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**UNCLASSIFIED SCIENTIFIC INFORMATION
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CENTRAL INTELLIGENCE AGENCY

SCIENTIFIC INFORMATION REPORT



20 February 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

Table of Contents

	<u>Page</u>
I. Chemistry	1
Chemistry and Technology of Fuels and Propellants	1
Nuclear Fuels and Reactor Construction Materials	3
Industrial Chemistry	8
Isotopes	15
Organic Chemistry	16
Pesticides	19
Physical Chemistry	24
Radiation Chemistry	33
Radiochemistry	35
II. Electronics	36
Communications	36
Wave Propagation	37
Instruments and Equipment	38
Components	39
Computers	41
Acoustics, Audio Frequencies	42
Reliability	43
Patents	44
III. Engineering	47

	<u>Page</u>
IV. Mathematics	48
Approximation Theory	48
Biharmonic Functions	54
Cybernetics	55
Numerical Analysis	56
Probability Theory	57
V. Medicine	58
Bacteriology	58
Epidemiology	61
Immunology and Therapy	61
Pharmacology and Toxicology	67
Physiology	68
Public Health, Hygiene and Sanitation	71
Miscellaneous	78
VI. Metallurgy	83
VII. Physics	85
Atomic Energy	85
VIII. Miscellaneous	93

I. CHEMISTRY

Chemistry and Technology of Fuels and Propellants

1. Book on Reaction Engine Fuels

Reaktivnyye Topliva (Reaction Engine Fuels), by N. A. Ragozin, Doctor of Technical Sciences, Gostoptekhizdat, Moscow, 1959, 8 printed sheets, 15,000 copies, price 5 rubles (announced in Tematicheskii Plan Vypuska Izdaniy Na 1959 God, Gostoptekhizdat, Moscow, No 2, Aug 58, p 18, Item No 79)

CPYRGHT

"This book will serve the needs of engineering and technical personnel of the petroleum conversion industry, engineers concerned with the operation of reaction engines, and designers of reaction engines.

"The book describes methods for the production of fuels for different reaction engines, reaction engine fuels used in the USSR and abroad, the properties of these fuels, the conditions under which the fuels burn in engines, operational characteristics, and rules for the storage and testing of fuels.

"The book will appear in the third quarter of 1959."

2. The Behavior of Liquid Fuels at Low Temperatures

Primeneniye Zhidkikh Topliv Pri Nizkikh Temperaturakh (Application of Liquid Fuels at Low Temperatures), by B. A. Englin, Candidate of Technical Sciences, Gostoptekhizdat, Moscow, 1959, 5 printed sheets, 15,000 copies, price 2 rubles 50 kopecks (announced in Tematicheskii Plan Vypuska Izdaniy Na 1959 God, Gostoptekhizdat, Moscow, No 2, Aug 58, p 19, Item No 80)

CPYRGHT

"This booklet will serve the needs of engineers of petroleum conversion plants and engineering and technical personnel concerned with automotive, water, and air transportation involving the operation of engines at low temperatures (e.g., in the winter, in Arctic regions, and at high altitudes).

"The booklet describes the behavior of liquid fuels (reaction engine, aviation, automotive, and diesel fuels) at low temperatures, the changes to which fuels are subjected under the conditions in question (formation

of ice crystals, increases in viscosity, separation of paraffin wax etc.), and measures which must be taken in connection with the storage, pumping, and application of fuels in the North and with the operation of aircraft engines at high altitudes.

"The booklet will be published in the third quarter of 1959."

3. USSR Book on the Production of Hydrogen To Be Published

Osnovy Proizvodstva Vodoroda (Fundamentals of the Production of Hydrogen), by Engr V. B. Ioffe, Gostoptekhizdat, Leningrad, 1959, 20 printed sheets, 20,000 copies, price 11 rubles 50 kopecks (announced in Tematicheskii Plan Vypuska Izdaniy Na 1959 God, Gostoptekhizdat, Moscow, No 2, Aug 58,) p 12, Item No 68)

"This book is of great interest to a wide circle of specialists active in the chemical and petroleum conversion industries, as well as in other branches of the national economy. It will also serve the needs of students at higher educational institutions.

"The book discusses present-day methods for the production and purification of hydrogen, problems pertaining to the operation of hydrogen installations, and safety procedures. Extensive reference material is included in it.

"The book will appear in the third quarter of 1959."

4. Stability of Petroleum Oils and Synthetic Oils to Air Shock

"Stability of Petroleum Oils and Synthetic Oils to Air Shock," by S. E. Kreyn and O. P. Makasheva; Moscow, Khimiya i Tekhnologiya Topliv i Masel, Vol 3, No 8, Aug 58, pp 9-15

The stability of petroleum oils to air shock is not connected with their stability to oxidation. It does not depend on the group chemical composition, but is substantially determined by the fractional composition or the vapor tension of the oil. The most stable oils to air shock are those which exhibit a high viscosity (oils of the types MK-22, MS-20, and others). However, these oils are not satisfactory from the standpoint of operation at low temperatures. Oils with a low viscosity are not resistant to air shock. Making these oils more viscous by means of additives does not increase their stability toward air shock.

Testing of synthetic oils showed that some esters of pentaerythritol and diethylene glycol with fatty acids have the highest resistance to air shock. Oils obtained on the basis of these products are equivalent to highly viscous petroleum oils as far as resistance to air shock is concerned. Furthermore, these synthetic oils are superior to petroleum oils with respect to suitability for use at low temperatures.

Thickening of pentaerythritol and diethylene glycol esters with vinipol and particularly with polymethacrylates results in oils with advantageous viscosity-temperature characteristics and a high stability toward air shock.

Chemistry and Technology of Nuclear Fuels
and Reactor Construction Materials

5. The Mechanical Properties of Uranium

"Mechanical Properties of Uranium," by G. Ya. Sergeyev, V. V. Titova, Ye. M. Savitskiy, A. A. Zhul'kova, and Z. P. Nikolayeva; Moscow, Atomnaya Energiya, Vol 5, No 6, Dec 58, pp 618-623

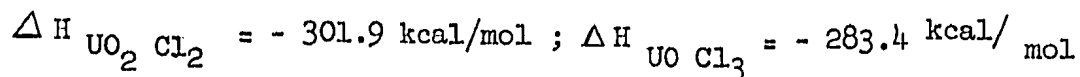
This article describes the results of mechanical testing of uranium at room temperature and elevated temperatures. Data are given on the hardness of uranium in the temperature range of 20-600° C, the extrusion pressure in the regions of the alpha and gamma phases, the mechanical properties exhibited when the metal is subjected to tension, and the impact ductility at the temperatures corresponding to alpha, beta, and gamma phases. It was established that the individual grains of large-grained uranium behave anisotropically in mechanical testing. It was furthermore established that allotropic changes and differences in the crystal structure of uranium modifications exert a pronounced effect on the mechanical properties. The dependence of the mechanical properties on the content of carbon in uranium was established.

6. The Heats of Formation of Uranyl Chloride and Uranium Monoxytrichloride

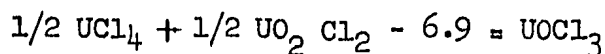
"Concerning the Heats of Formation of Uranyl Chloride and Uranium Monoxytrichloride," by S. A. Shchukarev, I. V. Vasil'kova, N. S. Martinova, and Yu. G. Mal'tsev; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 12, Dec 58, pp 2647-2650

The heat of solution of $FeCl_3$ in a 2% solution of HCl at 25° in a dilution of 1: 1760 was determined. The heat of formation of this salt in the same solution was also determined. The heats of solution of UCl_4 , UO_2Cl_2 , and $UOCl_3$ in a solution containing 0.5% of $FeCl_3$ and 2% of HCl were determined.

The standard heats of formation of uranyl chloride and uranium monoxytrichloride from the elements were determined and found to be



The thermal effect of the synthesis of uranium monoxytrichloride from uranyl chloride and uranium tetrachloride by the reaction



was calculated.

7. Heats of Formation of Uranyl Bromide and Uranium Monoxytribromide

"Heats of Formation of Uranyl Bromide and Uranium Monoxytribromide," by S. A. Shchkarev, I. V. Vasil'kova, and V. M. Drozdova; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 12, Dec 58, pp 2651-2653

The heats of dissolution of UO_2Br_2 and UOBr_3 in a solution containing 0.5% FeCl_3 and 2% HCl were determined. On the basis of the data that were obtained in work involving synthesis of the two compounds investigated, the standard enthalpies of the formation of these compounds were calculated.

8. Precipitation of Uranyl Ions With Lithium Ferrocyanide

"Amperometric Investigation of the Reaction of Precipitation of Uranyl Ions With Lithium Ferrocyanide," G. A. Kleyb; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 12, Dec 58, pp 2621-2629

By using the method of amperometric titration, the reaction of the precipitation of uranyl ions with ferrocyanide ions in the presence of lithium ions was investigated. It was found that, depending on the conditions of precipitation, the normal uranyl ferrocyanide $(\text{UO}_2)_2 [\text{Fe}(\text{CN})_6]$ or the double salts $5 (\text{UO}_2)_2 [\text{Fe}(\text{CN})_6] \cdot \text{Li}_4 [\text{Fe}(\text{CN})_6]$ and $5 (\text{UO}_2)_2 [\text{Fe}(\text{CN})_6] \cdot 2 \text{Li}_4 [\text{Fe}(\text{CN})_6]$ may form. Both double salts are incongruently dissolving compounds.

9. Properties of the 8-Hydroxyquinoline Salt of Uranyl

"Investigation of the System Uranyl Nitrate - 8-Hydroxyquinoline-Water by the Solubility Method," by A. Ye. Klygin and N. S. Kolyada; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 12, Dec 58, pp 2767-2770

The solubilities of 8-hydroxyquinoline at 25° in the range of $p_H = 4-11$ were investigated and the dissociation constants of this substance determined. The following values for the dissociation constants were found:

$$K_1 = \frac{[H^+][HR]}{[H_2R^+]} = 8.66 \times 10^{-6} ; K_2 = \frac{[H^+][R^-]}{[HR]} = 1.76 \times 10^{-10}$$

The solubilities of the uranyl salt of 8-hydroxyquinoline at different p_H values were determined. On the basis of the data obtained in regard to these solubilities; the solubility product of the salt was calculated and found to be equal to $P = [UO_2^{2+}][R^-]^2 [HR] = (1.9 \pm 0.5) \cdot 10^{-29}$ at 25°.

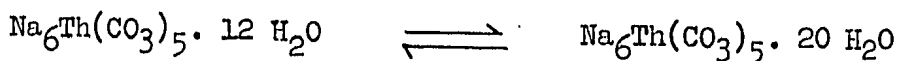
8-hydroxyquinoline is a group reagent for the precipitation of a number of metal ions. In the presence of ethylenediaminetetraacetic acid, it becomes a specific reagent for the precipitation of the uranyl ion.

10. Hydrates of Sodium Pentacarbothoreate

"On the Hydrated Modifications of Sodium Pentacarbothoreate," by I. I. Chernyayev, V. A. Golovnya, and A. K. Molodkin; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 12, Dec 58, pp 2671-2685

The syntheses of powdered $Na_6Th(CO_3)_5 \cdot 12 H_2O$ proposed by R. T. Cleve and A. Rosenheim and his collaborators have been repeated under somewhat different conditions. New methods for the synthesis of crystalline $Na_6Th(CO_3)_5 \cdot 20 H_2O$ and $Na_6Th(CO_3)_5 \cdot 12 H_2O$ were developed. A new method for the synthesis of $Na_6Th(CO_3)_5 \cdot 5 H_2O$ has been worked out. Sodium pentacarbothoreate was characterized by preparing the barium and calcium derivatives $Ba_3Th(CO_3)_5 \cdot 7 H_2O$ and $Ca_3Th(CO_3)_5 \cdot 7 H_2O$. By employing the method of heating curves, the thermal stability of $Na_6Th(CO_3)_5 \cdot 20 H_2O$ and $Na_6Th(CO_3)_5 \cdot 12 H_2O$ was investigated. It was established that, above 100° both hydrates are transformed into anhydrous $Na_6Th(CO_3)_5$, while above 300° two molecules of carbon dioxide are eliminated with the formation of ThO_2 and Na_2CO_3 .

The capacity for the mutual transformation of hydrates in mother liquors according to the scheme



was noted. Some crystallographic properties of these two hydrates were determined. The indices of refraction were determined and syngony of the crystals established.

The behavior of sodium pentacarborthoreate toward water, alkalis, acids, some organic solvents, and salts was investigated.

It was established that the water molecules in sodium pentacarborthoreate are not equivalent as far as the strength of the bonds which hold them in the complex is concerned. The last water molecule is retained with the greatest force. It is assumed that the coordination number of thorium in sodium pentacarborthoreate is equal to 6 and that every carbonate ion occupies a single coordination point. Accordingly, a new structural formula for sodium pentacarborthoreate is proposed, viz., $\text{Na}_6[\text{Th}(\text{CO}_3)_5 \cdot \text{H}_2\text{O}] (n-1) \text{H}_2\text{O}$.

11. The Reddening of Rocks Containing Radioactive Minerals

"The Origin of the Reddening of Rocks Which Contain Hydrothermal Uranium Deposits" by E. N. Baranov; Moscow, Atomnaya Energiya, Vol 5, No 6, Dec 58, pp 662-663

On the basis of the author's own investigation and of data published in the literature, the radiation-chemical reactions which lead to the reddening (because of the oxidation of ferrous iron to ferric iron) of rocks containing or surrounding deposits of radioactive minerals are discussed with reference to the fact that this reddening is one of the most commonly used indications in prospecting for uranium and thorium.

12. The Uranoscope

"The Uranoscope, a New Device To Be Used in Prospecting for Ores of Radioactive Elements," by M. K.; Moscow, Atomnaya Energiya, Vol 5, No 6, Dec 58, pp 667

On the basis of paper No 1358 presented by K. Takahashi, N. Katayama, and Motc-o Sato (Japan) at the Second International Conference on Peaceful Uses of Nuclear Energy, Geneva, 1958, the uranoscope, a new device designed by the authors of this paper, is described. It is pointed out that the uranoscope not only records the intensity of radiation, but also indicates the location of the source of radiation, working on the radar principle.

13. Methods for the Production of Beryllium

"Beryllium," by G. A. Meyerson, G. D. Sokolov, N. F. Mironov, N. M. Bogorad, Ya. D. Pakhomov, D. S. L'vovskiy, Ye. S. Ivanov, and V. M. Shmelev; Moscow, Atomnaya Energiya, Vol 5, No 6, Dec 58, pp 624-630

The properties of beryllium metal and the principal methods of producing it are discussed on the basis of results obtained in research done by USSR investigators. The magnesium-thermic reduction of fluoride, the electrolytic production of beryllium, and refining of beryllium by distillation in vacuum are compared.

