order, the problems can be solved by a series of consecutive approximations, each of which is obtained by the solution of a plane electrostatic problem. The latter condition permits the use of the well developed theory of functions of a complex variable for the solution of problems with axial symmetry.

114. Unified Field Theory for Gravitation and Electricity

"The Unified Theory of Gravitation and Electricity," by J. Pachner, Physics Department of the Technological Institute in Prague; Leipzig, Annalen der Physik, Vol 5, No 1/2, 1959, pp 70-106

Following a brief critical survey of the various unified field theories representing a further development of Einstein's general theory of relativity, the principles of the four-dimensional unified theory of gravitation and electricity are expounded. The field equations, which contain a matter-tensor density (proportional to the modified delta-function) and an electrical current-vector density, are derived from a heterogeneous Hamiltonian; their compatibility and completeness are proved, and their physical interpretation is given on the basis of the Maxwell approximation. The 1 + 1 + 4 indentities, which reduce the number of independent field equations, are interpreted as conservation principles. The equations of motion are derived from the field equations by the new method of Infeld (Acta Phys. Polon. 13, 187 (1954)), given explicitly in the lowest approximation for the case of the motion of two bodies, and integrated for the case of the motion of an electrically charged body. Finally, a fundamental system of units is devised, in which all physical dimensions are measured with dimensionless numbers; the interrelationship of natural constants is investigated, and a new hypotheses is proposed, according to which values other than zero of the coupling constant between the gravitational and electromagnetic portions of the uniform field are caused by the discontinuous character of the electrical charge.

115. Simplified Method of Demonstrating Disappearance of Gravitational Energy

"On the Problem of the Energy of the Gravitational Field," by H. G. Schoepf, Institute of Theoretical Physics, Greifswald University; Leipzig, Annalen der Physik, Vol 5, No 1/2, 1959, pp 1-3

On the basis of a special axially symmetrical solution of the Einstein field equations given by L. Marder (Proc.Roy.Soc.London (A), 246, 133 (1958)), it is shown, without using a special expression for the affine tensor t^{ν}_{μ}, that no gravitational energy is present in the case of a special field of gravitational waves.

116. Reversal of Spin Vectors in Charged 180° Bloch Walls

"Investigations of the Reversal of the Spin Vectors in Charged 180° Bloch Walls," by Ch. Greiner, Institute of Magnetic Materials, Jena; Leipzig, Annalen der Physik, Vol 5, No 1/2, 1959, pp 57-69

On the basis of experimental results, investigations were made of the reversal of the magnetization vectors, assuming anisotropy along one axis, for a plate-configuration of 180-degree Bloch walls. The charge distribution within the Bloch wall is given, and the wall thickness and energy density are computed, for three characteristic reversal paths. Wall thickness and energy density are discussed, in relation to the angle formed by the path of the magnetization into the Bloch wall, for two different ratios of magnetostatic energy to anisotropy energy.

117. Magnetohydrodynamic Flow Around Bodies

"Hypersonic Flow Around Bodies in Magnetohydrodynamics," by M. D. Dalyzhenskiy, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 23, No 6, Nov/Dec 59, pp 993-1005

This article discusses hypersonic flow around bodies in which a magnetic field is generated. The field acts upon the gas, which becomes electrically conducting as a result of thermal ionization produced during the transit through the strong shock wave in front of the body. The majority of articles in recent literature (for example, W. B. Bush, J. Aerospace Science, Vol 25, No 11, 1958) study the behavior of the flow of a conducting liquid in the vicinity of the front critical point of a blunt body; here, a study is made of the influence of the application of a strong magnetic field on the general flow picture. A detailed analysis is made of the case of flow around a body with rectilinear generatrices -- wedges and cones -- when the vector of the intensity of the magnetic field is directed perpendicular to the surface of the body. The method of solution is based on the assumption of the existence of a narrow turbulence zone between the body and the shock wave (Chernyy, G. G., Dokl. AN SSSR, Vol 107, No 2, 1956). The forces which act upon the test body were ascertained. The solution shows that, in the case of sufficiently strong fields, the force of the magnetic component has the same order of magnitude as a gas dynamic force, notwithstanding the narrowness of the zone of turbulent flow on which the magnetic field acts.

It is shown that, under the conditions established here, a separation of flow from the wall is possible. The location of the point of magnetic separation on the surface of the body is found. With increased field intensity, this point is dislodged upstream; consequently, if strong fields are used, separation zones can be created along the body, which leads to increased resistance by the body and, as can be expected, to decreased heat transfer to the body.

118. Structure of Perpendicular Magnetohydrodynamic Shock

"A Note on the Structure of a Perpendicular Magnetohydrodynamic Shock Wave," by A. G. Kulikovskiy and G. A. Lyubimov, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 23, No 6, Nov/Dec 59, pp 1146-1147

Magnetohydrodynamic shock configuration in a viscous heat-conducting gas has been treated by W. Marshall (Proc. Roy. Soc., 233a, 1935; Russian translation in Probl. Sovrem. fiz., No 7, 1957). There is also interest in limiting cases in which one or two dissipative coefficients are so small their influence can be neglected. The structure of a shock wave in the absence of heat conductivity has been investigated by Ludford (Journ. of Fluid Mech., Vol 5, No 1, 1959) and in the absence of viscosity and heat conductivity by Burgers (A Symposium on Magnetohydrodynamics, Stanford, Calif., 1958; Russian translation in Magnit. gidrodin., Atomizdat, 1958).

