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**UNCLASSIFIED SCIENTIFIC INFORMATION
REPORT**

21 AUGUST 1959

1 OF 2



CENTRAL INTELLIGENCE AGENCY

SCIENTIFIC INFORMATION REPORT



21 August 1959

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PLEASE NOTE

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

SCIENTIFIC INFORMATION REPORT

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I. BIOLOGY

1. Disinfection of Soils by Gamma-Radiation

"Concerning the Possibility of Using Gamma-Radiation for Disinfecting Soils and Control of Clubroot of Crucifers," by Candidate of Technical Sciences L. S. Lur'ye and L. G. Ter-Simonyan, All-Union Scientific Research Institute for Electrification of Agriculture and The Scientific Research Institute of Vegetable Cultivation; Moscow, Doklady Vsesoyuznoy Akademii Sel'skokhozyaystvennykh Nauk imeni V. I. Lenina, No 6, 1959, pp 28-29

In comparison with available physical and chemical methods for disinfecting soils the most important expected advantages of using gamma-radiation for this purpose are: (a) the practical possibility of guaranteeing the necessary technical and economic effectiveness of disinfection; (b) special preparation before sterilization need not be performed, such as cultivation, removal of roots, drying or moistening maintaining a determined temperature, etc; (c) the process of soil sterilization can be completely mechanized; (d) in the future, there is a possibility of increasing the profitableness of gamma-apparatuses designated for soil sterilization by using them in other branches of agriculture (prolonging vegetable storage time, preseeding treatment of seed, etc.)

2. Radiation Effects on Stored Potatoe Tubers

"On Certain Physiological and Morphological Changes in Eyes of Potato Tubers Under the Effect of Irradiation," by Ye. G. Sal'kova, and N. P. Korableva; Dokl Akademii Nauk SSSR, 1958, Vol 121, No 6, pp 1097-1100; (From Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 10, 25 May 59, Abstract No 12754, by Ye. Sal'kova.)

CPYRGHT

"It was shown that irradiation has different effects on the respiration of meristematic and reserve tissues of potato tubers. The respiration of the eyes is increased after irradiation by doses of 2,000-5,000 roentgens, and is decreased after the effect of doses of 10,000 roentgens and higher. The decrease in respiration after irradiation by doses that suppress germination is irreversible. The respiration of the reserve tissues in the tubers is increased after irradiation by doses of 10,000-20,000 roentgens but in 2-3 weeks returns to the original level. The activity of oxidative enzymes immediately after irradiation is unchanged. The difference in the oxidative enzymes after 4-8 months of preservation is connected with the significant morphological differences in the eyes of the control and irradiated tubers. Irradiation leads to increased pH value in all tissues of the eyes, and to shifts in the isoelectric zone of the proteins to the acid side."

3. Radiation Effects on Chlorophyll of Wheat Leaves

"The Effect of X-Ray Irradiation on the Content of Chlorophyll and Hemicellulose in Wheat Leaves," by I. M. Vasil'yev, Ch'in Su-Yun, and N. D. Rybalka, Doklady Akademii Nauk SSSR, 1958, Vol 121, No 3, pp 450-452; (From Referativnyy Zhurnal-- Khimiya, Biologicheskaya Khimiya, No 10, 25 May 59, Abstract No 12755, by Ye. Sal'kova)

CPYRGHT

"After irradiation of wheat sprouts by doses of 3,000-5,000 roentgens, chlorophyll accumulated in the leaves. The accumulation of chlorophyll is the result of suppressed growth caused by irradiation. The content of hemicellulose in irradiated plants decreases as a result of their depolymerization."

4. New Czechoslovak Biometeorological Observatory Established in Brno

"New Observatory Belongs Among the Best," (unsigned article); Prague, Prace, 18 Jun 59, p 1

A new biometeorological observatory has been constructed at the Higher Agricultural and Forestry School (Vysoka skola zemedelska a lesnicka) in Brno, which was established 40 years ago. The research observatory has 23 branch stations which are used for practical training in agricultural and forestry meteorology and bioclimatology. As far as construction, equipment, and planned research activity is concerned, the new observatory is ranked among the best work centers of this type, not only in Czechoslovakia, but elsewhere. The registering instruments in the meteorological booths are inspected daily to determine whether they register data precisely.

II. CHEMISTRY

Fuels and Propellants

5. Use of Oxygen in the Low-Temperature Coking of Coal

"Application of Air Enriched With Oxygen in the Low Temperature Coking of Coal," by N. V. Lavrov, Doctor of Technical Sciences; I. A. Makarov, Candidate of Technical Sciences; Engr V. S. Miroshnichenko; A. L. Perepelitsa, Candidate of Technical Sciences; Engineer A. Ye. Pinsker; and Engr I. I. Chernenkov; Moscow, Kislorod, Vol 12, No 2, Mar/Apr 59, pp 1-9

Using an industrial multizone shaft furnace with internal heating, and applying blowing with air enriched with 30-35% of oxygen, one can obtain, in addition to low-temperature coke and tar, power gas with a raised heat content (up to 2,200 kilocalories per normal cubic meter). When the air is enriched with up to 40% oxygen, a technological gas is produced from which one can obtain, by further conversion, a nitrogen-hydrogen mixture for ammonia synthesis. When the air is enriched with up to 50% oxygen and higher, and the flow of combustion gases ("smoke gases") from the zone of drying to the zone of low-temperature coking is prevented, one can obtain a gas with a heat content of 4000 kilocalories per normal cubic meter, which is suitable for household applications. No reconstruction of the furnace is required if oxygen-enriched air is used. The furnace operates in a normal manner, assuring the required productivity and a quality of low-temperature coke which is not inferior to that obtained when blowing with air that has not been enriched with oxygen. It has been established that it is possible to increase the efficiency of the process, i.e., increase the output of the furnace. The use of 100% oxygen per 1,000 kilocalories of gas produced in the process described is 2-2.5 times lower (in standard cubic meters) than the quantity which would be required when blowing with pure oxygen. The calculated cost of a thermal unit contained in the gas produced by low-temperature coking with air enriched with oxygen is lower than the cost of a thermal unit contained in gases applied in industry that are produced by current methods for the gasification of solid fuels. The cost of a thermal unit contained in gas produced by the method described in this article approaches that supplied in the form of natural gas under conditions encountered in Eastern Siberia.

The following editorial comment precedes this article:

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"The application of oxygen in the low-temperature coking of coal has not yet been discussed in technical literature. The use of oxygen in the low-temperature coking of coal in multizone shaft furnaces with internal heating, i.e., in furnaces of a type which are widely used in industry, is of great interest because the process in question makes it possible to produce, besides low temperature coke, also tar, and in addition, a gas with an increased heat content (3,800-4,000 kilocalories per standard cubic meter). This gas can be used for technological applications and for household needs. The use of oxygen per 1,000 kilocalories of heat content of the gas is 2-2.5 times lower than in the steam-oxygen gasification of coal.

"The process in question is suitable for application in regions which have a plentiful supply of cheap coal suitable for low-temperature coking but are lacking deposits of natural gas, as far as could be established in prospecting. Before the process described is applied, it should be subjected to technical and economic analysis, taking into consideration actual conditions in the region where application is contemplated.

"In connection with the publication of this article, the Board of Editors of Kislород expresses the hope that the new industrial process involving application of oxygen will attract the attention of specialists and also of scientific research, planning, and design organizations."

6. Methods to Prevent Boiling of Liquid Oxygen Due to Superheating

"Superheating and Sudden Boiling of Liquid Oxygen," by M. Ye. Lebedev, Candidate of Technical Sciences; Moscow, Kislород, Vol 1?, No 2, Mar/Apr 59, pp 15-21

The sudden boiling of liquid oxygen in open vessels (i.e., at a constant pressure) and in closed vessels (i.e., at a constant volume of the vessel and the vapor) is considered. Measures are recommended which would prevent sudden boiling due to superheating and avoid damage to equipment from this cause. These measures consist of placing pieces of cermet materials into the liquid oxygen, immersing a tube into the liquid, or introducing small hoods or bells into the vessel at places where the rate of heat transfer from the outside is greatest.

7. Measurement of the Gas Temperature Behind a Shock Wave

"Measurement of the Gas Temperature Behind a Shock Wave,"
by S. A. Losev and N. A. Generalov, Physical Faculty;
Moscow State University, Pribory i Tekhnika Eksperimenta,
No 3, May/June 59, pp 108-110

The method of measuring gas temperatures on the basis of emission and absorption capacity at wave lengths corresponding to the D-lines of sodium was applied under laboratory conditions for the measurement of high temperatures which develop in gases behind a strong shock wave. To determine absorption, illumination produced by an IPS-500 pulse lamp was used. Temperatures up to 4,000°-5,000° could be measured with an error of ± 100 -200° K.

Industrial Chemistry

8. Development of a USSR Ultrasound Viscosimeter

"An Ultrasound Viscosimeter," by N. Il'inskaya; Moscow,
Promyshlenno-Ekonomicheskaya Gazeta, Vol 4, No 66 (521),
7 Jun 59, p 2

Measurement of the viscosity of molten resins is important in the control of polymerization and polycondensation processes. Hitherto, to control viscosity individual measurements were made on samples taken separately. A sample of the liquid material was allowed to cool to room temperature and then subjected to investigation in the laboratory. Thus, there was a delay in determining viscosity. While the laboratory determination was being carried out, the reaction in the plant equipment continued: as the size of the molecules increased, the concentration and the viscosity of the substance changed in the reactor.

Workers at the Automatics Laboratory (headed by M. Parlashkevich) of the Scientific Research Institute of Plastics developed a device for the continuous measurement of viscosity. An ultrasound viscosimeter was developed after lengthy research conducted under the direction of Engineers I. Kogan and L. Menes. This device automatically measures the viscosity in an extensive range of temperatures (from minus 100 degrees to plus 200 degrees) and pressures.

The ultrasound viscosimeter consists of two parts, i.e., a sounding device immersed in the substance being tested and an electronic unit.

The two parts are joined by an electrical line. Operation of the device is based on the automatic recording of the damping of free vibrations of a magnetostriction plate welded into the extreme end of the sounding device. Longitudinal vibrations of the plate at the tip of the sounding device generate transverse waves in the medium being investigated. As a result, the vibrations of the plate are gradually damped. The damping that is produced depends on the viscosity of the substance.

The ultrasound viscosimeter was tested at the Karbolit Plant in the vicinity of Moscow. The first shipment of viscosimeters of this type will be released at the end of 1959.

With the use of viscosimeters of the type described, the control of polymerization and polycondensation processes can be made automatic. The viscosimeters can also be used in other branches of industry where control of viscosity is required, for instance, cracking processes and pressure molding or casting.

The staff of the Laboratory of Automatics has furthermore developed two simple devices for complete automatic control of catalyst feeding in the continuous production of phenolformaldehyde resins. These devices are a proportioning appliance with a small output and a conductivity meter. The new devices are already in use at an experimental industrial (pilot-plant) installation of the Plastics Institute in connection with work on the continuous production of phenolformaldehyde resins.

Inorganic Chemistry

9. Separation of Rare Metals by the Amalgam Method

"A Mercury Trap," (unsigned item); Moscow, Znaniye-Sila, Vol 34, No 6, Jun 59, pp 22-23

Many valuable metals, e.g., gallium, thallium, and indium, occur in various ores in insignificantly small quantities. By treating these ores with an acid, one may bring these metals into solution in the form of their salts. However, it is rather difficult to separate the metals from the resulting solutions, because a cubic meter of solution contains much less than a gram of the salt of the rare metal. To isolate the rare metals in a pure state, the so-called amalgam method for the extraction of rare metals from aqueous solutions has been developed at the Institute of General and Inorganic Chemistry, Academy of Sciences USSR.

If a zinc amalgam is introduced into a dilute aqueous solution of a thallium salt, the zinc will go into solution while the thallium will be transferred into the amalgam. Thallium from a very large quantity of aqueous solution passed in a stream over the amalgam can be concentrated in a relatively small quantity of mercury. By using an electrolytic method, thallium and other rare metals can be separated from the amalgams in a state of high purity. The purity of the metals produced in this manner is of the order of 99.9999 percent.

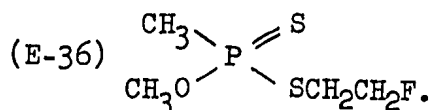
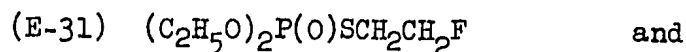
Insecticides

10. β -Fluoroethyl Esters of Phosphorus Acids Tested for Insecticidal Activity

"Organophosphorus Insecticides. β -Fluoroethyl Esters of Phosphorus Acids," by M. I. Kabachnik, Ye. I. Golubeva, D. M. Paykin, M. P. Shabanova, N. M. Gamper and L. F. Yefimova, Institute of Elemental Organic Compounds of the Academy of Sciences USSR; Leningrad-Moscow, Zhurnal Obshchey Khimii, Vol 29, No 5, May 59, pp 1671-1680

Thirty-one new compounds, derivatives of thio- and dithiophosphoric and thio- and dithioalkylphosphinic acids containing the β -fluoroethyl groups, were synthesized, characterized, and tested for their insecticidal activity. A majority of them exhibited weak activity and only two of them -- O,O-diethyl-S- β -fluoroethylthiophosphate (E-31) and O-methyl-S- β -fluoroethyldithiomethylphosphinate (E-36) -- are equal in activity to thiophos and mercaptophos.

The structural formulas given for these compounds are:



11. β -Fluoroethyl Amidoesters of Phosphorus Acid Found to be Weak Insecticides

"Organophosphorus Insecticides. Several Amidoesters of Phosphorus Acids Containing the β -Fluoroethyl Groups," by M. I. Kabachnik, Ye. I. Golubeva, D. M. Paykin, M. P. Shabanova, N. M. Gamper, and L. F. Yefimova, Institute of Elemental Organic Compounds of the Academy of Sciences USSR; Leningrad-Moscow, Zhurnal Obshchey Khimii, Vol 29, No 5, May 59, pp 1,680-1,683

Several alkyl- β -fluoroethylchlorophosphates with the general formula
$$\begin{array}{c} \text{RO} \\ \diagdown \\ \text{P}=\text{O} \\ \diagup \\ \text{FC}_2\text{H}_4\text{O} \quad \text{Cl} \end{array}$$
 and alkyl- β -fluoroethyldimethylamidophosphates with the general formula
$$\begin{array}{c} \text{RO} \\ \diagdown \\ \text{P}=\text{O} \\ \diagup \\ \text{FC}_2\text{H}_4\text{O} \quad \text{N}(\text{CH}_3)_2 \end{array}$$
 were synthesized, characterized, and tested for both systemic and contact types of insecticidal activity. In comparison with thiophos and mercaptophos these substances were weak insecticides.

12. Synthesis of New Esters of Dithiophosphoric Acid

"From the Field of Organic Insectofungicides. XLII. Synthesis of Several Mixed Esters of Dithiophosphoric Acid," by N. N. Mel'nikov, K. D. Shvetsova-Shilovskaya, M. Ya. Kagan, and I. M. Mil'shteyn, Scientific Institute of Fertilizers and Insectofungicides; Leningrad-Moscow, Zhurnal Obshchey Khimii, Vol 29, No 5, May 59, pp 1612-1614

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"To investigate the mechanism of the action of and the relationship of the insecticidal activity of mixed esters of dithiophosphoric acid to their structure, 21 compounds (17 of which have not been described in the literature) were synthesized, having the general formulas $(\text{RO})_2\text{PSS}(\text{CH}_2)_n$ and $(\text{RO}_2)\text{PSS}(\text{CH}_2)_n\text{OAr}$. All of the mixed esters of dithiophosphoric acid were synthesized by reacting calcium dialkyldithiophosphates with the corresponding halide derivatives."

13. New Insecticidal Compounds Synthesized

"The Synthesis and Investigation of Mixed Esters of Phosphoric Acid with the General Formula $O=P(OR)_2OR'$," by V. G. Pesin and A. M. Khaletskiy; Tr. Leningr. Khim. Farmatsevt. In-ta (Works of the Leningrad Chemico-Pharmaceutical Institute), 1958, Ser. 5, 56-67 (from Referativnyy Zhurnal--Khimiya, No 10, 25 May 59, Abstract No 34957, by V. Gilyarov)

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"In the search for biologically active substances compounds of the constitution $(3-Cl-6-[(RO)_2P(O)]C_6H_3)_2S$ (I) were prepared according to a method already described (F. R. Atherton and others, J. Chem. Soc., 1945, 660). In a typical experiment, 131 ml of $(C_2H_5O)_2P(O)H$ in 200 ml of ether are added to 130 g of 2,2'-dihydroxy-5,5'-dichlorodiphenylsulfide, 350 ml of ether, 340 ml of CCl_4 and 340 ml of $(C_2H_5)_3N$ (30-35°, 25 min.); stirring is continued for 2.5 hours; the filtrate is then concentrated by evaporation; the yield of I (where R is C_2H_5) is nearly quantitative, b. pt. 35-35.5°. Furthermore, other compounds similar to I were obtained which decomposed during distillation at 1 mm (the radical R and the values for n_D^{20} and d_{20}^{20} are given): CH_3 , 1.5360, --; C_4H_9 , 1.5190, 1.197; iso- C_4H_9 , 1.5135, 1.011; iso- C_5H_{11} , 1.5203, 1.162; iso- C_3H_7 , 1.5232, 1.235; C_6H_{11} , 1.5330, 1.209; $C_2H_5OC_2H_4$, 1.5200, 1.261; C_3H_5 , 1.5425, 1.283. The following reaction mechanism was proposed: $(RO)_2P(O)H$ (II) in the presence of $(C_2H_5)_3N$ reacts with CCl_4 in the form of $(RO)_2PONH(C_2H_5)_3$ (III) to form an unstable addition product which subsequently decomposes by a type of Arbuzov rearrangement with the formation of $(RO)_2P(O)Cl$ and $NH(C_2H_5)_3CCl_3$, which, with II yields III and $CHCl_3$. II (where R is C_3H_5) is obtained from C_3H_5OH , PCl_3 and CCl_4 ; the yield is 86.4%. To avoid an explosion, distillation is discontinued when about 15% of the original volume remains the flask. I (where R is C_2H_5) exhibits bactericidal, fungicidal, and insecticidal properties.

14. Simultaneous Extermination of Rodents and Their Ectoparasites by the Use of Ethylenefluorohydrin

"Ethylenefluorohydrin -- An Agent for the Simultaneous Extermination of Rodents and Ectoparasites," by N. M. Dukel'skaya, Ye. Kh. Zolotarev, and S. P. Motornyy, Complex Zoological Entomological Laboratory of Moscow State University; Moscow, Vestnik Moskovskogo Universiteta-Seriya Biologii, Pochvovedeniya, Geologii, Geografii, No 1, 1959, pp 65-71

Laboratory tests with ethylenefluorohydrin have shown that this substance is extremely toxic to rodents (LD₁₀₀ for white and gray rats is 0.5-0.6 mg/kg of body weight) and possesses insecticidal and acaricidal properties. Ethylenefluorohydrin can be used for the simultaneous extermination of rodents and their ectoparasites, and also for blood-sucking insects (mosquitoes), flies, and other insects.

The lethal dose of ethylenefluorohydrin for rodents is lower than that which has been established for the extermination of the ectoparasites -- fleas, lice, and mites. Because of the absence of defensive reactions relative to this poison, even at high concentrations, rodents eat up the poisoned food baits in quantities which contain much more than a lethal dose of ethylenefluorohydrin. Hence, they easily accumulate a toxic dose which is toxic to insects and mites which feed on their blood. Thus, in a short time the simultaneous extermination of the rodents and their ectoparasites is achieved.

Field tests have shown that upon extermination of common voles with a grain bait, which contains 3% ethylenefluorohydrin, fleas (100%) and lice (94.5%) die simultaneously with them. Gamasid mites being facultative blood-sucking pests, die in insignificant numbers.

Nuclear Fuels and Reactor Construction Materials

15. The Decomposition Pressures of Uranyl Nitrate Hydrates

"The Dissociation Pressure of Uranyl Nitrate Crystal Hydrates," by V. M. Vdovenko and A. P. Sokolov; Moscow, Radiokhimiya, Vol 1, No 2, May 59, pp 117-120

The decomposition pressures of the hexahydrate, trihydrate, and dihydrate of uranyl nitrate in the temperature range of 20-60° were determined. The pressures of water vapor in the system $[\text{UO}_2(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O}] - \text{UO}_2(\text{NO}_3)_2 \text{ aq} - (\text{H}_2\text{O})$ were measured in the temperature range of 60°-70°. An investigation was made of the thermodynamic characteristics of the hydrate systems formed by uranyl nitrate.

The hydrates of uranyl nitrate are components of the aqueous-organic solvate systems formed by uranyl nitrate, which are of importance in connection with the extraction of uranyl nitrate with organic solvents.

16. Addition Compounds of Uranyl Nitrate With Organophosphorus Compounds

"Investigation of the Formation of Complexes of Uranyl Nitrate With Organophosphorus Compounds," by V. G. Voden, G. P. Nikitina, and M. F. Pushlenkov; Leningrad, Radio-khimiya, Vol 1, No 2, May 59, pp 121-130

The composition of complex compounds formed by uranyl nitrate with the di-n-butyl ester of n-butyl phosphinic acid (DBEBP) and tri-n-butylphosphine oxide (TBPO) was determined. It was established that the composition of these compounds corresponds to the formula $\text{UO}_2(\text{NO}_3)_2 \cdot 2\text{T}$, where T is DBEBP or TBPO. The constants of complex-formation were found to be of the order of magnitude of 12 for $\text{UO}_2(\text{NO}_3)_2 \cdot 2 \text{TBP}$ (where TBP = tri-n-butylphosphate) and 9.5×10^2 for $\text{UO}_2(\text{NO}_3)_2 \cdot 2 \text{DBEBP}$. The magnitude of the association constant of the complex $\text{UO}_2(\text{NO}_3)_2 \cdot 2 \text{TBPO}$, which has been calculated, is of the order of 3.8×10^6 .

The observed increase of constants of complex-formation in the series of additives $(\text{C}_4\text{H}_9\text{O})_3 \text{PO} \rightarrow (\text{C}_4\text{H}_9)_3 \text{PO}$ indicates that the phosphoryl group plays a principal role in the formation of the complexes.

17. Extraction of Plutonium With Tributyl Phosphate

"Distribution of Plutonium During the Extraction With Tributyl Phosphate," by A. M. Rozen and E. I. Moiseyenko; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 5, May 59, pp 1209-1215

The coefficients of distribution of tetravalent and hexavalent plutonium during the extraction with a 20% solution of tributyl phosphate in kerosene were determined. The acidity of the aqueous phase containing nitric acid was varied in the range of 0.1-10 mols per liter and the uranium content in the range of 0-400 grams per liter. The distribution curves of Pu (VI) and Pu (IV) were determined. The relationships which affect the distribution of these two ions are discussed and interpreted.

18. The Effect of Alpha-Rays Emitted by Plutonium on the Valency State of This Element

"The Effect of Alpha-Radiation Emitted by Plutonium on the Valency State of This Element in Nitric Acid Solutions," by P. I. Artyukhin, V. I. Medvedovskiy, and A. D. Gel'man; Leningrad, Radiokhimiya, No 2, May 59, pp 131-135

The effect of NO_3^- and H^+ ions on the rate of reduction of Pu^{6+} under the action of its own alpha radiation was investigated. It was found that in nitric acid solutions, the initial velocity of the reduction of Pu^{6+} increases with increased concentration of the nitrate ion and decreases with increased concentration of the hydrogen ion. It is assumed that the reduction of hexavalent plutonium in nitric acid solutions takes place as a result of the action of hydrogen peroxide and nitric acid formed under the action of alpha radiation.

19. Production of Heavy Water and Heavy Hydrogen

"Industrial Methods for the Production of Heavy Water," by N. M. Zhavoronkov and K. I. Sakodinskiy; Moscow, Khimicheskaya Promyshlennost', No 3, Apr/May 59, pp 221-234

Industrial methods for the production of deuterium and heavy water are reviewed on the basis of non-USSR publications. Industrial processes based on electrolysis, chemical isotope exchange, distillation of water, and distillation of hydrogen are described. It is stated that the production of deuterium by the distillation of hydrogen was originally applied on an industrial scale in the USSR. A USSR installation consisting of units which treat 4,000 cubic meters of hydrogen per hour each is

described on the basis of report No 2,323 presented at the International Conference on Peaceful Uses of Atomic Energy held in Geneva in 1958 (the authors of the paper are M. P. Malkov, A. G. Zel'dovich, A. B. Fradkov, and I. B. Danilov). Evaluation of economic factors, the capital investment necessary, and the cost of the heavy water produced by different methods leads the authors to the conclusion that the two-temperature exchange between water and hydrogen sulfide, as applied at the Du Pont Savannah River Plant in the US, is the only method available at present by which heavy water can be produced in unlimited quantities at a low cost.

The method of hydrogen distillation is not regarded as satisfactory from the standpoint of the production of deuterium that may be needed as fuel for thermonuclear generation of power, because the demand for ordinary hydrogen for other purposes limits the production of deuterium by this method (i.e., the deuterium is only a by-product). The water-hydrogen sulfide exchange method is regarded as preferable, because it is free of this shortcoming.

20. Hydrogen Isotope Exchange Between Water and Isoamylthiol

"The Rate of Hydrogen Exchange Between Water and Isoamylthiol in the Medium of an Inert Solvent," by K. I. Sakodynskiy and N. M. Zhavoronkov, Chair of the Technology of Fixed Nitrogen and Alkalis, Moscow Chemico-Technological Institute imeni V. I. Mendeleev; Moscow, Nauchnyye Doklady Vysshey Shkoly -- Khimiya i Khimicheskaya Tekhnologiya, No 2, May 59, pp 256-259

The investigation described was carried out to obtain additional data on the hydrogen isotope exchange between S-H and O-H groups. On the basis of the results obtained, it is concluded that the exchange reaction between water and isoamylthiol in an inert solvent proceeds with a high velocity and is completed within 30 seconds. Acetone was used as a solvent.