Different powder metallurgy procedures for the production of parts from beryllium, the technology of melting in induction vacuum furnaces followed by centrifugal casting, investigations on the extrusion of shapes from beryllium, and the structure and properties of compact beryllium are discussed. It was established that samples of pure beryllium obtained by extrusion from hot-pressed batches produced by the vacuum method have a tensile strength of about 20 kilograms per square millimeter at 425°C and exhibit a high ductility, showing an elongation above 20%.

It is concluded that the method of vacuum melting followed by centrifugal casting will find application in cases when parts of large dimensions are to be produced, which cannot be readily made by the powder metallurgy method. When the vacuum method has been perfected, it will presumably be applied extensively in the extrusion of beryllium shapes.

14. Separation of Niobium and Tantalum by the Distillation of Their Pentachlorides

"Separation and Purification of Tantalum and Niobium by the Distillation of Their Pentachlorides; Part 2," by L. A. Nisel'son; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 12, Dec 58, pp 2603-2617

The volatile compounds of tantalum and niobium are considered from the standpoint of their application for the separation and purification of these elements by distillation. Results are reported of a theoretical calculation of the process of distillation of the pentachlorides of tantalum and niobium.

It has been demonstrated that the chlorides subjected to distillation must not contain any oxygen compounds. It was found that this condition can be fulfilled by supplementary chlorination of the initial chlorides with carbon tetrachloride or thionyl chloride under pressure.

Results are reported that were obtained by distilling mixtures of chlorides containing different proportions of tantalum, niobium, and admixtures accompanying these elements. Experiments conducted on a sieve plate column with 25 real plates (17-18 theoretical plates) confirm the correctness of the calculations that have been carried out and the assumption that had been made in regard to the high efficiency of the separation and purification of tantalum and niobium by the distillation of their pentachlorides. The boiling points of the pentachlorides of tantalum and niobium at atmospheric pressure have been determined. They were found to be $234.0 \pm 0.25^\circ$ for tantalum pentachloride and $248.3 \pm 0.25^\circ$ for niobium pentachloride.

[For additional information on nuclear fuels and reactor construction materials, see Item No 20.]

Industrial Chemistry

15. Significance of Current Work on Organoelemental Polymers

"Organoelemental Polymers," by K. A. Andrianov; Moscow, Uspekhi Khimii, Vol 27, No 11, Nov 58, pp 1257-1303

This article, which reviews in detail work on polyorganosiloxanes, organosiloxane-carbon polymers, polyalkylsiloxaneamines, polyalkylsilothianes, polyorganometalsiloxanes containing aluminum, polyorganosiloxanes containing boron (including a discussion of organic compounds of boron in general), polyorganotitanosiloxanes, polyorganosiloxanes containing tin and lead, polyorganosiloxanes containing antimony, polyorganosiloxanes containing germanium (including a discussion of germanium-organic compounds in general), and ferrocenes is prefaced by the following comment:

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"Currently a great interest is being evinced toward organoelemental polymers in connection with increased requirements put to high-molecular compounds on the part of various branches of the national economy and particularly on the part of machine building, the construction of instruments, aviation, rocket technology, and some other fields. Stringent requirements must be fulfilled as far as the thermal stability of polymers is concerned. These requirements are imposed by trends in the development of the fields of technology mentioned above. Let us take power engineering as an example. The expansion in the application of power-generating

equipment and the increased range of applications in this field necessitate production of electrical equipment on a large scale and, in connection with this, the use of large quantities of materials such as copper and magnetic materials.

"In addition to this, the development of aviation, rocket technology, electrification of work done underground, and electrification of the navy demand reduction of the weight and dimensions of electrical equipment. All this makes it necessary for designers to develop machines, equipment, and other electrical engineering devices in which a great amount of power is concentrated while the weight and dimensions are kept small. To solve the problems involved, the designer must increase the current density. This leads to sharp increases in the temperature at which the machines or equipment must operate. One must take into consideration in connection with this that polymers are an important material in the construction of machines, equipment, and, generally speaking, all devices used in connection with the generation of power. Polymers used as dielectrics are the first materials to be exposed to the action of heat evolved by parts of electric equipment which conduct current.

"The use of nuclear energy in power engineering increases to a still greater extent the range of utilization of electric power, while the specific conditions encountered in nuclear power engineering in a number of cases will put increased demands as far as temperatures are concerned which must be withstood by dielectrics. At present the construction of electrical machines and equipment necessitates prolonged exposure of polymers to temperatures of 180° or 200° and exposure for short periods to temperatures of 250°, 300°, 350°, and higher.

"Let us take another example, this time from modern aviation. The velocities at which aircraft are operated increase at a very rapid rate. The speeds at which rapid aircraft land at present result in heating of the tires of landing wheels up to temperatures of 320°. Furthermore, the important problem arises of protecting interplanetary vehicles from the heat which develops on their surface when they pass through the atmosphere at high velocities. In this particular case, heat-resistant polymers must aid in the solution of the problem of interplanetary travel which is placed before science and technology.

"It is known that at velocities of 2,000-3,000 kilometers per hour the temperature of the surface of airfoils may increase up to 300° or higher. This necessitates the application of thermal insulation to assure that the desired temperature is maintained inside the craft or missile.

"Present-day technological methods for the production of articles from metals, for instance, by investment precision casting, involve the application of polymers which must withstand contact with the molten metal. The shaping of metals, including nonferrous metals, also requires the use of polymers as lubricants which must withstand the action of high temperatures.

"The stringent requirements which are put to polymers as far as heat resistance is concerned naturally do not preclude the requirement to the effect that the material must operate satisfactorily at low temperatures down to minus 40° or minus 60°. The necessity therefore arises for synthesizing polymers the operational characteristics of which are satisfactory within an extensive range of temperatures. These polymers, in addition to being heat-resistant, must also exhibit sufficient elasticity, good mechanical characteristics, resistance to moisture, etc. From this standpoint, the synthesis and investigation of the properties of organoelemental compounds acquire great importance, particularly in view of the fact that the first representatives of organoelemental polymers, viz., polyorganosiloxanes, were found to exhibit satisfactory characteristics in this respect. Polyorganosiloxanes have a high heat resistance and are not affected to a significant extent by exposure to low temperatures."

16. Trends in the USSR Synthetic Rubber Industry

"Principal Directions in the Development of the Synthetic Rubber Industry During 1959-1965," by K. A. Yakovlev; Moscow, Kauchuk i Rezina, Vol 17, No 10, Oct 58, pp 1-5

An increase of the production of synthetic rubber by a factor of 3.4 is foreseen. The industrial production of synthetic rubber will no longer be based on the conversion of ethyl alcohol derived from natural products that can be used as foodstuffs. Plants have been built at which synthetic ethyl alcohol is produced from by-product gases of petroleum conversion plants. Toward 1966, the capacity of plants producing synthetic ethyl alcohol will be 2.1 times larger than in 1958. Production of ethyl alcohol from wood and sulfite liquor has also been organized. Production of synthetic rubber from synthetic and hydrolysis alcohol has made it possible not only to save raw materials which can be used as food, but also to reduce the cost of the alcohol.

At present considerable supplies of n-butane have become available, which can be used as raw material for the production of synthetic rubber. This butane will be converted into butadiene and the latter used as raw material for copolymerized oil extended synthetic rubber produced mainly by low-temperature polymerization (type SKMS-30 AM) and also of copolymer lattices.

Production of butadiene from butane is more advantageous than its production from ethyl alcohol.

Only sodium-polymerized butadiene rubber, butadiene-styrene rubber, and methyl-styrene rubber are being produced from butadiene at present. These elastomers cannot satisfy the constantly increasing requirements of the industry with regard to the useful life of tires, stability of the rubber at high temperatures, impermeability to air, stability to gasoline and oil, etc. The tire industry requires synthetic elastomers which are superior to natural rubber, or at least equal to it in quality. A large number of investigators at the All-Union Scientific Research Institute of Synthetic Rubber (VNIISK), the State Institute for the Design and Planning of Rubber Industry Plants (Giprokauchuk), synthetic rubber plants, and the Scientific Research Institute of the Tire Industry (NIISHP) are engaged in work on the solution of problems pertaining hereto. The investigators working in this field envisage the use of raw materials of the natural gas and petroleum industries as crude material for the rubber industry. Advances achieved in the field of the synthesis of monomers and intermediate products for the production of polymers will make it possible to produce under the Seven-Year Plan new types of synthetic rubbers for general and special applications.

To obtain the isoprene necessary for the production of isoprene rubber, which will be a complete substitute for natural rubber and will even be superior to the latter in some respects, one can start with isobutylene and formaldehyde; dehydrogenate isopentane-isopentene; or synthesize isoprene from acetone and acetylene. It is planned to produce isoprene rubber in 1959-65 mainly on the basis of isoprene obtained by the dehydrogenation of isopentane. In comparing isoprene rubber (SKI) with copolymer rubbers, one must take into consideration the qualitative superiority of isoprene rubber and the greater length of service given by rubber articles made of it. Experimental data show that the useful life of tires made of isoprene rubber is greater by 30% than that of tires made of the synthetic elastomers used at present. Although the production of tires from polyisoprene rubber (even when the isoprene is produced from isobutane and formaldehyde) requires a somewhat greater capital investment, this increased investment will pay for itself within a very short period of time (approximately 3 years).

The advantageous characteristics of butyl rubber, particularly its impermeability to gas, should be utilized by making this rubber available in sufficient quantities. Butyl rubber is produced by polymerizing isobutylene together with 2-3% of isoprene. The Seven-Year Plan provides for a development of the production of butyl rubber with the view of fully satisfying the demand for this elastomer on the part of the national economy.

The availability of extensive supplies of cheap isobutane and the development of a process for the dehydrogenation of isobutane to isobutylene make it possible to produce at a low cost butyl rubber with good technical characteristics.

It is more advantageous to produce isobutylene by the dehydrogenation of isobutane than by the dehydration of isobutyl alcohol, even when the isobutyl alcohol is produced by an oxo synthesis starting with propylene, carbon monoxide, and hydrogen.

Articles made of chloroprene rubber are distinguished by a high stability to organic solvents and oil, stability to ozone, incombustibility, stability to the effects of weather and light, resistance to the action of acids and alkalis, impermeability to gas, and advantageous physical and mechanical characteristics. This type of rubber is used extensively. The use of chloroprene latex also increases. Under the circumstances further expansion of the production of chloroprene polymers is necessary. The project of the Seven-Year Plan provides for further improvement of the characteristics of chloroprene rubber and chloroprene latex by producing copolymers of chloroprene with styrene, isoprene, and acrylonitrile and application of low temperature polymerization. At the same time, radical changes are planned in the production of acetylene, which is the principal starting material for the synthesis of chloroprene. At present, acetylene that is used for chemical synthesis is produced from calcium carbide. Introduction of more advantageous methods for the production of acetylene is planned. These methods comprise oxidative high-temperature pyrolysis of methane and electric cracking of gaseous hydrocarbons. Application of these methods will make it possible to lower the cost of acetylene by a factor of 1.5 and to reduce the capital investment which is necessary.

The cost of chloroprene rubber will be lower by 15% than that of copolymerized oil-extended rubber of the type SKMS-30 AM. Furthermore, the lower cost of acetylene will reduce the cost of intermediate products such as the acrylonitrile used for the production of nitrile rubbers.

In addition to a sizable increase in the industrial capacity for the production of elastomers for general applications, the production of different types of synthetic rubber for special applications will be organized. Various branches of the national economy require elastomers which will stand higher temperatures (up to 500°), and exhibit a high stability to chemically aggressive agents, a high resistance to wear, and other advantageous characteristics.

The project of the Seven-Year Plan provides for the production of the following elastomers for special applications:

1. Nitrile rubbers which exhibit a high resistance to gasoline and oil and a relatively high stability at low temperatures.
2. Silicone rubber, which preserves its electrical and dielectrical characteristics within a wide range of temperatures. Silicon elastomers can be used from minus 60° to plus 250°.

3. Butadiene methylvinylpyridine rubber, which exhibits a high stability to gasoline and oil, a high thermal stability, and a high resistance to wear. Articles made of this type of rubber can be used at temperatures up to 180-200°.

4. Butylacryl rubber to be used as material for rubber articles resistant to gasoline, oil, and ether. Rubber of this type can be used at temperatures up to 180-200°.

5. Polyester urathane elastomers which exhibit an exceptionally high resistance to abrasion. These elastomers are to be used for the production of articles and parts that must have an exceptionally high abrasion resistance. Polyester urethanes are promising not only as elastomers for special applications, but also as a mass-produced rubber for general purposes.

6. Butadiene methylvinylpyridine latex to be used for the impregnation of tire cords. Use of this latex increases the adhesion between the cord and the rubber used as material for the tires.

7. Lattices SKS-50 and SKS-65 to be used for the production of foam rubber and water-soluble paints.

The production of the sodium-polymerized butadiene rubber SKB will be curtailed sharply, because this type of rubber is greatly inferior to butadiene-styrene and isoprene elastomers. Some of the synthetic rubber plants now in operation (the Yaroslavl' and Voronezh plants) will produce only copolymer rubber in the future. The quality of the copolymer rubbers will be improved and their variety increased (oil-extended, carboxyl, and carbon-black-filled elastomers will be produced; a more advantageous emulsifier, i.e., wood rosin, will be used; etc.). Similar measures will be taken as far as production of lattices is concerned.

Extensive utilization of petroleum gas and natural gas as initial crude materials for the production of synthetic rubber will make it possible to improve the technical and economic indices of this production and reduce the capital investment, while at the same time the variety of products of this type will be increased and their quality improved.

17. Vulcanization of Rubber By Radiation

"Vulcanization Under the Action of Nuclear Radiation," by Z. N. Tarasova, M. Ya. Kaplunov, B. A. Dogadkin, V. L. Karpov, and A. Kh. Breger, Scientific Research Institute of the Tire Industry; Moscow, Kauchuk i Rezina, Vol 17, No 5, May 58, pp 14-21

The structure and properties of radiation vulcanizates of the rubbers SKB, NK, SKS-30 A, SKS-30 AM, SKI, and mixtures of NK with SKS-30 AM containing fillers were investigated. The vulcanized products were obtained by irradiation with a total dose of 10^7 - 10^8 roentgens in a nuclear reactor or with a Co^{60} source of gamma radiation. It was found that the density

of the vulcanization network formed as a result of irradiation is determined by the dose of absorbed energy, the type and composition of the rubber, the content of fillers in the mixture, the content of softeners and antioxidants, the conditions under which irradiation has been carried out (viz., the medium and temperature), and some other conditions.