This article examines the structure of a shock wave in the presence of heat conductivity and electrical conductivity and in the absence of viscosity.

119. Supersonic Flow of Ideal Gas Through Circular Cylindrical Shell

"Concerning Small Harmonic Vibrations of a Cylindrical Shell Along the Axis of Which An Ideal Gas Flows at Supersonic Velocity," by B. I. Rabinovich, Kiev; Moscow, Prikladnaya Matematika i Mekhanika, Vol 23, No 5, Sep/Oct 59, pp 879-884

This article considers a circular cylindrical shell, at one end of which is a flat base uniformly filled with supersonic forces; the other end is open, allowing the passage of a uniform supersonic flow of an ideal gas originating from the base. Under the assumption that the shell performs small steady harmonic oscillations in a certain plane, a study is made of the dynamic interaction between the gas and the walls of the shell. The compressibility of the gas leads to the emergence of additional nonstationary forces, the role of which, in general balance, depends on the Strouhal number; during the oscillations of the shell, the major vector of the gas dynamic forces is displaced and turned in relation to the longitudinal axis.

120. Supersonic Gas Flow Past a Cone

"Flow of a Viscous Heat-Conducting Gas Around a Cone at High Supersonic Velocities," by V. V. Lunev, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 23, No 6, Nov/Dec 59, pp 1006-1018

A study is made of the flow of a viscous heat-conducting gas around a spherical cone at a zero angle of attack at high supersonic velocities. The entire area of turbulent flow is divided into two clearly bounded types -- the viscous, in which the flow is laminar and is described by boundary-layer equations, and the nonviscous, in which the flow is described by equations of an ideal gas. The study is limited to the case of weak interaction, i.e., that region of flow is considered which is removed from the nose of the cone. Two systems of coordinates are used, with the center at the apex of the cone -- cylindrical coordinates for the nonviscous region and conical coordinates for the viscous region.

121. Relationship of Volume and Turbulent Velocity Potential in Minimum Drag Problem

"On Minimum Wave Drag Bodies," by V. N. Zhigulev and Yu. L. Zhilin, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 23, No 6, Nov/Dec 59, pp 1019-1029

Certain variations of the problem of a body which slightly disturbs a supersonic flow are treated. It is shown that it is possible, in the general case, to separate the problem of determining the drag from the problem of determining the minimum drag of the body proper. For a solution of the first problem, it is sufficient to express the interesting characteristics of the body (for example, the forces, moments, volume, etc.) through the value of the potential of the turbulent velocity on the characteristic surface enveloping the body. The example used here is the relationship between the volume of the body and the potential of the turbulent velocity on the characteristic surface enveloping the body.

It is shown that the potential of the turbulent velocity (corresponding to the flow around a minimum drag body, with arbitrary fixed approach and exit-flow cross sections and a given volume) on the trailing characteristic surface is satisfied by the poisson equation with mixed boundary conditions. Axisymmetrical bodies were found with minimum drag at fixed approach and exit cross section and given volume.

A study is also made of the problem of optimum choice of fuselage with given length and volume for a given wing, and an estimate is made of the drag of the wing-fuselage system.

122. Unsteady Motions of Plan-Form Wing in Supersonic Flow

"On Unsteady Motions of a Wing of Rectangular Plan Form," by V. A. Kovaleva, Dnepropetrovsk; Moscow, Prikladnaya Matematika i Mekhanika, Vol 23, No 6, Nov/Dec 59, pp 1030-1041

Certain results are given of an investigation of the unsteady motion of a thin, rigid, airfoil of finite span and rectangular plan form in a supersonic flow of arbitrary configuration varying with respect to time, as well as an unsteady motion characterized by wind gusts or shock waves. The problem is considered in linear arrangement. The solution is given of the problem for the case of a change of the angle of attack of the wing with time according to the condition $e^{at}(-\infty \leqslant t \leqslant 0)$, and this partial solution is applied to a case in which the angle of attack of the wing changes arbitrarily with time. Such problems have been studied by Ye A Krasil'shchikova (Izv. AN SSSR, OTN, No 3, 1958). Here, a concise solution is obtained for a wing of rectangular plan form, with the boundary effect taken into account.

123. Precession Theory of Gyroscopes -- Equations of Motion

"On Equations of the Precession Theory of Gyroscopes in the Form of Equations of Motion of Imaginary Points in the Image Plane," by A. Yu. Ishlinskiy, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 23, No 5, Sep/Oct 59, pp 801-809

This article gives rigorous equations of motion of gyroscopes in the form of equations of so-called imaginary points in a certain plane, called also the image plane or phase plane. It is shown that these well-known equations are satisfied only in the case of a considerable limitation of forces acting on the gyroscope.