21. The Properties of Niobium Iodides

"Preparation and Properties of Niobium Iodides," by D. M. Chizhikov and A. M. Grin'ko, Institute of Metallurgy imeni A. I. Baykov, Academy of Sciences USSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 5, May 59, pp 979-981

Depending on the temperature of the heated niobium and the method of preparation, products of the reaction of niobium with iodine vapor may have a different composition. By carrying out this reaction, iodides which, according to the chemical analysis, have the composition Nb I₅, Nb I₄, or Nb I_{3.2} were obtained. On the basis of X-ray diffraction analyses, the assumption is made that the reaction product consists of a solid solution containing niobium iodides of different composition.

When a reaction product of this type is heated in vacuum, elemental iodine is evolved. At 600-630° there is sublimation of iodide. At 700° disproportionation of the iodide takes place with the formation of niobium.

When powdered niobium and iodine are heated in an evacuated and sealed vessel, the reaction $Nb + 1.5 I_2 = Nb I_3$ takes place in the temperature range of 580-600° at a stoichiometric ratio of the reacting elements corresponding to the equation given. The niobium triiodide which is formed sublimes at 600° and deposits in the form of needle-shaped crystals. Some chemical properties of niobium triiodide were determined.

22. Refining of Niobium by the Iodide Method

"Iodide Refining of Niobium," by D. M. Chizhikov and A. M. Grin'ko, Institute of Metallurgy imeni A. A. Baykov, Academy of Sciences USSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 5, May 59, pp 982-984

A method is described for the preparation of pure niobium by thermal decomposition of niobium iodide at a temperature of the heating filament in the range of 1,300-1,600° and a temperature of the vessel in the range of 400-600°. Some characteristics of niobium iodide were determined. The high ductility of the metal obtained, the low values found for the microhardness of the metal, and analytical data indicated that the niobium iodide used had a high degree of purity with respect to the content of foreign metallic and gas admixtures it contained.

23. Production of Metallic Zirconium by the Electrolysis of a Melt Containing Potassium Fluorozirconate

"Investigation of the Decomposition Potential of the System K_2ZrF_6 -NaCl-KCl," by A. N. Sheyko and F. G. Feshchenko, Institute of General and Inorganic Chemistry, Academy of Sciences Ukrainian SSR; Kiev, Ukrainskiy Khimicheskiy Zhurnal, Vol 25, No 2, Mar/Apr 59, pp 166-172

The decomposition potentials, the reverse electromotive force of polarization, and the cathodic potentials in fused potassium fluoro-zirconate and in the system K_2ZrF_6 -KCl-NaCl were investigated and the effect on them of the temperature, the gas medium above the melt in the cathode space, and the concentration of K_2ZrF_6 were determined. It was established that three decomposition potentials are characteristic for the electrolysis of molten potassium fluoro-zirconate: the first corresponds to the reduction of zirconium salts to a lower valency of zirconium, the second to the deposition of metallic zirconium at the cathode, and the third to the decomposition of potassium fluoride with the formation of metallic potassium at the cathode. The lowest values of the decomposition potential are obtained when air fills the cathode space above the melt and the highest when argon fills this space.

24. The Polarography of Zirconium

"The Polarographic Behavior of Zirconium in Aqueous Solutions," by I. A. Korshunov and N. I. Malyugina, Scientific Research Institute of Chemistry at Gor'kiy State University imeni N. I. Lobachevskiy; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 5, May 59, pp 1,077-1,080

The polarographic behavior of zirconyl ions in aqueous solutions of different acids and salts was investigated. It was established that the limiting currents which are observed correspond to catalytic reduction of hydrogen ions in the presence of zirconyl ions. When the zirconyl ions form complexes with ions of citric, oxalic, tartaric, or other acids, the catalytic effect of zirconyl ions is lost.

25. Extraction With Water of Products of the Interaction of Niobium and Tantalum Pentoxides With Caustic Alkalis

"Products of the Interaction of Niobium and Tantalum Pentoxides With Caustic Alkalis," by A. V. Lapitskiy, Chair of Inorganic Chemistry, Moscow State University; Moscow, Vestnik Moskovskogo Universiteta-Seriya Matematiki, Mekhaniki, Astronomii, Fiziki, Khimii, Vol 13, No 6, Nov/Dec 58 (published in March 1959), pp 121-126

The products of the interaction of niobium pentoxide and tantalum pentoxide with caustic alkalis were investigated. It was established that upon interaction of tantalum pentoxide with solutions of sodium hydroxide there is formation of different aqueous tantalates, (orthotantalate, pentatantalate, and hexatantalate of sodium) depending on the concentration of the initial caustic solution. More precise data were obtained on the refraction indices of sodium pentatantalate and sodium hexatantalate. The refraction indices of sodium orthotantalate were determined for the first time. The process of the decomposition with water of alkali melts containing niobium and tantalum was investigated. A possible mechanism of the hydrolytic splitting of highly alkaline tantalates is proposed. It is pointed out that melting of niobium and tantalum concentrates with caustic alkali followed by extraction of these elements with water is one of the methods for the separation of niobium and tantalum from mineral raw materials. The purpose of the investigation described was clarification of the processes occurring during this type of extraction.

26. Ether Addition Products of Beryllium Halides

"Synthesis of Ether Addition Products of Beryllium Halides," by N. Ya. Turova, A. V. Novoselova, and K. N. Semenenko; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 5, May 59, pp 1215-1216

A method for the synthesis of products formed by the addition of ether to beryllium chloride and beryllium bromide is described. The syntheses were carried out by the direct reaction of metallic beryllium with halogens or hydrogen halides in absolute ether.

27. Dissociation Pressure of Sodium Fluoroberyllate

"Investigation of the Dissociation Pressure of Sodium Fluoroberyllate of the Composition Na_2BeF_4 ," by A. V. Novoselova, F. Sh. Muratov, L. P. Reshetnikova, and I. V. Gordayev; Chair of Inorganic Chemistry, Moscow State University; Moscow, Vestnik Moskovskoga Universiteta-Seriya Matematiki, Mekhaniki, Astronomii, Fiziki, Khimii, Vol 13, No 6, Nov/Dec 58 (published in March 1959), pp 181-190

The vapor pressures of beryllium fluoride in the temperature range of $762^\circ\text{--}1,103^\circ$, the vapor pressures of liquid sodium fluoride in the temperature range of $1073\text{--}1193^\circ$, and the dissociation pressures of sodium fluoroberyllate (Na_2BeF_4) at temperatures between $1,009$ and $1,197^\circ$ were determined. It was established that, because of the presence of complex molecules in the vapor phase, the apparent partial pressure of sodium fluoride above sodium fluoroberyllate is considerably greater than the vapor pressure above pure sodium fluoride. It follows from the experimental results obtained in the work described that the vapor phase above fused sodium fluoroberyllate contains complex molecules of the composition NaBeF_3 .

Organic Chemistry

28. The Synthesis of Fluorinated Styrenes

"Fluorinated Styrenes; Part 4 -2,5-Difluorostyrene and 2,5-Difluoro-beta-fluorostyrene," by D. V. Talalayeva, G. V. Kazennikova, and K. A. Kocheshkov, Physicochemical Institute imeni L. Ya. Karpov; Moscow, Zhurnal Obshchey Khimii, Vol 29, No 5, 1959, pp 1,593-1,595

For the first time 2,5-Fluorostyrene has been prepared. A method has been worked out for the production of 2,5-difluorophenyl lithium, which is used as a starting material for the synthesis of 2,5-difluorostyrene over 2,5-difluorophenylmethylcarbinol. For the first time 2,5-Difluoro- β -fluorostyrene has been prepared. The procedures used for the synthesis of the compounds mentioned are described.

29. The Reaction of Phosgene and Trialkylphosphites Re-investigated

"On the Reaction of Phosgene and Trialkylphosphites," by K. A. Petrov, N. K. Bluznyuk, and V. Ye. Burygin; Moscow-Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 5, May 59, pp 1,486-1,491

The authors firmly established that phosgene reacts with trialkylphosphites with the formation of the dialkylchlorophosphates, alkyl chloride, and carbon monoxide. This contradicts the results obtained by M. I. Kabachnik and P. A. Rossiyskaya (Izvestiya AN SSSR, OKhN, 1957, 48) who claimed that methyl chloride and the ester of chloroformylphosphinic acid are formed in the reaction of phosgene and trimethylphosphite.

Dialkylchlorophosphates react with intermediate phosphites to form the tetraalkyl esters of diphosphonic acids with the P-P-bonding or their isomeric subphosphates.

30. New Bacteriostatic and Growth-Promoting Substances

"Esters of Thiosulfonic acids - New Antibacterial and Growth Substances,": by B. G. Boldyrev; Nauchn. Zap. L'vovsk. Politekhn. In-t (Scientific Notes of the Lvov Polytechnical Institute), 1957, No 62, 353-362 (from Referativnyy Zhurnal -- Khimiya, No 9, 10 May 59, Abstract No 32581, by I. Mil'shteyn)

Alkylesters of alkanethiosulfonic acids with the general formula RSO_2SR' (I) are obtained by the action of alkyl halides on the water-acetone solutions of the K-salts of thiosulfonic acids; the latter are formed by the interaction of the corresponding sulfonic acid chlorides with an aqueous solution of KSH. In experiments in vitro all compounds exhibited marked tuberculostatic activity but in tests in vivo they did not manifest therapeutic activity because of their inactivation in the living organism. I compounds exhibit maximum bacteriostatic and bacteriocidal activity in relation to bacteria (B) of the Xanthomonas genus, somewhat lower activity with respect to B of the Corynebacterium genus and a minimum activity towards bacteria of the Pseudomonas and Erwinia genera. The results of field tests are also presented in the abstract.

31. Preparation of The Dialkylamides of Vinylsulfonic Acid and the Dialkylaminoethanesulfodialkylamides

"The Reaction of Aliphatic Amines with β -Chloroethanesulfochloride," by K. A. Petrov and A. A. Neymysheva; Moscow-Leningrad, Zhurnal Obshchey Khimii, Vol. 29, No 5, May 59, pp 1,494-1,496

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"Up to the present, not one representative of the dialkylamides of vinylsulfonic acid has been described. Experiments to obtain them by reacting aliphatic amines with β -chloroethanesulfochloride have not been successful.

"In this investigation conditions have been found whereby vinylsulfodialkylamides and dialkylaminoethanesulfodialkylamides were obtained by the action of dimethylamine and diethylamine on β -chloroethanesulfochloride. Yields up to 50% were obtained. The reaction was conducted in absolute ether or chloroform at various temperature (from -10 to + 60° C) with a molar ratio of sulfochloride to amine of 1:3".

32. A New Method of Obtaining Dialkylthiophosphinic Acids Described

"A Method of Obtaining Dialkylthiophosphinic Acids," by T. A. Mastryukova, A. E. Shipov, and M. I. Kabachnik, Institute of Elemental Organic Compounds of the Academy of Sciences, USSR; Moscow-Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 5, May 59, pp 1,450-1,453

A method was developed for synthesizing dialkylthiophosphinic acids, R_2PSOH , by the action of Grignard reagent on dialkylphosphorous acids with the subsequent addition of sulfur.

The acids, R_2PSOH , (where $R = C_2H_5, C_3H_7, iso-C_3H_7, C_4H_9, iso-C_4H_9$ and $C_6H_5CH_2$) were obtained by this method with a yield of 64-81%.

The structure of the dialkylthiophosphinic acids obtained by this method was confirmed by an alternate synthesis of the ammonium salt of dipropylthiophosphinic acid whose physical properties were found to be identical to those of the salt obtained by the method described.

33. A Newer, Simpler Method of Preparing Phosphorus Diiodide and Triiodide Described

"The Preparation of Phosphorus Diiodide and Triiodide," by Ye. S. Levchenko, I. E. Sheynkman, and A. V. Kirsanov, Institute of Organic Chemistry of the Academy of Sciences, Ukrainian SSR; Moscow-Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 5, May 59, pp 1,474-1,477

After a series of experiments, the authors found that phosphorus diiodide and phosphorus triiodide can be obtained in a completely pure state directly from iodine and red phosphorus with the subsequent crystallization from a suitable solvent. The best solvents are chlorobenzene and dichloroethane, for phosphorus diiodide and phosphorus triiodide, respectively.

The authors found that phosphorus diiodide has a melting point of 126° - 127° C, not 124.5° , as previously reported.

A chemist under laboratory conditions can easily prepare one kilogram of pure phosphorus diiodide in one work day.

34. A Method of Obtaining the Dialkyl Esters of Vinylphosphinic Acid and Substituted Diamides

"Method of Obtaining Dialkyl Esters of Vinylphosphinic Acid and Substituted Diamides," by M. I. Kabachnik and T. Ya. Medved', (Invention No 116882); Moscow, Byulleten' Izobreteniy, No 12, 1958, p 28

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"A method of obtaining the dialkyl esters of vinylphosphinic acid and substituted diamides is characterized by the fact that the acid chloride of chloroethylphosphinic acid is dehydrochlorinated at 330-340° C by passing over barium chloride deposited on pumice, into the acid chloride of vinylphosphinic acid; the later is brought into interaction with alcohols to obtain dialkyl esters or with secondary amines to obtain substituted diamides."

35. New Esters of Alpha-hydroxyalkylthiophosphinic Acids Synthesized

"On the Reaction of Dialkylphosphorous Acids with Aldehydes and Ketones. XX. The Esters of Several alpha-Hydroxyalkylthiophosphinic Acids," by V. S. Abramov and V. K. Khayrullin, Kazan Chemicotechnological Institute; Leningrad-Moscow, Zhurnal Obshchey Khimii, Vol 29, No 5, May 59, pp 1,599-1,604

Dialkylthiophosphorous acids can be obtained directly by the reaction of hydrogen sulfide with dialkylchlorophosphites, giving good yields.

Dialkylthiophosphorous acids enter a condensation reaction with aldehydes and ketones to form esters of alpha-hydroxyalkylthiophosphinic acids. Ten different esters of alpha-hydroxyalkylthiophosphinic acids were synthesized and characterized for the first time.

The condensation reaction with aldehydes and ketones takes place with the enol form of the thioacid. The reaction of the formation of esters of alpha-hydroxyalkylthiophosphinic acids and the presence of chlorine atoms in the thioacid radicals favor the displacement of the tautomeric equilibrium in the direction of the enol form.

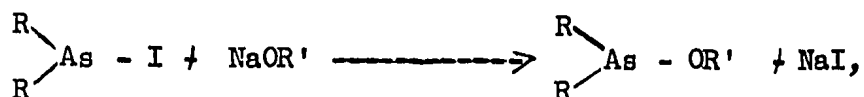
The esters of alpha-hydroxyalkylthiophosphinic acids are easily decomposed with scission at the P-C bond by heating and the action of alkalis which can be explained by the presence of a hydrogen bond.

36. New Esters of Dialkylarsinous Acid Synthesized

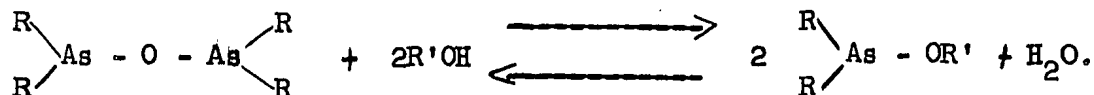
"Concerning Several Esters of Dialkylarsinous Acids," by Gil'm Kamay and B. D. Chernokal'skiy, Kazan Chemico-technological Institute imeni S. M. Kirov; Leningrad-Moscow, Zhurnal Obshchey Khimii, Vol 29, No 5, May 59, pp 1,596-1,599

Two methods were proposed for synthesizing the esters of dialkylarsinous acids:

(a) by reacting dialkyliodoarsine with the corresponding sodium alcohols



(b) by heating bis(dialkylarsyl) oxide with alcohols in the presence of calcium carbide which acts as a water-removing agent



The authors found that method (b) yielded better results.

The ethyl, n-propyl, and n-butyl esters of diethylarsinous acid; the ethyl ester of di-n-propylarsinous acid; the ethyl and the n-butyl esters of methyl-n-butylarsinous acid were obtained for the first time.

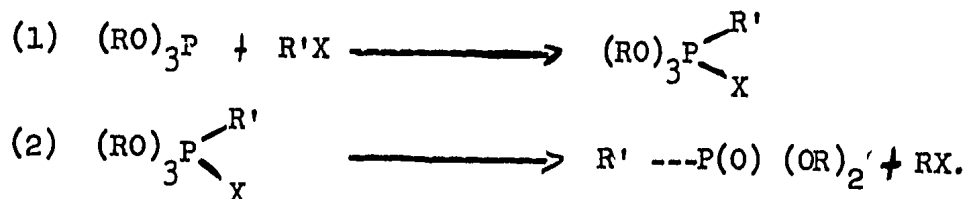
The authors established that the alkyl esters of dialkylarsinous acid interact with alkyl halides to form ionic salts. They also showed that esters of dialkylarsinous acids are hydrolyzed in air with the formation of the corresponding dialkylarsinic acids.

The physical data are set forth in two tables.

37. Arbuzov Rearrangement Studied

"On the Mechanism of the Arbuzov Rearrangement," by A. I. Razumov, Kazan Chemicotechnological Institute; Leningrad-Moscow, Zhurnal Obshchey Khimii, Vol 29, No 5, May 59, pp 1,635-1,639

The general scheme of the mechanism of the Arbuzov rearrangement was presented by A. Ye. Arbuzov in the following form:



A. I. Razumov studied this mechanism in detail and as a result of his study came to the following conclusions, and observations:

After studying the velocity of rearrangement of the ethyl esters of phosphorous, ethyl- and diethylphosphinous acids, it was shown that each substitution of an ethoxy group by an ethyl significantly increases the velocity of the rearrangement. An explanation was proposed as to the reasons for this difference in rearrangement velocity.

The author showed that traces of amine in triethylphosphite reduce the velocity of its rearrangement.

On the basis of a critical examination of published data and also of special experiments, a broader interpretation of the Arbuzov rearrangement is given.

38. New Class of Compounds Synthesized

"Research on the Synthesis and Rearrangements of Unsaturated Organogermanium Compounds. 1. Synthesis of Mono-, Di- and Triatomic Tertiary gamma-Germaniumacetylene Alcohols," by I. A. Shikhiyev, M. F. Shostakovskiy, N. V. Komarov, and I. A. Aslanov; Moscow-Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 5, May 59, pp 1,549-1,551

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"For the first time, the interaction of dimagnesiumdibromodimethylethynylcarbinol with alkylgermaniumbromides was investigated and a method was developed for synthesizing a new class of compounds- the germanium-containing tertiary mono-, di- and triatomic acetylene alcohols.

"The following compounds were prepared and characterized: (2-methylbutyn-3-ol-2)-4-trimethylgermane, bis-(2-methylbutyn-3-ol-2)-4-dimethylgermane and tri-(2-methylbutyn-3-ol-2)-methylgermane.

"The reaction of bis-(2-methylbutyn-3-ol-2)-4-dimethylgermane with acetic anhydride was studied. From this it was established that the corresponding acetate of bis-(2-methylbutyn-3-ol-2)-4-dimethylgermane was formed."

39. Quantitative Determination of Hexachlorocyclohexane Isomers in Technical Hexachlorane

"The Employment of the Cl^{36} Isotope for the Quantitative Determination of Hexachlorocyclohexane Isomers in Technical Hexachlorane," by L. A. Krasnousov, Ye. V. Volkova, and P. V. Zimakov; Tr. Komis, po Analit. Khimii AN SSSR (Works of the Commission on Analytical Chemistry of the Academy of Sciences, USSR), 1958, 9(12), 356-360 (from Referativnyy Zhurnal -- Khimiya, No 9, 10 May 59, Abstract No 32566, by T. Levi)

A method described earlier for determining the gamma-isomer of hexachlorocyclohexane (I), based on the use of Cl^{36} (Referativnyy Zhurnal-Khimiya, 1957, 1483), was modified to determine other isomers of I and for use in serial analyses. The perfected method is based on the measurement of the specific activity of the dry, tagged isomer which is applied to a paper target as drops of a solution in toluene, whereupon the latter is eliminated. For determining the isomer, a weighed quantity of the tagged isomer (obtained by chlorination of C_6H_6 in UV-light with Cl_2^{36} , diluted with Cl_2), about 0.05 g with a specific activity of 1000-1200 disintegrations/min/mg is added to a weighed in quantity (0.1-0.4g) of hexachlorane; the mixture

is homogenized by dissolving in acetone which is distilled off. For determining gamma-I the weighed in quantity is extracted with C_3H_7OH (2 x 1 ml) with heating; the extract is evaporated to 30% in a vacuum; the crystals are separated; the mother liquor is evaporated to dryness and the crude gamma-I is recrystallized from 0.5 ml of C_2H_5OH . For determining the alpha-isomer the other components are washed with CH_3OH (2-3 x 1 ml). Then the alpha-I is dried and dissolved in toluene (20-40 mg/g). After this, 2-3 drops of the solution are applied to a tracing paper target (18 x 20 mm); the target is covered with a sheet of tracing paper and clamped to a counter which measures the specific activity. The method was verified on artificial mixtures and technical hexachlorane (by the addition method); the mean error was about 0.5%

Radiochemistry

40. Papers on Radiochemistry, Nuclear Chemistry, and Radiation Chemistry Presented at the Eighth Mendeleev Congress

"The Eighth Mendeleev Congress," by V. P.; Moscow Atomnaya Energiya, Vol 56, No 6, Jun 59, pp 677-678

At the Eighth Mendeleev Congress of General and Applied Chemistry held on 16-23 March 1959 at Moscow, Academician A. P. Vinogradov (Head of the Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy) presented a report titled "Fundamental Problems of Radiochemistry," which was received with great interest.

Vinogradov stated that radioisotopes produced in connection with applications of nuclear energy for industrial or scientific purposes are used extensively in synthesis and as a means of inducing the polymerization of organic compounds. As a result, new substances with characteristics of value from a technical standpoint are obtained. Vinogradov emphasized that during the past few years it was possible to isolate several new transuranium elements by radiochemical methods.

A central point of attraction at meetings of the Section of Radiochemistry and the Chemistry of Isotopes were reports of Soviet and American scientists on the synthesis of element 102. Papers on this subject were given G. N. Flerov, the USSR scientist, and A. Ghiorso, a scientist active at the University of California. Both USSR and American scientists obtained identical results concerning the existence of element 102.

A number of reports presented in the Section of the Chemistry and Technology of Polymers dealt with successful applications of penetrating radiation in the synthesis of polymers.

At the last meeting of this section, Academician A. P. Aleksandrov reported on "The Chemical Aspects of the Application of Nuclear Energy." In this report, Aleksandrov discussed the prospects of the application of nuclear energy for technological purposes. He emphasized that the direct application of nuclear radiation for chemical purposes may become one of the most profitable uses of the energy contained in nuclear fuel. For instance, by using the radiation emitted by spent fuel elements from the nuclear energy electric power plant that is being built in Voronezh Oblast one can vulcanize hundreds of thousands of automobile tires per year. In his report, Aleksandrov mentioned many types of chemical manufacture in which radiation energy can be used to advantage. He said that extensive possibilities are open to the new field of science, i.e., radiation chemistry. He emphasized particularly that radiation chemistry makes it possible to manufacture products with entirely new properties, and which cannot be produced by ordinary methods. Considerable attention is being paid to radiation chemistry in the USSR: a number of institutes conduct work in the field of radiation chemistry, using cobalt-60 radiation sources, accelerators, and nuclear reactors.

41. The Decay of Se⁷²

"The Chemical State of Products of the Decay of Se⁷²," by A. Halpern, Institute of Nuclear Research, Polish Academy of Sciences; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 5, May 59, pp 1,205-1,208

The chemical forms of the stabilization of As⁷² atoms were investigated after formation of these atoms from H₂Se⁷²O₃ as a result of the capture of an orbital electron. It was found that at 20°, 44.3% of As⁷² on the average are stabilized in the trivalent state and 55.7% in the pentavalent state. At minus 196°, the corresponding values are 34.3% of As III and 65.7% of As V.

42. The State of Protactinium in Aqueous Solutions

"The State of Microquantities of Radioactive Elements in Dilute Solutions; Part 7 -- Investigation by the Adsorption-Desorption Method of the State of Protactinium in Aqueous Solutions," by I. Ye. Starik, L. D. Sheydina, and L. I. Il'menkova; Leningrad, Radiokhimiya, Vol 1, No 2, May 59, pp 168-170

An investigation of the absorption of protactinium on quartz glass from nitric acid and hydrochloric acid solutions in the pH range of 1-14 showed that the adsorption maximum is located in the range of pH = 5-5.2. The shape of the curves of adsorption and desorption of protactinium by quartz in contact with aqueous solutions indicates that the ionic form of this element is predominant at low values of pH (lower than 4-4.5) and the colloidal form at values of pH higher than 5. The solubility product of the hydroxide $\text{Pa}(\text{OH})_5$ at a protactinium concentration amounting to 10^{-12} mols per liter was found to be equal to 10^{-55} .

43. Chinese Preparation of Phosphorus 32

"Preparation of Radioactive Phosphorus-32 by the Nuclear Recoil Method Using Tributyl Phosphate as a Target," by Li Hu-hou (李 虎 侯), Institute of Atomic Energy, Academia Sinica; Peiping, K'o-hsueh T'ung-pao (Scientia), No 11, 11 Jun 59, p 364

The author reports a recent experiment on the preparation of phosphorus 32 by the Szilard-Chalmers process. One kilogram of tributyl phosphate used as target material was irradiated by a polonium-beryllium neutron source with a specific activity of the order of microcuries. The isotope was separated with H_2O . The yield was 15 curies of radioactive phosphorus. Its energy was determined at 1.725 Mev; its half-life, at 14.4 ± 0.3 days. This compares with 1.708 Mev and 14.30 days reported in the literature, the author says.