It was found that radiation vulcanizates exhibit a thermomechanical stability superior to vulcanizates containing thiuram. In radiation vulcanizates, the relative velocity of strain relaxation depends on the density of the vulcanization network. The relaxation curves are linear. These findings testify to the formation of carbon-carbon cross links. Active carbon black reduces the velocity of chemical relaxation in radiation vulcanizates. During the irradiation of purified rubbers an intensive process of oxidation takes place; as a result, there is a complete loss of unsaturation when the dose of radiation amounts to 60 megaroentgens. In technical rubbers an insignificant degree of formation of oxygen-containing groups is observed. At doses of 60 megaroentgens the content of 1-4 double bonds in technical rubber is reduced by 30%. The conditions under which heavy multilayer samples can be obtained by radiation vulcanization were investigated. It was established that it is possible to produce a homogeneous vulcanization network independently of the thickness of the sample within the limits from 0.1 to 40 millimeters. The conditions under which molding is carried out were found to be important for the production of homogeneous samples.

The physicomechanical and technical properties of rubbers obtained by radiation vulcanization were investigated. It was found that radiation vulcanizates have a superior resistance to thermo-oxidative aging as compared with the best sulfur vulcanizates and that they exhibit a small residual deformation, a low hysteresis, a high resistance to multiple deformations, and a high resistance to heat.

The tensile strength of radiation vulcanizates obtained by applying the right dose of radiation is equal to the tensile strength of the best sulfur vulcanizates.

Vulcanization of tire casings by irradiation has been carried out on an experimental basis. Cobalt-60 was used as a source of gamma radiation and a dose of 50 megaroentgens was applied.

The effect on tire cords of irradiation in a nuclear reactor was investigated; it was found that terylene [dacron] cord is the most resistant.

18. Chinese Presents Procedure for Synthesis of Silicone Rubber

"Preparation of Silicone Rubber," by Chiang Ying-yen (江英彦), Institute of Chemistry, Academia Sinica; Peiping, Kao-fen-tzu T'ung-hsun (Reports on Macromolecules), Vol 2, No 4, 1958, pp 248-249

This article discusses the preparation of silicone rubber by the direct process, using dimethyl dichlorosilane as the starting material, silica as the filler, and benzoyl peroxide as vulcanizing agent. Introductory remarks note that silicone rubber is resistant to temperatures ranging between 250 and minus 80 degrees centigrade and has a tensile strength of at least 50-60 kilograms per cubic centimeter.

[SIR Note: The author gives no bibliography or other source of information, nor does he state that silicone rubber is produced anywhere in China. The cumulative subject index for Volumes 1 and 2 of this journal lists this article under "research reports." Other articles of interest indexed as research reports, which do not necessarily have a bearing on silicone rubber; include the following: "Preparation of Polystyrene Sulfonic Acid Cation Exchange Resins," by Chu Hsiu-ch'ang and Ts'ao Chia-chen, Vol 1, p 51; "Preparation of Isopropyl Benzyl Hydroperoxide," by Yang Jen-chung, Vol 1, p 119; and "Preparation of Isopropyl Benzyl Hydroperoxide," by Kao Pao-yuan and Cheng P'ing, Vol 1, p 173]

Isotopes

19. The Electromagnetic Separation of Platinum Isotopes

"Electromagnetic Separation of Platinum Isotopes," by V. M. Gusev; Moscow, Atomnaya Energiya, Vol 5, No 6, Dec 58, pp 641-642

A method is described whereby the stable isotopes of platinum are separated and enriched electromagnetically after the platinum has been ionized in a gas discharge chamber. The degrees of enrichment are compared with those obtained at the Oak Ridge Laboratory with the use of the electromagnetic separator there. It is pointed out that the electromagnetic method of separation must be applied for the separation of platinum isotopes and isotopes of other elements of the platinum group because all known compounds of these elements are unstable.

Organic Chemistry20. Organophosphorus Research

"Addition of Complete Esters of Phosphorous and Phosphinous Acids to Conjugated Systems. III. Interactions of Trialkylphosphites With Cinnamic, Maleic and Pyruvic Acids," by Gil'm Kamay and V. A. Kukhtin, Tr. Kazansk. Khim-Tekhnol. In-ta (Works of the Kazan' Chemicotechnological Institute), 1957, No 23, 133-137 (from Referativnyy Zhurnal -- Khimiya, No 19, 10 Oct 58, Abstract No 64551 by B. Gilyarov)

CPYRGHT

"As a continuation of the study of the reactions of $(RO)_3P$ (1) with unsaturated acids (cf. Report II, RZhKhim, 1958, 46845) it was established that (1) reacts with $C_6H_5CH=CHCOOH$ and maleic acid to form correspondingly $(RO)_2P(O)CH(C_6H_5)CH_2COOR$ (2) and $(RO)_2P(O)CH(COOH)CH_2COOR$ (3). $(C_2H_5O)_3P$ (1a) and $CH_3COCOOH$ react violently to form $(C_2H_5O)_3PO$. (1a) and $CH_3COOCH=CH_2$ (after 20 hours at $100-120^\circ$) do not react. The data for compound (2) are given in the order: R, yield in %, boiling point in $^\circ C/mm$, n^{20}_D and d_4^{20} : C_2H_5 , 50.5, 189-190/7, 1.4906 and 1.1199; C_3H_7 , 51, 196-197/4, 1.4868, 1.0819; C_4H_9 , 37.1, 208-209/2, 1.4856 and 1.0682; and also for compound (III): C_2H_5 , 17.5, 143-146/0.5, 1.4390 and 1.1446; C_3H_7 , 19.2 157-158/1, 1.4348 and 1.0425."

"The Action of Carbon Tetrabromide on Acid and Neutral Esters of Phosphoric Acid," by Gil'm Kamay and F. M. Kharrasova, Tr. Kazansk. Khim.-Tekhnol. In-ta (Works of the Kazan' Chemicotechnological Institute), 1957 No 23, 127-132 (from Referativnyy Zhurnal -- Khimiya, No 20, 25 Oct 58, Abstract 67569 by V. Gilyarov)

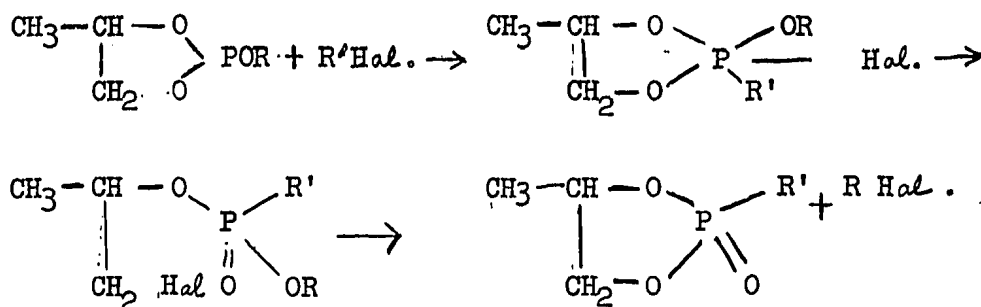
On reacting $(RO)_2P(O)H$ ($R = CH_3$ or C_2H_5) with CBr_4 in ether at a temperature of $\sim 20^\circ$, $CHBr_3$ can be separated. $(C_2H_5O)_3P$ and $(C_4H_9O)_3P$ react violently with CBr_4 ; only C_2H_5Br and C_4H_9Br are separated. From $(C_6H_5O)_2PCl$ or $C_6H_5OPCl_2$ with ROH in the presence of C_5H_5N in ether the following esters are obtained (enumerated are the yield in %, boiling point in $^\circ C/mm$, n^{20}_D , and d_4^{20}): $C_6H_5OP(OCH_3)_2$ (I) 36.6, 86/12, 1.4940, 1.1248; $(C_6H_5O)_2POCH_3$ (II), 47, 169.5-170.5/11, 1.5568, 1.1643; $(C_6H_5O)_2POC_2H_5$ (III), 66.5, 169.5-170/12, 1.5483, 1.1342; $(C_6H_5O)_2POCH_2C_6H_5$ (IV), 61.5, 197.5-198/14, 1.5836, 1.1674. When 15.5 grams of $(C_6H_5O)_3P$ and 15.6 grams of CBr_4 are heated ($100-120^\circ C$, 6 hours in an atmosphere of CO_2), $(C_6H_5O)_2P(O)Br$ (V) is obtained; yield 42.5%, boiling point $198-200^\circ/3mm$, melting point $46-47^\circ$. With 7.25 grams of (I) and 12.9 grams of CBr_4 in ether CH_3Br and $CHBr_3$ are obtained yield 79.4%, and unpurified $(CH_3O)C_6H_5OP(O)Br$, yield 8.6%, n^{20}_D 1.5050, d_4^{20} 1.2162. (II)-(IV) with CBr_4 form RBr and (V).

"On Esters of Propylenel Glycol Phosphorous Acid and Their Conversions," by A. Ye. Arbuzov and N. A. Razumova, Kazan' Chem-icotechnological Institute imeni S. M. Kirov; Moscow, Izvestiya Akademiya Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 9, Sep 58, pp 1061-1069

This article reports the results of the study of the interactions between cyclic esters of propylenel glycol phosphorous acid and alkyl halides (the Arbuzov Rearrangement). As a result of this interaction two types of compounds are formed:

1. cyclic propylenel glycol esters of alkylphosphinic acid;
2. open-chain halide esters of alkylphosphonic acid.

As a result of the study of the rearrangement process, a mechanism of this rearrangement was proposed which can be represented by the following equations:

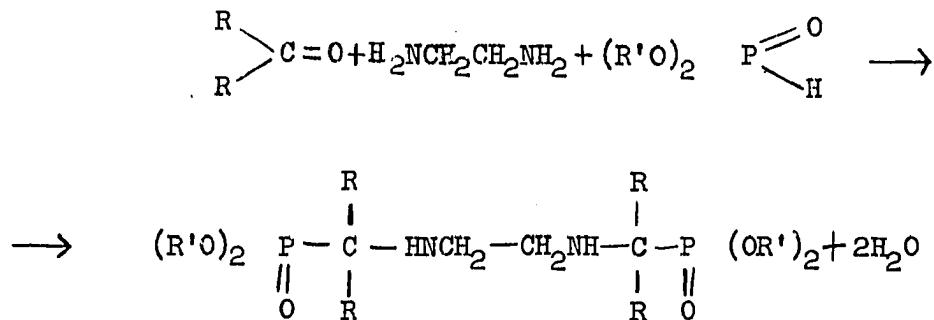


It was established that the process can terminate at the stage of the formation of the halide esters of alkylphosphonic acids depending chiefly on the temperature at which the reaction is carried out.

It is possible that the rearrangement of the alkyl-cyclic esters in some cases proceeds in two parallel ways. The first, according to the scheme assumed for the trialkyl esters of phosphorous acid; and the second, with an intermediate stage of opening of the ring.

"Synthesis and Investigation of the Complex-Forming Capacity of Several Organophosphorus Compounds," by M. I. Kabachnik, T. Ya. Medved', G. K. Kozlova, V. S. Balabukha, M. M. Senyavin, and L. I. Tikhonova, Institute of Organoelemental Compounds, Academy of Sciences USSR; Moscow, Izvestiya Akademiiya Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 9, Sep 58, pp 1070-75

The authors investigated the complex-forming capacities of several alpha-aminoalkylphosphinic acids and derivatives of these acids prepared by them earlier. They also specially synthesized and investigated several ethylenediaminobisphosphinic acids. The latter were obtained by reacting aldehydes or ketones with ethylenediamine and dialkylphosphites:



The esters of ethylenediaminobisphosphinic acid formed in this manner were saponified by the action of hydrochloric acid to the corresponding free acids. Acetone, methylethylketone, propionic aldehyde, and benzaldehyde were used as the carbonyl component. The esters of ethylenediaminobisphosphinic acid were characterized in the form of their picrates. Only the methyl ester of ethylenediaminobisisopropylphosphinic acid was isolated in the free state. The free acids occurred as achromatic, crystalline, high-melting-point substances, insoluble in organic solvents and readily soluble in weak acids and alkalis.

The complex-forming capacity of aminoalkylphosphinic acids was checked by the chromatographic method described in work of Senyavin and Tikhonova (M. M. Senyavin and L. I. Tikhonova, Zhurnal Neorganicheskoy Khimii, Vol 1, No 12, 1956, p 2772). The activity of the complex-forming agent was characterized by the total volume of the filtrate (V_{max}), flowing out of a cationite column with the ions of the element adsorbed on it, from the beginning of the washing up to attainment of the maximum concentration of the element being washed out in the filtrate. The value of V_{max} under otherwise equal conditions) depends on the degree of stability of the complex-forming compound, and is lower when the latter is higher. For this experiment, ions of the rare-earth elements ytterbium and yttrium were used containing the isotopes Yb¹⁷⁵ and Y⁹¹.

The data obtained show that some ethylenediaminobisphosphinic acids, namely, ethylenediaminobisisopropylphosphinic acid, ethylenediaminobispropylphosphinic acid, and ethylenediaminobisbenzylphosphinic acid, form stable complex compounds with ytterbium and yttrium. Several aminoalkylphosphinic acids, including alpha-aminoisopropylphosphinic acid, hydroxybenzylphosphinic acid, N-dimethylaminoisopropylphosphinic acid, and alpha-aminoisobutylphosphinic acid, form less stable complex compounds with ions of these elements.

21. Reactions of Trialkylphosphites

"On the Reaction of Trialkylphosphites With Nitrosyl and Nitryl Chloride," by B. A. Arbuzov and E. N. Ukhvatova, Scientific Research Chemical Institute imeni A. M. Butlerov of Kazan' State University imeni V. I. Ul'yanov-Lenin; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 11, Nov 58, pp 1395-1396

As a result of the investigation it was concluded that:

1. Oxidation to trialkylphosphates is brought about by the action of nitrosyl chloride or nitryl chloride on trialkylphosphites.
2. In the case of triethylphosphite, a small amount of tetraethylpyrophosphate could also be isolated.