124. Two-Rotor Gyrocompasses

"On the Theory of Gyrocompasses," by V. N. Koshlyakov, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 23, No 5, Sep/Oct 59, pp 810-817

This article investigates the perturbation equations of two-rotor gyrocompasses which do not possess the properties of the three-dimensional gyrocompass of Geckeler-Anschuetz, the sensing element of which has identical periods of natural undamped oscillations in relation to the three major axes of inertia close to the Schuler period. This property is achieved here by an appropriate spring connection between the gyroscopes, creating around the vertical axes of the casings the moment N in accordance with the law $N = \lambda \sin 2\varepsilon$, where λ is a certain coefficient of proportionality and 2ε is the angle between the axes of the natural gyration of the gyroscopes. The fundamentals of the theory of the three-dimensional compass with certain simplified assumptions have been present in the literature. The equations given by A. Yu. Ishlinskiy ("On the Theory of the Gyrohorizon-Compass," PMM, Vol 20, No 4, 1956) can be applied to the study of gyrocompasses not possessing the properties of the three-dimensional gyrocompass and related to the two-rotor compass of Anschuetz, as well as to certain domestic two-rotor gyrocompasses.

This article presents a study of the stability of nonperturbation motions of such gyrocompasses under the assumption that they are mounted on a ship maneuvering in the latitude range of 70-80 degrees.

In the gyrocompasses considered here, the condition $N = \lambda \sin 2\varepsilon$ is not satisfied.

When gyrocompasses, rather than the axes of their frames, are deflected by a certain small perturbation angle δ from the position of unperturbed equilibrium characterized by the angle $\varepsilon = \varepsilon_0$, the spring connection between the gyroscopes supplies the reducing moment in accordance with the law $M = s\delta$, where s is the steepness of the reducing moment characteristic, depending on the rigidity of the spring connection.

125. Stability of Solid Body of Rotation Containing a Liquid

"On the Stability of the Rotary Motions of a Solid Body With a Liquid Filling," by V. V. Rumyantsev, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 23, No 6, Nov/Dec 59, pp 1057-1065

This article considers the stability of the rotary motions of a solid body with a cavity completely or partially filled with an ideal incompressible homogenous liquid.

Since the general problem of the stability of the motion of continuous media has not been stated up to the present time (The literature reports attempts to present this problem as a problem of the stability of a system with a finite number of degrees of freedom, which, in a number of articles, cannot be considered conclusive), this article considers the problem primarily from the viewpoint of the stability of the motion of the solid body; the problem of the stability of the motion of the liquid is of interest only to the extent that it exerts an influence on the stability of the motion of the body, the two aspects of the problem naturally being related. The problem of the dual system here is posted in relation to the complete variable characterizing the motion of the solid boyd and in relation to the partial variable characterizing the motion of the liquid. In such a representation, the problem of the stability of the motion of a solid body and of a liquid inside its cavity leads to the investigation of the conditional stability of a system which is stable in relation to part of the variables, but not in relation to all variables, a determination of the motion of a mechanical system with an infinite number of degrees of freedom.

This problem is solved with the aid of the second method of Lyapunov, proceeding from the complete equations of perturbed motion.

126. Probability Concepts in the Shell Stability Problem

"Statistical Method in the Theory of the Stability of Shells," by I. I. Vorovich, Rostov-na-Donu; Moscow, Prikladnaya Matematika i Mekhanika, Vol 23, No 5, Sep/Oct 59, pp 885-892

The idea of applying probability concepts to the problem of the stability of shells, proposed by V. I. Feodos'yev ("On the Stability of Spherical Shells Under the Effect of an External Uniformly Distributed Pressure," PMM, Vol 18, No 1, 1954) and A. S. Vol'mir (Gibkiye Plastinki i Obolochki [Flexible Plates and Shells], Gostekhizdat, 1956), gives promise for a solution of such problems as the assignment of admissable loads to a shell during an investigation of its stability, with its operating conditions and manufacturing tolerances taken into account, and the assignment of tolerance for the basic parameters of shells (chiefly calculating the necessary precision of manufacture for the inside surface of the shell).

A treatment of the statistical theory of the stability of shells should, in the author's opinion, include the following:

1. statistical methods of describing the factors which determine the nature of the deformation of a shell from case to case and experimental methods of determining the statistical characteristics of such factors;

2. statistical methods of describing the parameters which characterize the deformation of a shell and experimental methods of determining the statistical characteristics of such parameters; and

3. the relationship between the statistical characteristics of the parameters which describe the deformation of a shell and the statistical characteristics of the factors which determine the character of deformation of a shell from case to case.

This article considers an approximate approach to the formation of such a theory. It assumes that all the factors which determine the particular nature of bending of a shell may be divided into three groups:

1. the distribution of elastic and geometric properties of the shell;

2. the distribution of the parameters which characterize the method of sealing the shell; and

3. the distribution of the external forces applied to the shell.