Miscellaneous

44. The 8th Mendeleev Congress

"Results of the 8th Mendeleev Congress," by S. Ya. Plotkin, Candidate of Technical Sciences; Moscow, Khimicheskaya Nauka i Promyshlennost', Vol 4, No 2, May 59, pp 145-153

The Eighth Mendeleev Congress of General and Applied Chemistry was held on 16-23 March 1959 in Moscow. This congress was the most extensive and representative chemical meeting ever held in the USSR. More than 5,000 scientists, engineers, and persons active in the industry participated in the congress, including in addition to USSR chemists, chemists from Austria, Great Britain, Belgium, the Netherlands, Italy, the US, France, West Germany, and other countries.

Of great interest were reports on new developments in the field of the chemistry of radioactive elements and isotopes and also papers dealing with applications of these elements and isotopes in scientific research. Progress in the rapidly developing field of radiation-chemical reactions was reviewed in some papers.

A report entitled "Fundamental Problems of the Chemistry of Polymers" was presented by Academician V. A. Kargin. Kargin pointed out that the primary task of USSR polymer chemistry is the synthesis of new polymeric substances stable under the effect of high temperatures and resistant to oxidation. In addition to thermal stability, polymers of this type must exhibit the necessary mechanical strength at ordinary temperatures: this means that the temperature at which embrittlement develops must be sufficiently low. In other words, thermostable polymer materials must have satisfactory operational characteristics within a very extensive temperature range.

Consequently, the problem of extending the temperature range in which polymer materials can be used consists not only of the production of polymers which are stable at very high or very low temperatures, but also involves the development of materials which exhibit a high tensile strength, are sufficiently elastic, and have a high impact strength.

The second task which has to be accomplished is the development of polymers which not only have superior characteristics, but which can be produced at a low cost and made available in sufficient quantities.

The third task consists of the solution of problems involved in the conversion of polymers to finished products.

At the present stage of development of synthetic chemistry and polymerization techniques, one can introduce into almost any organic compound groups which are capable of undergoing polymerization or polycondensation, so that the compounds in question can be converted into polymers.

Clarification of the mechanism of catalytic polymerization processes, which lead to the formation of regularly formed chains, is undoubtedly one of the principal tasks of present-day polymer chemistry.

Kargin pointed out that the emphasis which was placed on synthetic polymers distracted the attention of research workers from natural polymers, primarily cellulose. However, the role played by cellulose as the most common and accessible textile material is still very important, particularly if the possibilities of modifying cellulose fibers chemically are taken into consideration. The best method of modifying and thus improving cellulose is the grafting of synthetic polymers, primarily acrylonitrile, to the surface of synthetic fibers.

Academician A. N. Nesmeyanov presented a report entitled "The Periodic System of Elements and Organic Chemistry." Nesmeyanov's report dealt with the chemistry of organoelemental compounds.

He discussed the capacity of elements to form organoelemental compounds in relation to the position of the elements in the periodic system, then analyzed the problem of the stability of organoelemental compounds as affected by the nature of the compound and the species of radicals contained therein. The organoelemental compounds of nontransition metals were discussed. The author of the report characterized the most important methods of the synthesis of organoelemental compounds of nontransition metals, including metallization, step-wise alkylation, and the "onium" method of synthesis. After this, Nesmeyanov dwelt on the practical applications of compounds of this type, pointing out their importance as antiseptics, chemotherapeutics, anti-knock agents, and insecticides. He also discussed their use as transmitters of organic radicals and anions in polymerization reactions.

The report considered in detail organometallic compounds of transition metals, namely carbonyls, "cenes", and complexes of aromatic nuclei with transition metals. He summarized the results of work on "cenes", i.e., organometallic compounds with a sandwich structure, research on which was initiated by the discovery of ferrocene in 1952. Nesmeyanov outlined the results of research on the chemistry of ferrocene conducted at the Institute of Organoelemental Compounds, Academy of Sciences USSR, Moscow State University, and in the laboratories of scientists active outside of the USSR.

In conclusion, Nesmeyanov reviewed the progress achieved during recent years in research on polyheteroatomic organoelemental compounds, organoelemental compounds with homoatomic chains, and organoelemental compounds with heteroatomic chains.

The basic problems of chemical kinetics were discussed extensively in a report by Academician N. N. Semenov, who pointed out that free radicals play a principal role in chain reactions which take place in connection with such important industrial processes as cracking, oxidation, polymerization, etc. The reactivity of radicals is determined quantitatively by the constant of the rate of the reaction of these radicals with different molecules, i.e.,

$$K = B e^{-E/RT},$$

where E is the energy of activation.

The velocity constant, and consequently, also the velocity of the reaction, depends principally on the magnitude of the activation energy E. Even a small change in E brings about a considerable change in the velocity, whereas changes in B ["predeksponent"] result in proportional changes of the velocity. Polanyi was the first to establish the relationship which exists between the magnitude of the activation barrier ξ (i.e., the magnitude of the energy of activation of an exothermic reaction) and the heat effect of the reaction:

$$\xi = A - \alpha(q)$$

Semenov described research he conducted on a great number of radical reactions, for which experimentally determined values of ξ and q were available. He found that in every case (with the exception of reactions in which halogen atoms participate) the relationship $\xi = 11.5 - 0.25(q)$ applies to exothermic reactions and the relationship $E = 11.5 + 0.75(q)$ to those that are endothermic. This rule, in addition to making it possible to calculate the activation energies of radical reactions in a number of cases, enables one to approach a solution of the problem of reactivity, because, if this rule is assumed to be rigidly valid, the activation energy is determined solely by the thermal effect of the reaction.

Semenov stated that at the Institute of Chemical Physics and the Laboratory of Anisotropic Structures, new and interesting data on free radicals were obtained by applying the method of paramagnetic resonance.

Interesting results were obtained in the investigation by the method of paramagnetic resonance of complexes formed by the co-precipitation of ribonucleic acid, together with proteins. The complexes that are formed

give a very broad signal similar to that emitted when the paramagnetic resonance of metals is measured. The number of unpaired electrons was found to be very high, as much as 10^{21} electrons per gram. One may assume that the intact electron pairs of nitrogen become unpaired and the electrons then enter into strong mutual interaction with other unpaired (free) electrons (Blyumenfel'd).

A report on the principal problems of radiochemistry was presented by A. P. Vinogradov (a complete text of Vinogradov's report will be published in Khimicheskaya Nauka i Promyshlennost', Vol 4, No 4, 1959).

A report by V. P. Nikolayev dealt with problems of the construction of chemical plant equipment. Nikolayev brought out that in connection with the expansion of the construction of chemical equipment, which has been foreseen under the Seven-Year Plan, there will be increased production of high-strength heat-resistant steels and expansion of the production of titanium, tantalum, and alloys of tantalum with niobium, as well as a number of other construction metals. There will also be considerable expansion of the application of plastics and other nonmetals as construction materials for chemical equipment.

Academician A. P. Aleksandrov discussed the chemical aspects of the application of nuclear energy. He stated that one of the most important tasks of present-day science is the development of direct means for the chemical application of nuclear radiation. According to Aleksandrov, the radiant energy of spent fuel elements from only one of the nuclear power plants being built in the USSR can be used to vulcanize hundreds of thousands of tires and to produce a huge quantity of polyethylene. Radiation chemistry opens new possibilities of improving the efficiency and reducing the production cost in connection with important technical processes, such as the fixation of nitrogen in the form of nitric acid or ammonia, or the production of polymers with any predetermined set of properties. Many chemical reactions of this type are accompanied by the evolution of energy which can be utilized additionally for the generation of electric power.

More than 100 papers and communications were presented and discussed in the Section of Inorganic Chemistry and Technology. The tasks of USSR inorganic chemistry in connection with the decisions of the 21st Congress of the CPSU were discussed. Among these tasks are the synthesis and investigation of inorganic polymers with suitable characteristics required for technical applications, development of the chemistry of semiconductors, many-sided utilization of chemical, agrochemical, and metallurgical raw materials, development of the chemistry and technology of rare metals, and

theoretical research on the chemistry of simple and complex compounds of all elements of the periodic system. The Chinese scientist, Lu Ta-kang, presented a report in which he discussed basic trends in inorganic chemistry and also reported that all rare-earth elements had been isolated [in China] in the form of pure salts by the application of ion-exchange resins.

Reports were given on the chemistry of the rare elements gallium, indium, scandium, and hafnium. Some problems of the synthesis of peroxide compounds were discussed and also the characteristics and applications of such compounds.

Reports by L. Kolditz and F. Tilo (GDR) on monomeric and polymeric fluoroarsenites and fluoroantimonites were heard with great interest.

More than 200 reports and communications were presented in the Section of Organic Chemistry. Among them was a report on the stability of organo-silicon compounds and their susceptibility to hydrolysis. This report was presented by G. Schott (GDR). The papers on the chemistry and technology of organoelemental compounds dealt principally with problems of the chemistry of ferrocenes and of organic compounds of other transition elements, the synthesis and properties of onium compounds, investigation of tautomerism on the example of organoelemental compounds, and investigation of processes of telemerization and syntheses based on telomers (A. N. Nesmeynov and co-workers).

Among the reports presented in the Section of Analytical Chemistry was one by V. Kemula (Poland) on a polarographic method for the determination of small quantities of impurities by the suspended drop method and one by E. Minczewski (Poland) on titrations in nonaqueous solvents. Considerable attention was paid at meetings of this section to chromatographic research, mass chromatography (G. Schay, Hungary), the application of radioactive isotopes in the investigation by the chromatographic methods of processes of complex-formation, and determination of rare elements by methods of isotope dilution.

In the Section of Physical Chemistry, information was presented on the theory and application of the isotopic kinetic method for the investigation of the mechanism of complex reactions. A number of reports dealt with the role played by tunnel effects in reactions of hydrogen isotopes and low-temperature reactions.

Thirteen papers dealt with oxidation reactions and reactions of free radicals. Among them was a report on the kinetics of vapor-phase nitration of alkanes and the interactions of alkyl radicals with nitrogen dioxide. Considerable attention was paid to fundamental problems pertaining to catalysis.

More than 80 reports were presented in the well-attended meetings of the Section of Chemistry and Technology of Polymers. Papers given in this section reported results of research on the synthesis of thermostable organo-metallic polymers of a new type, i.e., polyorgano-alumosiloxanes. Information was given on the most urgent present-day problems of polymer chemistry, i.e., those pertaining to the production of block and graft copolymers. More than 20 communications dealt with the physics and physical chemistry of polymers. A report entitled "Research on the Production of the Synthetic Fiber Vinyon from Polyvinyl Alcohol" was given by Li Hsing-jih (China).

In the Section of Agricultural Chemistry, Fertilizers, and Insectofungicides a great number of reports dealt with new insecticides and the insecticidal activity of organophosphorus compounds and organic derivatives of arsenic. Among the many compounds discussed were esters and ester amides of pyrophosphoric, thiophosphoric, and dithiophosphoric acids, dichlorovinyl esters of ethylphosphinic acid, products of the alkylation of thiophos, and esters of alkylthioarsinic acids. The results that were obtained in investigations on a new class of organophosphorus insecticides were reported, as well as a new method for the preparation of trialkyldithiophosphates and tetraalkyldithiopyrophosphates by the interaction of dialkoxyphosphondisulfides with trialkylphosphites.

Furthermore, reports were given on methods for the synthesis of insecticides by the interaction of cyclochloropentadiene with different unsaturated compounds and also on the synthesis of secondary trichloromethylcarbinols and their esters. Scientists from China, Hungary, Rumania, and Bulgaria participated actively in meetings of the Section of Agricultural Chemistry, Fertilizers, and Insectofungicides.

In the Section of the Chemistry and Technology of Silicates, the most important problems were discussed which have a bearing on the implementation of the extensive program that has been drawn up for the expansion of the production of construction materials. Reports on the following subjects were made: the investigation of the structure of various new types of glass and the development of scientific methods for controlling the properties of glass, results of investigations dealing with cements (adhesives), phenomena of resonance absorption by alumosilicates in the region of radio frequencies, electrochemical properties of silicate systems, and heat-resistant concrete.

In the Section of Theoretical and Applied Electrochemistry, more than 90 reports and communications were presented and discussed. The reports given in this section dealt with the development of electrochemical methods in nonferrous metallurgy and possible ways of further increasing the velocity of electrochemical processes, specifically by sharply raising the current density. Considerable interest was evinced towards reports dealing with work on electrochemical methods to be applied in the technology of

rare metals and the further development of electrochemical production methods, particularly as far as the manufacture of caustic alkalis and chlorine is concerned. There were also reports on the energy of solvation of ions and molecules, as well as reports on other subjects.

Still other reports dealt with problems involved in the theory and practical application of processes of the deposition of metals and amalgam metallurgy, the corrosion of metals, and a new field of polarography, i.e., the polarography of fused media. Alloys of tantalum with niobium, which have been obtained by the electrolysis of melts, can successfully replace pure tantalum and niobium in the chemical industry, in the production of evacuated electrical devices, and in a number of other fields of technology. The method which has been developed makes it possible to produce alloys of niobium with tantalum from any tantalum-niobium ore, avoiding the difficult and complex operation of separating tantalum from niobium.

Electrochemists from Poland, Hungary, Italy, and the GDR presented reports in the Section of Electrochemistry. Of particular interest was a report by the Polish scientist, V. Kemula, on a new electrochemical method of analysis which makes it possible to detect the presence of impurities, even when they constitute only one hundred millionth part of the principal component.

In the opinion of participants at the meetings of this section, particular attention should be paid in the current Seven-Year period to the electrochemical synthesis of organic compounds, the electrochemistry of rare metals and semiconductors, the production of metals of ultra-high purity, and methods for the development and application of heat-resistant coatings.

The principal subjects with which the Section of Radiochemistry and of the Chemistry of Isotopes was concerned were problems in the field of chemistry of uranium and transuranium elements, the behavior of radioactive isotopes in different processes, the most important theoretical and experimental problems of radiation chemistry, isotope exchange, etc. Reports presented in this section dealt with some newly discovered chemical properties of neptunium, new data on the chemistry of americium, etc. Interesting reports on methods for the synthesis and identification of element 102 were given by A. Ghiorso (US) and G. N. Flerov.

Extensive discussion of reports on different subjects demonstrated that fundamental research in the field of radiochemistry with the application of the newest methods is being conducted by USSR scientists.

Fundamental problems of the chemistry of metals and alloys are at present attracting a considerable amount of attention on the part of investigators and engineers who are active in this field. More than 60 reports presented at the congress dealt with problems of this type. The reports in question discussed properties of different elements of the periodic system from the standpoint of metal chemistry, the chemistry of nitrides of high-melting metals, the properties of alloys of rare elements, results obtained in research on some metal systems, and problems of the chemistry of semiconductor alloys. It was noted that one of the most important problems of metal chemistry is the advancement of research on the electronic structure of metals and alloys.

III. ELECTRONICS

Automation and Computers

45. Industrial Automation in USSR

"Automation of Industry is Important Link in Engineering Progress," (unsigned article); Moscow, Avtomatika i Telemekhanika, No 6, Jun 59, pp I-IV

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The article contains the following passages:

"The level of scientific and engineering development in our country at present is such that it affords the possibility of introducing extensive automation to all branches of the national economy and revision of technological processes so that they will be adaptable to complete automation.

"In general, however, automation in our country lags behind the requirements of national economy, also the level of automation development in certain capitalistic nations, especially that of the US. We are automatizing generally not all of the phases of production processes, but merely certain sections of the processes, thus failing to attain full efficiency.

"The following are the principal reasons for slowness in the automation of our industry.

"Automation is often applied prior to detailed study of the technological process itself or, to already existing processes which are not adaptable to automation.

"Estimates of expected improvement in efficiency are often not made prior to the design of automated installations.

"Other reasons are the insufficient number and capability of the automation instrument building enterprises, inconsistency of the products of these enterprises, lack of certain important automation instruments, obsolescence of a considerable part of the presently manufactured instruments; all this complicates the design and introduction of new systems of automation.

"A lack of qualified personnel to conduct scientific and research work, instrument design, construction, installation and operation of automated installations is felt. Training of experts in the field of automation proceeds at present at such a slow pace that a gap between the demand

for such experts and their availability is increasing steadily every year, rather than becoming smaller. The number and capability of scientific-research organizations obviously do not match the demands arising in this field. Insufficiency in experimental facilities at the institutes, design bureaus, and the plants have resulted in the delay of research work, and especially in its application to practice. As a result, numerous new technological ideas of tremendous significance to the national economy, which originated in the USSR, were often applied in practice abroad before they have been realized in the USSR."

46. Static Characteristics of Reactor Control Systems

"Computation of the Static Characteristics of Systems With Reactor Control," by D. A. Alenchikov; Moscow, Avtomatika i Telemekhanika, No 5, May 59, pp 595-605

This work represents an expansion and development of the graphical methods of computing the static characteristics of systems with reactor control which were proposed by V. S. Kulebakin "On the Use of Semiconductor Rectifiers in a System of Automated Electric Drive," Publishing House of the Academy of Sciences USSR, Department of Technical Sciences, No 2, 1958.

Graphical Methods for solving nonlinear problems encountered in the design of complicated systems with reactor control are discussed. A graphical method is given for constructing the trajectories of operating points with consideration in the first approximation of losses in the reactor which are dependent on the operating current as well as on the voltage drop in the saturable reactor.

A detailed account is given of a method for constructing the characteristics of load output values.

47. Simulation Used for Discrete Action Systems

"On the Use of Simulation for the Analysis of Linear Pulse Systems With Variable Parameters," by G. P. Tartakovskiy', Moscow, Avtomatika i Telemekhanika, No 5, May 59, pp 583-590

"The article examines the question of simulation of discrete action linear systems having variable parameters to obtain a pulse response in a form suitable for further use.

"It is shown that a pulse response, as a function of the moments of application of the pulses, may be obtained by means of simulation of a pulse system related to the initial system. Means for forming structural diagrams of models of related pulse systems are found which are analogous to existing methods of simulation of continuous-action systems."

48. Conference on Automatic Control

"Sixth Scientific-Technical Conference of Young Scientists of the Institute of Automation and Telemechanics of the Academy of Sciences USSR," by S. P. Adamovich, V. M. Baykovskiy, V. Yu. Kneller, O. P. Kuznetsov, A. A. Maslov, D. P. Pemelin, B. P. Pemrukhin, and A. B. Shubin, Moscow, Avtomatika i Telemekhanika, No 5, May 59, pp 682-687

The sixth scientific-technical conference of young scientists of the Institute of Automation and Telemechanics of the Academy of Sciences USSR, organized by the Committee of the All-Union Lenin's Young Communist League of the Institute, was held on 19 and 21 January 1959.

Doctor of Technical Sciences, Professor V. S. Pugachev, in his report "Basic Problems of the Theory of Information and the Theory of Statistical Solutions and Their Importance in the Development of the Theory of Automatic Control," gave an account of three classes of problems which require statistical methods for solution. These were problems of filtering signal from noise, problems of transmission of information through noisy channels, and problems of building self-adjusting systems.

Further reports at the conference were given in the following sections: I and II -- automatic control, III -- computer devices, IV -- elements and devices of automation and telemechanics, V -- the theory of transmission of information, VI -- the theory of relay action devices, and VII -- automatized electric drive.

[For additional information see also under Engineering.]

Communications

49. Power-Line Carrier Application

"Equipment EPDK-3 and EUDK-3 for High-Frequency Channels of Telephone Communications and Telemetering," by R. A. Izrailev, F. S. Krasnov and E. I. Stolyar; Moscow, Elektricheskiye Stantsii, No 6, Jun 59, pp 71-75

In 1958, the radio industry began the production of high-frequency power-line carrier equipment for telephone communications and telemetering, which were designated EPDK-3 (terminal sets) and EUDK-3 (intermediate repeaters). This equipment is designed for one telephone channel and two duplex telemetering channels to be installed on 35 and 110 kv power lines. The permissible attenuation for each link of the communication line is 3.5 nepers when the level of noises is minus 4 nepers, and 6 nepers in absence of noise. Two-sideband amplitude modulation is utilized in this equipment. The carrier frequency can be selected in the range from 50 to 500 kc. The master oscillator operates with an accuracy of 0.1% without a quartz-crystal stabilizer. The power of the carrier frequency at the transmitter output is 3 w for the frequency range of 50 to 350 kc, and 2.5 w for frequency range of 350 to 500 kc. The transmitted frequency band of the telephone channel is 300-2,400 cycles, for the telemetering channel it is 2,710 cycles (subcarrier 2,790 cycles) and 2,980-3,320 cycles (subcarrier 3,150 cycles).

The first experimental unit of this power-line carrier equipment was installed for testing purposes in the Donbass Power System.

50. Radio Communication Competition of Amateurs

"1959 Field Day," by N. Kazanskiy, Moscow, Radio, No 6, Jun 59, p 16

The 1959 Field Day radio communication competition for radio amateurs will be conducted uninterruptedly for 24 hours from 18:00 25 July to 18:00 26 July [Moscow time ?]. The competition will be conducted on the following three frequency ranges: 38-40, 144-146 and 420-425 Mc. Hundreds of amateur radio operators are expected to participate in the competition.

51. Power Addition of Several VHF Oscillators

"Bridge Methods for Addition of Power From Several VHF Oscillators and Transmitters," by V. M. Katushkina and Z. I. Model', Moscow, Elektrosvyaz', No 7, Jul 59, pp 17-25

The article describes the multipolar bridge network and the iterated network system of power addition from several VHF oscillators (covering meter and centimeter ranges.)

The multipolar bridge network method for adding the power from several VHF oscillators or transmitters not directly coupled has been widely used during the past several years. The multipolar bridge network consists of a single symmetrical device with the number of inputs equal to the number of oscillators. To realize such a system, Z. I. Model' and A. A. L'vovich have suggested a special bridge assembled with components having lumped constants. The iterated network principle was suggested by V. M. Katushkina in 1956 and was based on the use of bridge which permits adding up power from two oscillators without losses. Utilizing this principle it is possible to add up in the first link the power of two equal oscillators, and in the next link to add power of the first two with the power of the third oscillator, etc.

The iterated network system is also adaptable for combining the power from a system of waveguides.

52. Recent Soviet Patents in the Field of Communications

"Authorship Certificates," (unsigned article), Moscow, Elektrosvyaz', No 7, Jul 59, pp 78-79

Class 21a, 8₀₁. No 117874. M. V. Tsalyuk and I. P. Yudenkov. Self-Exciting Full-Wave Oscillator With Two Tubes.

Class 21a¹, 7₀₅. No 118048. O. V. Tregubov. A Method for Measuring Telegraph Distortions.

Class 21a¹, 32₃₅. No 117145. V. S. Babenko, G. I. Byalik and P. V. Shmakov. Encoding Cathode-Ray Tube.

Class 21a¹, 32₃₅. No 117682. K. I. Medvedev. A Method for Making Cross-Line Grid in Television Transmitting Tube.

Class 21a¹, 32₅₄. No 117824. A. P. Nefed'yev. Transmitting Television Cathode-Ray Tube.

Class 21a¹, 32₅₄. No 117847. K. K. Derkach and E. I. Saradzhishvili. Device for Correcting the Nonuniform Sensitivity of Television Transmitting Tubes.

Class 21a¹, 34₂₀. No 117859. Ya. A. Ryfkin. Method to Improve Resolving Power of Storage Transmitting Television Tubes.

Class 21a¹, 34₃₁. No 101193. V. V. Odnol'ko. Device for Reproduction of Color Television Images.

Class 21a², 18₀₁. No 117133. L. Ye. Leykhter and B. I. Chernyayev. Method for Improving the Signal-to-Noise Ratio in Low-Frequency Amplifiers.

Class 21a⁴, 22₀₅. No 117316. S. F. Stepanenko. Method to Improve Noise Immunity of Amplitude-Modulated Telegraph Signals.

Class 21a⁴, 48₆₈. No 117037. A. I. Germ. Waveguide Phase Inverter.

53. Fundamental Scheme For Development of a General Theory of Electrical Signals

"On Fundamental Principles of the Theory of Electrical Signals," by F. H. Lange, Rostock; Leipzig, Hochfrequenztechnik und Elektroakustik, Vol 68, No 1, May 59, pp 25-35

It is shown that the heretofore unknown parameters, entropy and correlation coefficient, can, without restriction, be incorporated into a general system of electrical parameters which embraces the new statistical approach as well as the traditional time and spectral approaches, correlation analysis being the link which joins probability theory to spectral analysis and practical statistics. The scheme proposed here gives a good survey of the classification and possibility of mutually converting all heretofore introduced signal parameters, and is considered a suitable basis for the development of a general theory of electrical signals.

Components

54. Transistorized Integrating Amplifiers

"Integrating Transistor Amplifiers," by A. A. Groshev, Moscow, Radiotekhnika i Elektronika, No 6, Jun 59, pp 1,038-1,046

Integrating amplifiers incorporating electronic tubes are widely used in automation, radar, and computers.

Research was conducted to find out the extent to which transistors could replace the tubes in these integrating amplifiers and to improve the reliability of the equipment. Formulas were derived for calculation of transfer factor and time constant for a transistorized integrating amplifier. Calculations were carried out for both single and multistage integrating amplifiers.

The calculated values were in good agreement with the experimental results, as seen from one special case: input impedance (calculated) 2.7 Mohm, (experimental) 2.9 Mohm; amplification factor 700 and 650; equivalent input impedance 0.968 and 0.99 Mohm; time constant 6.85 and 6.50 sec. The type P6G transistors were used for this experiment in the integrating amplifiers.

55. Traveling-Wave Tube Absorbers

"Thin-Film Helical Absorbers for Traveling-Wave Tubes," by V. V. Slutskaya and S. I. Ugorskaya; Moscow, Radiotekhnika i Elektronika, No 6, Jun 59, pp 988-994

An absorbing thin-film helix insert placed between the inlet and outlet of the traveling-wave tube will prevent the onset of undesired oscillations and stabilize the operation of the tube.