Pesticides

22. New Insecticides, Fungicides and Bactericides

"Tables of Results of the Initial Investigation of New Insecticides, Fungicides, and Bactericidal Compounds" (unsigned article), Organ. Insektofungitsidy i Gerbitsidy (Organic Insectofungicides and Herbicides), 1958, 316 - 360 (from Referativnyy Zhurnal -- Khimiya, No 24, 25 Dec 58, Abstract No 82805, by I. Mil'shteyn)

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"The results of the investigation of compounds synthesized by various scientific research organizations are presented. Of the compounds investigated for contact insecticidal properties against *Calandra granaria*, the

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most active were $\text{FC}_6\text{H}_4\text{SCCl}_3\text{-p}$, $(\text{C}_2\text{H}_5\text{O})_2\text{PONHCSNHC}_6\text{H}_5$, $\text{ClC}_6\text{H}_4\text{SCCl}_3\text{-p}$, $\text{C}_6\text{H}_5\text{SO}_2\text{NHPOFOH}$, $m\text{-NO}_2\text{C}_6\text{H}_4\text{SO}_2\text{NHPOFOH}$, and $p\text{-ClC}_6\text{H}_4\text{SO}_2\text{NHPOOKF}$. Of the compounds investigated as systemic insecticides, the most active were $(\text{CH}_3\text{O})_2\text{-PSNHNH}_2$, $(\text{CH}_3\text{O})_2\text{PSN}(\text{C}_2\text{H}_4\text{OH})_2$, $(\text{iso-C}_3\text{H}_7\text{O})_2\text{PSN}(\text{C}_2\text{H}_4\text{OH})_2$, $(\text{iso-C}_3\text{H}_7\text{O})_2\text{PSNC-H}_5\text{C}_2\text{H}_5$, $(\text{CH}_3\text{O})_2\text{SPSCH}_2\text{NHCOCOC}_2\text{H}_5$, $(\text{C}_2\text{H}_5\text{O})_2\text{SPSCH}_2\text{N}(\text{CH}_3)\text{COCOC}_2\text{H}_5$, $[\text{N}(\text{CH}_3)_2]_2\text{-}^6\text{-PSOPO}[\text{N}(\text{CH}_3)_2]_2$, $(\text{C}_2\text{H}_5\text{O})_2\text{OPNCH}_3\text{PO}(\text{OC}_2\text{H}_5)_2$, $(\text{CH}_3\text{O})\text{P}(\text{O})[\text{OPS}(\text{OC}_2\text{H}_5)_2]_2$, $[(\text{CH}_3)_2\text{N}](\text{C}_2\text{H}_5\text{O})\text{POOPS}(\text{OC}_2\text{H}_5)_2$, $[(\text{CH}_3)_2\text{N}] \text{POOSP}(\text{OC}_2\text{H}_5)_2$, $(\text{C}_2\text{H}_5\text{O})_2\text{SOSP}(\text{OC}_2\text{H}_5)[\text{N}(\text{CH}_3)_2]$, $(\text{C}_2\text{H}_5\text{O})\text{SP}[\text{N}(\text{C}_2\text{H}_5)_2](\text{OCH}_3)$, technical $[(\text{CH}_3)_2\text{N}]_2\text{POOSP}(\text{OC}_3\text{H}_7\text{-iso})$, $(\text{C}_2\text{H}_5)_2\text{PSSCH}(\text{CH}_3)\text{SC}_2\text{H}_5$, and $[(\text{C}_2\text{H}_5)_2\text{N}]_2\text{PSOSP}(\text{OC}_2\text{H}_5)_2$. As fungicides against *Fusicladium dendriticum* Fuck., the most active were $\text{CCl}_2\text{-C}(\text{CH}_3)=\text{N-NH-C}(=\text{O})$, $\text{NH}_2\text{NHC}(=\text{S})\text{SHNHNH}_2$, $(\text{CH}_3)_2\text{NN-HC}(=\text{S})\text{SH}\cdot\text{NH}_2\text{N}(\text{CH}_3)_2$, $(\text{NH}_2\text{NHOSO}_2)_2\text{Cu}$, $\text{NH}_2\text{NHC}(=\text{S})\text{NH}_2$, $(\text{NH}_2\text{NHSCS})_2\text{Zn}$, 1,6-dinitro-beta-naphthol, 2-nitroso- and 4-nitroso-alpha-naphthol, 1-nitroso-beta-naphthol, its Cu salt, $(p\text{-BrC}_6\text{H}_4\text{O})_2\text{PONHCOOCH}_3$, $(p\text{-BrC}_6\text{H}_4\text{O})_2\text{PONHCOOC}_4\text{H}_9$, $(\text{C}_2\text{H}_5\text{O})_2\text{PONNaCSOC}_2\text{H}_5$, $(\text{C}_2\text{H}_5\text{O})_2\text{PONNaCSOC}_2\text{H}_5$, $(\text{iso-C}_3\text{H}_7\text{O})_2\text{PONNaCSOC}_2\text{H}_5$, $(\text{iso-C}_3\text{H}_7\text{O})_2\text{PONNaCSOC}_3\text{H}_7\text{-iso}(\text{C}_6\text{H}_5\text{O})_2\text{PSNCS}$, $\text{C}_{17}\text{H}_{35}\text{CNCH}_2\text{CH}_2\text{NHCH}_2\text{COOH}$, $\text{CH}_2\text{C}(=\text{O})\text{N}(\text{SCCl}_3)\text{C}(=\text{O})\text{CH}_2\text{Cl}_3\text{-CSCS}_2\text{NHC}_2\text{H}_4\text{NHCS}_2\text{SCCl}_3$, 1-nitroso-3-bromo-beta-naphthol, $\text{C}_6\text{H}_5\text{CH}_2\text{CS}_2\text{NHCH}_2\text{-CH}_2\text{NHCS}_2\text{CH}_2\text{C}_6\text{H}_5$, monooximes of chloro- and methylquinone, and $\text{Cl}_3\text{COC}_6\text{H}_4\text{CN-p}$, $\text{Cl}_3\text{COC}_6\text{H}_4\text{Cl-p}$. The following were active against *Pseudomonas malvacearum* E. Smith: 2,4,5-trichlorophenol, 4-nitro-alpha-naphthol, the Cu and Zn salts of 1-nitroso-beta-naphthol, dinitrothioeyanoanabenzene, and the Mn, Zn, Na and Fe salts of ethylene-bis-dithiocarbamic acid."

23. New Systemic Insecticides

"Amides and Hydrazides of Thiophosphoric Acid as Systemic Insecticides," by A. G. Zen'kevich, N. N. Mel'nikov, Ye. A. Pokrovskiy, and A. S. Sedykh, Organ. Insektofungitsidy i Gerbitsidy (Organic Insectofungicides and Herbicides), 1958, 51 - 60 (from Referativnyy Zhurnal -- Khimiya, No 24, 25 Dec 58, Abstract No 82787, by I.

CPYRGHT Mil'shteyn)

"In addition to the compounds described earlier (RZhKH, 1956, 3953), a number of acetamides of dialkoxythiophosphoric acid with the general formula $(\text{RO})_2\text{PSNHCOCCH}_3$ (I) and bis-[dialkyl]-aminothiophosphate]-methanes with the general formula $[(\text{RO})_2\text{PSNH}]_2\text{CH}_2$ (II) have been synthesized. To a suspension of NaNH_2 in boiling C_6H_6 , a hot benzene solution of acetamide is added, the precipitate is separated, dried, treated with a solution of dialkylchlorothiophosphate, toluene or xylene is added, the mixture heated on a water bath, the NaCl precipitate separated, the filtrate washed with

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water, dried and distilled. (I) was obtained with the following R, boiling point in °C/mm, n_{D}^{20} , d_{4}^{20} : C_3H_7 , 90-95/0.13, 1.4679; C_4H_9 , 130/1-2, 1.4684, 1.0128. To the amide of dialkylchlorothiophosphate, a 40% solution of CH_3O was added, the mixture agitated for 7 days, the product extracted with ether and then distilled. (II) was obtained with the following characteristics: C_2H_5 , —, —; C_3H_7 , 110-120/0.05, 1.5021, 1.1143; C_4H_9 , 140-156/0.07, 1.4810, 1.0629. All the amides and hydrazides of thiophosphoric acid as well as (I) and (II) were investigated for systemic insecticidal properties. The following possess intraplant activity: $(CH_3O)_2PSNH_2$ (III), $(C_2H_5O)_2PSNH_2$, $(C_3H_7O)_2PSNH_2$, $(iso-C_3H_7O)_2PSNH_2$, $(CH_3O)_2PSN(CH_3)_2$, and $(CH_3O)_2PSN(C_2H_5)_2$. The most effective is (III) which has an activity approaching that of octamethyl.

24. Contact and Intraplant Insecticides

"Contact and Intraplant Insecticides of the Systox Group of Compounds," by P. V. Popov, L. P. Bocharova, N. S. Ukrainets, and A. S. Sedykh, Organ. Insektofungitsidy i Gerbitsidy (Organic Insectofungicides and Herbicides), 1958, 13 - 25; (from Referativnyy Zhurnal -- Khimiya, No 24, 25 Dec 58, Abstract No 82788, by I. Mil'shteyn)

CPYRGHT

"The contact toxicity of the following 18 organophosphorus compounds against *Calandra oryzae* L. was investigated: the thiol isomer of systox (I), the thione isomer of systox (II), the thione isomer of methylsystox (III), the thione isomer of methylethylsystox (IV), $(C_2H_5O)_2PSOC_2H_4OC_2H_5$, $(C_2H_5O)_2PSSCH_2OC_2H_5$, $(C_2H_5O)_2PSSCH_2OC_3H_7-iso$, $(C_2H_5O)_2PSSC_2H_4OC_2H_5$, $(CH_3O)-(iso-C_3H_7O)PSOC_2H_4SC_2H_5$, $(CH_3O)(C_4H_9O)PSOC_2H_4SC_2H_5$, $(CH_3O)(iso-C_5H_{11}O)PSOC_2H_4SC_2H_5$, $M=74$, $(RO)_2PSSC_2H_4SC(=NH)NH_2$ ($R=CH_3$, C_2H_5 , C_4H_9), $(C_2H_5O)_2PSSC(=NH)NH_2$, $(C_2H_5O)_2PSO-C=CH-C(CH_3)=N-C(=S)-NH$, and DDTP. In addition, the activity of (I)-(IV) against *Aphis fabae* Scop., *Megalosiphum picridis* L., and *Metatetranychus citri* McG. was also studied. (I) possesses the most active contact toxicity properties followed by technical mercaptophos (IV), (II), (III) and (IV). The intraplant activities of (I), metasystox, (V), octamethyl (VI), acetylcarbamide (VII) were investigated using *Epitetranychus urticae* Koch. on grapes and cucumbers, and *M. ulni* Koch., on apple trees. The intraplant action of (II) and (IV) against red citrus mites was investigated using trifoliate. With a concentration of 0.015-0.03%, (I) and (II) have a persistence of 20-36 days. (VII) is a good intraplant insecticide, but a more detailed study of its activity is required. With a concentration of $\leq 33\%$, (I), (II), (IV), and (V) do not burn plant leaves.

25. Insecticidal Activity of Certain Organophosphorus Compounds

"The Insecticidal Activity of Certain Mixed Esters of Phosphoric and Thiophosphoric Acid," by P. V. Popov and N. S. Ukrainets, Organ. Insektofungitsidy i Gerbitsidy (Organic Insectofungicides and Herbicides), 1958, 122 - 127; (from Referativnyy Zhurnal -- Khimiya, No 24, 25 Dec 58, Abstract No 82795, by I Mil'shteyn)

CPYRGHT

"The results of determining the insecticidal activity of 45 esters of phosphoric and thiophosphoric acids toward *Calandra granaria* are presented. Some of the esters investigated were: trimethyl-, triethyl-, triisopropyl-, tris-(beta-ethoxyethyl)-, beta-ethoxyethyldiethylthiophosphate, diethyl-4-nitrophenylphosphate (I), dimethyl-3-methoxy-, dimethyl-3-ethoxy-, dimethyl-3-propoxy-, dimethyl-3-isoamyloxythiophosphate, dimethyl and diethylamides of dimethyl- and diethylthiophosphoric acid, octamethyl, diethyl-4-chloro-, diethyl-2,4-dichlorophenyl-phosphate, diethyl-4-chloro-, diethyl-2,4-chlorophenylthiophosphate, and others. The most toxic compounds have one phenylic radical; an NO₂ group in the para position increases the insecticidal properties; changing the NO₂ to a Cl in the phenyl nucleus decreases toxicity; the introduction of a second Cl atom on the 2 position lowers activity still further; 1,4-dihydroxyphenyl-bis-(dialkylphosphates) and -thiophosphates are more active than the corresponding 1,3-dihydroxyphenyl compounds. Of all the compounds, only (I) approaches the toxicity of thiophos. However, it is highly toxic to warm-blooded animals."

26. Organophosphorus Compounds Containing Heterocyclic Radicals

"Esters of Phosphoric and Thiophosphoric Acids Containing Heterocyclic Radicals, Report No I, Compounds Containing Pyrimidyl and Imidomethyluracil Radicals," by B. A. Arbuzov and V. M. Zoroastrova, Chemical Institute imeni A. M. Butlerov, Kazan' State University imeni V. I. Ul'yanov-Lenin; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 11, Nov 58, pp 1331-1339

The authors synthesized the following esters of phosphoric and thiophosphoric acids containing pyrimidyl and imidouracil radicals: 2,4-dimethylpyrimidyl-6-diethylphosphate; 2,4-dimethylpyrimidyl-6-diethylthiophosphate; 2-phenyl-4-methylpyrimidyl-6-diethylphosphate; 2-phenyl-4-methylpyrimidyl-6-diethylthiophosphate; 2-phenyl-4-methylpyrimidyl-6-diisobutylphosphate; 2-imido-4-methyluracil-6-diethylphosphate; 2-imido-4-methyluracil-6-diisobutylphosphate; 2-imido-4-methyluracil-6-diethylthiophosphate; C₁₃H₂₄O₄N₃P and C₉H₁₆O₄PN₃.

Some of the synthesized compounds were tested by M. A. Kudrinaya at the Kazan' Affiliate of the Academy of Sciences USSR for their insecticidal activity against the grain weevil and for their toxicity to mice. As a result of the data obtained 2-imido-4-methyluracil-6-diethylphosphate was found to have an LD₁₀₀ of 2.5 mg/kg while the remainder of the compounds synthesized were less toxic or only slightly toxic.

27. Some New Insectofungicides

"In the Field of Organic Insectofungicides, Report XXXVI, The Interaction of Tetrachloro- and Pentachlorocyclopentadienes With Certain Unsaturated Compounds," by N. N. Mel'nikov and S. D. Volodkovich, Scientific Institute for Fertilizers and Insectofungicides; Moscow, Zhurnal Obshchey Khimii, No 12, Dec 58, pp 3317-3319

Special research was undertaken to synthesize and study the condensation products of 2,3,4,5-tetrachloro- and 1,2,3,4,5-pentachlorocyclopentadienes with certain unsaturated compounds, primarily bicyclo-[2,2,1]-heptene, bicyclo-[2,2,1]-heptadiene-2,5, esters of maleic acid and certain other substances. It was shown that this reaction proceeds easily under the same conditions as the reaction of unsaturated compounds with hexachlorocyclopentadiene. In all, 14 polycyclic compounds, never before described in the literature, were synthesized.

A study of the insecticidal properties of these compounds on the housefly, conducted by Ye. F. Granin under the direction of K. A. Gar, indicated that the most active insecticide was 1,2,3,4,10-pentachloro-1,4,5,8,-diendomethylenehexahydronaphthalene which is twice as active as chlorindane, but it is less active than aldrin. 1,2,3,4,-Tetrachloro-1,4,5,8,-diendomethylenehexahydronaphthalene was practically inactive. Therefore, according to the authors, the nature of the substituent in the endomethylene bridge greatly affects the toxicity of aldrin type compounds. Insecticidal activity decreases from dichloro- to monochloro derivatives, and still further to difluoro derivatives.