127. Propagation of Complex Compressional Elastic-Plastic Waves

"On the Propagation of Elastic-Plastic Waves in the Case of Complex Compression," by N. Cristescu, Bucharest; Moscow, Prikladnaya Matematika i Mekhanika, Vol 23, No 6, 1959, pp 1124-1128

Kh. A. Rakhmatulin (PMM, Vol 22, No 6, 1958) considered the particular case in which the complex compressional wave is the wave of a powerful explosion propagating at a speed less than that of ordinary elastic-plastic (Riemann) waves and assumed that when a detonation occurs within the plastic body, a cluster of ordinary plastic waves propagates first and is followed by the wave of the powerful explosion, which represents the complex compressional wave.

This article considers the same problem based on Rakhmatulin's formulas, but also considers other possible cases of propagation which may emerge for certain materials. It is shown, for example, that, for certain materials, a complex dynamic compression generally is transmitted in a plastic body by complex waves only. These waves propagate in the body faster than ordinary plastic waves (Cristescu, N., PMM, Vol 19, No 5, 1955; Cristescu, N., Probleme dinamice in Teoria plasticitatii [Problems of Dynamics in the Theory of Plasticity], Bucharest, 1958). The investigation made here is more qualitative than quantitative, since the theory of small elastic-plastic deformations applied in this work has not yet been confirmed by experimentation nor adjusted for dynamic problems.

128. Propagation of Elastic Waves in Two-Component Media

"On the Propagation of Elastic Waves in Two-Component Media," by L. Ya. Kosachevskiy, Stalino; Moscow, Prikladnaya Matematika i Mekhanika, Vol 23, No 6, Nov/Dec 59, pp 1115-1123

On the assumption that, even though the dynamics of two-component media have been treated extensively in recent literature the fundamental problem of deriving the equations of motion of two-component media cannot be considered conclusively solved, this article contributes a study of a simplified case of motion, the propagation of elastic waves in a homogeneous isotropic medium consisting of solid and liquid components. Solutions are given of the problem of the reflection of two-dimensional waves and of the problem of surface waves on the free boundary of a half-space. It is shown that the stress-deformation relationship of

Ya. I. Frenkel' ("On the Theory of Seismic and Seismoelectric Influences on Damp Soil," Izv. AN SSSR, seriya georg, i geofiz., Vol 8, No 4, 1944) is equivalent to an analogous relationship of M. A. Biot ("Theory of Propagation of Elastic Waves in a Fluid-Saturated Porous Solid," J. Acoust, Soc. Am., 28, No 2, 1956); the equations of motion of the latter, however, are more general.

129. Bending of Infinitely Thin Plate on Elastic Half-Space

"The Bending of an Infinite Plate on an Elastic Half-Space With a Modulus of Elasticity Variable With Depth," by G. Ya. Popov, Novosibirsk Engineering Construction Institute; Moscow, Prikladnaya Matematika i Mekhanika, Vol 23, No 6, 1959, pp 1095-1100

The problem of the impression of a die into a nonhomogeneous elastic half-space appears in the works of B. G. Korenev (DAN SSSR, Vol 112, No 5, 1957) and V. I. Mossakovskiy (PMM, Vol 22, No 1, 1958). This article gives a solution of the problem of the bending of an infinitely thin plate lying on an elastic half-space, the modulus of elasticity of which is an exponential function of depth. The two-dimensional case of this problem, i.e., the bending of a girder plate, is treated in detail. By means of a limiting transfer, the solution of the problem of the bending of a beam plate on a homogeneous elastic half-space is obtained in a new form.

130. Theory of Ideal Plastic Anisotropy

"On the Theory of Ideal Plastic Anisotropy," by D. D. Ivlev, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 23, No 6, Nov/Dec 59, pp 1107-1114

An investigation is made of the behavior of an ideal anisotropic inelastic-plastic body under conditions of plasticity generalizing the plasticity condition of Tresk.

It is pointed out that Hill (Mathematical Theory of Plasticity, Oxford, 1950; Russian translation published by Gostekhteoretizdat, 1956) evidently was the first to suggest the condition of plasticity of an ideal anisotropic body generalizing the condition of plasticity of Mises ("The Mechanics of the Plastic Deformation of Crystals," ZAMM, Vol 8, 1928) which is repeatedly used in practice.

131. Rotation of Cylinder in Viscous Plastic Medium

"The Rotation of a Cylinder With Variable Angular Velocity in a Viscous Plastic Medium," by A. I. Safronchik, Saratov; Moscow, Prikladnaya Matematika i Mekhanika, Vol 23, No 6, Nov/Dec 59, pp 1051-1056

The article states and solves the problem of unsteady flow of a viscous-plastic medium in contact with a cylinder rotating with varied angular velocity. A method is devised for solving two-dimensional, axisymmetrical boundary-value problems for parabolic equations. An equation is given for the determination of the radius of distribution of the viscous-plastic flow.