The article describes the characteristics of thin-film helices from various materials used as local absorbers in traveling-wave tubes. The thin-film helical absorbers were prepared in the following manner: on the surface of the tube's bulb or on a thin glass tube which fits tightly over the tube's bulb a thin film of metal or alloy is deposited by the method of evaporation in vacuum. The pitch of the helix is chosen so that the retardation from the main helix be equal to that from the insert helix. The direction of the main helix winding is in opposite direction to that of the insert helix to insure maximum power transfer from the main helix to the insert helix. For mechanical stability, the thin-film helix is covered with high-temperature lacquer (K-44). The following materials were used for deposition of the thin-film helices: nichrome, constantan aquadag and tin chloride. The experiment was conducted in the frequency range from 1,660 to 2,000 Mc.

The ease of changing the position of the helical inserts or replacing one type with another, offers new possibilities for experimental investigation and practical utilization of traveling-wave tubes in new fields of high-frequency technique.

Instruments and Equipment

56. Stability of Molecular Oscillator

- "Absolute Stability of Molecular Oscillator with an Ammonia Molecular Beam," by N. G. Basov and A. N. Orayevskiy, Physics Institute imeni P. N. Lebedev; Moscow, Radiotekhnika i Elektronika, No 7, Jul 59, pp 1,185-1,195

The author proposes to improve the frequency stability of a molecular oscillator by incorporating two mutually coupled cavity resonators.

A theoretical analysis is given which establishes the dependence of molecular oscillator frequency on its basic parameters. The investigation culminates in the conclusion that a molecular oscillator utilizing two counter molecular beams and the 3.2 line of ammonia inversion, can attain frequency stability of the order of 10^{-10} to 10^{-11} .

57. Oscillograph Recording on Semiconductor Coated Paper

"Oscillograph Records a Finished Graph," (unsigned article); Moscow, Izvestiya, 16 Jun 59

A new oscillograph was developed by the joint efforts of the Scientific Research Institute of Electrography, Lithuanian SSR, and the Institute of Physics of the Earth, Academy of Sciences USSR. In this oscillograph the recording is done on a paper tape coated with an inexpensive semiconductor material. The record appears in a visible form on the tape at the time of recording and does not require any further processing.

It is expected that mass production of such oscillographs will be organized in 1960 in Lithuania and Moldavia.

58. Visual Method of Saw-Tooth Voltage Examination

"Visual Method for Determining Nonlinearity of Saw-Tooth Voltage," by D. I. Atayev; Moscow, Izmeritel'naya Tekhnika, No 6, Jun 59, pp 35-38

The author suggests a new method for fast and precise determination of nonlinearity of saw-tooth voltage.

The conventional direct observation of saw-tooth voltage does not reveal the degree of nonlinearity with high precision. However, if the linear saw-tooth voltage is fed to an oscilloscope after being differentiated, then pulses with horizontal flat top will be observed. If the saw-tooth voltage is nonlinear, then the flat top of the pulse, depending on the nature of nonlinearity, will have either a positive or negative slant. Thus, a rough appraisal of the nonlinearity of saw-tooth voltage can be obtained by observing its derivative on the screen. For a more precise estimate, measurement is made of the difference of the saw-tooth voltage derivative at the beginning and the end of the pulse. The latter is accomplished by feeding to the horizontal deflection plates of the cathode-ray tube the differentiated saw-tooth voltage and to the vertical plates, in proper sequence, a scanning voltage of triangular or sinusoidal wave form.

The device comprises the following units: saw-tooth voltage generator, differentiating circuit, linear amplifier, sinusoidal oscillator, phase inverter, push-pull amplifier, and pulse shaping circuit. The device is capable of handling frequencies up to 100 kc.

Materials

59. Indium Arsenide - Indium Selenide Solid Solutions

"Investigation of the In As-In₂ Se₃ Section of the System In-As-Se" by S. I. Radautsan, Moldavian Affiliate of the Academy of Sciences USSR and Physicotechnical Institute, Academy of Sciences USSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 5, May 59, pp 1,121-1,124

Solid solutions in the system indium arsenide-indium selenide were investigated by thermal analysis. The results obtained confirmed the data on this system published earlier, which were based on the results of an investigation by the X-ray diffraction method. The investigation in question was carried out from the standpoint of possible applications of solid solutions in this system as semiconductors.

60. Barium Titanates

"Conditions for the Formation of Barium Titanates," by E. K. Keler and N. B. Karpenko, Institute of Silicate Chemistry, Academy of Sciences USSR; Zhurnal Neorganicheskoy Khimii, Vol 4, No 5, May 59, pp 1,125-1,137

The constitutional diagrams of the system BaO - TiO₂ and of the calcination products in the system BaCO₃ + TiO₂ were investigated to establish the composition and properties of the barium titanates that are formed. Data are given on the barium titanates, the existence of which was established.

61. Parameters of Minority Carriers From Transit-Time Measurements Alone

"A Method of Determining the Diffusion Constants of the Drift Mobility and Life of Minority Carriers in Semiconductors by Means of Transit-Time Measurements," by G. Richter, Physical Technical Institute, [East] German Academy of Sciences; Berlin, Monatsberichte der Deutschen Akademie der Wissenschaften zu Berlin, Vol I, No 1, 1959, pp 8-9

Following is the full text of a brief report submitted 27 October 1958:

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"In their well-known transit-time experiments, Haynes and Schockley (Phys. Rev., 81, 1959, p 835) neglected diffusion effects in the determination of the drift mobility μ . In the method proposed here, the diffusion of the carriers is taken into account, making it possible to determine, on the basis of transit-time measurements alone, the mobility, the diffusion constant, and the life of minority carriers independent of one another.

"A disturbance of the minority carrier concentration, which shifts within the crystal under the effect of drift and diffusion, can be described from the one-dimensional point of view by the differential equation

$$(1) \quad D \Delta N - \mu E \frac{\partial N}{\partial x} - \frac{N}{\tau} = \frac{\partial N}{\partial t}$$

and suitable boundary and initial-value conditions. The solution for the case where a short-lived ($\Delta t \ll \tau$) disturbance has taken place at an arbitrary point within the crystal (emitter $x = 0$) is as follows:

$$(2) \quad N(x,t) = \frac{1}{\sqrt{4\pi Dt}} \exp \left[-\frac{\mu E}{2D} x - \left(\frac{1}{\tau} + \frac{\mu^2 E^2}{4D} \right) t - \frac{x^2}{4Dt} \right].$$

"At the distance x from the emitter, let there be a collector. The measured collector current is proportional to N(x,t). The time t^m between injection and the maximum collector current is determined experimentally.

"t^m is defined by the condition $\frac{\partial N}{\partial t} = 0$, which results in the relationship

$$(3) \quad \frac{x^2}{t^2} = \frac{2D}{t} + \frac{4D}{\tau} + \mu^2 E^2$$

between t, x and E.

"Method I: With a previously fixed distance x between emitter and collector, two pairs of values, (t₁^m, E₁) and (t₂^m, E₂) are measured. With the aid of the Einstein equation $\mu = \frac{e}{kT} D$, μ and τ can be determined from equation (3).

"Method II: With a variable distance x between emitter and collector (injection by moveable light sonde), two pairs of values (t₁^m, x₁) and (t₂^m, x₂) are measured, the electrical field being constant; as in Method I, μ and τ can be determined by means of the Einstein equation.

"A combination of Method I and Method II can be used for an experimental testing of the Einstein equation.

"(Detailed treatment will appear during 1959 in Annalen der Physik.)

"Designations: D diffusion constant

μ drift mobility

τ life of minority carriers

Δt duration of injection."

Wave Propagation

62. Unidirectional Waves in Waveguides

"Surface Waves in Ferrite Filled Waveguides," by A. L. Mikaelyan and A. K. Stolyarov; Moscow, Radiotekhnika i Elektronika, No 7, Jul 59, pp 1,079-1,093

Waveguides filled with ferrite are capable of forming unidirectional waves, thus offering the possibility of building a new type of limiting gates. The operation of such a limiting gate is based on the fact that a wave having some specific direction will experience great attenuation, while a wave having other direction will pass with little attenuation. The behavior of waves in flat waveguides with one side wall and in common rectangular waveguides was investigated. Theoretical calculation and experimental data have shown that in all ferrite-filled waveguides, it is possible to form ferrite-surface waves with very low phase velocity. It was also shown that the surface wave will form when the magnetic permeability of ferrites is either negative or positive; that even in nonsymmetrical systems the ferrite-surface wave might possess unidirectional properties; and that the ferrite-surface wave may also propagate in tapering waveguides filled with ferrite.

The experiment was conducted at a frequency of 3,400 Mc with a 44 X 25 mm waveguide filled with polycrystalline ferrite.

63. Side-Lobe Radiation of Paraboloid

"Side Radiation of Ideal Paraboloid With Circular Aperture," by L. B. Tartakovskiy; Moscow, Radiotekhnika i Elektronika, No 6, Jun 59, pp 920-929

The article compares the current and aperture methods of parabolic antenna calculation, pointing out the limitations of the latter.

The current-method calculation of radiation pattern for parabolic antennas permits study of the side lobes for their shape and intensity level. The current method has potential possibilities for further refinement by introduction of diffraction correction of current distribution. The basic difference between the current method and the aperture method consists in the appearance of a nonlinear component of the phase function, the gradient of which is small in comparison with the gradient of the linear component.

A series of formulas are given which permit simple calculation of the configuration of the side lobes, which depend primarily on the current distribution over the circular aperture, the wave length, diameter of the aperture, and the focal distance.

64. Traveling-Wave Antennas

"Traveling-Wave Antennas With Resistance Coupling," by G. Z. Ayzenberg; Moscow, Radiotekhnika, No 6, Jun 59, pp 3-16

Resistance coupled traveling-wave antennas (authorship certificate No 97750, 22 June 1953, G. Z. Ayzenberg) are now widely used at radio stations in the USSR. The article gives the parameters of such antennas, and explains their advantages. A series of new formulas are derived for calculation of the directive gain of traveling-wave antennas for various arrangements of the antenna components.

The outstanding advantages of traveling-wave antennas are their noise immunity and relatively small area, as compared to equivalent antennas of other design. In general, the characteristics of a traveling-wave antenna are determined by the number and length of dipole arms, the value of resistance coupling, the characteristic impedance of collecting feeder and the height of antenna suspension. The optimum height of antenna suspension is from 40 to 100 m for longer waves and from 12 to 20 m for shorter waves. A series of radiation patterns show that the level of side lobes is very low, of the order 0.05 to 0.1.

The resistance coupled traveling-wave antennas are recommended as receiving antennas for short wave operation on account of better noise immunity characteristics.

Considerable research was conducted by L. K. Olifin and N. N. Shergin with traveling-wave antennas having a characteristic impedance of 160 ohms and decoupling resistance of about 190 ohms, which proved to be the most efficient variant.

Miscellaneous

65. New Soviet Book Criticized

"The Book of P. P. Mesyatsev 'Application of Theory of Probability and Mathematical Statistics in Design and Production of Radio Equipment,' "by M. I. Eydel'nant; Tashkent, Izvestiya Akademii Nauk Uzbek SSR, Seriya Fiziko-Matematicheskikh Nauk, No 2, 1959, pp 88-91

CPYRGHT The author severely criticizes the book, describing it as useless and even misleading.

"To present all the comments which arise during the reading of the book 'Application of Theory of Probability and Mathematical Statistics in Design and Production of Radio Equipment' (Moscow, Defense Publishing House) it would be necessary to rewrite the whole book (it has 16.5 signatures), and in addition to supplement almost each sentence with appropriate comments. Therefore, we will limit ourselves with a more or less detailed examination of the first two chapters of the book's total of five, assuming that this will provide sufficient information as to the character of the whole book.

"In general it is difficult to understand what the author is talking about, especially for those who do not understand what is meant by 'complex' and 'simple' events.

"Assertions of the author that 'the efficiency of production does not depend on the error probability' (i.e., does not depend on the probability, and consequently on the actual percentage of rejects) is obviously an absurdity.

"Example 29 is curious from the standpoint of the absurdity of the answer.

"In example 51, again, the formulated conditions are not clear.

"In conclusion we should note that the examined book contains a multiplicity of gross mathematical (and not only mathematical) mistakes and errata (and at end of the book only an insignificant portion of these mistakes is pointed out,)"

66. Recent Soviet Patents in the Field of Electronics

"Class 21. Electrical Engineering," (unsigned article); Moscow, Byulleten' Izobreteniy, No 10, 1959, pp 17-27

Class 21a, 20₀₁, No 119889. V. Z. Poyzen and T. V. Makarova. Polarized Relay.

Class 21a¹, 36. No 119892. V. Ye. Khazatskiy. Magnetic Trigger Amplifier.

Class 21a¹, 36. No 119893. L. A. Chinenkov and E. D. Demin. Closed-Circuit Shift Register Built With Magnetic Elements Having Rectangular Hysteresis Loop.

Class 21a⁴, 8₀₂. No 119897. I. I. Blashkin. Network for Parametric Stabilization of Frequency in an Oscillatory Circuit.

Class 21a⁴, 35₁₁. No 119899. S. D. Dodik. High-Precision Compensated DC Voltage Regulator.

Class 21a⁴, 66₀₁. No 119900. K. M. Pyabov. Omnidirectional Antenna for Reception of Vertically and Horizontally Polarized Radio Waves in a Four-Band VHF Range.

Class 21b, 27₀₁, No 119902. A. Kh. Cherkasskiy. A Method of Conversion of Heat Energy Into Electrical With the Aid of a Thermoelectric Generator.

Class 21c, 35₀₇. No 119908. N. F. Shishkin, P. Ya. Danilin, V. P. Oleksevich and V. I. Prokof'yev. Fast-Acting Switching Device.

Class 21e, 28. No 119928. A. A. Batovrin and N. P. Galich. Induction Type Phase Inverter.

Class 21e, 30₁₀. No 119931. B. Ye. Rabinovich and A. M. Fedorov. Electronic Diode Voltmeter.

Class 21e, 37₁₀. No 119935. L. I. Rabkin, Ye. V. Ebanoidze, Z. A. Isayeva and N. P. Goryachev. Method of Ferrite Testing.

IV. ENGINEERING

67. Soviets Hold Second Conference on Problems of Contemporary Gyroscopy

"Second Scientific and Technical Intervuz Conference on Problems of Contemporary Gyroscopy," by Ye. F. Otvagin, Secretary of the Organization Committee; Leningrad, Izvestiya Vysshikh Uchebnykh Zavedeniy, Priborostroyeniye, No 5, Sep/Oct 1958, pp 161-163

The Second Intervuz Conference on Problems of Contemporary Gyroscope Technique, convoked by decision of the Ministry of Education USSR, took place in the Leningrad Institute of Precision Mechanics and Optics from 24 to 27 November 1958.

Representatives from 16 educational institutions, scientific research institutes, special design bureaus, and plants -- about 70 organizations and institutions from 12 cities in the Soviet Union -- participated in the conference.

The following specialists in instrument building from the countries of the People's Democracies were also present: Prof Lin Shih-ou, Docent Wen Ch'en-yuan, and Candidate of Technical Sciences Chang Yen-shen, People's Republic of China; Prof Kasimir Hlembicki, Poland; and Senior Instructor Josef Kamarad, Czechoslovakia.

A. A. Kapustin, chairman of the Organizing Committee, director of the Leningrad Institute of Precision Mechanics and Optics (LITMO) and Candidate of Technical Sciences, in opening the scientific and technical conference emphasized the important role of contemporary gyroscope technique and elaborated on the basic tasks of the conference.

Fifteen papers delivered by representatives of 11 organizations were read and discussed.

The first paper, by V. N. Lavrov (All-Union Scientific Research Metrological Institute -- VNIMI), Candidate of Technical Sciences, "The Practice of Developing and Applying Gyrocompasses in Mining," was devoted to the development of mine surveying gyrocompasses and the peculiarities of their application. For 7 years, the work with gyroscopic methods was oriented around 600 mines with an average accuracy of 1'30". The future investigations of VNIMI were directed at the creation of improved special mine surveying gyro-compasses with the sensing element in a floating gimbal.

The paper of Docent V. S. Novoselov (Leningrad State University) on "Oscillations of Nonstationary Stabilized Gyroscopic Systems on a Fixed Base" had a theoretical character. Novoselov suggested a method of separating fast and slow oscillations (based on the change of the independent variable) for gyroscopic systems with constant coefficients.

Candidate of Technical Sciences P. A. Il'in's (LITMO) paper, was devoted to the creation of new small-size designs of gyroscopic registers of ship rolling, which were completed in several variants.

The paper of V. S. Mochalin, Candidate of Technical Sciences, "On the Question of Constructing Differential Equations of Motion of Certain Gyroscopic Systems," aroused an active interest from the audience.

The second day of the conference was opened with the paper of Academician A. Yu. Ishlinskiy (Moscow State University), on "Concerning the Autonomous Determination of the Position of a Moving Object by Means of a Spatial Gyrocompass, a Directional Gyro, and an Integrating Device." The paper contained the theoretical basis for a design sketch of a new gyroscopic gyrolatitude-compass instrument which is simpler in a technical respect than similar well-known design schemes.

G. P. Shishkin, chief engineer of the Institute of Mechanics of the Academy of Sciences Ukrainian SSR, spoke on the experiment of developing a three-axis gyrostabilizer for a loop antenna intended for aereoelectrical prospecting for natural resources. In creating the stabilization system, units of series-produced instruments were used.

The four succeeding papers were devoted to problems of the theory and design improvement of mine surveying gyrocompasses.

Engr I. B. Zhitomirskiy examined the problem concerning the influence of external torques on the stability of readings of the gyrocompass with centering control of the sensing element on a pivot, and from the point of view of the physics of the phenomena he estimated the order of magnitude of each disturbing influence.

A detailed paper on "Magnetic Shielding of Mine Surveying Gyrocompasses" was delivered by Engr N. P. Tikhomirov (VNIMI). As has become known, changes in the magnetic field of 0.02 oersteds and higher influence the gyrocompass readings, as a result of which special magnetic shields are proposed. The report aroused great interest and received a high evaluation by the delegates of the conference.

The third day of work of the conference began with a paper by Ye. F. Levchuk (Kazan State University) on "Mine Surveying Gyrocompass With an Unloaded Sensing Element in a Fluid" which contained the theoretical basis of a two-stage gyrocompass whose bearings are completed in the form of pivots resting on watch jewels.

The paper of M. A. Sergeyev (LITMO), Candidate of Technical Sciences, on "Two Degree Gyrocompass With a Proportional Characteristic of the Recovering Torque and With a Zone of Insensitivity" contains the theoretical determination of types of motion of the sensing element of the gyrocompass in azimuth during equalization of the lifting force and the weight force. Watch jewel bearings were also used on the precession axis.

The paper of B. I. Nazarov, Candidate of Technical Sciences, "On Errors of a Two-Degree Integrating Gyroscope Depending on the Oscillations of the Base" aroused great interest. The author has developed a theory taking into account the oscillations of the base and evolved a formula for errors which increase with time in the case of a fixed relationship of frequency and phase-shift between the external oscillations along two axes. The derived formulas were confirmed by experimental data.

S. S. Rivkin, Doctor of Technical Sciences, delivered a substantive paper entitled "On the Influence of Error of a Gyroscopic Device on the Dynamic Accuracy of Automatic Stabilizing Systems." On the basis of the statistical theory of stationary random processes the author made a determination of the errors of the gyrohorizon and of the entire system of automatic stabilization of an inertial mass for real conditions of ship motion. As a result of the conducted investigation, a method for estimating the influence of errors of gyroinstruments on the dynamic accuracy of stabilization systems was developed.

The following two papers, which provoked lively discussion, were delivered the final day of the conference:

"The Effect of Ship Maneuvering on Gyrocompass Readings," by M. M. Bogdanovich, Candidate of Technical Sciences, and "A Gyrocompass With an Electromagnetic Pendulum", by Engr B. M. Mitnik, (Central Scientific Research Institute of the Maritime Fleet -- TsNIIMF). The latter paper, based on a theoretical foundation, suggested uniting a directional gyrocompass with a gyrolatitude-compass or with a gyrocompass and indicated the possibility of creating a two-system instrument.

In the resolution adopted by the conference participants it is indicated that the following are the basic problems in the field of applied gyroscopy:

1. The development of methods of gyrostabilization of moving objects
2. Improvement of gyrosystem elements by increasing their sensitivity, accuracy, reliability, decreasing size and weight, and also consideration of the economy of designs
3. The development of new methods for analyzing the accuracy of gyroscopic systems
4. Introduction of methods for statistical processing of readings of gyroscopic instruments to determine their probability characteristics under various conditions of operation, on the basis of the theory of automatic regulation; the utilization of frequency methods and methods of statistical dynamics

5. The use of modern computing and calculating equipment in gyroscopy
6. The development of small-size gyroscopic equipment
7. The creation of a gyroscopic indicator of the latitude and longitude of a site
8. Further improvement of special gyroscopic equipment for recording oscillations of objects, as well as designing of instruments for processing recordings of oscillations.

It was recommended that in teaching courses on gyroscopy and within the system of the Scientific and Technical Society for Instrument Building, the problems of analyzing the accuracy of gyroscope instrument operation under actual conditions on the basis of the utilization of probability and frequency methods of the theory of automatic regulation be examined.

It was proposed that in the work of a subsequent intervuz scientific and technical conference on the problems of gyroscopy, reports be provided on methods of teaching gyroscopic disciplines in the vuzes, for exchanging of experience, and for the establishment of fundamental regulations on questions of teaching gyroscopy.

The conference turned to the Commission on Terminology of the Academy of Sciences USSR with a request for developing terminology of applied gyroscopy.

Even though work was not conducted in separate sections in the conference, all papers were heard with great attention and stimulated a lively interest. The conference was conducted under business-like creative conditions on the proper organizational level. During the course of the conference, a general viewpoint was determined on certain important problems; scientific relations between various institutions and organizations were strengthened.

68. Stability of Aircraft With Autopilot

"The Effect of Certain Typical Nonlinearities on the Adjustment of an Autopilot," by M. Ye. Salukvadze, Tbilisi; Moscow, Avtomatika i Telemekhanika, No 5, May 59, pp 553-563

CPYRGHT

"The method of power balance is used to study the effect of nonlinearity of the control element, on adjustment of an autopilot as displayed in restriction of the aileron angle during investigation of roll stability. Considerable drive nonlinearity and quasi-nonlinearity of the mixer relay of the autopilot during investigation of the longitudinal stability of the aircraft was observed."

Regulation limits of the transmission ratios of the autopilot which correspond to the stability of the flight system are derived.

The author expresses thanks to A. M. Letov and B. V. Shirokorad for their assistance.

69. Periodic Motions in Servomechanism of Autopilot

"A Study of the Periodic Motions in the Vibrating Circuit of an Electrical Servomechanism with Constant Disturbances," by I. N. Krutova, Moscow, Avtomatika i Telemekhanika, No 5, May 59, pp 564-575

The present work is a continuation of an earlier article by the author ["The Dynamics of the Vibration Circuit of a Servomechanism in a System of Free Oscillations," Avtomatika i Telemekhanika, No 4, 1959] in which the circuit and principles of operation of the vibration circuit of the servo-

CPYRGHTmechanism of an autopilot were given.

"In this article, the author considers a vibration circuit having two parallel control channels. Processes in the circuit are described by three first-order equations. Dynamics of the circuit are examined by means of a phase plane and the method of point transformation. The stability and singularity of self-oscillations which arise as the result of constant disturbances and also the parameters of self-oscillations and static characteristics of the circuit are determined."

70. Applications for Induction Tachometer

"Induction Tachometer as an Angular Acceleration Pickup," by S. T. Kazaryan; Moscow, Avtomatika i Telemekhanika, No 5, May 59, pp 676-681

The possibility of using a dc induction tachometer as an angular acceleration pickup is examined. The principle of operation is based on the fact that a change in the speed of rotation of the rotor of the tachometer results in a change in the magnetic field of the instrument, the transverse component of which -- the transverse flux -- will induce an emf in the transverse winding. The magnitude of this emf will be directly proportional to the angular acceleration of the rotor and the direction of emf will depend on the sign of angular acceleration.

71. Sensing Elements in Aviation Automation Systems

"Thermal Errors Compensation of Elastic Sensing Elements in Aviation Automation Systems," by N. Ya. Vovchenko; Novocherkassk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Elektomekhanika, No 5, May 59, pp 53-58

In aircraft automation systems transducers are widely used with flexible-membrane sensing elements which are capable of measuring pressure, altitude, speed, etc. These flexible-membrane transducers often operate at temperatures above 200°C and require, therefore, some correction of readings due to temperature fluctuation.

The compensation for such reading errors caused by temperature fluctuations can be effected by incorporating the proper resistors into the electric circuit of the device. These heat-sensitive resistors are generally connected in series with the potentiometer, and are selected in accordance with the characteristics of the elastic sensing element, the transmission mechanism and the potentiometer. Self-balancing bridges are also widely used as the temperature-error compensating units.

The described method of error correction due to temperature fluctuation is applicable not only for cases of potentiometric pick-up of the signal from the elastic sensing element, but also for cases of signal pick-up with the aid of capacitive, inductive and induction transducers.

72. Design of Boilers with Supercritical Parameters

"Unit-Connected Boilers of 300,000 w Capacity with Steam Parameters of 300 atm abs, 650°C," by V. M. Biman and K. A. Rakov, All-Union Heat Engineering Institute, Moscow, Tenloenergetika. No 7, Jul 59, pp 46-55

During 1956-1957, at the All-Union Heat Engineering Institute and Orgenergostroy eight variants of superparameter boilers with steam generating capacity of 830 tons per hour were worked out. These boilers were designed to operate at a steam pressure of 300 atm abs and temperature of 650°C, burning pulverized coal from the Moscow basin. The boilers have provision for two intermediate steam reheatings, one at 60 atm abs from 420 to 570°C and the other at 14 atm abs from 370 to 570°C. The temperature of feed water was fixed at 275°C. The over-all efficiency of the boiler is expected to be about 94%.