28. Studies Involving Tagged Organophosphorous Compounds

"The Penetration of Diethyl-4-nitrophenylthiophosphate Into the Body of Warm-Blooded Animals," by K. A. Gar, N. A. Sazonova and V. I. Chernetsova, Organ. Insektofungitsidy i Gerbitsidy (Organic Insectofungicides and Herbicides), 1958, 68-79 (from Referativnyy Zhurnal -- Khimiya, No 24, 25 Dec 58, Abstract No 82791, by I. Mil'shteyn)

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"After animals (white mice, guinea pigs, rabbits, and cats) have been poisoned with thiophos (I) (a preparation tagged with P³² was used) administered orally and cutaneously, P was detected within a short time in all the organs of the animals tested. The distribution of the phosphorus was approximately the same in all the animals tested. Thiophos is carried by the blood; P is found in the blood a few minutes after the thiophos is administered. The quantity of thiophos P in the bodies of animals slaughtered 4 days after oral administration is markedly lower. After 10 days, only an insignificant amount of thiophos is found in the organism. Thiophos is quickly broken down in the bodies of animals. The thiophos hydrolysis products are eliminated from the body with the urine. The authors believe that the hydrolysis taking place in the body of the animals is of an enzymatic nature."

Physical Chemistry

29. Review of the Activities of the Physicochemical Institute imeni L. Ya. Karpov

"The 40th Anniversary of the Physicochemical Institute imeni L. Ya. Karpov" (unsigned article); Moscow, Zhurnal Fizicheskoy Khimii, Vol 32, No 12, Dec 58, pp 2657-2662

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"The 40th anniversary of one of the leading scientific research organizations of the Soviet Union, i. e., the Physicochemical Institute imeni L. Ya. Karpov, took place in 1958.

"This institute launched its activity in 1918 under the name of the Central Chemical Laboratory of the Chemical Division, Supreme Council of the National Economy (VSNKh).

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"One of the organizers of the institute and later its permanent director for 28 years was the outstanding scientist A. N. Bakh, who attached a very great importance to the advancement of work in applied chemistry and was of the opinion that development of a new and advanced chemical technology is impossible without a sound theoretical basis. He considered that physical chemistry is this theoretical basis. Beginning with the first years of his direction of the institute, Bakh assembled talented young people who had demonstrated their ability by doing research in physical chemistry. With the support of the government he organized a very well-equipped institute, which was operated on the principle that there must be a firm connection between science and practical applications.

"Important problems pertaining to the development of new processes of chemical technology and the improvement of old processes were solved by the institute. Individual laboratories of the institute were subsequently reorganized into independent institutes of applied chemistry. For instance, this is the origin of the Institute of Plastics, the Institute of Synthetic Fibers, the Institute of the Nitrogen Industry, the Coal Institute, the Institute of Special Chemistry, etc.

"The Institute imeni Karpov has conducted extensive organizational work in connection with the development of USSR physical chemistry. It initiated the holding of regular conferences and the publication of periodicals in this field. The advanced physicochemical experimental work and the major theoretical investigations conducted at the institute made it famous both in the USSR and abroad. A broad scope of research was always characteristic of the institute. Before World War II, the most prominent work done at the institute was within three major subdivisions of physical chemistry, namely, surface phenomena and electrode processes, the structure of matter, and chemical kinetics. After World War II, the relative weight of work on methods for the production of polymers and the treatment of polymer materials increased and research in the field of catalysis expanded. Research in radiation chemistry and work on the separation of mixtures increased in volume with the result that these subdivisions developed into major independent fields of research.

"Research done at the institute in the field of electrochemistry and surface phenomena played a prominent role in the development of this field of knowledge in the USSR. The problem of the localization of electromotive forces, the structure of the double electric layer at the boundary between metals and solutions, and the effect of the electric field on the kinetics of reactions taking place at electrodes received a firm theoretical basis as a result of investigations conducted at the institute under the direction of D. N. Frumkin. Subsequent many-sided investigation on the kinetics and mechanism of the electrolytic formation of hydrogen made it possible to formulate a number of basic relationships pertaining to electrochemical kinetics, which is one of the principal subdivisions of present-day theoretical electrochemistry.

"In later work done under the direction of V. I. Veselovskiy, a number of investigations was carried out on the mechanism and kinetics of reactions of electrochemical oxidation and of electrochemical separation of isotopes. As a result of this work, attention was turned to the role played by surface compounds. Concepts were advanced on the mechanism of the initiation of electrochemical reactions by the action of light and nuclear radiation, as a result of the action produced by electrochemically active products of radiolysis and excitation, by virtue of the absorbed radiation of electrons, and because of the effect exerted by semiconductor electrodes.

"Research in the field of radiation electrochemistry conducted at the Laboratory of Electrochemistry added valuable information in the new field of physical chemistry formed by radiation chemistry, which deals with the laws of the transformation of the energy of nuclear radiation into chemical energy.

"In work conducted under the direction of Ya. M. Kolotyrkin, it was demonstrated that adsorbed components of the solution, particularly anions of the electrolyte, exert an important influence on the kinetics of electrode reactions. The most recent work done at the Laboratory of Electrochemistry made it possible to establish correlations pertaining to the electrochemical behavior of metals and their behavior with respect to corrosion under consideration of passivation. In investigations confirming the results obtained by other investigators, it could be demonstrated that there is no essential difference between anodic and chemical passivation of metals in aqueous solutions of electrolytes. The results of this research led to actual methods for the evaluation of the corrosion properties of metals depending on their composition and to the development of effective methods for the protection of metal constructions against corrosion.

"Of great importance is research in the field of colloidal chemistry done at the institute (Rabinovich, Kargin). In the research in question, the mechanism of the coagulation of colloids by electrolytes and the problem of the stability of colloidal systems were investigated. This work led in recent years to a clarification of the mechanism of the formation of colloidal particles. It was found that under ordinary conditions existing during the formation of colloidal solutions, when the rate of the separation of a substance exceeds the rate of its crystallization, rather large particles are formed which in most cases are spherical and amorphous. These particles later crystallize and disintegrate under the formation of a large number of crystals, which are the commonly encountered colloidal particles.

"Systematic investigation of the physicochemical properties and behavior of smokes and fogs was launched in the USSR at the institute (Petryanov, Fuks). The investigations in question led to the development of new and original methods for the investigation of aerosol systems. An ultramicrophotographic method for the simultaneous determination of the dimensions and charges of aerosol particles on a large scale, which was developed at the institute, has found particularly extensive applications. Of especial importance has been work done at the institute on the theoretical aspects and practical applications of processes for capturing aerosol particles by fibrous materials used in filtration. New filtering materials developed at the institute (FP = Petryanov's filters), which consist of ultrafine polymer fibers, have been applied extensively. Methods were developed for the practical application of these materials in the purification of air and of industrial gases, for the protection of individuals, and for gravimetric, radiometric and radiographic measurements carried out on aerosol systems.

"Research on non-aqueous solutions begun in 1928 at a laboratory organized by A. M. Monoszon played a considerable role in the formation of present-day concepts pertaining to the electrochemistry of homogeneous catalysis, the theory of acids and bases, and other subdivisions of general and physical chemistry. Among the investigations within this range, one must first of all note work on the electrochemistry of nonaqueous solutions in which the values of normal potentials of different metals in some solutions were established (Pleskov) and research concerning the effect exerted by the properties of solvents on acid-base equilibria and catalysis in solutions (Shatenshteyn).

"Work in the important subdivision of the chemistry of surface phenomena, which comprises the statics, kinetics, and dynamics of molecular adsorption, was conducted under the direction of A. A. Zhukhovitskiy. In the course of work done in this field, a theory of adsorption from actual solutions was formulated and a theory of the surface tension of concentrated solutions.

"Beginning with 1948, particular attention in the field of sorption processes was paid to the investigation of the properties of high-polymer ion-exchange materials and the development of processes for the separation of mixtures (Tunitskiy). The kinetic properties of USSR ion-exchange agents were determined, a theory of the diffusion of ions in ion-exchange agents was developed which takes into consideration the electric field generated during diffusion, and the principal relationships pertaining to the dynamics of ion-exchange adsorption and the theory of chromatography were established. Furthermore, problems were solved that are related to the separation of radioactive and stable isotopes (e.g., those of carbon, nitrogen, and oxygen). A low-temperature method for the separation of carbon isotopes was developed. At the same laboratory, by using a mass-spectrometric method, the processes of dissociation were investigated which take place when electrons collide with ions. In addition to this, mass-spectrometric methods of chemical analysis were developed.

"Considerable attention to the investigation of the separation of stable isotopes of light elements was paid in work done at a laboratory organized in 1946 by N. M. Zhavoronkov. At this laboratory, work was done on the theoretical and experimental aspects of hydrodynamics and mass-transfer in processes of absorption, rectification, molecular distillation, and chemical exchange. On the basis of the work that had been done, methods were developed for the calculation of some processes under stationary conditions. Furthermore, new principles were proposed for the design of equipment for the separation of mixtures. On the basis of results that were obtained, methods for the production of materials containing heavy isotopes of nitrogen, oxygen, and other elements in a concentrated form were introduced into the industry and applied there successfully.

"Beginning with 1936, work on polymerization and the properties of polymers was expanded and conducted on a large scale at the institute. The most important achievements of the Laboratory of Polymerization Processes directed by S. S. Mevedev were demonstrations of the free-radical nature of polymerization processes and formulation of concepts pertaining to the initiation of polymerization and to the initiation and termination of chains as processes which originate because of the formation and interaction of free radicals. The mechanisms of initiation processes in photopolymerization was clarified. In recent years, work has been done on the effects of gamma radiation on polymerization processes and polymers. Phenomena of redistribution of primarily absorbed energy between components were discovered and investigated. Furthermore, the mechanism of the cross-linking of polymer chains under the action of gamma radiation in dependence on the structure and the physical state of polymers was studied. New concepts were formulated concerning the mechanism of emulsion polymerization, which made it possible to establish the general validity of relationships known previously and of new relationships established in work done at the laboratory. New data and relationships were also discovered in investigations on cationic polymerization and copolymerization.

"Work done at the Laboratory of Colloid Chemistry (V. A. Kargin) in the field of high-molecular compounds had the purpose of clarifying the connection between structure and the properties of polymers. Investigation of phase equilibria in polymer solutions proved the latter to be true homogeneous solutions. This result conflicted with the tendency prevalent then to regard these solutions as being of the lyophilic colloidal type. Work along these lines made it possible to estimate the flexibility of the chains of a number of polymers, to get results on the density of the packing of chains, and to correlate the data obtained with the properties of solid transparent polymers.

"A theory describing the behavior of amorphous polymers in a wide range of temperatures was developed and a thermomechanical method for the investigation of polymers proposed. Particular attention was paid to flow processes, which are of great importance from the standpoint of the treatment of polymers. A new phenomenon of chemical flow was discovered which involves scission and recombination of chain molecules. The mechanism of the deformation of crystalline polymers was clarified. This deformation was found to involve a recrystallization process.

"Structural investigations demonstrated that, in addition to phase transformations, a high degree of orientation may be established in amorphous polymers. Cellulose is a typical example of an amorphous polymer in which a high degree of orientation exists. By the application of various methods for the investigation of structure combined with electron microscopy it was possible to clarify in a general manner the development of order and crystalline structures in polymers.

"The investigation of the radiolysis of polymers led to a knowledge of the principal characteristics of the mechanism of this process and to the development of measures for protection against the effects of radiation as well as the synthesis of polymers stable toward the effects of radiation (V. L. Karpov).

"In 1945 systematic investigations dealing with the synthesis of organometallic compounds and the clarification of their structure were begun at the institute under the direction of K. A. Kocheshkov. In the early period of work on this subject, principal attention was paid to the discovery and investigation of the most important types of these compounds. Later, on the basis of results obtained in the study of organoelemental compounds, the laboratory participated in the development of methods for the synthesis of monomers (particularly fluoroorganic monomers) for the production of polymers with predetermined characteristics. Theoretical research done at this laboratory on crystalline organometallic compounds and complexes derived from them led to valuable results applied in the catalytic polymerization of unsaturated hydrocarbons.

"Problems of chemical structure and of the reactivity of organic compounds constituted the principal field in which work is being done at the Laboratory of Molecular Structure (Syrkin, Gur'yanova, Shorygin, and Shigorin). The development and application of different physicochemical methods, for instance, quantum-chemical methods of calculation, Raman spectroscopy, infrared spectroscopy, investigation of absorption spectra in the ultraviolet field, measurement of dipole moments, the method of tracer atoms, etc., made it possible to clarify a wide range of aspects of this problem and to obtain significant results as far as investigation of the structure and reactivity of individual classes of organic compounds

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is concerned. Furthermore, other general relationships pertaining to organic chemistry were established. A considerable proportion of research done in this laboratory dealt with the formulation of fundamental relationships applicable to the theory of methods applied in the investigation of the structure of molecules. Important results along this line were obtained as far as the theory of the intensity of lines of Raman spectra and the interpretation of resonance Raman spectra are concerned.

"Within the same general range of research are investigations carried out at the Laboratory of Isotope Reactions (A. I. Shatenshteyn) in which systematic work is done on the kinetics and mechanism of hydrogen exchange in nonaqueous solvents (ammonia, hydrogen fluoride, and others). A prerequisite for research in this field was the concept concerning the acid-base nature of hydrogen exchange in solutions and the idea in regard to the capacity of hydrocarbons for participation in protolytic reactions with strong bases and acids. The work in question represents a valuable contribution to the investigation to the problem of reactivity of organic substances and of the mutual influence exerted by atoms on each other in molecules.

"An important contribution to the problem of the structure of substances and to the clarification of the nature of the chemical bond was also made by work done at the X-Ray Laboratory (G. S. Zhdanov) where systematic chemical investigation of representative groups of chemical compounds is being conducted. The research in question led to the discovery of the phenomenon of superperiodicity in crystals. Work on the crystal chemistry of cyanides and particularly of thiocyanates led to important discoveries of crystal-chemical relationships affecting the structure of crystals consisting of different structural elements and pertaining to the nature of the chemical bond. Under the leadership of this laboratory, the application of X-ray methods is being introduced into the chemical industry.

"Research on the theory of structure, thermodynamics, and properties of simple and complex compounds, particularly compounds of a variable composition, is being conducted at the Laboratory of Complex and Solid Compounds (B. F. Ormont). In the work in question, a number of general relationships was established.

"Work done by I. A. Kazarnovskiy deals with the investigation of the structure of higher oxygen compounds of metals and the mechanism of the formation and decomposition of such compounds. Kazarnovskiy discovered new and very important compounds, viz., the sodium superoxide Na O_2 (Novoxide), potassium ozonide (KO_3), and ozonides of other alkali metals.