132. Irregular Flow of Viscous Plastic Material Between Parallel Walls

"The Irregular Flow of a Viscous Plastic Material Between Parallel Walls," by A. I. Safronchik, Saratov; Moscow; Prikladnaya Matematika i Mekhanika, Vol 23, No 5, Sep/Oct 59, pp 925-935

This article presents a rigorous solution of one nonstationary problem of uniform viscous plastic flow, illustrated by a flow with an invariant pressure jump. The velocity distribution and the law of the change of the core of the flow are found by the method of I. I. Kolodner (Communications on Pure and Applied Mathematics, IX, No 1, 1956).

133. Complexity of Stability Criterion in Creep Problem

"On the Criterion of Stability in the Case of Creep," by S. A. Shesterikov, Chair of the Theory of Plasticity, Moscow State University; Moscow, Prikladnaya Matematika i Mekhanika, Vol 23, No 6, Nov/Dec 59, pp 1101-1106

Although the majority of articles dealing with the stability problem in the case of creep examine the stability problem of a linearly compressed rod (the simplest form for explaining most of the qualitiative stability characteristics), it is shown that the problem must be stated in a number of principally different ways. This article considers one such approach only, from the viewpoint of the stability of the rectilinear form of equilibrium.

134. Beam Concept in Theory of Elastic Bodies With Liquid Inclusions

"On the Theory of the Vibrations of Elastic Bodies Containing Liquid Cavities," by N. N. Moiseyev, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 23, No 5, Sep/Oct 59, pp 862-878

In modern engineering, various problems are encountered which require an investigation of the combined oscillations of an elastic body and a liquid. In the usual representation, the investigation of such problems becomes quite complex; here, an approximation theory is presented which is based on the following simplified assumptions:

(a) Linearity of the problem: all shifts and velocities are assumed to be infinitely small; the equations of motion and the boundary conditions are linearized correspondingly;

(b) Beam concept: the real elastic body is substituted for by a beam with a straight-line liquid axis, the accuracy of the hypothesis of flat cross sections being assumed;

(c) The liquid is ideal and incompressible, and its motion is laminar;

(d) The mass force is the force of gravity; and

(e) external forces are conservative.

The article derives the general equations, considers the solvability of the general problems, gives an analysis of the spectrum, and formulates the variation principles and their characteristics.

135. Two-Dimensional Contact Problem in Creep Theory

"Two-Dimensional Problem in Creep Theory," by N. Kh. Arutyunyan, Yerevan; Moscow, Prikladnaya Matematika i Mekhanika, Vol 23, No 5, Spe/Oct 59, pp 901-924

This article develops a solution of the two-dimensional contact problem of creep theory which accounts both for the aging and the change of the modulus of instantaneous deformation of the material.

The general equations are given for the theory of plastic "inheritance" connecting the components of deformation and stress, taking into account the creep of the material in the case of a two-dimensionally deformed state of aggregation. With the use of these equations in the case of the exponential law which connects stresses and strains, a provisional solution is given of the problem of the equilibrium of the half-plane occurring under conditons of nonlinear creep and under the effect of a concentrated load applied normal to its free surface.

On the basis of the results obtained here, it is shown that the solution of the two-dimensional contact problem in nonlinear creep theory reduces to a joint solution of two interrelated integral equations.

136. Formation of Detonation Waves

"Formation of a Detonation Wave by Burning of Gas in Pipes," by G. D. Salamandra, T. V. Bazhenova, and I. M. Naboko, Moscow Power Engineering imeni Krzhizhanovskiy; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 29, No 11, Nov 59, pp 1354-1359

The shape of the flame front and its consecutive variations were studied and described. It was found that a detonation wave in a long pipe is the result of interaction of the flame front with a series of shock waves formed before the flame front in the predetonation stage. The work was done in the Laboratory of Combustion Physics of the Power Engineering Institute, Academy of Sciences USSR, under the direction of Prof A. S. Predvoditelev, Corresponding Member, Academy of Sciences USSR.

137. Effect of Shock Waves on Flames

"Interaction of Weak Shock Waves With a Flame Front," by G. D. Salamandra and I. K. Sevast'yanova, Moscow Power Engineering Institute imeni Krzhizhanovskiy; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 29, No 11, Nov 59, pp 1360-1367

The relationship of the distance from ignition point to shock-wave formation point to the compound composition and the initial pressure of the burning mixture has been experimentally found for the burning of explosive mixtures in a tube closed on two sides. The work was done in the Laboratory of Combustion Physics of the Power Engineering Institute, Academy of Sciences USSR, under the direction of Prof A. S. Predvoditelev, Corresponding Member, Academy of Sciences USSR.

138. Crisis in Boiling Mechanism

"Relations of Hydrodynamics of a Two-Component Layer to the Theory of Crises in the Boiling Mechanism," by S. S. Kutateladze and V. N. Moskvicheva; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 29, No 9, Sep 59, pp 1135-1139

Certain data on bubbling of a fluid through a fluid are presented. It is revealed that a change in the hydrodynamic structure of a two-component layer is determined by the same dimensionless parameter as the transition from bubble boiling to film boiling.

The existence of complex structural changes in the two components layer has been established.