The authors compare the eight proposed variants of boiler construction, pointing out the specific advantages of each layout.

73. Hydraulic Turbine Controls

"Hydraulic Turbine Control System at the Volzhskaya [Volga] Hydroelectric Station imeni V. I. Lenin," by M. I. Smirnov; Moscow, Energomashinostroyeniye, No 6, Jun 59, pp 8-11

The hydraulic turbines of the Volga Hydroelectric Station were designed and built at the Leningrad Metal Plant and are unique with respect to their size and power generating capacity. The power generating capacity of each unit is 126,000 kw, the diameter of the water wheel is 9.3 m, and the weight of the unit is 1,400 tons. Due to the unusually large size of the turbine and the absence of fast-operating gates in front of the turbine, very rigid demands were posed for the regulating system of these turbines.

The turbines of the Volga Hydroelectric Station are of adjustable-blade propeller type having a twin-system of regulation acting simultaneously on the wicket guides (gates) and the propeller blades.

The system of automatic control consists of the following units: a complex regulator unit controlling the wicket guides and the propeller wheel, lubrication pressure system of the control devices, servomotor operating the wicket guides, servomotor operating the propeller blades, and a device for protecting the turbine from racing. The operating characteristics of this automatic regulating system are as follows: closing time of the wicket guides (gates) is about 11 sec, closing time for the blades of the propeller is about 55 sec, maximum increase in the head pressure at the time of load removal is about 20%, maximum increase of turbine speed is about 31%.

Special tests conducted in 1958 with the aid of oscillographs have shown that this system of regulation has very satisfactory dynamic characteristics.

74. Effect of Superimposed Direct Current Magnetization

"Methods for Determining Harmonic Content of Magnetizing Current When Superimposing Direct Current on Alternating," by M. S. Libkind and G. I. Kugushev, Power Engineering Institute, Academy of Sciences USSR; Moscow, Elektrichestvo, No 7, Jul 59, pp 55-57

An investigation of the harmonic content of magnetizing current, when a strong dc field is superimposed on a 50 cycle ac field, was undertaken in an effort to develop new control static devices which would improve the power factor in ac power lines. In this investigation the principle of magnetic amplification was applied to high-power electrical equipment.

Experiments were conducted with superimposed magnetization on high-power transformers in the Moscow Regional Power System network (at a 400-kv substation in 1956). Numerous oscillographic charts depicting the shape of magnetizing current curves under various conditions were obtained in the process of investigation.

It was disclosed that even a small deviation of the magnetic flux form from the sinusoidal has a pronounced effect on the harmonic content of magnetizing current. Charts were constructed which permit determining the harmonic content of magnetizing current with an accuracy of 10% for the first harmonic and up to 40% for the second, third and fourth harmonics, for conditions of simultaneous application of dc and ac fields.

75. Synchronous Condensers for Complex Power Networks

"Problem of Application of Booster Synchronous Condensers," by N. N. Shchedrin and Yu. A. Rozovskiy, Direct Current Scientific Research Institute; Minsk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Energetika, No 4, Apr 59, pp 1-7

The most effective way of maintaining the stability in a unified complex electric power network, is the maintenance of voltage stability at the high-voltage buses of the intermediate substations. This can be achieved by installation of booster synchronous condensers.

Investigations conducted by the Institute of Electromechanics (Academy of Sciences USSR), the All-Union Scientific Research Institute of Power Engineering, Leningrad Polytechnic Institute, the Direct Current Scientific Research Institute, and the Moscow Power Engineering Institute have shown that in case of effective control of excitation, the static stability of the system can be maintained with the help of a rather limited capacity of synchronous condensers. Special parameter booster synchronous condensers, in conjunction with efficient regulation and proper generator breaking, are sufficiently effective to increase the transmitting capacity substantially, permitting in many cases solution of the problem of system stability without resorting to installation of serial capacitors.

76. Vectorial Representation of "Opposition Quadrupoles"

"Representation of Electrical Quadrupole and Magnetic Dipole Radiation," by A. Rubinowicz, Institute of Physics, Polish Academy of Sciences, Warsaw; Max-Planck-Festschrift 1958, Berlin 1959, pp 65-82

If a linear electrical dipole loaded by the current $J(t)$ and located in space by the vector $\vec{\alpha}$ is opposed by a second, equal but antiparallel, dipole by means of a displacement expressed by the vector $\vec{\beta}$, the result will be a current system which emits an electrical quadrupole radiation and a magnetic

dipole radiation. The magnetic dipole radiation produced in such a case corresponds to a magnetic dipole moment which is perpendicular to the plane of the two vectors $\vec{\alpha}$ and $\vec{\beta}$. It is equal to the dipole moment of a current loop which is loaded with the current $1/2J(t)$ and which has the configuration of the edge of the parallelogram determined by the $\vec{\alpha}$ and $\vec{\beta}$ vectors. The electrical quadrupole radiation is determined by a degenerate symmetrical tensor T_s . The directions of the other two major axes are given by the two angle bisectors of the directions of the two vectors $\vec{\alpha}$ and $\vec{\beta}$. The absolute values of the corresponding eigenvalues are equal to the squares of the diagonals of a rhombus with sides $1/2(\alpha\beta)^{1/2}$, which is extended in the directions of the two vectors $\vec{\alpha}$ and $\vec{\beta}$. A method is described for representing the "spherical-function quadrupoles," which indicated the electromagnetic radiation of the individual Zeeman components of an electrical four-terminal network, by means of the above "opposition quadrupoles."

77. Reinforced Concrete in Heavy Machine Building

"Application of Reinforced Concrete in Heavy Machine Building," by K. N. Kartashov and I. G. Lyudkovskiy, Moscow, Promyshlennoye Stroitel'stvo, No 6, Jun 59, pp 33-39

CPYRGHT The article discusses the possibilities of utilizing prestressed reinforced concrete in heavy machinery construction.

"The Scientific Research Institute for Concrete and Reinforced Concrete in cooperation with the Central Scientific Research Institute of Technology and Machine Building, has completed the engineering project for a prestressed-concrete power press. The metal and labor expenditures, as well as the total cost of the reinforced concrete presses is only one eighth that of all-metal presses built in the US. At present, the reinforced concrete presses can be built with considerably greater power than the all-metal presses, because the power of the latter is limited by technological capabilities of the plant and available transportation facilities."

78. New Acoustic Method of Nondestructive Inspection

"New Acoustic Method of Material Inspection and Certain Data on Its Application," by Yu. V. Lange, Moscow, Priborostroyeniye, No 6, Jun 59, pp 23-25

The new acoustic method of nondestructive material inspection is especially suitable for examination of bonded laminated and honeycomb structures. The method is based on measurement of mechanical resistance to elastic vibrations induced in the examined material and by reading the response of the pick-up unit.

This principle, in the author's opinion, has been applied for the first time by Prof A. V. Rimskiy-Korsakov of the Acoustics Institute, Academy of Sciences USSR, in his study of mechanical resistance of various materials to vibration. This new method of materiology was called the "reaction method," and was found to be very effective in flaw detection in the bonding of composite materials.

The basic component of the device is a pick-up unit consisting of two piezoelectric elements connected by a road made of sound transmitting material. The upper piezoelectric element is excited from a sound generator and serves as a source of elastic vibrations. The second piezoelectric element is connected to an amplifier. The pick-up unit is terminated by a feeler-tip, which is in contact with the examined material. A force of reaction is produced when the pick-up unit is pressed against the examined material, causing mechanical deformation in the second piezoelectric element and subsequent potential rise in it. Such a potential at the pick-up unit is proportional to the mechanical impedance of the material. If the bonding between the layers or honeycomb structure is good, the mechanical impedance of the material is also high. The pick-up unit can operated in the range of frequencies from 2 to 7 kc, depending on properties of examined material. Even individual cells of the honeycomb panels can be tested for proper bonding.

This method permits the inspection of materials which formerly could not be satisfactorily inspected by conventional methods.

79. Construction of new Patent Office in USSR

"New Building for Library of Technical Patents," (unsigned article); Moscow, Izobretatel' i Ratsionalizator, No 5, May 59, p 24

The construction of a seven-story building to house the All-Union National Library for Technical Patents will begin this year in Moscow on Berezhkovskaya Naberezhnaya (waterfront). This will be the All-Union Center for Collection, Study, Dissemination, and Extensive Utilization of Soviet and Foreign Patents. In numerous rooms of the new building will be displayed drawings, patterns, and models; lectures, consultations, and seminars on the subject of the inventor's rights, economics, and engineering will be conducted here. Conferences, meetings, and assemblies will take place here.

80. Motion of a Liquid in Open, Prismatic Channels

"Generalized Law of Bakhmetev," by K. I. Dolmatov, Tashkent Institute of Railroad Transport Engineers; Tashkent, Doklady Akademii Nauk Uzbekskoy SSR, No 5, May 1959, pp 8-11

The fundamental equation of the erratic motion of a liquid in open, prismatic channels with slope $i > 0$ has the form

$$\frac{dh}{ds} = \frac{i(x^2-1)}{x-j}$$

where x is the relative outflow characteristic, and j is the depth function of the current.

Many methods exist for the integration of this equation (see Chertousov M. D., Gidravlika (Hydraulics), Gosenergoizdat, Moscow -- Leningrad, 1957). All of these methods postulate a certain connection between the relative outflow characteristic and the relative depth of the channel. A general law is established in the mentioned work from which it is possible to obtain any known law between x and h .

The fundamental equation of the erratic motion of a liquid in open, prismatic channels for $i > 0$ is described by

$$\frac{ds}{dh} = \frac{x^2 - j}{i(x^2 - 1)}$$

In the present work, solution of this equation is sought in the form $s = hf(x)$, where $f(x)$ is the unknown current function.

V. MATHEMATICS

81. Imaginary and Real Roots of Algebraic and Transcendental Equations Determined by Iteration Method

"On Some Iterations of High Orders," by Sh. Ye. Mikeladze, Corresponding Member of the Academy of Sciences Georgian SSR, Tbilisi Mathematics Institute imeni A. M. Razmadze, Tbilisi State University imeni Stalin; Tbilisi, Soobshcheniya Akademii Nauk Gruzinskoy SSR, Vol 22, No 3, Mar 1959, pp 257-264

A general method of obtaining iterations of a high order is given for one equation and a system of equations. The consequent iteration converges rapidly to the solution (solutions) sought for, wherein it is not certain that the derivatives of all orders of the functions used defining the iteration existed. Thus, for one equation, as well as a system of equations, the method enables determination of imaginary, in addition to real, roots. The method can be applied equally well to algebraic and transcendental equations.

82. Errors Introduced in Approximate Methods for Determining Eigenvalues of a Hermite Kernel Discussed

"Concerning an Estimate of the Error of Approximate Methods of Determining Eigenvalues of a Hermite Kernel," by I. P. Mysovskikh; Moscow, Matematicheskii Sbornik, Vol 48(90), No 2, Jun 59, pp 137-148

Two basic methods are encountered while considering approximate methods for solving integral equations. The first method is the method of substituting the kernel with a close one (for example, the degenerate kernel), and the second method is the method of mechanical quadratures. While the problem concerning an estimate of the error introduced during the solution of a nonhomogeneous equation has been solved satisfactorily, (see L. V. Kantorovich and V. I. Krylov, Priblizhennyye metody vysshego analiza [Approximation methods of High Analysis], Gostekhizdat, Leningrad, 1950, L. V. Kantorovich, "Functional analysis and applied mathematics," Uspekhi matem. nauk, Vol 3, No 6(28), 1948, pp 89-185, and I. P. Mysovskikh, "Concerning an estimate of the error arising during the solution of an integral equation by the method of mechanical quadratures," Vestnik LGU, seriya matem mekh. i astr., Vol 19, No 4, 1956, pp 66-72), the same cannot be said regarding the corresponding problem of an error estimate for eigenvalues. From the few works on an estimate of the error for eigenvalues, the author point out the work of H. Wielandt, "Error Bounds for Eigenvalues of Symmetric Integral Equations," which appeared in Symposium in Applied Mathematics, Vol 7, published in New York, Toronto, and London, 1956. An estimate

appeared there of the error magnitudes for reciprocals by eigenvalues of the Hermite kernel calculated by the method of mechanical quadratures. However; the a priori estimates indicated there are too high.

In the present work, a posteriori estimates are given of the error arising during approximate calculation of eigenvalues of a Fredholm integral equation of the second kind with a Hermite kernel.

83. Convergence Rate to Normal Distribution of Sums of Independent Random Variables

"On One Class of Limit Theorems for Independent Random Variables," by V. V. Petrov; Moscow, Teoriya Veroyatnostey i Yeye Primeneniya, Vol 4, No 2, Apr-Jun 59, pp 224-228

This paper deals with the rate of convergence to the normal law in L_2 of the distribution function and the frequency function of sums of non-identically distributed independent random variables.

84. Multidimensional Diffusion Processes

"On Boundary Conditions for Multidimensional Diffusion Processes," by A. D. Venttsel'; Moscow, Teoriya Veroyatnostey i yeye Primeneniya, Vol 4, No 2, Apr-Jun 59, pp 172-185

The problem considered in the paper is as follows: given an elliptical operator M in a closed bounded region K , the most general boundary conditions are sought, which restrict M to an infinitesimal operator of a Markov process in K . This problem is solved for the case of K being a circle or a sphere and only for processes invariant by rotations. In the general case when a process is given, boundary conditions are found which are satisfied by all smooth functions in the domain of the infinitesimal operator of the process; however, it is not known whether this domain can be constructed from the boundary conditions.

85. Bound for the Sum of Independent Random Variables

"An Extremal Problem in Probability Theory," by Yu. V. Prokhorov, Mathematics Institute imeni V. A. Steklov, Academy of Sciences, USSR; Moscow, Teoriya Veroyatnostey i Yeye Primeneniya, Vol 4, No 2, Apr-Jun 59, pp 211-214

The following two theorems were proved: let $\xi_1, \xi_2, \dots, \xi_n$ be independent random variables satisfying the conditions

$$M \xi_k = 0, \quad |\xi_k| \leq c, \quad 1 \leq k \leq n, \quad \sum_{k=1}^n D \xi_k = \sigma^2,$$

and let ξ be their sum such that

$$\xi = \xi_1 + \xi_2 + \dots + \xi_n. \quad \text{Then}$$

Theorem 1. For all $x > 0$

$$P \left\{ \xi \geq x \right\} \leq \exp \left\{ -\frac{x}{2c} \operatorname{Arsh} \frac{xc}{2\sigma^2} \right\}. \quad (1)$$

Theorem 2. The right side of (1) is in a certain sense the "true" bound for $P \left\{ \xi \geq x \right\}$.

86. Completeness of the Solution for an Integral-Differential Equation

"Concerning the Completeness of the Solution of an Integral-Differential Equation," by R. M. Martirosyan, Institute of Mathematics and Mechanics, Academy of Sciences, Armenian SSR; Yerevan, Doklady Akademii Nauk Armyanskoy SSR, Vol 28, No 3, Jun 59, pp 97-108

The problem concerning the completeness in $L_2(0, \infty)$ of the solutions $\psi(x, \lambda_n)$ of the equation

$$\psi''(x, \lambda) + (\lambda - q(x) - r(x)) \psi(x, \lambda) + \int_x^\infty T(x, t) \times \psi(t, \lambda) dt = 0 \quad (1)$$

for $\lambda = \lambda_n$ is investigated on the assumption that the solutions

$\varphi(x, \lambda_n)$ of the equation

$$\varphi''(x, \lambda) + (\lambda - q(x)) \varphi(x, \lambda) = 0$$

87. Cornish-Fisher Expansion Related to Asymptotically Normal Transformations of Random Variables

"On the Transformations of Random Variables," by L. N. Bol'shev; Moscow, Teoriya Veroyatnostey i yeye Primeneniya, Vol 4, No 2, Apr-Jun 59, pp 136-149

In the paper the relationship between asymptotically normal transformations of random variables and the Cornish-Fisher expansion is established. This relationship enables asymptotically normal transformations to be constructed by a general method. Some generalizations of Wilson-Hilferty and Bartlett transformations may serve as examples. The percentage points of the χ^2 distribution with n degrees of freedom, $n \geq 80$, are given.

The last example is devoted to the construction of normal random numbers.

88. Necessary and Sufficient Conditions for Systems of Linear Differential Equations With Polynomial Coefficients to Possess Solutions in Polynomial Form

"Finite Form of Solutions of a System of Linear Differential Equations With Polynomial Coefficients," by N. I. Tereshchenko; Kiev, Ukrainskiy Matematicheskiy Zhurnal, Vol 11, No 1, Jan-Mar 1959, pp 93-104

This paper discusses systems of linear differential equations with polynomial coefficients. The necessary and sufficient conditions are established for the existence of solutions of such systems in finite form, i.e., in the form of polynomials. A simple algorithm is given for finding the solutions in finite form.

An example is presented showing the practical application of the results.

89. Distribution Function for Sums of Independent Random Variables Expanded

"Asymptotic Expansions for Distributions of Sums of Independent Random Variables," by V. V. Petrov; Moscow, Teoriya Veroyatnostey i YeYe Primeneniya, Vol 4, No 2, Apr-Jun 59, pp 220-224

Asymptotic expansions are given for the distribution function and frequency function of sums of nonidentically distributed independent random variables.

VI. MEDICINE

Bacteriology

90. Disinfectants Cause Morphological Changes in STI Vaccine Spores

"Electron Microscopic Investigation of Morphological Changes in Spores of the STI Anthrax Vaccine Under the Effect of Several Disinfectants," by P. A. Ivashkevich, S. D. Belokhvostov, and Yu. S. Voronin; Moscow, Zhurnal Mikrobiologii, Epidemiologii, i Immunobiologii, Vol 30, No 6, Jun 59, pp 74-77

The authors of this article employed electron microscopic methods to study morphological changes in spores of the STI live anthrax vaccine under the effects of aqueous solutions of formaldehyde, monochloramine, diocide, and a freshly prepared mixture consisting of a 17% aqueous solution of formaldehyde and 10% (by weight) monochloramine.

It was determined in the first stage of the research that STI vaccine spores can differ morphologically, depending on the method of culturing and the culture medium on which they were prepared. The differences are apparent in the basic structure of the spore surface, its size, and its form. Of the three morphological types distinguished, spores of the third type, cultured on agar, were found to be the most resistant to all the above-mentioned disinfectants. These results are shown in a table. Seven illustrations demonstrate the morphological alterations produced in the spores by the disinfectants.

The following conclusions are presented on the basis of these experiments:

"1. It was established on investigation by electron microscopic methods that formaldehyde does not cause visible changes in spores of the STI anthrax vaccine and that the action of chlorine-containing preparations was accompanied by swelling and a decrease in the electro-optic density of the spore membrane.

"2. The strong sporocidal action of mixtures containing 17% formaldehyde and 10% monochloramine (disinfecting formula No 2) in aqueous solution is evidently conditioned by the rapid penetration of formaldehyde into the spore as a result of the disintegration and increase in the permeability of the spore membrane under the effect of monochloramine."

91. Effect of Disinfectants on Spores of STI Vaccine

"Morphological Characteristics and Resistance of Spores of the Antianthrax STI Vaccine to Certain Disinfectants," by P. A. Ivashkevich, S. D. Belokhvostov, and G. I. Rozhkov; Moscow, Zhurnal Mikrobiologii, Epidemiologii, i Immunobiologii, Vol 30, No 6, Jun 59, pp 78-81

This article is introduced by a brief discussion of the permeability of the membranes of various sporogenous microorganisms (*B. cereus*, *B. megatherium*, *B. subtilis*, *B. anthracis*, and *B. anthracoides*) in which it is suggested that the number of layers forming the membrane may affect the resistance of the organism to the action of physical and chemical factors. The purpose of the research reported in the article was to investigate the characteristics of the structure of antianthrax STI vaccine spores and their resistance to a number of disinfectants.

The morphology of the spores was studied by means of an EM-3 electron microscope; ordinary light and phase-contrast microscopes were also used. The existence of three distinctly different morphological types of spores was established by electronoscopic methods. These types are illustrated and are described in the text. The differences were not apparent when the spores were examined with an ordinary light microscope.

The resistance of the different morphological types of spores to formalin, monochloramine, diocide, and a freshly prepared mixture of 17% aqueous formaldehyde and 10% monochloramine was tested. The article states that these experiments were performed according to the methods described in Organizatsionno-Metodicheskikh Materialakh po Dezinfektsii, Dezinseksii, i Deratizatsii (Organizational-Methodological Data on Disinsection, Disinfection, and Deratization) 1950, edited by V. I. Vashkova. A table shows results of the experiments.

The authors state that on the basis of the data presented and other published information, it may be presumed that spores with a rough, uneven surface possess one more layer than spores having a smooth surface, and that the increased resistance of morphological types II and III spores is connected with the presence of this additional layer. Other conclusions presented are as follows:

"The presence of three morphological types of spores was established upon electron microscopic examination of the STI anthrax vaccine.

"The morphological characteristics of the spores are connected with the method of culturing.

"The morphological types of spores described did not have uniform resistance to disinfectants. Spores from agar cultures were found to be the most resistant."

92. Soviet and US B. tularensis Strains Studied Comparatively

"Certain Differences in the Tularemia Pathogen in the Old and New World," by N. F. Olsuf'yev, O. S. Yemel'yanova, and T. N. Dunayeva, Tularemia Laboratory, Department of Natural-Focus Infections, Institute of Epidemiology and Microbiology imeni Gamaleya; Moscow, Vestnik Akademii Meditsinskikh Nauk SSSR, Vol 14, No 6, Jun 59, pp 51-57

This article reports the results of a comparative study of Soviet and US B. tularensis strains which was carried out on the basis of reviews of published information on the subject, and examination of US virulent Schu strain; the strain was acquired from professors in California and Kansas. It is pointed out that this strain is widely employed in the US in experimental laboratory work and does not differ in virulence from other strains isolated from rabbits and ticks and used for the same purposes. Virulent strain No 503, isolated from Dermacentor pictus Herm. ticks by N. G. Olsuf'yev in 1949, was chosen for comparison with the US strain. Virulence and morphological, cultural, biochemical, and antigenic characteristics of the two strains were compared.

The results of the experiments on virulence following the subcutaneous introduction of the Schu and 502 strains to white mice, guinea pigs, white rats, and rabbits are given in a table.

CPYRGHT Analysis of the results of these experiments led to the following conclusions:

"1. It was shown in experiments on laboratory animals that tularemia strains isolated within the USSR have lower virulence than the standard American Schu strain. The most substantial differences were observed in testing on domestic rabbits, for which the DCIM of our strains is approximately one billion times greater than the American strain.

"2. Our strains, differing from the American, do not ferment glycerin.

"3. The biological differences noted characterize, according to published data, all or most of the strains isolated in the USSR or the US which permits us to consider the population of B. tularensis distributed throughout the old and new worlds as two varieties.

"4. The essential differences between B. tularensis and Pasteurella or Brucella provide the basis for agreeing with K. A. Dorofeyev's suggestion (1947) to separate the tularemia pathogen into the independent genus Francisella.

"5. The name Francisella tularensis palaeartctica Olsuf'yev, Yemel'yanova, and Dunayeva should be adopted for the European-Asiatic (palaeartctic) variety of the tularemia microorganism, whereas the name Francisella tularensis tularensis McCoy et Chapin should be reserved for the American (non-Arctic) variety."

Epidemiology

93. Clinical Analysis of Hog Cholera in Chinese Children

"Clinical Observations of 30 Cases of Salmonella Choleraesuis Infection in Wuhan Children," by Tsou Chen (鄒 珍), Department of Pediatrics, Wuhan Military Hospital; Peiping, Chung-hua Erh-k'o Tsa-chih (Chinese Journal of Pediatrics), Vol 10, No 3, May 59, pp 241-242

The author describes the clinical characteristics of 30 cases of proved Salmonella choleraesuis infection which occurred in Wuhan area during 1955-57. The patients were from 4 months to 8 years old. Twenty-two cases occurred in 1957. Blood cultures were positive in 29 cases. The blood was taken 4-15 days after onset. Treatment with synthomycin was satisfactory in 16 cases, the patients receiving daily doses of 50-70 milligrams per kilogram of body weight orally or 30 milligram per kilogram of body weight intramuscularly. The manifestations were similar to the typhoid-septicemic type of salmonellosis described by L. E. Holt in 1953.

94. Initial Report on Epidemiology of Tick-Borne Fever in Sinkiang

"Sinkiang Tick-Borne Relapsing Fever," by Jen Min (任 敏), Department of Infectious Diseases, People's Liberation Army Hospital No 12; Peiping, Jen-min Pao-chien (People's Health), No 5, May 59, pp 404-408.

This article analyzes the clinical and epidemiological features of an endemic, tick-borne relapsing fever found in the Sinkiang area.

The author reports that the number of cases treated at his hospital gradually rose from one in 1954 to 11 in 1957, totaling 26 cases in 46 months. He assumes that many other cases have gone unrecognized because of lack of information and inadequate medical facilities.

As reported, an epidemiological investigation was conducted in 1957 by the author's department in cooperation with Li Tzu-i (李子宜) of the Epidemic Control and Quarantine Station, Sinkiang Military District. Four species of ticks were found in the burrows of rodents found in the homes of patients. One species, *Ornithodoros papillipes*, proved to be vector of spirochetal relapsing fever after the spirochetes were isolated from the blood of small animals which had been inoculated with coxal gland secretion of the tick.

Differential diagnosis is discussed with emphasis on tick-borne versus louse-borne spirochetal relapsing fever. The specific fever curve of the former is plotted to show irregular intermittence. Unlike louse-borne relapsing fever, Sinkiang tick-borne relapsing fever does not respond to penicillin treatment or to a single course of treatment with nearsphenamine, the author says. However, several courses of treatment with nearsphenamine were effective in eight cases.