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"In the field of kinetics and catalysis, work done by M. I. Temkin is of particular importance. Temkin was the first to formulate a general theory of absolute velocities of heterogeneous reactions and processes of activated adsorption. He proved the correctness of a logarithmic adsorption isotherm (Temkin's isotherm), starting from concepts concerning the inhomogeneity of the surface and the mutual effect of adsorbed particles on each other. The theory of phenomena taking place on inhomogeneous surfaces was used by him successfully for determining the kinetics and mechanism of important technological processes such as those applied in the synthesis of ammonia, in conducting water gas reactions, in the gasification of coal, etc. Treatment in a general form of the problem concerning the bond energy of intermediate surface compounds that is optimal for the reaction in question represented a significant contribution to a theory which would make possible the expedient selection of catalyysts.

"Of considerable interest from the standpoint of the theory of acid-base catalysis is work conducted in this [Temkin's] laboratory on the determination of the temperature dependence of the acidity of the most important concentrated acids. The results obtained made it possible to interpret in a novel manner the dependence of the reaction velocity on the acidity of the medium.

"Investigations conducted at the Laboratory of Heterogeneous Catalysis, which was organized in 1929 and then headed by M. Ya. Kagan, led to the development of catalyysts for the synthesis of a number of important products such as acetone, acetaldehyde, butyric aldehyde, and butanol. Suitable catalysts have been developed and processes investigated for the dehydrogenation of paraffinic hydrocarbons. Furthermore, the physicochemical characteristics of aluminum oxide, aluminosilicate, and chromoaluminum catalysts were established. The mechanism of the Lebedev synthesis of butadiene from alcohol was clarified.

"Work at the Laboratory of Heterogeneous Catalysis which is now headed by G. K. Boreskov, is concerned with the scientific aspects of the selection and production of catalysts. Work done at this laboratory led to the clarification of the effect of the porous structure of catalysts on processes of mass transfer and heat transfer occurring during the course of catalytic reactions. Extensive experimental data were obtained which indicate that a number of metal and oxide catalysts have a specific catalytic activity which remains approximately constant. The dependence of the catalytic activity of elements on their position in the periodic system was subjected to systematic investigation. New catalysts were developed for hydrogenation, oxidation, hydration, catalytic purification of gases, etc.

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MARCH 1, 1959

SECRETARY OF COMMERCE STRAUSS NOTES
NATIONAL WEIGHTS AND MEASURES WEEK

Secretary of Commerce Lewis L. Strauss directed the nation's attention today to National Weights and Measures Week--March 1 to 7. The National Bureau of Standards, a part of the U. S. Department of Commerce, is the ultimate source of accuracy in this country for the standards of measurement upon which all commercial transactions involving quantity are based.

The first Federal weights and measures law was enacted by Congress on March 2, 160 years ago, National Bureau of Standards historians pointed out. This early law dealt with the accuracy of weights and measures and other instruments used in determining duties on imports.

In modern times, according to NBS, weights and measures operations are extremely complex, and play a vital role in every area of commerce and industry where goods are exchanged, and when agreement as to value or quantity is essential.

To the housewife buying a pound of butter, the prairie farmer selling wheat, the steel manufacturer producing tons of sheet metal, the basis of confidence in the exchange of goods is the accuracy of the national standards of measurement, as maintained by the National Bureau of Standards, and their extension into the day-to-day business of the nation through the state standards of measurement.

The Bureau called attention to the fact that John Quincy Adams in 1821, when he was Secretary of State, stated in a report: "Weights and measures may be ranked among the necessaries of life to every individual of human society. They enter into the economical arrangements and daily concerns of every family. They are necessary to every occupation of human industry; to the distribution and security of every species of property; to every transaction of trade and commerce; to the labors of the husbandman; to the ingenuity of the artificer; to the studies of the philosopher; to the researches of the antiquarian; to the navigation of the mariner, and the marches of the soldier; to all the exchanges of peace, and all the operations of war. The knowledge of them, as in established use, is among the first elements of education, and is often learned by those who learn nothing else, not even to read and write. This knowledge is riveted in the memory by the habitual application of it to the employments of men throughout life."

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"Particular attention is paid to the solution of problems pertaining to new polymerization processes (specifically processes carried out with the application of high-energy radiation), the synthesis of new monomers, and the synthesis of block and graft polymers. The intention exists of further expanding the investigation of the structure of monomers and of their reactivity.

"Considerable attention is also paid to the investigation of radiation-chemical processes. In addition to the expansion of the range of radiation-chemical reactions being investigated and the scope of work on their kinetics and mechanism, the task has been set of finding ways for the practical application of processes of this type. Considerable attention is being paid in connection with this to work on polymer systems (applications of radiation polymerization, production of graft polymers, radiation vulcanization of elastomers and plastics, etc.) and processes of oxidation, halogenation, and others.

"The decisions made by the plenary sessions of the Central Committee CPSU and the theses of N. S. Khrushchev's report presented at the 21st Congress of the CPSU, which have been published under the title "Control Figures of the Development of the USSR National Economy During 1959-1965" for consideration by the whole people, impose on the staff of the institute the obligation of making a contribution to the advancement of the chemical industry. There can be no doubt that the staff of the institute will be equal to the task involved in this."

Radiation Chemistry

30. The Effect of Radiation Emitted by Radioactive Isotopes on the Physical and Chemical Properties of Solid Substances

"The Effect of Radiation Emitted by Radioactive Elements on the Physicochemical Properties of Solid Substances," by V. I. Spitsyn, Institute of Physical Chemistry, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 11, Nov 58, pp 1296-1302; p 1399

The author of the report and his collaborators (I. Ye. Mikhaylenko, V. G. Finikov, V. V. Gromov, and others) investigated the effects of radiation emitted by radioactive elements on the rate of isotope exchange, adsorption capacity, and other characteristics of solids. The rate of the isotopic exchange of sulfur at an elevated temperature (840°) between solid potassium sulfate containing S³⁵ and gaseous sulfur trioxide was found to depend on the specific radioactivity of the K₂SO₄. As a result of an increase of this radioactivity from 0.01 millicurie per gram to 2 millicuries per gram, the rate of isotopic exchange increases by a factor of approximately 6. A further increase of the radioactivity of K₂SO₄ to 10-20 millicuries per gram leads to a reduction of the rate of isotopic exchange.

Similar results were obtained in an investigation of the rate of isotopic exchange of oxygen in the system $\text{Na}_2\text{SO}_4 - \text{O}_2$ at 680-780°. In the experiments that were conducted, gaseous oxygen containing O^{18} and Na_2SO_4 containing different quantities of the radioactive isotope S^{35} were used. The rate of isotopic exchange was measured by the mass-spectrometric method. It was established that increasing of the specific radioactivity of Na_2SO_4 up to one millicurie per gram increases the rate of exchange while further increases reduce the rate of exchange.

It was also established that the quantity of methylene blue adsorbed by a barium sulfate precipitate depends on the content of S^{35} in the latter.

A. A. Balandin, V. I. Spitsyn, N. P. Dobrosel'skaya, and I. Ye. Mikhaylenko found that the rate of dehydration of cyclohexanol on a catalyst consisting of a mixture of MgSO_4 with Na_2SO_4 increases with an increasing content of S^{35} in the catalyst mixture.

The effects that have been observed are apparently due to changes in the crystal lattice taking place as a result of the action of the radiation. These changes lead to an increased chemical activity on the surface of the solid substances investigated.

This report was presented at a general conference of the Department of Chemical Sciences, Academy of Sciences USSR, held 22-23 May 1958.

31. The Action of Gamma Radiation on Aqueous Solutions of Tin and Titanium Salts

"The Action of Gamma Radiation Emitted by Co^{60} on Aqueous Solutions of Tin and Titanium Salts," by L. P. Sidorova, A. V. Zimin, and M. A. Proskurnin; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 12, Dec 58, pp 2793-2797

It was established that, in the irradiation of 10^{-2} molar solutions of Sn^{2+} in sulfuric acid, the yield of hydrogen does not depend on the concentration of the acid within the range from 1-4 N and amounts to 0.36-0.40 molecule per 100 ev. It was furthermore established that introduction into a 10^{-2} molar stannous tin solution of Fe^{2+} ions in 10^{-2} molar and 10^{-3} molar concentrations does not noticeably change the hydrogen yield. It was shown that reduction of suspended $\text{Sn}(\text{OH})_2$ to metallic tin by hydrogen atoms proceeds further in a weakly alkaline medium than in a weakly acidic medium. It was established that in 10^{-2} molar and 0.1 molar solutions of Ti^{3+} in hydrochloric acid the radiolysis of water comprises 5.0 molecules per 100 ev, whereas in sulfuric acid solutions it amounts to 4.2 molecules per 100 ev. It is concluded that redox systems with single electron transitions of the $\text{Ti}^{3+} \rightarrow \text{Ti}^{4+}$ type are best suited for bringing about the maximum yield in water radiolysis. On the other hand, systems with two - electron transitions of the $\text{Sn}^{2+} \rightarrow \text{Sn}^{4+}$ type give yields close to the molecular in this radiolysis.

Radiochemistry

32. New Antimony Isotopes

"New Isotopes of Antimony," by I. P. Selinov, Yu. A. Grits, D. Ye. Khulelidze, Ye. Ye. Baroni, Yu. A. Bliodze, A. G. Demin, and Yu. P. Kushakevich; Moscow, Atomnaya Energiya, Vol 5, No 6, Dec 58, p 660

Tin enriched with the Sn^{112} and Sn^{114} isotopes was irradiated with deuterons having an energy of 10 Mev. The antimony isotopes formed as a result of the bombardment were isolated chemically and identified thereby. The nuclear reactions by which the antimony isotopes were formed are discussed. Work is being conducted on the clarification of the radioactive disintegration chains of the newly discovered isotopes.

33. Preparation of the As^{74} Isotope by Irradiation of Germanium on the Cyclotron

"Preparation of the As^{74} Isotope on the Cyclotron," by A. I. Guldashvili, P. P. Dmitriyev, N. N. Krasnov, V. Ya. Mishin, and Ye. N. Khaprov; Moscow, Atomnaya Energiya, Vol 5, No 6, Dec 58, pp 660-661

Arsenic isotopes were produced by bombarding metallic germanium in a cyclotron with deuterons having an energy of 10.8 Mev. The Marsh method was used to concentrate the arsenic. The arsine that had formed was decomposed and the radioactive arsenic deposited in the form of a black mirror in the quartz capillary of a modified Lockemann apparatus. By distilling this arsenic from the capillary, concentrated As^{74} preparations were obtained.

II. ELECTRONICS

Communications

35. Multichannel Systems

"Parallel Selection Multichannel System With Controlled Coupling," by M. Ye. Gertsenshteyn, A. M. Pokras, and L. G. Solovey; Moscow, Radiotekhnika, No 12, Dec 58, pp 20-25

Multichannel systems in which several transmitters or receivers, tuned to various frequencies, are connected to one antenna have found wide application in modern SHF radio-engineering equipment. For rather narrow frequency bands and relatively low matching requirements, the problem of separation or combination of channels may be solved with the aid of a system of parallel sections, in which various filters are connected to each other in parallel and to the common transmission line by means of a simple and compact ramified waveguide joint.

The article discusses a calculation method for a simple ramified waveguide with a traveling wave ratio of about 0.95 at the output. A five-channel ramified waveguide was designed for frequency range of 8,600-9,200 Mc, using two-section filters for channel separation.

36. 1,500-Mc Radio Station

"Radio Station Operating on 1,500 Mc," by V. Lomanovich; Moscow, Radio, No 12, Dec 58, pp 18-21

A radio transmitting and receiving station operating on a 1,500-Mc frequency was recently designed. It draws its power supply from a 6-v storage battery. A transistorized converter supplies the required plate voltage. Power of about 0.1 w is fed from the transmitter to the antenna. The over-all power consumption of the station is 9 w when transmitting and 6 w when receiving. The station is built with two basic blocks. The radio-frequency block contains a master oscillator (using a 6S11D miniature tube) assembled according to a common-grid circuit. The antenna is inductively coupled to the oscillator. The radio-frequency block is mounted on the antenna pole. The antenna horn is of a pyramidal shape, producing a 40° radiation beam in the vertical plane. The power supply and control block include a combined AF modulator-amplifier (tube 6S6B) and a dc converter. The converter is assembled on push-pull principle of a blocking oscillator using P4 type transistors.

Adjustment of the master oscillator to 1,520 Mc is accomplished with the aid of a plate cavity-resonator. Semiconductor diodes DG-Ts25 are used in the rectifying bridge circuit.

Tubes 6S5D and 12S3 are the recommended substitutes for the tube 6S11D; the latter is used in radiosondes.

37. Transmission of Information

"Transmission of Information in Channels With Feedback," by P. L. Dobrushin; Moscow, Teoriya Veroyatnostey i Yeye Primeneniya, Vol 3, No 4, 1958, pp 395-412

The use of feedback is shown not to increase the capacity of channels without memory. Several simple channels with memory are considered and their capacities are compared when feedback is and is not used.

Wave Propagation

38. Generation of Millimicrosecond Pulses

"Generation of Millimicrosecond Pulses of High-Repetition Rate," by B. A. Mamyrin, Moscow, Radiotekhnika, No 11, Nov 58, pp 27-38

The article presents a method for generating millimicrosecond pulses having a repetition rate of the order of one megacycle and amplitude of about 200 v. A method of engineering calculation for such an oscillator and the operating conditions for the output stage tubes are given. The miniature tube GU-29 is recommended for the output stage of such a generator.

A millimicrosecond pulse generator developed at the Leningrad Physico-technical Institute of the Academy of Sciences USSR will be described in a separate article at a later date.

The author expresses thanks to I. F. Kalinkevich for his assistance.

39. Inclined-Incidence and Reflection Ionosphere Sounding

"Certain Problems Related to Inclined-Incidence and Reflection Sounding of the Ionosphere," by B. I. Osetrov; Moscow, Radio-tekhnika, No 12, Dec 58, pp 3-10

The inclined-incidence and reflection method is a new and effective way of investigating the condition of the ionosphere. The works of N. I. Kabanov, K. M. Kosikov, and others have shown that the method accurately

reflects the actual picture of ionosphere distribution. This method provides valuable data which helps to improve the reliability of radio communication, especially communication with microwave frequencies. With the help of the inclined-incidence and reflection method it is possible to maintain control of radio-wave communication and to monitor the operating frequencies.

The essence of the method consists in measuring the backward scatter propagation produced by an inclined radio beam at the point of incidence with the ionosphere or the ground surface. If a receiver with cathode-ray scope is located in the vicinity of the transmitter, a series of scatter-reflected signals will be observed on the scope. The amplitude of the scatter-reflected signals depends on the transmitter pulse power, gain factor of transmitting and receiving antennas, scattering properties of the ionosphere or ground, absorption of ionosphere, sensitivity of the receiver, and some other factors.