139. Radiating Heat Wave

"A Heat Wave Radiating Energy From the Front," by E. I. Andriankin, Institute of Chemical Physics, Academy of Sciences USSR; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 29, No 11, Nov 59, pp 1368-1372

The propagation of a nonself-modeling heat wave, radiating energy from its front, is investigated. The case is analyzed when the radiation path in cold gas is long for all frequencies below a certain critical frequency ω_0 and short for higher frequencies. The path of quanta in the heated region is supposed to be much smaller than the radius of the wave front, thus the radiative transfer of energy occurs by means of thermal conductivity.

140. Ring-Shaped Plasma Pinch

"On Possible Equilibrium Configurations of a Thin Ring-Shaped Plasma Conductor in a Magnetic Field," by Yu. V. Vandakurov, Physicotechnical Institute, Academy of Sciences USSR; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 29, No 11, Nov 59, pp 1312-1317

A field is defined, into which a thin ring-shaped, (approximately circular, cross section) plasma conductor is to be placed so that equilibrium is maintained. Such configurations are analyzed which have corresponding skin currents with both components and the volume currents running along the conductor.

141. Charged Particle Moving in Rarefied Plasma

"The Motion of a Charged Relativistic Particle in the Magnetic Field of a Direct Cylindrical Current of a Rarefied Plasma," by N. I. Shtepa, Orsk State Pedagogical Institute; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 29, No 11, Nov 59, pp 1346-1353

The motion of a relativistic particle in a magnetic field of the discharge current of a rarefied plasma is analyzed, assuming that the current is direct, cylindrical in shape, and of homogenous density. The correlations determining the radial dimensions of the region of permitted motion are obtained in squares, as well as the period of radial oscillations, the period of rotation around the axis of symmetry, and the mean drift velocity of the particle in the axial direction.

142. Stability of Plasma Pinch

"On the Stability of a Cylindrical Plasma Conductor With Volume Currents," by Yu. V. Vandakurov and K. A. Lur'ye, Leningrad Physicotechnical Institute, Academy of Sciences USSR; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 29, No 9, Sep 59, pp 1170-1173

The effect of various distributions of azimuthal currents along the cross sections of the plasma pinch is theoretically analyzed. It may be inferred from the derived formulas that the stability of a varying field is always lower than that of a homogeneous field.

143. Modern Accelerator Design

"Design of a Strong Focusing Accelerator With a Constant Magnetic Field," by V. K. Grishin; Leningrad Zhurnal Tekhnicheskoy Fiziki, Vol 29, No 9, Sep 59, pp 1065-1067

One of the computing methods for the parameters of a strong focusing accelerator with a constant magnetic field, such as equilibrium orbit, betatron oscillations, and efficiency coefficient of the magnetic field, is analyzed by using a synchrotron as example. In a cyclic synchrotron, the magnetic field is created alternatively by the radial sectors of positive and negative field direction, between which "free" gaps are located. The correlations derived establish a simple connection of the accelerator's parameters with the dimensions of magnetic sectors and the characteristics of the magnetic field and permit a rapid and sufficiently accurate selection of the accelerator type.

144. Cherenkov Effect by Moving Charge

"The Cherenkov Effect in the Case of a Charge Moving Over an Interface," by A. G. Sitenko and V. S. Tkalich, Kharkov State University; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 29, No 9, Sep 59, pp 1074-1085

The possibility of microwave emission by an electron moving near a dielectric has been pointed out by V. L. Ginzburg (DAN SSSR, 56, 145, 253 (1947)). This phenomenon is analyzed in an attempt to determine the type of radiation produced by a moving charge, as well as by a charged modulated beam, near a dielectric.

145. Cherenkov Radiation of Dipole Moments

"Cherenkov Radiation of Dipole Moments Moving Along a Channel Axis in a Dielectric," by L. S. Bogdankevich, Physics Institute imeni Lebedev, Academy of Sciences USSR; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 29, No 9, Sep 59, pp 1086-1089

The field and the emission of magnetic and electric dipoles moving along a channel axis in a dense medium are computed. It is shown that if the radius of the channel $a \ll \lambda$, the emission of the electric dipole moving perpendicular to its axis increases $\frac{4\varepsilon^2}{(\varepsilon+1)^2}$ times in comparison with the emission in a continuous medium.

146. Recharge of Ne and Kr Ions

"Recharge of Triple-Charged Ne^{3+} and Kr^{3+} in Neon and Krypton," by I. P. Flaks and L. G. Filippenko, Leningrad Physicotechnical Institute, Academy of Sciences USSR; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 29, No 9, Sep 59, pp 1100-1109

Results of experimental determination of cross sections of recharge of ions Ne^{3+} and Kr^{3+} in neon and krypton within the ion energy range of 6 to 90 kev are described.

At single collisions of triple-charged ions with atoms of gas, simultaneously with the capture of one ($I^{3+} \rightarrow I^{2+}$) and two ($I^{3} \rightarrow I^{+}$) electrons, the capture from the shell of the gas atom of three electrons ($I^{3+} \rightarrow I^{0}$) has also been observed.