95. Brucellosis in East Germany

"On the Importance of Brucellosis in Human Medicine," by H. Kneidel and E. Toeppich, Academy of Social Hygiene, Labor Hygiene, and the Advanced Training of Physicians, Berlin-Lichtenberg; Leipzig, Monatshefte fuer Veterinaermedizin, Vol 14, No 13, 1 Jul 59, pp 407-408

Medical statistics of East Germany, West Germany, Czechoslovakia, and Poland for the period 1951-1958 show an increase in the number of officially reported cases of brucellosis. In East Germany those areas with the great number of reported cases of brucellosis in humans also showed many cases in livestock herds; on the other hand, some areas with numerous cases of brucellosis in livestock showed no cases at all of brucellosis in humans, or a number of cases far below that expected. Of 102 officially reported cases of brucellosis in humans, 39 were contracted by veterinarians (38.2%). In 28 of these cases, the infection probably resulted from obstetrical activity, in 2 cases from slaughtering, in one case from work in the laboratory, in one case from handling virulent vaccine, and in 7 cases the method of infection could not be established.

The maximum period from the occurrence of the first symptoms to the time of diagnosis was 133 days; the average was 32 days for persons trained in veterinary hygiene, and 44 days for the untrained.

According to available East German statistics, during the period 1948-1957, 3 percent of all veterinarians contracted a manifest brucellosis; for farmers the rate was only 1.4 out of 100,000.

Immunology and Therapy

96. Antibiotics Effective Against Experimental Tularemia

"A Comparative Study of the Action of Several Antibiotics on Experimental Tularemia," by S. A. Tsareva, Institute of Microbiology and Epidemiology of the Southeastern USSR; Moscow Zhurnal Mikrobiologii, Epidemiologii, i Immunobiologii, Vol 30, No 6, Jun 59, p 130

This article is the author's summary of a study of the effectiveness of the Soviet antibiotics streptomycin, biomycin, levomycetin, colimycin, synthomycin, albomycin, and ekmolin against experimental tularemia. White mice infected with 10 dcl of a virulent strain of *B. tularensis* were used to determine the therapeutic action of these antibiotics. The daily dose of all the antibiotics was 2 mg, and of ekmolin, 0.5 ml. Streptomycin, colimycin, and albomycin were introduced subcutaneously and biomycin, levomycetin, and synthomycin, orally. The following conditions were considered in evaluating the therapeutic action of these antibiotics: the number of times the daily dose was introduced (one and three times a day); the initiation of therapy (simultaneously with infection of 24, 48, and 72 hours post infection); and the duration of the course of therapy (7, 10, and 14 days).

As a result of the experiments performed, it was established that streptomycin, biomycin, levomycetin, and colimycin are effective antibiotics in the therapy of tularemia. Synthomycin, albomycin, and ekmolin had no therapeutic effect against experimental tularemia.

Oncology

97. Hungarians Report Soviets Find Sausages Can Facilitate Cancer Formation

"Interesting Discoveries of Soviet Scientists Concerning Cancer" (unsigned article); Budapest, Magyar Nemzet, 16 Jun 59

A nationwide oncology service has been operating in the Soviet Union since 1945. Institutes have been established in all parts of the country for the detection and treatment of cancer.

A. Novikov, director of the Moscow Oncological Institute, has said the following concerning the results of screening examinations done so far:

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"In the course of almost 15 years of work we have examined more than 100 million persons; 8-10 million men and women are screened yearly. The Soviet research institutes are seeking to discover to what extent air pollution increases the incidence of lung cancer. On the basis of suggestions made by the researchers, state organs are taking steps to install special smoke filters to decrease air pollution.

"The work of the Leningrad scientists produced interesting results. They showed that certain smoke curing processes in the meat industry result in materials being introduced into fillings which, after entering the body, may facilitate cancer formation. On the basis of their recommendations, the experts in the meat industry are developing new smoke curing processes for the preparation of sausages.

"As a result of the successful work of the Soviet cancer prevention service, the number of cancer cases is decreasing at a fast pace."

Physiology

98. Gastric and Pancreatic Functions Affected by Temperature

"Effect of High Temperature on the Secretary Function of the Stomach and Pancreas," by N. I. Putilin and L. N. Staritskaya, Kiev Scientific Research Institute of Nutrition, Laboratory of Physiology; Kiev, Fiziologichnyy Zhurnal, No 3, May/June 59, pp 315-321

The authors of this article state that the results of experiments on dogs revealed that high environmental temperature (45°C) causes a considerable increase in the latent period, a decrease in the amount of gastric and pancreatic juices secreted during the reflex phase, a considerable increase in the period of secretory activity, and a decrease in the total amount of juice secreted during the period of secretory activity. A distorted secretion picture was noted in the experiments in which animals were fed meat and bread. It was found that the effect which high environmental temperature has on the secretory activity of the stomach and pancreas depends on the period of time that the experimental animals spent in such an environment and also on when they were fed. The indicated changes were observed to a greater degree in those animals which were fed immediately before or after exposure to action of high temperature. The indicated changes in the secretory activity of the stomach and pancreas were much less prominent in animals which were fed an hour before or an hour after being exposed to action of high temperature.

99. Chinese Study Human Salt and Water Requirements in High Temperature Environment

"A Further Study of the Water and Salt Metabolism of Men Working in Hot Environments," by Yang Hun (楊 焜), Huang Mei-Hsia (黃 美 霞), Chang Meng-pen (章 孟 本) and Hsia Shih-chun (夏 世 鈞), Department of Physiology and Department of Labor Hygiene, Wuhan Medical College; Peiping, Sheng-li Hsieh-pao (Acta Physiologica Sinica), Vol 22, No 3, Sep 58, pp 187-192

In 1955, a study was conducted to establish a suitable regime of water and salt intake for Chinese workers employed under high environmental temperatures. The authors' initial results were published in the No 1, 1957, issue of Wuhan I-hsueh-yuan Hsueh-pao (Journal of Wuhan Medical College). The present experiment was undertaken to confirm those results.

Fifty-four workmen were selected as subjects. Except for one who was 52, all were 20-35 years of age, and most of them were 20-26 years old. The subjects were divided into three groups as follows: (1) high salt intake, 30 grams per day; (2) moderate salt intake, 24 grams per day; and (3) low salt intake, 16 grams per day. The environmental conditions under which the men worked ranged as follows: temperature 32-42 degrees centigrade, relative humidity 39-86 percent, black body temperature 37-55 degrees centigrade, radiant heat intensity 0.8-1.6 calories per square centimeter per minute, wind velocity 0.8-2.0 meters per second. All experimental conditions were controlled as rigidly as possible.

There was no significant difference in the physiological indexes between the first and the second groups, while those of the third group with low salt intake showed a large negative balance of sodium chloride and significant increases in the specific gravity of plasma and rectal temperature. The authors, therefore, conclude that more than 30 grams of sodium chloride per day is apparently unnecessary for those who perspire 6 liters a day, that 24 grams per day is sufficient, and that less than 16 grams per day under the same conditions may be detrimental.

The relation between water intake and production of perspiration is discussed. No rigid regime for water intake is considered necessary. --
Abstract

100. Chinese Observe Changes in Acetylcholine Content of Brain During Experimental Traumatic Shock

"The Nervous Mechanism in Experimental Shock and Accompanying Changes in the Acetylcholine Content of the Brain," by Ch'en Chao-hsi (陈肇熙) Department of Physiology, Chinese Academy of Medical Sciences; Peiping, Sheng-li Hsueh-pai (Acta Physiologica Sinica), Vol 22, No 3, Sep 58, pp 256-265

A total of 298 normal, male albino rats were used in the controlled experiments reported in this paper. Traumatic shock was induced in some of the animals by crushing and then beating the hind limbs. Functional changes which occurred in the brain were studied by investigating the quantitative changes in cerebral acetylcholine. The nervous mechanism of traumatic shock was thereby explored.

From the results of the experiments the author draws the following conclusions:

1. A marked increase in the acetylcholine content of the brain occurs in experimental traumatic shock. This phenomenon, which possibly indicates central inhibition, was prevented in traumatized animals when a tourniquet was used effectively to check bleeding.

2. Application of the tourniquet for 15-20 minutes on the root of both hind limbs proved to be a reliable method for preventing the shock induced by trauma on the hind limbs. Local circulation as well as local nerve conduction could be completely blocked by the mechanical compression. On release of the tourniquet, the local blood flow was immediately restored, but the nervous function showed no improvement during the 30-minute observation period. This latter fact indicates that the shock-preventing effect of the tourniquet depends chiefly on blockade of the local nervous conduction which protects the central nervous system against invasion of nociceptive impulses coming from the injured area.

3. Evidence of the nervous mechanism of shock was afforded by the facts that shock could be induced by traumatizing the perfused hind limb which has been left with nerves as the only means of communication with the rest of the body, and by prolonged electrical stimulation of the sciatic nerves of conscious rats.

4. Results of the study indicate the importance of the early removal of local stimulating agents and the blocking of local nerves for 15-20 minutes in the prevention and management of surgical shock.

Footnotes give the following information:

The present study was conducted under the guidance of Prof Chang Hsi-chun (張錫鈞).

Some of the results reported in this paper were presented at the 13th Annual Conference of the Chinese Society of Physiological Science in 1956. The entire paper was recently presented at the 21 January 1958 meeting of the Peiping Chapter of the society.

The author's current mailing address: Department of Physiology, Ch'i-ch'i-ha-erh Medical College, Ch'i-ch'i-ha-erh, Heilungkiang Province.

[SIR NOTE: A 12-page English version of this article appears in the Peiping Scientia Sinica, Vol 8, No 5, May 1959.]

101. Chinese Demonstrate Inhibition of Acid Phosphatase by Heparin

"Preliminary Report on the Inhibition of Rat Mammary Gland Acid Phosphatase by Heparin," by Ku Kuo-yen (顧國彦), Institute of Experimental Biology, Academia Sinica; Peiping, Shih-yen Sheng-wu Hsueh-pao (Acta Biologiae Experimentalis Sinica), Vol 6, No 2, Dec 58, pp 181-189

The author reports on experiments conducted on animals to study the inhibitory effect of heparin on the acid phosphatase of the rat mammary gland. His preliminary conclusions follow:

1. Heparin can inhibit the activity of acid phosphatase of the rat mammary gland.
2. The inhibitory effect of heparin can be abolished by the introduction of toluidine blue.
3. The inhibitory effect of heparin was dependent on pH and heparin concentration. Other things being equal, the lower the pH, the greater the inhibition; the higher the heparin concentration, the greater the inhibition.
4. Inhibition is effected when heparin combines directly with the acid phosphatase, possibly through a salt linkage. The combination is reversible. The complex is disassociated by raising the pH, and enzyme activity reappears by the subsequent removal of heparin.

The author mentions other experiments performed in his laboratory which demonstrated the inhibitory activity of heparin on the acid phosphatases of the lungs, kidneys, and livers of man, rat, and rabbit.

The author acknowledges the help of Prof Ch'eng Yao-chin (姚錦), who edited his manuscript.

Public Health, Hygiene and Sanitation

102. Filtration Used to Purify Air From Microorganisms

"Filtration as a Method of Purifying Air From Microorganisms," by Ye. Yu. Zuykova, Institute of General and Communal Hygiene imeni A. N. Sysina; Moscow, Gigiyena i Sanitariya, Vol 24, No 6, Jun 59, pp 72-73

This article reports a comparative study of the filtration capabilities of two types of filters, the FP-5 and No 3 membrane filters. The author's description of the research is as follows:

"In this research, membrane filters, ordinarily used for filtering water, were tested for purifying air from microorganisms suspended in it. For this purpose, the filters were previously sterilized by boiling and were then dried, since wet membrane filters are practically impermeable to air. Two series of investigations (20 experiments in each series) were performed to test the effectiveness of each of the aforementioned filters. The first series was performed in one of the cabinets of the laboratory with the natural microflora of contained in the air (a dust phase bacterial aerosol). The second series of experiments was carried out in an experimental chamber with a capacity of 250 liters, into which an 0.1 ml suspension of a B prodigiosum culture in physiological solution, containing 200 million microbial cells per ml (droplet phase of a bacterial aerosol), was dispersed. The B. prodigiosum bacterial aerosol can be considered as being finely dispersed since the size of the majority of the droplets varied from 2-10 microns.

"In both series of investigations, the effectiveness of filtration was tested according to the following method: Air from the laboratory room or experimental chamber was drawn through two filters placed one in front of the other; the first was a test filter of the FP or membrane filter No 3 type, and the second was a control. The control filter was also a No 3 membrane filter. In this manner, air was drawn either through an FP type filter and then a No 3 membrane filter or through two No 3 membrane filters (the first, a test filter, and the second, a control). The control No 3 membrane filter was seeded on nutrient agar, and the effectiveness of the air filtration was calculated according to the number of mature colonies

on it. A parallel determination was made of the content of bacteria in the air of the laboratory, or the concentration of *B. prodigiosum* in the air of the experimental chamber. A parallel study of the filtering capacity of FP filters and No 3 membrane filters was done in each experiment during one workday.

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"The bacterial count of the air in the laboratory in which the experiments were performed fluctuated from 600 to 3,500 bacteria per cu m; the average number of bacteria was 1,500 per cu m, in connection with which it should be mentioned that such microorganisms as *Sarcinia*, *Staphylococcus albicans* and *aureus*, and gram-positive sporogenous bacilli predominated. The average concentration of *B. prodigiosum* in the air of the experimental chamber was 29,000-30,000 bacteria (per 250 liters).

"Each experiment consisted of two control analyses by the determination of the total seedability of the laboratory air or the *B. prodigiosum* concentration in the experimental chamber, two tests of the effectiveness of FP filters, and two tests of the trapping capacity of the membrane filters. It was established as a result of the investigations carried out that FP and No 3 membrane filters trap an overwhelming majority of the microorganisms suspended in the air, both in the dust and droplet phases of a bacterial aerosol.

"In the experiments carried out in the laboratory room, the trapping capacity of the FP type filters fluctuated from 99.81% to 100% (an average of 99.97%). It was 99.9 and 100% in the majority of cases. The trapping capacity of membrane filters was also high; it varied within the limits of 99.89 and 100%, with an average of 99.966%. In the experiments carried out in the experimental chamber, it was established that type FP filters trapped 100% of the dispersed cultures of *B. prodigiosum* in 19 out of 20 cases, and 99.995% in only one case, with an average of 99.998%. The membrane filters trapped 99.978% of the dispersed *B. prodigiosum* cultures.

"Certain differences in the results obtained when the experiments were carried out in the laboratory room and in the experimental chamber can be explained by isolated cases in which the membrane filters were contaminated at the time of seeding, since, even when all precautions were observed, it was difficult to keep the dishes from becoming contaminated from the air. During the filtration of the air from the laboratory, it was impossible to differentiate the foreign contamination from passage through the filter, whereas in the experiments with the droplet phase of the *B. prodigiosum* aerosol, only the number of colonies of extraneous bacilli which were not encountered in the air of the room were calculated.

"The filters investigated had a high trapping capacity with respect to a bacterial aerosol in the dust and droplet phase.

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"Each experiment consisted of two control analyses by the determination of the total seedability of the laboratory air or the *B. prodigiosum* concentration in the experimental chamber, two tests of the effectiveness of FP filters, and two tests of the trapping capacity of the membrane filters. It was established as a result of the investigations carried out that FP and No 3 membrane filters trap an overwhelming majority of the microorganisms suspended in the air, both in the dust and droplet phases of a bacterial aerosol.

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"The filters investigated had a high trapping capacity with respect to a bacterial aerosol in the dust and droplet phase.

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"Comparing the characteristics of the FP type filters and membrane filters, it should be mentioned that FP filters are more suitable and simpler for the rapid filtration of large volumes of air than membrane filters, since both are characterized by low resistance to a current of air. Membrane filters having high trapping capacity, at the same time, create high resistance to the passage of air. Also, they are rather fragile.

"On the basis of the experimental data, FP type filters can be recommended for use in ventilating ducts and in equipment for conditioning the air to purify it from microorganisms whenever necessary."

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The conclusions presented on the basis of this research are as follows:

"1. Air filtration is one of the simplest and most prospective methods of purifying air from microorganisms suspended in it.

"2. It was established as a result of the experiments carried out that FP type filters and membrane filters have high trapping capacity with respect to bacterial aerosols, either in the dust or droplet phase. An average of 99.998% of a B. prodigiosum bacterial aerosol in the droplet phase is trapped with FP type filters, and 99.978%, with membrane filters.

"3. FP type filters are simpler and more suitable for use than membrane filters and can be recommended for purifying air from microorganisms."

103. Aerosols Used to Control Mosquitoes

"An Effective Method for Controlling Mosquitoes," by Agronomist K. Mamayev; Moscow, Meditsinskiy Rabotnik, 22 May 59, p 2

Various repellants (kerosene, clove, and anise, and other oils) have been used for protection from blood-sucking insects (mosquitoes, gnats, and gadflies) but they all have pungent, unpleasant odors. A better agent for protection is dimethylphthalate, which is a colorless oily liquid with a very weak aromatic odor.

However, all these liquids offer only individual protection. Scientists have long sought an effective method for collective protection against the blood-sucking insects. Finally their efforts have been successful. For the past several years aerosols -- poisonous fogs -- have been used for exterminating mosquitoes in Pioneer camps, rest home areas, areas around hospitals and sanitoriums, and living areas of sovkhoses and kolkhoses. The aerosols are produced by the AG-L6 generator which forms the fog from a solution of DDT or hexachlorocyclohexane dissolved in mineral oils. On settling, the fog covers plants completely with fine droplets. Insects which alight on this toxic medium are killed. In addition, the aerosols do not damage woods, undergrowth, and grasses; they possess no harmful effect on domestic animals. The generators are usually mounted on trucks.

Since 1955 the Moscow Oblast Station of Green Plant Protection has used aerosols yearly to treat areas around pioneer camps, sanatoriums, rest homes, and hospitals.

104. Biological Gloves

"Biological Gloves," by D. Romanov, Industrial Sanitation Doctor, Gor'kiy; Moscow, Meditsinskiy Rabotnik, 22 May 59, p 3

At the Gor'kiy factory "Krasnoye Sormovo", for work requiring the handling of different solvents and synthetic tars, a protective paste is used on the hands -- the so-called "biological gloves." The preparation of the paste is simple; it consists of 300 g of casein gum "extra," 10 g of 25% ammonia, 300 g of glycerine, 850 g of alcohol, and 850 g of water.

The finely dispersed, gray-yellow casein is dissolved in half the water, after which the ammonia in the remaining water, the glycerine, and the alcohol are added in that order. A gray-cinnamon mixture having a pungent odor is obtained.

Before starting his work, the worker smears the paste on his hands. On setting, it forms a stable, colorless or slightly cinnamon-colored film in the form of a glove. It is easily washed off with warm water and soap.

Radiology

105. Effect of Different Ranges of Hypothermia on the Course of Radiation Sickness

"The Effect of Hypothermia on Changes in Blood Protein Composition During Radiation Sickness," by P. I. Abakeliya, T. N. Dzhaparidze, and M. G. Gachechiladze, Soobshch. AN GruzSSR (Reports of the Academy of Sciences Georgian SSR), 1958, Vol 21, No 1, pp 109-114 (From Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 10, 25 May 59, Abstract No 12930, by I. El'man)

CPYRGHT

"The irradiation of dogs by 400 r doses of X-rays produced a distinct picture of radiation sickness. Cooling of the animal organisms to a body temperature of + 28 to + 29° C, effected immediately after irradiation and during the climax of radiation sickness, had a favorable effect on the course of the sickness. The blood protein composition of the animals

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maintained at cool temperatures did not change sharply, and within 40-60 days after irradiation it was completely normalized. Cooling of the animals to + 24 to + 25° C had no beneficial effect, and the dogs died from radiation sickness as did those in the control group."

105 b. Vitamin B₁₂ Administered Before Irradiation Ineffective for Survival

"The Effect of Vitamin B₁₂ on the Survival of Mice Subjected to Total Irradiation by Various Doses of X Rays," by G. D. Berdyshev, Sb. Nauchn. Rabot. Molodykh Uchenikh. Med. In-t. Tomsk, Tomskiy Un-t, (Collection of Scientific Works of Young Scientists of Tomsk Medical Institute, Tomsk University), 1958, pp 30-32 (From Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 10, 25 May 59, Abstract No 12354, by I. El'man)

CPYRGHT

"In experiments on a large group of white mice (a total of 384) subjected to total irradiation by various doses of X rays (350, 500, and 750 r), it was established that vitamin B₁₂ administered to animals before irradiation had no essential effect on the survival of mice as compared to control animals, nor did it cause a change in their weight."

106. Agents Which Block Blood Oxygen Transport Have Prophylactic Effect in Radiation Hazards

"On the Antiradiation Protective Effect of Substances Which Block Oxygen Transport by Hemoglobin," by E. Ya. Grayevskiy and M. M. Konstantinova. Dokl. A N SSSR, 1958, Vol 122, No 3, 381-384 (From Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 8, 25 Apr 59, Abstract No 10603, by I. Chertkov)

CPYRGHT

"A dose of 3.5 kg [sic; presumably mg] of NaNO₂ was administered to mice intraperitoneally, or the mice were maintained in an atmosphere containing 0.5% CO, and at various periods afterwards were irradiated by a dose of 900 r (at a rate of 600 r per min). A statistically reliable connection was noted between the amount of methemoglobin formed and the degree of protection afforded the animals from the lethal effect of ionizing radiation. The protective effect produced by the prophylactic administration of NaNO₂ or by the inspiration of CO is dependent on the hypoxia which is produced in an organism due to disturbed O₂ transport."

107. Fluctuation of Blood Alkaline Reserve in Acute Radiation Sickness

"The Status of the Blood Alkaline Reserve in Acute Radiation Sickness," by B. S. Babashev, Tr. In-ta Klinich. i Eksperim. Khirurgii AN KazSSR (Works of the Institute of Clinical and Experimental Surgery, Academy of Sciences Kazakh SSR), 1958, No 4, pp 64-67 (From Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 10, 25 May 59, Abstract No 12929, by I. El'man)

CPYRGHT

"The blood alkaline reserve fell sharply in dogs subjected to X-irradiation by doses of 500-600 r. The maximum drop was noted during the 8-10-day period after irradiation and was equal to 28.7 or 14.9% of the volume of carbon dioxide, depending on the dose of irradiation."

108. Conference Report on Radiobiology

Radiobiologiya; Trudy Vsesoyuznoy Nauchno-Tekhnicheskoy Konferentsii po Primeneniyu Radioaktivnykh i Stabil'nykh Izotopov i Izlucheniya v Narodnom Khozyaystve i Nauke (Radiobiology; Works of the All-Union Scientific-Technical Conference on the Use of Radioactive and Stable Isotopes and Radiations in the National Economy and Science); Moscow, 1958, 286 pp

This book, Radiobiologiya, (Radiobiology) is a collection of reports presented at the radiobiological section of the All-Union Scientific-Technical Conference on the Use of Radioactive and Stable Isotopes and Radiation in the National [Soviet] Economy and Science, 4-12 April 1957.

The contents and abstracts of certain of the reports are presented below.