The article describes investigation of ionosphere inhomogeneities with the aid of the inclined-incidence and reflection sounding method.

Instruments and Equipment

40. Instruments Used in Aviation Engineering

"Electromagnetic Oscillographs Used in Aviation Engineering Study and Testing," by V. P. Nikulin; Moscow, Priborostroyeniye, No 12, Dec 58, pp 16-18

In testing aviation equipment, both on the ground and in the air, multi-channel electromagnetic oscillographs are used widely to record data on light-sensitive paper or film. High sensitivity of vibrating elements in these instruments permits recording microcurrent from transducers without any amplification. Nonelectrical parameters that can be recorded with the aid of electromagnetic oscillographs include altitude of flight, airspeed, g-loads, angle of attack, angular velocity, rpm, fuel consumption, temperature, pressure, vibration and stresses in various structural members, etc.

These oscillographs operate from a 27-v dc line, with permissible voltage fluctuation of $\pm 10\%$. The accuracy of readings is from ± 0.3 to $\pm 1.5\%$, the sensitivity for current is from 5,000 to 10,000 mm/milliamp, and the natural frequency of oscillating components is from 10,000 to 15,000 cycles. The following electromagnetic oscillographs were developed at one of the instrument building plants of the State Committee for Aviation Engineering and at scientific research institutes: a small size five-component (galvanometer) K5-22 oscillograph, 9-component K9-21 oscillograph, 12-component K12-21 oscillograph, 12-component 12-OS-2 oscillograph, and 20-component K20-21 oscillograph. The weight and over-all dimensions of the mentioned instruments are as follows, respectively: 8.5, 28, 10. 9.5 and 19.9 kg; 255 x 214 x 130, 230 x 320 x 445, 205 x 185 x 390, 370 x 230 x 230, and 282 x 266 x 480 mm.

41. Soviets Make Television Microscope

"Television Microscope" (unsigned article); Bratislava, Pravda,
2 Dec 58, p 4

The Leningrad Electrical Engineering Institute completed a television microscope which can transmit a picture up to 70 meters. Essentially, the equipment is composed of an ordinary microscope, instruments for the conversion and amplification of the optical image, and a unit for sending impulses to the television receiver. The resulting picture of the microscopic object is observed on the receiver picture tube.

42. Spectral Analysis of Microscopic Particles

"An Instrument for Microspectrometry With Spectral Photometers,"
by K. H. Brauer and F. Froehlich, Institute for Experimental
Physics, Halle University; Berlin, Experimentelle Technik der
Physik, Vol 6, No 5, 1958, pp 216-222

An accessory device for spectral photometers is described and illustrated, with which absorption measurements can be made on any microscopic objects and with which pointwise measurements of plane objects which are extended in micro-ranges can be produced as a function of the coordinate in the plane of the object. The performance of the device when used together with the Jena universal spectrophotometer is investigated for the wavelength range of 250-1,100 millimicrons. Some examples of possible uses of the device are given.

[For additional information on instruments, see Item No 12.]

Components

43. Iron-Carbon Batteries

"Iron-Carbon Battery VDZh-400," by S. Gantman; Moscow, Radio,
No 12 Dec 58, pp 45-46

At the All-Union Scientific Research Institute of Current Sources, an iron-carbon battery with alkaline electrolyte and electrodes of activated carbon and spongy iron was developed. This battery is designated VDZh-400 and can be used for filament heating of battery receivers, in signalization and automatic blocking on railroads, in wire communication systems, for lighting, etc. The carbon electrode is prepared by pressing a mixture of activated charcoal wetted with a solution of cautchouc in benzine and paraffin.

The basic characteristics of the VDZh-400 battery are: diameter 221 mm, height 75 mm, weight 5 kg, emf about 0.9 v, average discharge current 0.5 a, maximum permissible discharge 1.0 a, and capacity about 400 amp-hours.

44. Triode 6S11D

"Triode 6S11D" (unsigned article); Moscow, Radio, No 12, Dec 58, p 27

The principal application of the triode 6S11D is for generation of SHF radio waves. The tube is of metal-glass construction, with silver-plated cylindrical cathode and plate outlets, and disk-type grid outlet. The indirectly heated cathode requires 6 v for the heater and draws about 172 milliamp of current. The over-all length of the tube is 47.5 mm. The tube parameters are as follows: transconductance 6.5 milliamp per v, amplification factor 16.7 output power not less than 300 milliwatts, input capacitance 2.53 micromicrofarads, output capacitance not greater than 0.1 micromicrofarad, and maximum generated frequency 1,800 Mc.

45. Pulse-Duration Control Method

"Pulse-Duration Control With Blocking Oscillator," by B. S. Danilov; Moscow, Radiotekhnika, No 12, Dec 58, pp 36-44

Two coupled blocking oscillators can be conveniently applied to the control of pulse duration when a nonlinear two-terminal network of proper parameters is incorporated into the circuit. Such a circuit contains two parallel-connected blocking oscillators sharing the common core of a pulse transformer. The volt-ampere characteristic of the two-terminal network is such that it permits a wide range of voltage and current fluctuation, thus enabling control of pulse duration by feeding additional energy to the system. The experiment was conducted with 6N8S tubes.

The author thanks S. A. Dobrov for assistance rendered.

46. Chinese-Made Photo Conductive Cell Described

"Properties and Applications of a Chinese-Made Cadmium Sulfide Photoconductive Cell," by Chou Ting-hsin (周鼎新), Shanghai Precision Medical Apparatus Plant; Peiping, I-chi yu Shih-yen Chi-shu (Instruments and Experimental Techniques), No 2, 1958, pp 31-37

This article gives the characteristics and applications of a cadmium sulfide photoconductive cell manufactured in China by the state-operated Shanghai Precision Medical Apparatus Plant. According to the author, the initial trial manufacture of the semiconductor device was carried out in

1956. Basic research on its improvement was concluded in June 1957. Its performance is reportedly comparable to that of the Soviet FS-K₁ and FS-K₂ models and the German (Dr B. Lange) 1956 photocell.

An illustration showing sizes of the Chinese and foreign models as compared with a paper clip is included. Technical performance data are well supported with charts.

Computers

47. Equivalent Circuits for Relaxation Phenomena

"On the Theory of Relaxation. II. Electrical Network Models for the Relaxation Behavior of Matter," by S. Kaestner, Institute for Plastics of the German Academy of Sciences in Berlin, Berlin-Adlershof; Leipzig, Annalen der Physik, Vol 2, No 3/4, 1958, pp 146-162

Electrical networks are given which can be used as "analogy models" for the relaxation behavior of any system. In the most generalized case, they are made up of inductances or capacitances, ohmic resistances, and ideal transformers. Certain special cases are discussed in which the desired result is obtained without ideal transformers; such cases are of special importance for the design of analog computers. Additional models are computed which can be used especially for theoretical considerations and which are very simple in structure. These models contain, however, a certain number of negative circuit elements.

Materials

48. Electrical Properties of HgSe-HgTe System

"Electrical Properties of Thin Films of HgSe-HgTe System," by O. D. Yel'pat'evskaya, Semiconductor Institute of the Academy of Sciences USSR; Moscow-Leningrad, Zhurnal Tekhnicheskoy Fiziki, No 12, Dec 58, pp 2676-2683

Thin films of semiconductors can be utilized for construction of such components as photosensitive layers, resistors, semitransparent contacts, and bolometers. Numerous experiments have shown that the current-carrier mobility of the film is substantially lower than that of the solid material. The hole mobility for germanium single crystal is $1,900 \text{ cm}^2/\text{v}\cdot\text{sec}$, while that for the film is only $50 \text{ cm}^2/\text{v}\cdot\text{sec}$. The highest value for the current-carrier mobility in the film was obtained with HgSe-HgTe and GaSb, for which it was about $1,000 \text{ cm}^2/\text{v}\cdot\text{sec}$.

The decrease of carrier mobility in continuous thin films, where the grain structure has not yet developed, is explained by the fact that a great portion of free electrons is scattered over the surface of the film. The film samples of tellurium and selenium and their solid solutions several microns thick were deposited on mica or glass plates.

It was shown that under certain conditions of preparation of HgSe film, the carrier mobility can be raised to almost that of a single crystal, while the temperature dependence can be reduced considerably.

49. X-Ray Analysis Device for Modern Ceramic Capacitor Materials

"An X-Ray Counter-Tube Goniometer With a Precision Focusing Tube as Radiation Source," by A. Eckardt, Institute of Technical Physics, Friedrich Schiller University, Jena, and F. Stary, Institute for Experimental Nuclear Research, Dresden Technische Hochschule; Berlin, Experimentelle Technik der Physik, Vol 6, No 5, 1958, pp 193-202

This article describes and illustrates (four photographs and seven diagrams) an X-ray counter-tube goniometer developed at VEB Keramische Werke, Hermsdorf. An attempt was made to get the highest possible resolution through the use of an X-ray tube with an effective focal spot width of 30 microns, used in the Bragg focusing arrangement. Various factors are considered which influence the width of the interference lines. Several of the first interference diagrams show that the attempted resolution was achieved.

Acoustics, Audio Frequencies

50. Research at Radio Broadcasting and Acoustics Institute

"At the Laboratories of the Leningrad Scientific Research Institute of Radio Broadcasting and Acoustics," by B. Semenov, chief engineer; Moscow, Radio, No 12, Dec 58, pp 8-9

The Leningrad Scientific Research Institute of Radio Broadcasting and Acoustics (IRPA) is working on problems of developing complex broadcasting equipment operating at higher frequency ranges. At the Department of Acoustic Equipment, the ribbon microphone ML-11B with cardioidal characteristics, microphone ML-15 with circular directivity characteristics, dynamic microphone MD-38 with a 40- to 15,000-cycle band-pass, and capacitor microphone MK-3 with a 40- to 15,000-cycle band-pass were recently developed. New wide-band (12-15 kc) loudspeakers 1GD-9, 2GD-3, 3GD-7, 4GD-1, 5GD-10, and 5GD-15 were designed at the institute.

At present the IRPA is developing a magnetic-electric sound pickup with a band-pass of 30-15,000 cycles, and a new acoustic system utilizing the principle of pseudostereophonic sound presentation, which does not require side speakers.

51. Ultrasonic Crystal Microphones for Underwater Detection

"Crystal Microphones With Small Dimensions for the Detection of Ultrasonic Oscillations in Liquid Media," by H. Markgraf, German Office for Measure and Weight; Berlin, Feingeräetetechnik, No 12, Dec 58, pp 543-547

The article discusses seignette salt crystal microphones in miniature design for the detection of the directional characteristics of hydroacoustic ultrasonic waves in open waters.

After a description of the production of the piezoelectric crystal and the design of the microphones, the results of tests are reported. The measured sensitivity of the microphones ranges from 2 to $5 \cdot 10^{-6}$ v/microbar at a temperature of 24.9°C, which was considered satisfactory. The frequency response is practically linear between 30 and 200 kilocycles per second.

A description is then given of a microphone sonde with a lithium sulfate crystal for admeasuring relative sonic field values in liquids within a frequency range of 30 kc-30 Mc.

The crystals (seignette salt and lithium sulfate) were grown by Dr. Gollwitzer and Dr Schwinghammer in the chemical laboratory of the Central Physical-Technical Institute (PTZ) of the German Office for Measure and Weight (DAMG).

Reliability

52. Reliability Sections Organized

"Toward Further Successes of Soviet Radio Electronics" (unsigned article); Moscow, Radiotekhnika, No 11, Nov 58, pp 3-4

The article contains the following passages:

CPYRGHT

"To organize the radio engineering society and mobilize its attention toward fastest solution of all requirements related to reliability problems, the Central Administration of the Scientific-Technical Society imeni A. S. Popov has organized in 1958 a special Reliability Section, which already has begun to function.

"The Central Administration of the society has approved the recommendations of the Reliability Section to organize similar sections at a number of oblast, kray, and republic administrations of the society, where radio electronics enterprises are located. The initial steps have been already taken to organize such sections."

53. Appeal for Emphasis on Reliability

"Resolution of the Reliability Section of the Central Administration of the Scientific and Technical Society of Radio Engineering and Electrical Communications imeni A. S. Popov (NTORiE) "(unsigned article); Moscow, Radiotekhnika, No 11, Nov 58, p 74

CPYRGHT The article contains the following passages:

"The Reliability Section of the Central Administration of NTORiE imeni A. S. Popov appeals to the leaders of scientific research, design, and manufacturing institutions connected with radio electronics and other allied fields, and to the party, trade-union, and Komsomol organizations of these institutions, as well as the primary organizations of the society, to intensify the struggle for improved-quality production in all sectors of design, assembly of equipment, and manufacture of individual components.

"At the scientific research institutes it is necessary to expand substantially the work related to the study and improvement of component reliability. At the design bureaus and research institutions the cause of equipment failure should be studied relentlessly.

"The Reliability Section of the Central Administration of NTORiE imeni A. S. Popov requests that the TsBNIT [Central Bureau for Scientific and Technical Information?] on radio electronics and the Bureau of New Technology (BNT) of the Ministry of Defense organize the translation and publication of foreign materials related to the subject of radio electronic equipment reliability."