The capture cross section of three electrons (σ_{30}) is smaller than the capture cross sections of one (σ_{32}) and two (σ_{31}) electrons, but in the true gas, the cross section σ_{30} reaches the value of $10^{-16} cm^2$.

With the decrease of the ion kinetic energy T_0, the cross section σ_{30} increases, and at $T_0 < 10 - 15$ kev, the cross section σ_{30} is somewhat higher than the capture cross section of two electrons (σ_{31}).

For the pair Ne^{3+} - Kr, the cross section σ_{30} is of the order $10^{-17} cm^2$, and for the pair Kr^{3+} - Ne, the σ_{30} is rather small, but it could be measured.

In the true gas, the cross sections σ_{32} and σ_{31} are close in magnitude and increase with higher ion energy. At $T_0 = 90$ kev for the pair Kr^{3+} - Kr: $\sigma_{32} = 1.8 \cdot 10^{-15} cm^2$, $\sigma_{31} = 6.5 \cdot 10^{-16} cm^2$. For the pair Ne^{3+} - Ne: $\sigma_{32} = 4 \cdot 10^{-16} cm^2$, $\sigma_{31} = 1.8 \cdot 10^{-16} cm^2$.

For ions and atoms belonging to different elements, the cross sections σ_{32} and σ_{31} differ by more than one order.

In the case of recharge of Ne^{3} ions in krypton, the cross sections σ_{32} and σ_{31} decrease with the ion energy. For the pair Kr^{3+} -Ne, the cross sections σ_{32} and σ_{31} increase with rising energy.

The relation of the cross section to the sign of the magnitude of the defect of the energy ΔE was established. For exothermal processes ($\Delta E < 0$), the cross sections are considerably larger than for endothermal processes ($\Delta E > 0$).

147. Modeling of a Uranium Water Reactor

"Modeling of Control Response and Temperature Variation of Water Density in Uranium-Water Reactors on Intermediate Neutrons," by V. B. Klimentov and V. M. Gryazev; Moscow, Atomaaya Energiya, Vol 7, No 6, Dec 59, pp 519-523

Results of experimental modeling of control response and temperature effect conditioned by variation of the water density in intermediate neutron uranium-water reactors are analyzed. The efficiency of control rods of various types is obtained, and the ratio of critical dimensions of uranium-water reactors to the density of the water filling the active zone is established.

148. Betatron Designs

"Principles of Designing and Basic Data of Betatron Equipment of the Moscow Transformer Plant," by E. B. Gel'perin; Moscow, Atomnaya Energiya, Vol 7, No 6, Dec 59, pp 509-518

The design principles of betatron equipment for defectoscopy, medical, physical and other purposes are described. The conditions responsible for the azimuthal asymmetry of the betatron magnetic field and methods for its compensation are described. The multistage construction of the electromagnet of the betatron devised by the Moscow Transformer Plant (MTZ) providing for a more homogeneous (in azimuth) magnetic field is described. Data on the specialized designs of betatrons of the MTZ of the following types are presented: stationary four-stage with accelerated electrons at 20 and 50 Mev, suspended and rotating for medical purposes at 25 Mev, rotating and mobile for defectoscopy at 25 Mev, and swinging (pendulum type) for medical purposes at 15 Mev.

149. Operation of a Betatron Depending on Injection

"On the Action of a Betatron With Injection of Electrons by Short Pulses," by O. S. Kolotov, Yu. N. Lobanov, and N. I. Tulinova; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 29, No 9, Sep 59, pp 1173-1174

Electrons were injected in to a betatron chamber with rectangular pulse duration shorter than one electron revolution. An effective electron capture was achieved, even if the electrons did not fill the circular orbit. Experimental data led to the conclusion that the efficiency of electron capture is probably weakly related to interaction of bursts of electrons which have made a different number of revolutions in the chamber.

150. X-Ray K Spectra

"A New Method of Computing X-Ray K Spectra of Absorption," by Ye. G. Nadzhakov and R. L. Barinskiy, Physics Institute of the Bulgarian Academy of Sciences, Institute of Rare Elements, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 129, No 6, Dec 59, pp 1279-1282

The computation is carried out based on the assumption that a hole in the K shell of the absorbing atom leads to the formation of a system different from levels of the molecule (like an exciton in a solid). It is attempted to check the reliability of the basic assumption.

151. The $(p, \pi^{\pm})$ Reaction

"On the $(p, \pi^{\pm})$ Reaction," by A. K. Lavrukhina, Institute of Geochemistry and Analytical Chemistry imeni Vernadskiy, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 129, No 6, Dec 59, pp 1277-1278

The reactions $(p, \pi^{\pm})$ of very small cross sections are investigated by radiochemical means. It is assumed they are a result of peripheric collisions at high energies, in the case when the nucleus is supposed to be formed of a proton core and a meson cloud.

152. Injection Into Cyclic Acclerators

"Injection Theory in Cyclic Accelerators With Strong Current," by A. N. Lebedev, Physics Institute imeni Lebedev, Academy of Sciences USSR; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 29, No 11, Nov 59, pp 1339-1345

The kinetic equation is applied to injection conditions of a ring shaped synchrotron at strong currents with occurrence of collective particle interaction. The relation of the coefficient of the collective capture to the injection current is found.