1. Concerning the Initial Mechanisms of the Biological Effects of Ionizing Radiations, by A. M. Kuzin
2. Biophysical Research on Radiation Reactions of an Organism, by G. M. Frank
3. Ionizing Radiations and Cell Metabolism, by M. N. Meysel'
4. Concerning Changes in the Biological Characteristics of the Blood in Irradiated Animals (The Problem of Toxemia), by P. D. Gorizontov
5. The Significance and Nature of Primary Radiation [Induced] Genetic Changes, by N. P. Dubinin
6. The Kinetics of Radiochemical Transformations in a Biosubstrate and the Prophylactic Effect
7. The Biosynthesis of Purines and the Metabolism of Their Precursors Under Normal Conditions and After Roentgen Irradiation, by G. A. Kritskiy
8. Structural Changes in Connective Tissue Proteins in Acute Radiation Sickness Caused by Roentgen Rays, by L. T. Tutochkina, N. D. Petrova, L. I. Polikarpova, and V. V. Shikhodyrov
9. The Effect of Intensive Irradiation on the Structure and Certain Physiological Characteristics of Microorganisms, by M. N. Shal'nova
10. The Effect of Gamma-Neutron Radiation on Microorganisms, by T. S. Remezova

11. Conditions for Increased Biosynthesis of Ergosterol by Yeast Organisms, by R. D. Gal'tsova
12. Concerning the Role of Local and Distance Effects of Ionizing Radiations, by E. Ya. Grayevskiy, N. F. Barakina, A. A. Neyfakh, Z. N. Faleyeva, and I. M. Shapiro
13. The Effect of Ionizing Radiations on Factors Which Determine the Composition and Properties of the Immediate Nutritive Environment of Organs and Tissues of Animal Organisms, by L. S. Shtern
14. Concerning the Mechanism of Early Changes in the Permeability of Histo-Hematic Barriers Under the Effect of Roentgen Rays, by M. M. Gromakovskaya, and S. Ya. Rapoport
15. The Effect of Roentgen Rays of the Histamine Content of Tissues, by Ye. I. Krichevskaya
16. Concerning the Distribution of Dyes Introduced Intravenously Into Tissues of Mice Under Normal Conditions and After X-Ray Irradiation, by L. I. Korchak
17. A Hemotoxic Factor in Tissues of Animals Subjected to the Effect of Ionizing Radiations, by S. A. Korol' and M. R. Mednik
18. A Comparison of the Protective Effect of Homogenates of Hemopoietic and Other Tissues, by Yu. Soshka
19. The Effect of Certain Humoral Tissue Factors on the Synthesis of DNA After Irradiation, by V. Drashil and Yu. Soshka
20. Concerning the Role of the Adrenals in the Development of Radiation Sickness, by A. V. Tonkikh
21. Concerning the Pathogenesis of Endocrine Disturbances Due to Radiation Injuries (The Reaction of the Anterior Lobe of Hypophysis to Irradiation), by Ye. A. Moiseyev
22. Cytochemical Changes in the Central Nervous System Due to the Effect of Ionizing Radiations, by A. L. Shabadash
23. The Influence of Various Doses of Ionizing Radiations on the Morphology of the Brain and Internal Organs of Animals Subjected to Total Irradiation in Physiological and Pathological Conditions, by M. M. Aleksandrovskaya
24. Vital Control of Disturbances of Oxidative Processes in the Central Nervous System, by A. D. Snezhko

25. Super-Slowing of Rhythm During Changes in the Electrical Potential of the Cerebral Cortex and of the Hypothalamus Due to Radiation Injury, by N. A. Aladzhalova
26. Concerning the Problem of the Effect of Ionizing Radiation on Animals With a Different Type of Nervous System in Physiological and Pathological Conditions, by L. I. Komlyarevskiy, L. S. Gorsheleva, and L. Ye. Khozak
27. Concerning Certain Disturbances of the Higher Nervous Activity in Rats Born of Mothers Subject to Ionizing Radiation During the Period of Pregnancy, by I. A. Piontkovskiy, I. A. Volodina, and V. Ye. Miklashevskiy
28. The Role of the Nervous System in the Radiation Reactions of an Organism, by P. F. Minayev
29. Disturbances in the Cortico-Visceral Interrelationships in Acute Radiation Sickness, by I. T. Kurtsin
30. An Analysis of the Effect of Roentgen Rays on the Secretory and Motor Functions of Small Segments Cut Out of the Lesser and Greater Curvatures of the Stomach, by A. V. Solov'yev and O. V. Solodkina
31. The Role of the Superior Cervical Sympathetic Ganglia in Reactions to Penetrating Radiation in Control Rats and Rats Acclimatized to Hypoxia, by Z. I. Barbashova
32. Physiological and Biochemical Data on the Nature of Hemorrhage Due to Experimental Radiation Injuries of Animal Organisms, by B. A. Kudryashov, G. V. Andreyenko, P. D. Ulitina, G. G. Bazaz'yan, V. Ye. Pastorova, N. P. Sytina, T. M. Kalishevskaya, and Ye. Ye. Shimonayeva
33. The Functional Condition of the Skin Vessels After Total Irradiation of Dogs by Roentgen Rays, by V. V. Yakovlev
34. Concerning the Problem of the Significance of the Functional Condition of the Liver in the Development and Course of Radiation Sickness, by M. F. Belovintseva and Ye. N. Speranskaya
35. Radiation Stimulation of Plants and Its Possible Theoretical Interpretation, by N. V. Timofeyev-Resovskiy and N. V. Luchnik
36. The Effect of Neutrons on the Growth and Development of Plants, by S. Tselishchev and V. Mogilevkin
37. The Effect of Ionizing Radiations on Changes in the Components of Enzyme Reactions in the Lipid Metabolism of Plants, by Ye. V. Budnitskaya

Abstracts of Articles From Book on Radiobiology

"Biophysical Research on the Radiation Reactions of an Organism," by G. M. Frank, compilation, Radiobiologiya (Radiobiology), M., Academy of Sciences USSR, 1958, pp 14-25 (from Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 7, 10 Apr 59, Abstract No 8701, by Ye. Limanova)

CPYRGHT

"The investigation of radiation reaction of mammals is possible by three methods which complement each other: (1) the study of the phenomena on model systems; (2) parallel study on models and in vivo; and (3) in vivo investigation of initial reactions of an organism (the study of the bioelectric currents, oxidative processes, and disturbances in the structure of the cerebral cortex). These approaches are critically evaluated and illustrated by examples."

"The Biosynthesis of Purines and the Metabolism of Their Precursors Under Normal Conditions and After X-Irradiation," by G. A. Kritskiy, compilation; Radiobiologiya (Radiobiology), M., Academy of Sciences USSR, 1958, pp 68-73; (from Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 7, 10 Apr 59, Abstract No 8699, by N. Pokidova)

CPYRGHT

"It was shown that C^{14} in pigeon liver homogenates is deposited chiefly in the adenine group of AMP [adenine monophosphate] and in the hypoxanthine group of IMP [inosine monophosphate]. Free hypoxanthine which is deposited in liver homogenates is almost absent in the nucleotides of the liver. This points out the necessity of the ribosidation of purine precursors during their biosynthesis, and the biosynthesis of purines in the pentose-phosphate cycle. It has been established that following the total irradiation of pigeons, the synthesis of hypoxanthine is increased immediately after irradiation but it is sharply decreased during the ensuing days. The incorporation of C^{14} from 1- C^{14} glycine into organic acids is decreased after irradiation. The great resistance of pigeons to X-irradiation may be connected with the increased synthesis of purines in the pigeon."

"Structural Changes in Connective Tissue Proteins in Acute Radiation Sickness Caused by Roentgen Rays," by L. T. Tutochkina, N. D. Petrova, L. I. Polikarpova, and V. V. Shikhodyrov, compilation, Radiobiologiya (Radiobiology), M., Academy of Sciences USSR, 1958, pp 74-79 (from Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 11, 10 Jun 59, Abstract No 14390, by K. Maskhuliya)

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"X-ray irradiation decreased the uptake of C^{14} glycine in the procollagen of the skin of rats, and during the 13-20-day period after irradiation, the C^{14} uptake into the muscle proteins of mice was also decreased. After irradiation, the uptake of C^{14} in the liver proteins of mice rose at first but then fell. Changes in the metabolism of procollagen were more noticeable and were observed earlier than the beginning of the inhibition of C^{14} uptake into muscle proteins; the latter ran parallel with the loss of weight in the irradiated animals. The inhibition of C^{14} glycine uptake into the procollagen during the early phase of radiation sickness was not connected with decreased food intake (in contrast to the later phase), but intensive destruction of the cellular elements in connective tissue occurred during this phase. The idea of the possible activation of proteolytic enzymes is postulated. The intravenous administration of K-salts of chondroitin sulfate (0.3-1 mg/g weight) 5-10 minutes before irradiation increased the survival rate of the mice. It is thought that although the changes noted in collagen proteins were not specific for radiation sickness, evidently they do play an important role in the pathogenesis of this sickness."

"Conditions for the Increased Biosynthesis of Ergosterol by Yeast Organisms," by R. D. Gal'tsova and I. P. Vakina, compilation, Radiobiologiya (Radiobiology), M., Academy of Sciences USSR, 1958, pp 97-102; (from Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 8, 25 Apr 59, Abstract No 9573, by V. Tovarnitskiy)

CPYRGHT

"It was shown that the ergosterol (I) content in various yeast cultures differs (0.4-3.5%). The best producers of (I) are *Sacch. carlsbergensis* 10D (3.4-3.5%), and *Sacch. carlsbergensis* Fröhberg (2.4% - 2.5%). X-ray irradiation (60 kiloroentgens) increases the content of (I) in the two above-mentioned yeast strains up to 5.5% and 2.6%, respectively. Studies were conducted on the effect of various nutrition conditions on the content of (I) in yeast organisms. It was shown that by excluding or restricting nitrogen nutrition, and in the presence of sources of C such as saccharose, glucose, or pyruvic acid, the content of (I) in yeast is increased by a factor of 2 to 2 1/2. The simultaneous effect of X-irradiation and the unilateral carbohydrate nutrition makes it possible to raise the increment of (I) in the yeast organisms even higher, and, by using strains with a high capacity for the biosynthesis of (I) (*Sacch. carlsbergensis* 10D), to raise the content of (I) to 10% in 3-4 days and to 12% in 5-6 days."

"The Effect of Ionizing Radiations on Factors Which Determine the Composition and Properties of the Immediate Nutritive Environment of Organs and Tissues of Animal Organisms," by L. S. Shtern, compilation, Radiobiologiya (Radiobiology) M., Academy of Sciences USSR, 1958, pp 112-120; (From Referativnyy Zhurnal-Khimiya, Biologicheskaya Khimiya, No 10, 25 May 59, Abstract No 12919, by N. Pokidova)

CPYRGHT

"Following X-ray irradiation, early changes are observed in the functional condition of the histo-hematic barriers(GGB). After total irradiation of the animals, an increase was noted in the permeability of the GGB, which arises at various periods in different tissues; however, after 2-3 days the permeability decreases sharply. Irradiation increases the permeability of the placental barrier and of the GGB of the fetus at all stages of its development, even in the first hours. Irradiation causes the inhibition of the synthesis of high-polymer phosphorus compounds and of a number of enzyme systems. The administration of 25% alcohol at the rate of 2 ml/100 g of body weight 30 minutes before the irradiation of mice increases their survival and decreases injuries to bone marrow."

"X-ray Effect on the Histamine Content of Tissues," by Ye. I. Krichevskaya, compilation, Radiobiologiya (Radiobiology), M., Academy of Sciences USSR, 1958 pp 126-129; (from Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 7, 10 Apr 59, Abstract No 8679, by V. Korzhov)

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"After the X-ray irradiation of rats by 800 r doses, a marked increase was noted in the concentration of histamine in various tissues. At the same time, differences were noted in the reactions of various tissues. The maximum increase of histamine in the skin and stomach was attained within 5 minutes after irradiation. During the ensuing period, the concentration of histamine started to fall, and by the 72d hour it was significantly below normal. In the liver and kidneys, the maximum rise was noted 60 minutes after irradiation, and by the 72d hour it remained above normal. Changes in the concentration of histamine in the brain and blood at various periods after irradiation were insignificant."

"Cytochemical Changes in the Central Nervous System Due to the Effect of Ionizing Radiations," by A. L. Shabadash, compilation, Radiobiologiya (Radiobiology), M., Academy of Sciences USSR, 1958, pp 161-167; (from Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 7, 10 Apr 59, Abstract No 8673, by N. Pokidova)

CPYRGHT

"The study of the cytochemistry of nucleoproteins of the central nervous system of cats, rats, and rabbits subjected to total irradiation by doses ranging from 150-1,000 r showed that the brain substance is sensitive to ionizing radiation. After nonlethal X-ray doses, the histochemical changes were unevenly pronounced in the various branches of the nervous system and were not qualitatively identical. The selective vulnerability of the diencephalic region to ionizing radiation was noted. In 50-60% of the experimental animals, a significant decrease occurred in the content of the ribonucleoproteins in the mitochondria toward the end of the first week, and there were disturbances in their morphology."

"A Vital Observation of Disturbances in Oxidative Processes in the Central Nervous System," by A. D. Snezhko, compilation Radiobiologiya (Radiobiology), M., Academy of Sciences USSR, 1958, pp 177-183 (from Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 8, 25 Apr 59, Abstract No 10100, by N. Pokidova)

CPYRGHT

"After the direct effect of ionizing radiation on the brains of experimental animals, polarographic determinations showed that the quantity of O₂ in the brain during the first hours after irradiation is increased above the normal level, as a result of the inhibition of the respiratory function of the tissue. After irradiation of the abdominal region, O₂ pressure in the brain is decreased in a reflex manner in response to peripheral impulses. The subcortex after any localization of irradiation evidently reacts sooner, but recovers sooner from the injuries. It is possible that the rhythmic fluctuations of O₂ pressure which are detected in various living systems reflect the aerobic phase of the respiratory cycle. A temporary block of the respiratory rhythm, evident in all living systems, was detected during the first hours after irradiation."

"Physiological and Biochemical Data on the Nature of Hemorrhage in Experimental Radiation Injury of Animal Organisms," by B. A. Kudryashov, G. V. Andreyenko, P. D. Ulitina, G. G. Bazaz'yan, V. Ye. Pastorova, N. P. Sytina, T. M. Kalishevskaya, and Ye. Ye. Shimonayeva, compilation, Radiobiologiya (Radiobiology), M., Academy of Sciences USSR, 1958, pp 237-243 (from Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 7, 10 Apr 59, Abstract No 8686, by N. Pokidova)

CPYRGHT

"A study of the components of the coagulation system of white rats under the effect of roentgen rays or of internal gamma radiation showed that the hemorrhagic syndrome which arises as a result of radiation injury is caused both by a deficiency in blood prothrombokinase which is connected with a sharp decrease in thromboplastic activity and by decreased capillary resistance. Prophylaxis was attained by 'lumbar shielding' (screening of the upper lumbar region) in combination with the administration of vitamin B₁₂ (eight injections of 5 gammas each) and folic acid (15 injections of 2 mg each). In cases of hemorrhage due to wounds in the parenchymatous organs, quick and desirable hemostasis was obtained by plugging the wounds with a fibrin sponge moistened with a very active solution of thrombin. The authors conclude that in 'lumbar shielding' the screening of the liver has the determining factor."

Surgery

109. Chinese Report on a Year's Use of Hibernation Anesthesia

"The Application of Artificial Hibernation in Surgical Operations," by Chao Chun (趙 俊) and Hsieh Jung (謝 榮), Surgical Anesthesia Group of Peking Union Hospital, Chinese Academy of Medical Sciences; Peiping, Jen-min Pao-chien (People's Health), Vol 1, No 5, May 59, pp 400-403

The authors sum up a year's (September 1957-August 1958) experience in the use of artificial hibernation for 86 major operations on 84 patients. They conclude that for carefully selected, suitable cases, hibernation anesthesia, produced by the combined use of nerve-blocking drugs and artificial hypothermia, plays a definite role in preventing surgical shock, ensuring a smooth operation and good recovery. The literature on the subject is reviewed.

110. Chinese Research on Wound Healing and Tissue Regeneration

"Studies on Wound Healing and Tissue Regeneration. VIII. Reaction of Organism to Preserved Skin Transplanted Onto Skin Wound," by Chu Jun (朱 涇), Institute of Experimental Biology, Academia Sinica; Peiping, Shih-yen-sheng-wu Hsueh-pao (Acta Biologiae Experimentalis Sinica), Vol 6, No 2, Dec 58, pp 97-104

The author reports experiments conducted to study the white rat's reaction to preserved heterodermal grafts and the effect of such grafts on experimental skin wounds. It was found that the transplanted skin, which had been preserved in formalin or alcohol and thoroughly washed before use, formed a temporary protective cover over the wound for about 3 weeks. During that time the connective tissues in the wound grew rapidly and infiltrated the graft, forming fibrous scar tissue. The epidermis of the wound also grew horizontally into the graft so that in 2 weeks the distinction between the dead transplanted skin and the tissue of the living rat became hardly noticeable. After 3 weeks the skin graft gradually wasted away.

According to the author, the results indicate that clinical use of preserved skin grafts may be practical.

Five of the author's earlier research reports on the subject of wound healing and tissue generation are cited as references. They are as follows:

"Studies on Wound Healing and Tissue Regeneration. I. Contraction in the Healing of Skin Wounds in Rats," by Chu Jun; Peiping, Shih-yen Sheng-wu Hsueh-pao (Acta Biologiae Experimentalis Sinica), Vol 4, 1955, pp 293-336

"Studies on Wound Healing and Tissue Regeneration. II. Histological Studies on the Healing Process of the Wound of Whole Skin Defect in Rats," by Chu Jun; *ibid.*, Vol 5, 1956, pp 173-198

"Studies on Wound Healing and Tissue Regeneration. VI. Growth and Behavior of the Epidermis and Connective Tissues in the Healing of Incised Wounds in Rats," by Chu Jun; *ibid.*, Vol 6, 1958a, pp 19-36

"Studies on Wound Healing and Tissue Regeneration. VII. Reactions of the Organism to Collagenous Materials," by Chu Jun, 1958b (unpublished)

"Studies on Wound Healing and Tissue Regeneration. V. The Healing Process of Chemical Wounds in Mouse Skin," by Lu Shu-hsia (呂 淑霞) and Chu Jun; *ibid.*, Vol 6, 1958, pp 9-18

111. Electro-Narcosis Method Developed by Soviets

"Electro-Narcosis" (unsigned article); Prague, Ceskoslovensky Cerveny Kriz, No 6, Jun 59, p 17

According to a brief article in the Czechoslovak Red Cross monthly, a collective at the Soviet Research Institute of Experimental Surgery has developed a working model of an instrument to induce electro-narcosis. Electronic gears control the amount of current applied to the patient, and electromechanical equipment automatically discontinues the current in the event of damage. The electric impulses are visible on an oscilloscope.

During experiments on animals, one electrode is placed on the eyes and one on the tail of the experimental animal. Workers at the institute have been able to minimize the pain to such an extent that they can perform cavity operations, amputations, etc. without causing damage. The animals were still unable to feel pain 8-15 minutes following the operations.

Miscellaneous

112. East German Medical Research Institutions

"Scientific Research Institutions of the German Democratic Republic," by Prof Ye. Khol'shteyn; Moscow, Meditsinskiy Rabotnik, 30 Jun 59

The Berlin Academy of Social Hygiene, Labor Hygiene, and the Advanced Training of Physicians is subordinate to the Ministry of Health, German Democratic Republic. Within the network of the academy there is a Clinic and Polyclinic of Occupational Diseases.

The polyclinic is located in a new four-story building and has a number of therapeutic cabinets for treating all types of ambulatory patients. The clinic has a number of specialized departments such as dermatology and X-ray. Patients afflicted with occupational diseases of the lungs, with dermatosis, and with problems of locomotion are treated in the clinic. In addition to treating patients, these two establishments compile data for establishing social security benefits and do scientific research in various specialized fields.

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The basis scientific research institutions of the academy include the Institute of Labor Hygiene, which is engaged in research on the problem of the prophylaxis of occupational pathology. To control the current spread of occupational diseases affecting lungs, a number of silicosis treatment stations have been established in East Berlin, Dresden, Jena, Magdeburg, etc. Other departments of the institute are located in Stalinstadt.

The Institute of Applied Physiology is about to be organized and established; however, work is being carried on in applied physiology in such fields as the wireless transmission of medical measurements.

The Institute of Social Hygiene, like the above two institutes, is subordinate to the academy and is working on the solution of problems of school hygiene and research on cancer, caries, and goiter.

The Institute of the Organization of Public Health is primarily concerned with maintaining the health and well-being of the East German population. The Department for the Advanced Training of Physicians and Pharmacists and the Scientific Research Institute of Labor Hygiene in Jena are also within the network of the academy.

113. Floating Hospital on Caspian Sea

"News Items From the Socialist Camp--a Floating Hospital"
(unsigned article); Brussels, Le Drapeau Rouge, 14 May 59, p 4

According to this item in a French-language Communist newspaper, when any of the thousands of fishermen on the Caspian Sea become ill, they will no longer have to return to port for care. A floating medical establishment has been organized for them with hospital service, an X-ray room, a diagnostic laboratory, a dental clinic, and an operating room. The Caspian Sea fishermen also have at their disposal a dispensary ship whose personnel includes a surgeon, a dentist, a dermatologist, and a therapist. Its laboratory is well-equipped to perform all kinds of analyses.

VII. METALLURGY

114. Preparation of Special Tubing and Rods From Molybdenum Disilicide

"Technology for Preparing Tubing and Rods from Molybdenum Disilicide," by G. V. Samsonov and P. S. Kislyy, Institute of Powder Metallurgy and Special Alloys, Academy of Sciences Ukrainian SSR; Moscow, Ogneupry, No 6, 1959, pp 276-278

Molybdenum disilicide powder with a starch paste plasticizer (2 to 4% by mass) is both compacted and extruded in a special die press operation to form tubing and rods. Blanks are dried for 24 to 48 hours at room temperature and then placed in a tubular graphite furnace under a covering of beryllium or aluminum oxide. Sintering consists of heating to 600 to 700°C in a hydrogen atmosphere and holding at this temperature for 30 minutes, followed by heating to 1,950°C and holding for 5 to 10 minutes. Blanks are then furnace-cooled to 900-1,000°C. Shrinkage was 12 to 20% and porosity varied from 5 to 12%. Variation of porosity along a 400- to 500-mm length of tubing did not exceed one percent.

Oxides of silicon, aluminum and zirconium were added to powder mixtures in tests to increase the electrical resistance of MoSi₂ tubing and rods. SiO₂ is considered most acceptable as it produces a linear change in the ratio of specific electrical resistance to the quantity added. A 10% admixture of SiO₂ lowers the mechanical strength of MoSi₂ heating components but increases air oxidation resistance and operating temperatures from 1,660-1,680°C to 1,710-1,730°C. MoSi₂ elements containing SiO₂ will give long service in an oxidizing medium at 1,650 to 1,680°C if given a preliminary firing in such a medium at 1,700 to 1,740°C. Thermocouples with an outer case of MoSi₂ and inner core of boron carbide or boron saturated graphite have a thermal coefficient of thermoelectromotive force equal to 28.3 microvolts/degree, whereas in the 500 to 1,800°C range, the ratio of this coefficient to temperature is sharply linear.

115. High-Speed Tools from Cast Precipitation Hardening Alloys

"Investigation of Cast Precipitation Hardening Cutting Tool Alloys," by Engr A. D. Klement'yev, Tomsk Polytechnic Institute; Stalinsk, Izvestiya Vysshikh Uchebnykh Zavedeniy -- Chernaya Metallurgiya, No 3, Mar 59, pp 77-83

Vacuum induction melts of alloy 8 (60% Fe, 20% Co, 20% W) with single and complex admixtures of Ni, Cr, Mn, Si, Ti, C and V were employed in tests to develop high-speed cast nickel-cobalt-tungsten cutting alloys. Best overall qualities of hardness, red hardness, and stability were obtained with the complex admixture of 0.1 to 0.2% C, 0.2% Ti, 1% Mn and 1% Ni. Recommended three-step tempering consists of heating at 550°C for 15 minutes, 650°C for 15 minutes and 550°C for 1 hour. Cutting tools from an alloy designated as "No 94" (1% Mn, 1% Ni, 0.15% C) had a life of 26 minutes as compared to 3.3 and 1.3 minutes for standard high-speed steels R18 and R9, respectively, under identical conditions. Additional satisfactory results with admixtures of boron and larger quantities of manganese and chromium indicate the possibility of further improvement of cast precipitation hardening cutting tool alloys.

[For additional information on Metallurgy see also under Chemistry, Nuclear Fuels and Reactor Construction Materials]

VIII. PHYSICS

Nuclear Physics

116. Analysis of Nuclear Quadrupole Resonance

"The Use of Nuclear Quadrupole Resonance for Determining Lattice Vibrations in the Chlorate Series," by V. S. Grechishin and F. I. Skrypov, Leningrad State University imeni Zhdanov; Moscow, Doklady Akademii Nauk SSSR, Vol 126, No 6, Jun 59, pp 1229-1231

The temperature dependence of frequency of the nuclear quadrupole resonance is investigated in the chlorate series with one- or two-valent metals. A superoscillator with self-damping and high response was used for the observation of the quadrupole resonance. The signal of the nuclear quadrupole resonance in barium chlorate at room temperature exhibited two peaks, because the frequency was modulated in such a way as to provide resonance conditions twice during a modulation period. The experimental results are tabulated.

117. Energy Spectrum of Photons

"The Fine Structure of the Energy Spectrum of Photoprotons From Ca-40," by A. P. Komar and T. N. Dragnev, Physicotechnical Institute of the Academy of Sciences USSR, Leningrad Polytechnical Institute imeni Kalinin; Moscow, Doklady Akademii Nauk USSR, Vol 126, No 6, Jun 59, pp 1234-1235

The energy and angular distribution of photoprotons from Ca-40 were studied by means of the photoemulsion NIKFI-22 of 200 μ thickness. A Ca-40 lamina with a thickness of 8.4 mg/cm² was irradiated by gamma rays from the synchrotron of the Physicotechnical Institute of the Academy of Sciences USSR with a maximum energy of 85 Mev. The obtained histogram of energy distribution was analyzed by the method of Ye. P. Ferreyra and P. Ya. Valoshek (Materials of the International Conference in Geneva 1955 (1958)). The curve exhibits some peaks, particularly within the range of 9.5-12 Mev, which may be explained by resonance.

118. Scattering of Fast Charged Particles

"Excitation of Collective States in Nuclei by Scattering of Charged Particles," by S. I. Drozdov; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1875-1881

Elastic and inelastic scattering of fast charged particles on black nonspherical nuclei is investigated in the diffractive approximation. The radius of the nucleus and its nonsphericity parameter can be determined by comparing the calculations with the experimental data.

119. Superfluidity of Nuclei

"Investigation of the Superfluid State of Atomic Nuclei," by V. G. Solov'yev, Joint Institute of Nuclear Research, Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1869-1874

The variational principle proposed by N. N. Bogolyubov, (DAN, 119, 52 (1958)) and the physical ideas and mathematical methods developed in the theory of superconductivity are applied to a study of the properties of heavy nuclei. Residual interactions between nucleons located in the outer shell which lead to the appearance of the superfluid state of the nucleus are considered from the viewpoint of the nuclear shell model. The energy of the ground superfluid state and of a set of excited states is computed for an even, as well as odd, number of nucleons in the shell. Some regularities in the level pattern of even-even nuclei and nuclei with odd A values are revealed.

The energy changes of the ground nuclear state caused by a change in the number of nucleons in the outer shell by unity have been calculated. From these calculations it can be concluded that even-even nuclei are more stable with respect to β -decay than odd-odd nuclei and the results quantitatively agree with the semi-empirical Weizsacker formula. The results depend only slightly on the choice of a nuclear model and are also valid for strongly deformed nuclei.

120. Annihilation of Positronium

"Three-Photon Annihilation of Positronium in the P-State," by A. I. Alekseyev, Moscow Engineering Physics Institute; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1839-1844

A relativistically invariant expression for the probability amplitudes of three-photon annihilation of positronium has been obtained by summation of an infinite number of graphs of a definite class. The probability for three-photon annihilation of positronium in the P-state is calculated in the nonrelativistic limit and the selection rules for this process are found.

121. Wave Functions of Mesic Atoms

"Energy Levels and Approximate Wave Functions of Mesic Atoms," G. Ye. Pustovalov, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1806-1817

The energies of the 1S-, 2S-, 3S-, 2P, and 3P-levels of mesic atoms are computed in the nonrelativistic approximation under the assumption of a uniform nuclear charge density distribution within a sphere of radius R. By numerical solution of the Schroedinger equation, formulas are deduced for the dependence of the quantum defect Δn on $t = R_0 Z / a_u$ (a_u is the Bohr radius of the meson orbit). Approximate wave functions of the corresponding states are presented. It is shown how relativistic corrections and level shifts due to change of the shape of the nuclear charged distribution can be found by employing these wave functions and perturbation theory.

122. Transition Probabilities in Nuclei

"Transition Probabilities between the Levels of the Rotational Band of Nonaxial Nuclei," by A. S. Davydov and V. S. Rostovskiy, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1788-1796

The energies and wave functions of the rotational states ($J \geq 4$) of nonaxial nuclei are calculated. The reduced probabilities for E2 transitions between them are derived. Conditions under which the rotational states can be characterized by quantum numbers K are ascertained. It is shown that when the shape of the nucleus deviates from axial symmetry the interval rule 1:3; 3:7:12 observed in the rotational band of axial nuclei is violated. The theory is compared with experiments.

123. Electromagnetic Cascades

"Monte-Carlo Computation of Electromagnetic Cascades With Account of the Effect of the Medium on the Bremsstrahlung," by A. A. Varfolomeyev and I. A. Svetloolobov; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1771-1781

Electromagnetic cascades initiated by 10^9 , 10^{10} , 10^{11} , $5 \cdot 10^{11}$, 10^{12} , and $3 \cdot 10^{12}$ ev primary electrons are computed for depths up to 2.8 radiation units. The Monte-Carlo method was employed. Real (nonasymptotic) cross sections for elementary electromagnetic processes in the photographic emulsion were taken into account. Two types of calculations were carried out: those based on the Bethe-Heitler formulas and those based on formulas which take into account the effect of multiple scattering and polarization of the medium on bremsstrahlung.

124. Reaction Threshold

"Resonance Effects in the Scattering of Particles Near the Reaction Threshold," by A. I. Baz'; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1762-1770

The energy dependence of the scattering cross section $X(aa)X$ near the threshold of the reaction $X(ab)y$ (X , a , Y are arbitrary particles) is studied under the assumption that long-range attractive forces act between b and Y . It is shown that if these forces are capable of producing a bound state of particles $b + Y$, then resonances should be observed in the scattering cross sections. These resonances are located below the threshold of the reaction $X(ab) Y$. A detailed study is made of the case when attractive Coulomb forces act between b and Y . The number of resonances in this case is found to be infinite and their density trends to infinity when the threshold is approached from below.

125. Special Case of a Stripping Reaction

"Comparison of the Differential Cross Sections for the (d,p) and (d,t) Reactions," by A. B. Kurepin and V. G. Neudachin, Institute of Nuclear Physics, Moscow State University, Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1725-1730

The (d,t) reaction is regarded as a special case of a stripping reaction between two complex systems. The reduced widths derived from the (d, t) and (p,d) reactions by choosing various triton wave functions are compared. The neutron wave function relative to the deuteron in triton when yields best agreement with the experiments is found. A value ≈ 0.40 is derived for the probability to find the triton in the "deuteron + neutron" state.

126. Nucleon-Nucleon Scattering

"Nucleon-Nucleon Scattering in High Angular Momentum States," by A. F. Grashin, Moscow Engineering Physics Institute; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1717-1724

The properties of the one-pion exchange approximation of nucleon-nucleon elastic scattering are considered in detail. The scattering phase shifts are computed. A new procedure for phase shift analysis is suggested which should lead to a reduction of the multiplicity of the solution and permit one to obtain more accurately the experimental phase shifts.

127. Generation of π -Mesons

"Generation of π -Mesons by High Energy Cosmic Ray Alpha-Particles," A. A. Loktionov and Zh. S. Takibayev, Institute of Nuclear Physics, Academy of Kazakhstan SSR, Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1697-1702

The experimental data are compared with the hydrodynamical theory of multiple meson production. It is shown that for showers with an energy ≥ 10 Bev per nucleon, the results of an analysis of the observed star parameters do not contradict the concept of an interaction between the incident alpha-particle and a "tunnel" consisting of the nucleons of the target nucleus.

128. Increase in Cosmic Ray Intensity

"A Case of Sharp Increase of Cosmic Ray Intensity in the Stratosphere," by N. P. Rymko, V. F. Tulinov, and A. N. Charakhch'yan, Physics Institute imeni Lebedev, Academy of Sciences USSR, Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 6, No 6, Jun 59, pp 1687-1689

An increase of the intensity of the cosmic radiation was observed in the stratosphere on 8 July 1958 at a latitude of 64°N . At an altitude of 30 km the intensity was more than twice the normal value. On the other hand, at latitudes of 51° and 41° no increase was observed.

129. Depolarization of μ^+ -Mesons

"Depolarization of μ^+ -Mesons in Photographic Emulsions," by A. O. Vaysenberg, N. V. Rabin, and V. A. Smirnitskiy, Institute of Theoretical and Experimental Physics, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1680-1686

The asymmetry coefficient in $\pi^+ - \mu^+ - e^+$ -decay has been measured in an ordinary and diluted NIKFI-R emulsion, and in the same emulsion placed in a strong magnetic field. An analysis of the results obtained and also of those contained in the literature indicates that the asymmetry coefficient in the NIKFI-R emulsion ($a = -0.077 \pm 0.012$) is significantly smaller than that for the Ilford G-5 emulsion ($a = -0.139 \pm 0.014$). A two-fold dilution of the NIKFI-R emulsion with gelatin leads to a sharp increase of the asymmetry coefficient ($a = -0.127 \pm 0.028$). The polarization in the NIKFI-R emulsion is restored by application of a magnetic field, the asymmetry coefficient being increased up to $a = -0.28 \pm 0.02$ at a field strength of 17,000 G.

130. Distribution of π^0 -Mesons

"Reaction of $p + p \rightarrow p + \pi^0$ in the Energy Range From the Threshold to 665 Mev," by A. F. Dunaytsev and Yu. D. Prokoshkin, Joint Institute of Nuclear Research; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1656-1671

The angular distribution of π^0 -mesons produced in proton-proton collisions have been investigated at 400 - 665 Mev. The distributions were found to be close to isotropic in agreement with the phenomenological resonance theory of S. Mandel'shtam (Proc Roy Soc, A 244, 491, 1958). The total cross sections were measured in the energy range 313 - 665 Mev. At energies above 400 Mev, the main contribution to the reaction cross section is given by the resonant transitions. At the lower proton energies the non-resonant Ss-transition becomes essential, its contribution to the total cross section being $0.032 \eta_m^2 \cdot 10^{-27} \text{ cm}^2$. The comparison of the measured cross sections of neutral and charged pion production with those calculated from the resonance theory makes it possible to conclude that the transition with the total angular momentum $J = 2$ is preferential.

131. 660 Mev Proton and Nuclei Interaction

"Interaction Between 660 Mev Protons and Atomic Nuclei and the Nuclear Internal Momentum Distribution of Nucleons," by L. S. Azhgirey, I. K. Vzorov, V. P. Zrelov, M. G. Meshcheryakov, B. S. Neganov, R. M. Ryndin, and A. F. Shabudin, Joint Institute of Nuclear Research; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59 pp 1631-1649

An investigation is carried out on the angular distribution and (by magnetic analysis) on the energy spectra of secondary particles (mainly protons with energies ≥ 60 Mev) emitted at angles of 7, 12.2, 18, 24, and 30° in reactions between 660 Mev protons and the nuclei of Be, C, Cu, and U. The cross sections for the emission of such secondary charged particles increase with decrease of the angle. In the order of decreasing energy the various spectral regions of all investigated elements correspond respectively to diffractive scattering of protons on nuclei (in the small angle region), single quasi-elastic proton-nucleon collisions, π - meson production on bound nucleons, and intranuclear cascade.

The experimental energy spectra for single quasi-elastic proton-nucleon scattering are compared with the spectra computed in the impulse approximation under various assumptions regarding the momentum distributions of the nucleons in the nuclei. The Be and C data are consistent with a Gaussian nucleon momentum distribution with a $1/e$ value at an energy of approximately 20 Mev.

132. Instant Spectrum of the Hard Component of Cosmic Rays

"Instant Spectrum of Particles of the Hard Component of Cosmic Rays at an Altitude of 9 Km," by L. T. Baradzey, M. V. Solov'yev, Z. I. Tulinova, and L. I. Filatova, Institute of Nuclear Physics, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1617-1620

With the aid of a cloud chamber in a magnetic field the instant spectrum of particles of the hard component of cosmic rays has been obtained at an altitude of 9 km for momentum values lying between $0.3 \cdot 10^9$ and $6 \cdot 10^9$ ev/c. In the indicated momentum range the particles were separated with respect to charge. It is found that in the $(1-5) \cdot 10^9$ ev/c instant range protons comprise (50 ± 10) percent of the total number of particles.

133. Scattering Amplitudes Analysis

"The Possibility of Determining the $\pi - \pi$ Scattering Amplitudes by Analysis of the $\gamma + p \rightarrow N + \pi + \pi$ Reactions Near the Threshold," by A. A. Ansel'm and V. N. Gribov; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1890-1893

It is shown that a study of the $\gamma + p \rightarrow p + \pi^+ + \pi^-$, $p + \pi^0 + \pi^0$, $n + \pi^+ + \pi^0$ reactions near their threshold should permit one to determine the scattering amplitudes of π -mesons on π -mesons for zero energy if the meson-meson interaction is of a resonance nature, and to determine a certain combination of these amplitudes if the interaction is not of a resonance nature.

Plasma Physics

134. Acceleration of Plasma

"Acceleration of Plasma Clusters by High Frequency Electromagnetic Fields," by M. A. Miller, Radiophysical Institute of Gor'kiy State University, Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1909-1917

It is shown that it should be possible to accelerate clusters of a completely ionized quasi-neutral plasma located in a moving high frequency potential well. If the well is formed by the fields of two waves of different frequency it can be accelerated only by changing the frequency of one of the waves or by employing wave guides of varying cross section. Some peculiarities of linear and cyclic plasma accelerators are considered.

135. Relativistic Magnetohydrodynamics

"Theory of Relativistic Magnetohydrodynamic Waves," by I. A. Akhizer and R. V. Polovin, Physicotechnical Institute, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1845-1852

One-dimensional simple waves in relativistic magnetohydrodynamics and relativistic hydromagnetic discontinuities (contact, tangential, Alfvén, fast and slow shock waves) are considered. The Zemplén theorem is proved for shock waves of arbitrary intensity.

136. Motion of a Plasma Loop

"The Motion of a Plasma Loop in Axially Symmetrical Magnetic Fields," by L. M. Kovrizhnykh, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1834-1838

Some problems related to the dynamics of a plasma loop located in an inhomogeneous axially symmetrical magnetic field are considered.

137. Radiation of a Moving Charge

"The Radiation Force in the Motion of a Charge in a Medium," by V. L. Ginzburg and V. Ya. Eydman, Radiophysics Institute of Gor'kiy State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1823-1833

The radiative force is computed for a charge moving in a medium which, in the general case, is considered to be anisotropic and gyrotropic. The radiative force in a medium can play a significant role when the particle moves in a magnetoactive plasma, in channels and slits in dielectrics, and also in wave guides. At velocities larger than the phase velocity of light in the medium the radiative force which changes the amplitude of the oscillations and which is related to the emission of anomalous Doppler frequencies, possesses a different sign than that of radiative friction due to the emission of normal Doppler frequencies. The total radiative force which is responsible for the change in the amplitude of the oscillations of a particle in an isotropic medium corresponds to friction also in the case of superlight motion. However this friction may be appreciably smaller than the radiative friction encountered at sublight velocities. In an anisotropic medium, amplification of the oscillations may occur instead of friction. The decrease of the radiative friction or the appearance of the amplification may be related to the peculiarities of the anomalous Doppler effect as revealed by a quantum mechanics analysis and also to the instability of the superlight particle beams.

138. Magnetohydrodynamic Waves

"Cylindrical and Plane Magnetohydrodynamic Waves," by K. P. Stanyukovich, Higher Technical School imeni Bauman; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1782-1787

Cylindrical waves produced in a conducting medium by a magnetic field are considered. The two cases when the field is directed along the Z axis and along the angle φ are analyzed. Special attention is paid to "sound" waves as well as to those possessing velocities close to that of light.

139. Parameters of High-Temperature Plasma

"Spectroscopic Investigations of Powerful Pulsed Discharges in Hydrogen. III. Determination of the Parameters of a High-Temperature Plasma," by S. Yu. Luk'yanov and V. I. Sinitsyn; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1621-1624

Results of spectroscopic measurement of the parameters of a high-temperature plasma are presented. It is shown that at the moment of maximal constriction the density of the charged particles at the axis of the discharge is 35—40 times greater than the initial density of the neutral atoms. The ion temperature in this case attains a value of 1—2 million degrees.

Solid State Physics

140. Ginzburg-Landau Equations of Superconductivity

"The Microscopic Deduction of the Ginzburg-Landau Equations in the Theory of Superconductivity," by L. P. Gor'kov, Institute of Physical Problems, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1918-1923

It is shown that the phenomenological Ginzburg-Landau equations are valid in superconductivity theory in the London temperature range near T_c . A doubled electron charge, however, is involved in the theory, this being related to the physical meaning of $\psi(x)$ as the wave function of Cooper pairs. The constant χ is found to be small. The problem of the surface energy on the boundary between the normal and superconducting phases near T_c is discussed.

141. Cherenkov Radiation

Transition Radiation and the Vavilov-Cherenkov Radiation," by V. Ye. Pafomov, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1853-1858

The angular distribution of the radiation emitted by a charged particle passing through the boundary between vacuum and an isotropic ferroelectric and between vacuum and a dielectric crystal is considered. It is shown that the radiation significantly depends on the sign of the group velocity. Transition radiation is considered in connection with those peculiarities of the Vavilov-Cherenkov radiation which occur in crystals and also in isotropic media in the frequency range with a negative group velocity. The "reverses" Doppler effect is considered.

142. Thermal Conductivity of Superconductors

"Effect of Anisotropy on the Thermal Conductivity of Superconductors," I. M. Khalatnikov, Institute of Physical Problems, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1818-1822

The electron part of the thermal conductivity of superconductors is calculated with consideration of anisotropy. It is shown that for uniaxial crystals the temperature dependence of the thermal conductivity may be different along different crystallographic axes.

143. Van Der Waals Forces

"Van Der Waals Forces in an Inhomogeneous Dielectric," by I. Ye. Dzyaloshonskiy and L. P. Pitayevskiy, Institute of Physical Problems, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1798-1805

The nonadditive part of the free energy of an inhomogeneous dielectric caused by long wave fluctuations of the electromagnetic field in it is computed by aid of the diagram technique. The corresponding part of the stress tensor (stress tensor of Van der Waals forces) is also computed. Formulas for Green's functions of the electromagnetic field in an absorbing medium are also presented.

144. Conductivity Electrons in Diamond-Type Crystals

"Electrical, Optical, and Elastic Properties of Diamond-Type Properties of Diamond-Type Crystals. IV. Interaction Between Conductivity Electrons and Lattice Vibrations," by V. S. Mashkevich, Kiev Polytechnic Institute; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1736-1742

The interaction between conductivity electrons and lattice vibrations due to the polarization related to them is considered. The possibility of existence of polaron states is investigated. The electron mobility is evaluated.

145. Electron-Spin Resonance of F-Centers

"Contribution to the Theory of Electron-Spin Resonance of F-Centers in Crystals With NaCl-Type Lattices," by L. A. Shul'man, Tadzhiik State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1709-1716

Two F-center models are employed: the De Boer model and the Hilsch-Pohl model. The wave function of the ground state of the F-center is set up for each of the models (molecular orbit approximation). The hyperfine interaction between the F-center electron and magnetic moments of the nuclei of the first and second coordinational spheres is considered. The coupling constants for the corresponding spin Hamiltonian are computed. Paramagnetic resonance absorption of radio frequencies of F-centers is considered. The shape and width of the absorption band are obtained. The theory is found to agree with the experimental data for the KCl crystal.

146. Neutronographic Study of Mn and Fe Carbonates

"Neutronographic Investigation of the Antiferromagnetism of Mn and Fe Carbonates," by R. A. Alikhanov, Institute of Physical Problems, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1690-1696

A method for low temperature neutronography of powders has been developed. The antiferromagnetic structure of $MnCO_3$ and $FeCO_3$ has been investigated. It is shown that in $MnCO_3$ the spins in the antiferromagnetic state lie in the basis plane and symmetry plane. In $FeCO_3$ the spins are directed along the rhombohedral axis. According to Dzyaloshinskii, this should signify that $MnCO_3$ is weakly ferromagnetic, whereas $FeCO_3$ is not.

147. Properties of Gd

"The Magnetic Properties of Gadolinium Oxides," by K. P. Belov, M. A. Zaytseva, and A. V. Fed'ko, Moscow, State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1672-1679

The temperature dependence of the magnetic properties of gadolinium ferrites with garnet and perovskite structures and also of gadolinium manganite has been measured. It is found that at the compensation point and Curie point there is an anomalous growth of the coercive force and a very small paraprocess in garnet-ferrite. There is also an anomaly in the behavior of the temperature dependence of magnetostriction. The perovskite gadolinium ferrite possesses a weak ferromagnetism of the hematite type. After heating the sample in a field above the Curie point the magnitude of this ferromagnetism increases. Gadolinium manganite has paramagnetic properties, but in the region of helium temperatures magnetic hysteresis phenomena are observed.

148. Galvanometric Phenomena in Cr

"Investigations of Galvanometric Phenomena in Chromium at Low Temperatures," by Ye. S. Borovik and V. G. Volotskaya, Physico-technical Institute, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1650-1655

The Hall effect and variation of the resistance of chromium is studied in magnetic fields up to 27,000 Oe at temperatures of from 4.2 to 78°K. The concentrations and mobilities of the electrons in chromium are calculated from the data obtained. A preliminary investigation of the properties of zirconium has been carried out.

149. Plastic Deformations of Rock Crystals

"Investigation of the Initial Stages of Plastic Deformation of Rock Salt Crystals," by R. I. Garber and L. M. Polyakov, Physicotechnical Institute, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1625-1630

Plastic deformation processes in rock salt involving the formation of elementary displacements which constitute a special deformation state are investigated. Further deformation leads to the formation of single gliding bands. The activation energy required for annealing of the residual stresses in the elementary displacements is twice as small as that of the slipping bands. Additional attenuation of light has been detected near the traces of the elementary displacements. It is suggested that this is due to the effect of the line inhomogeneities which are oriented differently on both sides of each trace. Some traces of elementary displacements have been found to contract after the load is removed as in the case of elastic twins of sodium saltpeter. The trace of the elementary displacement on the lateral surface of the crystal has been found to have a smooth profile which extends over 1,500 Å. This smooth profile can be satisfactorily explained by the effect of surface tension forces which are in thermodynamic equilibrium with the additional residual strains stresses.

150. Sound Absorption in Superconductors

"Problem of Thermal Conductivity and Sound Absorption in Superconductors," by V. Z. Kresin, Moscow State Pedagogical Institute; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1947-1948

The problem of sound absorption in superconductors in the case when $\omega\tau \ll 1$ (ω - the frequency of sound, and τ the time of relaxation) is analyzed. When in such a sound field, the electron is a lattice with a slightly modified constant. The absorption of the sound energy occurs because of the irreversibility of the lattice deformation process.

Theoretical Physics

151. Five-Dimensional Space Theory

"Action as a Space Coordinate. X," by Yu. B. Rumer, Institute of Radiophysics and Electronics, Siberian Affiliate of Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1894-1902

The difficulties encountered in five-optics in formulation of the spinor equations are surmounted in the present work. It is shown that the requirement of invariance with respect to physically permissible transformations leads to correct spinor equations.

The requirement of physical permissibility separates subgroups of general transformations of the four-dimensional space-time and gauge transformations from the general transformation group of five-dimensional space. Restriction of the group of permissible transformations does in no means signify in principle invalidity of the five-dimensional conception. The most important feature of the five-dimensional theory is the periodic dependence of the fields on the action coordinate with a period of h . This fact and also the consequences from it cannot be reduced to a simple unification of the four-coordinate point transformation group and the gauge transformation group. An essentially five-dimensional effect is also the existence of the scalar χ - field whose appearance in the theory of the field of a charged material particle yields formulas which differ from those of present-day gravitation theory.

152. Expansion of a Wave Function in Series

"Theory of Scattering Via Quasi-Stationary States," by V. I. Serdobol'skiy, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1903-1908

A continuous spectrum wave function which describes S-scattering is expanded in a series in terms of a set of quasi-Stationary wave functions with complex energy. The validity of the expansion is demonstrated by investigating the analytical properties of the solution. The dispersion formulas obtained are somewhat more convenient for expressing the dependence of the cross section on energy than are those in previous theories.

153. Deviations From Coulomb Law

"Radiative Deviations From the Coulomb Law at Small Distances," by V. G. Vaks; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1882-1889

Radiative corrections to the Dirac equation in a coulomb field are considered for distances $r \ll \hbar/mc$. The calculations are carried out in the first order in e^2 and in the second order in Ze^2/mc . The resultant change in the coulomb singularity of the wave functions turns out to be small and only with difficulty can be differentiated from the effect due to the finite dimensions of the nucleus.

154. Exciton in Polar Crystals

"The Mean Free Path of the Exciton in Polar Crystals," by A. V. Tulub, Leningrad State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1859-1868

An intermediate-coupling calculation of exciton-phonon scattering has been carried out by expressing the scattering amplitude according to F. Low (Phys Rev, 97, 1392, 1955) in terms of matrix elements between exact eigenstates of the Hamiltonian. These eigenstates correspond to the initial and final states of the scattered exciton. The basic approximation made is the use of Haken's (Zsf Phys, 146, 527, 1956; Fortschritte der Physik, VI; 7/8, 1958) exciton wave functions for these initial and final states. Calculations are made in detail for the case of large quantum numbers and for the ground state of the exciton. The mean free path of the exciton remains finite also in the case when the electron and the hole effective masses are the same.

155. Lattice-Spin Relaxation

"Contribution to the Theory of Lattice-Spin Relaxation," by K. A. Valiyv, Kazan Pedagogical Institute; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1743-1749

A theoretical analysis is made for relaxation in systems containing two types of interacting spins and with very different lattice relaxation periods. The correlation function method is applied to rapidly relaxing spin variables of the system.

156. Resonance Exciton Transfer

"Effect of Resonance Excitation Transfer in the Theory of a Large Radius Exciton," by E. I. Rashba, Institute of Physics, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 6, Jun 59, pp 1703-1708

A theory for large radius excitons is proposed which takes into account coulomb as well as resonance interaction. Transition to a continuum performed under certain assumptions leads to an integro-differential equation which contains a nonrelativistic contact term.

IX. MISCELLANEOUS

157. Hungarian Scientists Rewarded

"Awards" (unsigned article); Budapest, Akademiai Kozlony,
15 Jan 59

The President of the Hungarian Academy of Sciences has recognized the following persons for their outstanding scientific research or successful scientific organization work done in 1958 they have been awarded the sums indicated:

Ireneusz Juvancz, pro tempore chief of the Biometrics Department of the Mathematics Research Institute, 3,000 forints.

Gyorgy Kuruca, deputy director of the Central Physics Research Institute, 3,000 forints.

Imre Biacsi, deputy director of the Agricultural Research Institute, 2,000 forints.

Dr Tibor Valyi-Nagy, pro tempore chief of the Antibiotics Department of the Experimental Medical Sciences Research Institute, 5,000 forints.

Ervin Stark, deputy director of the Experimental Medical Sciences Research Institute, 3,000 forints.

Sandor Baranya, deputy director of the Technical Physics Research Institute, 3,000 forints.

Frigyes Komuves, director of the Signal Technology Industrial Research Institute, 4,000 forints.

Ferenc Nagy, deputy director of the Central Chemical Research Institute, 4,000 forints.

Otto Tokes, chief of the Secretariat of the Presidium [of the Hungarian Academy of Sciences], 5,000 forints.

Peter Vas-Zoltan, chief of the International Contacts Department [of the Hungarian Academy of Sciences], 3,000 forints.

Barna Gujdi, chief of the Personnel Department [of the Hungarian Academy of Sciences], 3,000 forints.

158. Technical and Scientific Libraries in Hungarian Universities

"Situation and Tasks of University Institutional Libraries,"
by Laszlo Mora, Central Library of the Budapest Technical
University; Budapest, Felsooktatasi Szemle, Vol VIII, No 4,
Apr 59, pp 237-242

The institutional libraries in Hungary are now in the process of being centralized; i.e., catalogues are being prepared and the central library of the university is given the job of administering them as branch libraries. At present, 10-15 percent of the university institutional libraries are completely centralized and another 10-15 percent are still completely independent, both from the central library and from one another. The following two tables reflect the general situation of library growth.

Status of Specialized University Libraries in Hungary (end of 1958)

<u>Type of University</u>	<u>Location</u>	<u>No of Institutional Libraries</u>	<u>Total No of Volumes</u>
Science	Budapest	83	640,000
"	Szeged	46	240,000
"	Debrecen	40	150,000
"	Pecs	42	140,000
Economics	Budapest	25	40,000
Technical	Budapest	109	280,000
"	Miskolc	23	43,000
"	Sopron	16	22,000
"	Veszprem	13	5,000
Agricultural	Godollo	35	60,000
Medical	Budapest	45	120,000

Institutional Libraries of Technical Universities in Budapest (1957 data)

<u>Type of School</u>	<u>No of Institutional Libraries</u>	<u>Average No of Volumes</u>	<u>Average Yearly Increase in Volumes</u>
Mechanical engineering	30	2,766	283
Chemical engineering	15	2,600	186
Electrical engineering	17	1,835	150
Architectual engineering	13	4,538	402
Engineering	15	3,456	325
Transportation engineering	8	2,520	283

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