153. New Ion Injector

"Source of Negative Ions," by Ya. M. Fogel, A. G. Koval, and A. D. Timofeyev, Physicotechnical Institute, Academy of Sciences Ukrainian SSR; Leningrad, Zhurnal Tekhnicheskoy Fiziki, Vol 29, No 11, Nov 59, pp 1381-1387

The construction and the characteristics of the negative ion source which will be used as injector of negative ions into the new horizontal recharge electrostatic accelerator of the Physicotechnical Institute of the Academy of Sciences Ukrainian SSR are described. The ion gun and the lens focusing the negative ions are identical to those by J. A. Weinman and J. R. Cameron (Rev. Sci. Instr., 27, 288 (1956)). The only difference between the Soviet and the American source is that the conversion of positive ions into negative ones occurs in a mercury vapor target. It permitted use of a diffusion pump with lower pumping speed for the vacuum of the chamber.

Authors state that systematic research aimed at clarifying the conditions undulying construction of a source for various type negative ion streams has been under way since 1952 "in the division of Academician (of The Academy of Sciences Ukrainian SSR) A. K. Val'ter Physicotechnical Institute, Academy of Sciences Ukrainian SSR."

154. Hungarian Atomic Energy Committee

"Chairman of Council of Ministers Visits Physics Institute" (unsigned news item); Budapest, Magyar Nemzet, 12 Dec 59, p 6

According to source, on 11 December 1959, Dr Ferenc Munnich, Chairman of the Council of Ministers, and Mihaly Kokeny, secretary of the Atomic Energy Committee "which works for the Council of Ministers," visited the Central Physics Research Institute in Csilleberc.

155. New Rumanian Nuclear Physics Laboratory

"Electronics Laboratory for Nuclear Physics and Automation" (unsigned news item); Bucharest, Scinteia, 30 Dec 59, p 1

According to an article in source, the Institute of Atomic Physics of the Academy of Sciences of the Rumanian People's Republic has begun research work in an Electronic Laboratory for Nuclear Physics and Automation (Laboratorul de Electronica Pentru Fizica Nucleara si Automatizari). The article says that the new laboratory is intended for the elaboration of studies, plans, and designs of special apparatus necessary for research in nuclear physics.

Apparatus intended to extend the application of nuclear energy into various fields of activity will also be produced. The laboratory will study and execute plans for the automation of production processes in various branches of industry with the aid of radioactive isotopes.

According to the article, the laboratory contributes to "developing the foundation of nuclear research in Rumania and creates the opportunity for the training and specialization of cadres in this field."

Spectroscopy and Optics

156. Two Articles on Polarization of Resonance Fluorescence in Diffuse Radiation

"Calculation of the Degree of Polarization of Resonance Fluorescence During the Occurrence of Radiation Diffusion. I.," by R. Seiwert, Institute of Optics and Spectroscopy of the German Academy of Sciences, Berlin-Adlershof, and W. Ermisch, Second Physics Institute of Humboldt University, Berlin; Leipzig, Annalen der Physik, Vol 5, No 1/2, 1959, pp 4-14.

If the resonance fluorescence emission inside a resonance vessel is reabsorbed, a depolarization occurs as a result of the directional emission and absorption of the π - and σ -light. In the case of anomalous Zeeman effect, there is an additional depolarization as a result of the fact that π - and σ -light results in most cases of excitation with π - or σ -light. Equations are derived for computing the polarization degree of the resonance fluorescence in the case of very weak magnetic fields and weak reabsorption of the resonance emission.

"Calculation of the Degree of Polarization of Resonance Fluorescence During the Occurrence of Radiation Diffusion. II.," by R. Seiwert and W. Ermisch; Leipzig, Annalen der Physik, Vol 5, No 1/2, 1959, pp 15-30

The equations derived in part I are applied for three cases for which experimental data were available. The good agreement of the results with the experimental data confirms that, in the case of very low particle densities, the depolarization is actually caused by radiation diffusion.

157. Czechoslovak Solar Filter

"In the Institute Where Crystals Grow" (unsigned news item); Prague, Obrana Lidu, 15 Dec 59, p 2

Source carries an article on the work and successes of the Research Institute of Minerals (Vyzkumny ustav pro mineraly) in Turnov. According to the article, the institute, which is the only one of its kind in Europe, has developed a new type of optical filter, suitable for viewing solar activity and nuclear reactions. The filter, which is allegedly 10-20 times cheaper to produce than the Lyott filter, generally used throughout the world, is made up of 12-22 slices of synthetic crystal, measuring 30-33 millimeters in diameter, and has only two polarized foils. The crystal, which is grown at the institute, is cut with a diamond saw.

The article claims that virtually all Czechoslovak observatories and scientific research institutes are now equipped with the new filter and that inquiries are being received for deliveries of the filters to foreign purchasers.

The filter was developed by D'Ivan Sulc of the institute.

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