Patents

54. Recent Soviet Patents in the Field of Electronics

"Class 21. Electrical Engineering" (unsigned article); Moscow, Byulleten' Izobreteniy, No 10, Oct 58, pp 36-59

Class 21a¹, 903. No 115492 -- A. I. Borovikov; Frequency Relay

Class 21a¹, 3204. No 115446 -- M. V. Kukharev; Device for Plane Scanning of Images With Oscillating Mirror

Approved For Release 1999/09/08 : CIA-RDP82-00141R000100250001-6

Class 21a¹, 3210. No 115236 -- I. Ya. Lyamichev; Method and Device for TV Image Transmission

Class 21a¹, 3212. No 115585 -- A. M. Khal'fin and V. N. Krasnov; Method for TV Signal Transmission

Class 21a¹, 3234. No 115218 -- I. I. Tsukkerman; Method for Transmission of Color Images

Class 21a¹, 3235. No 115353 -- A. S. Selivanov; Transmitting TV Tube

Class 21a¹, 3235. No 115577 -- B. V. Krusser, I. K. Malakhov, and A. P. Nefed'yev; Method for Reduction of Internal Noises in Transmitting TV Tubes

Class 21a¹, 3402. No 115617 -- I. Ya. Lyamichev; TV Receiving Screen

Class 21a¹, 3550. No 115221 -- B. I. Lytkin; Method for Separation of Frame Synchronizing Signals in TV Receiver

Class 21a³, 1710. No 115403 -- I. V. Prangishvili; Contactless Switch

Class 21a⁴, 602. No 115239 -- Yu. N. Prozorovskiy; Generator of Milli-microsecond Video Pulses of Triangular Shape

Class 21a⁴, 13. No 115726 -- A. D. Artyn; Method of Phase Modulation

Class 21a⁴, 2202. No 115481 -- A. A. Bronnikov; Electromechanical Band-Pass Filter

Class 21a⁴, 5002. No 115494 -- L. I. Kupriyanovich; Device for Calling and Switching Channels of Radiotelephone Communication

Class 21a⁴, 6601. No 115634 -- A. M. Model'; Separating Filter for Feeding an Antenna From Several Transmitters

Class 21a⁴, 71. No 115341 -- N. A. Isayev; Compensated Stepwise Voltage Divider

Class 21a⁴, 71. No 115538 -- B. M. Kuvaldin, N. K. Kaminskiy and S. P. Kuznetsov; Phase Detector for Measurement of Phase Shift Between Voltages With Multiple or Rational-Fractional Frequencies

Class 24a⁴, 71. No 115709 -- R. Ye. Makhlin; Wavemeter With Two Tunings for Measurement of Small Frequency Difference

Class 21a⁴, 7204. No 115618 -- A. M. Model'; Separating Waveguide Filter

Class 21d², 1203. No 115377 -- V. I. Shiryayev and V. G. Golyatin;
Device for Forming of Control Pulses

Class 21g, 1301. No 115688 -- V. P. Tychinskiy; Method for Obtaining
Nonlinear Characteristics of Traveling-Wave Tube and Device for Accomplish-
ing It

Class 21g, 1317. No 115681. -- V. P. Tychinskiy; Vacuumless Amplifier
of SHF Oscillations

III. ENGINEERING

55. "Energeticheskiy Byulleten'" Discontinued

Moscow, Energeticheskiy Byulleten', No 12, Dec 58, back cover

Gostoptekhizdat announces that the publication of the periodical Energetichskiy Byulleten' will be discontinued after the December 1958 issue.

IV. MATHEMATICS

Approximation Theory

56. Fourier Series of Eigenfunctions of Differential Operators

"The Use of Fractional Powers of Operators in Studying Fourier Series of Eigenfunctions of Differential Operators," by M. A. Krasnosel'skiy and Ye. I. Pustyl'nik, Voronezh State University; Moscow, Doklady Akademii Nauk SSSR, Vol 122, No 6, Oct 58, pp 978-981

In recent years interest has increased in the investigation of Fourier series of eigenfunctions of the Laplace operator and other differential operators (see, for example, the works of O. A. Ladyzhenskaya, Smeshannaya zadacha dlya giperbolicheskogo uravneniya [The Mixed Problem for a Hyperbolic Equation], 1953, and the works of V. A. Il'in, Usp. matem. nauk, Vol 13, No 1, [79] [1958], and Izv. AN SSSR, Ser. Matem., Vol 22, No 1, 1958 and the bibliographies presented there). Questions concerning the conditions for uniform convergence, concerning the speed of convergence of these series, concerning application of the Fourier method to the solution of boundary value problems, concerning the term-by-term differentiation of series, etc., have been studied.

The series of enumerated problems, in the opinion of the authors, lead to considerations utilizing positive, fractional powers of differential operators. All the difficulties are reduced to determining from which to which functional spaces the negative powers of the operators are in effect, and this is known in essence for the specific, differential operators. Note was taken of the fact that in a similar case fractional powers were utilized in the theory of nonlinear integral equations and in the theory of parabolic equations by M. A. Krasnosel'skiy in his work Topologicheskiye Metody v Teorii Nelineynykh Integral'nykh Uravneniy (Topological Methods in the Theory of Nonlinear Integral Equations), 1956, and by M. A. Krasnosel'skiy, S. G. Kreyn, and P. Ye. Sobolevskiy in their work which appeared in DAN, Vol 112, No 6, 1957.

57. Approximation by Interpolation Polynomials

"Approximation of Nonperiodic Functions by Interpolation Polynomials," by D. L. Berman, Novgorod Pedagogical Institute; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy Matematika, No 6 (7), Nov/Dec 58, pp 30-35

Let a matrix of basic points

$$-1 \leq x_1^{(n)} < x_2^{(n)} < \dots < x_n^{(n)} \leq 1, n = 1, 2, \dots$$

and a function $f(x)$ defined on the segment $[-1, 1]$ be given. Let us denote by $L_n(f, x)$ the Lagrangian algebraic interpolation polynomial of order $(n-1)$ constructed for the n -th row of matrix (1) and for the function $f(x)$.

As is known,

$$L_n(f, x) = \sum_{k=1}^n f(x_k^{(n)}) \varphi_k^{(n)}(x),$$

where $\left\{ \varphi_k^{(n)}(x) \right\}_{k=1}^n$ are fundamental polynomials of Lagrange constructed for the n -th row of matrix (1).

We will designate the set of all functions defined on the segment $[-1, 1]$ and satisfying the inequality

$$\left| f(x_2) - f(x_1) \right| \leq \left| x_2 - x_1 \right|, \quad x_1, x_2 \in [-1, 1]. \text{ by } H^{(1)}.$$

We set

$$E_n(x, L_n) = E_n(x) = \sup_{f \in H^{(1)}} \left| f(x) - L_n(f, x) \right|.$$

S. M. Nikol'skiy has made a systematic study of the quantities $E_n(x)$ for different methods of approximation and different classes of functions. In his work "Approximation of Periodic Functions of Trigonometric Polynomials," Tr. Mat. Inst. im. V. A. Steklov AN SSSR, Vol 15, pp 45-49, 1945, he obtained an asymptotic estimate of the quantity $E_n(x)$ for the approximation of 2π periodic functions, satisfying the Lipschitz conditions by Lagrangian trigonometric interpolation polynomials having equally spaced basic points.

The different trait of the present work is the fact that the quantity $E_n(x)$ is studied in the case when the interpolation process of Lagrange is built for an extremely wide class of basic point matrices. In particular, all the matrices of the form (1) belong to the class of matrices made up of the roots of Jacobi polynomials

$$I_{\eta}(\alpha_n, \beta_n)(x), \quad n = 1, 2, \dots$$

with parameters satisfying the inequalities

$$-1 \leq \alpha_n \leq -\gamma_1 < 0, \quad n = 1, 2, \dots,$$

$$-1 \leq \beta_n \leq -\gamma_2 < 0, \quad n = 1, 2, \dots,$$

where γ_1 and γ_2 are fixed positive numbers as small as you please.

"Concerning the Convergence and Summability of Interpolation Processes for Functions of Two Variables," by I. A. Kipriyanov, Voronezh Forestry Engineering Institute; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy Matematika, No 6 (7), Nov-Dec 1958, pp 111-126

It has long been noted that theorems concerning the convergence of Fourier Series as a rule carry over to convergence of trigonometric interpolation process with equally spaced basic points.

J. Marcinkiewicz made a systematic research of this problem in his work "Concerning Interpolation," I, II. Stud. Math., t. VI. Following the work of S. N. Bernshteyn [1] many authors (see, for example [2], [3], and [4]) studied the problem of summing a trigonometric interpolation process with equally spaced basic points by methods which earlier had been justified for the summation of Fourier Series.

More general results, however, were obtained by S. M. Lozinskiy, Rec. Math., 14 (56), No 3, 1944. He showed that in a certain sense each theorem concerning the convergence and summation of a Fourier series may be carried over to the convergence and summation of a trigonometric iteration process with equally spaced basic points. In addition, S. M. Lozinskiy proved that these results remain in force for more general approximating processes, containing iteration processes as a particular case.

The present work has as its goal to indicate a class of functions of two variables to which the results of S. M. Lozinskiy carry over completely.

[1] S. N. Bernshteyn, "Trigonometric Interpolation According to the Method of Least Squares," DAN, No 1-2, 1934.

[2] S. M. Lozinskiy, "On Convergence and Summability of Fourier Series and Interpolation Processes," Rec. Math., 14 (56), No 3, 1944.

[3] I. F. Natanson, "Summation of Fourier Series by the Method of S. N. Bernshteyn i V. Rorozinskiy," Tr. L. Ind. In-Ta, No 4, 1937.

[4] F. I. Kharshiladze, "On Bernshteyn's Method of Summation," Mat. Sb., Vol II (53), 1942.

58. Applications of the Two-Sided Methods of Approximation

"Several Applications of the Methods of Two-Sided Approximations," by S. N. Slugin, Kazan' State University imeni V. I. Ul'yanov-Lenin; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy Matematika, No 6 (7), Nov-Dec 58, pp 244-256

The paper further develops the methods of approximate solution of operator equations as presented in [1], [2], and [3] and their application to a certain class of equations for which similar methods are not applied more than in particular cases.

[1] "Approximate Solution of Integral-Differential Equations on the Basis of Chaplygin's Method," Izv. Vuzov MVO, Mat., No 1, pp 211-221, 1957.

[2] "Unrestrictedly Applicable Method of the S. A. Chaplygin Type for Ordinary Differential Equations of the n-th Order," DAN, Vol 110, No 6, pp 936-939, 1956.

[3] "An Iteration Method for One-Sided Approximations for the Solution of Operator Equations," IAN, Ser. Mat., 21, No 1, pp 117-124, 1957.

59. Estimation of the Error for Numerical Integration of Ordinary Differential Equations

"Estimating the Error of Numerical Integration of Ordinary Differential Equations," by S. M. Lozinskiy, Leningrad Air Force Academy imeni A. F. Mozhaysky; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy Matematika, No 5 (6), Sep-Oct 58, pp 52-89

The work is the first part of a paper devoted to the estimation of the error arising in numerical integration. Preliminary definitions and lemmas are presented on which are based a theory and two theorems dealing with the estimation of the error of numerical integration by extrapolation methods.

In the second part the author intends to publish a generalization of the known theorems by the corresponding estimates of the error of interpolation methods and a consideration of examples, as well as an account of a certain "linearized" theorem for the error of numerical integration.

60. A Class of Converging Iteration Methods

"Concerning One Class of Converging Iteration Methods," by E. E. Tamme, Tartu State University; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy Matematika, No 5 (6), Sep-Oct 58, pp 115-121

A general theorem concerning the convergence of a wide class of iteration methods was given by Yu. Ya. Kaazik in his work "Concerning the Approximate Solution of Nonlinear Operator Equations by Iterative Methods," which appeared in UMN, Vol 12, No 1, 1957, p 195.

In the present work the convergence of one class of iteration methods is studied with the help of a majorant, and the possibility of forming new methods of this class is indicated. The majorant equation is taken in the form of a real equation for simplicity. It was noted that analogous results could be obtained with a maximizing equation constructed in a certain Banach semiseries space.

Two works of V. Ye. Mirakov which appeared in UMN, Vol 11, No 3, 1956, pp 171-174, and DAN, Vol 113, No 5, 1957, pp 977-979, as well as the work of L. V. Kantorovich, which appeared in DAN, Vol 76, No 1, 1951, pp 17-20, were referred to concerning the Banach space.

51. The Remainder Term of Formulas for Numerical Differentiation Discussed

"Concerning the Estimate of the Remainder Term of Formulas for Numerical Differentiation," by M. L. Brodskiy; Moscow, Uspekhi Matematicheskikh Nauk, Vol 13, No 6 (84), Nov-Dec 58, pp 73-77

Let $f(t)$ be a function having the $(n+1)$ -th derivative bounded on a certain interval δ . If the interpolation polynomial $P_n(f;t)$ is constructed to the basic points $a_0, a_1, \dots, a_n \in \delta$ and x is a particular point $\in \delta$, then the question concerning the estimate of the error of the approximating formula

$$f^{(k)}(x) \approx P_n^{(k)}(f;x) \quad (1)$$

arises through the value $f^{(n+1)}(t)$ for $(1 \leq k \leq n)$.

J. F. Steffensen in his work Interpolation, Baltimore, 1927, proved that if x was in the interval, bounded by the greatest and the smallest of the numbers a_0, a_1, \dots, a_n , then the formula

$$f^{(k)}(x) - P_n^{(k)}(f;x) = R_{n+1}^{(k)}(f;x) = f^{(n+1)}(\xi) / (n+1)! w_{n+1}^{(k)}(x), \quad (2)$$

is correct where $R_{n+1}(f;t) = f(t) - P_n(f;t)$; $w_{n+1}(t) = \prod_{i=0}^n (t-a_i)$; and ξ is a point inside Δ , where Δ is the smallest segment containing a_0, a_1, \dots, a_n and x .

Sh. Ye. Mikeladze in his work "Numerical Integration," Uspekhi Matematicheskikh Nauk, Vol 3, No 6 (28), p 5, 1948, made the assertion that formula (2) is correct for any $x \in \delta$, except the roots of the polynomial $w_{n+1}^{(k)}(t)$.

This assertion is not correct. In fact, if the assertion had been correct, then taking formula (2) to the limit, we would obtain the result that is also correct in the case when x is one of the roots of the polynomial $w_{n+1}^{(k)}(t)$, and that would indicate that the approximating formula (1) at those roots is exactly expressed for all functions $f(t)$ of the considered class, that is, the values $f^{(k)}(t)$ at the roots of the polynomial $w_{n+1}^{(k)}(t)$ are determined in a single-valued manner by the values $f(a_0), f(a_1), \dots, f(a_n)$. Sh. Ye. Mikeladze repeated his

assertion relative to formula (2) in the book Chislennyye metody matematicheskoye analiza, (Numerical Methods of Mathematical Analysis), p 266, Moscow, Gostekhizdat, 1953, and obtained, on the basis of that assertion, a series of new estimates for formulas of numerical differentiation with central differences. For example, the following estimate was obtained by Collatz in the paper "The Obtaining of Differences With a Better Approximation for Linear Differential Equations," Schriften Math. Sem. Inst. angew. Math, Univ, Berlin, 3, 1, 1935, and also presented in the book of L. V. Kantorovich and V. I. Krylov, Priblizhennyye Methody Vyshevo Analiza (Approximating Methods of Advanced Analysis) p 196, Leningrad-Moscow, Gostekhizdat, 1949, namely,

$$f^{(4)}(a) - 1/8h^3 [-f(a+3h) + 8f(a+2h) - 13f(a+h) - 8f(a-2h) + f(a-3h)] = 403/2520 h^4 \omega M_7[f], \quad (3)$$

where $M_{n+1}[f] = \sup_{t \in \Delta} |f^{(n+1)}(t)|$, $|\omega| \leq 1$. Sh. Ye. Mikeladze also gave for the right side of that formula the expression $7/120 h^4 \omega f^{VII}(\xi)$.

In the present work it is proved that formula (2) is correct for particular cases, except the case considered by Steffensen, and that the estimates, obtained by Sh. Ye. Mikeladze for formulas of numerical differentiation with central differences are correct; however, the assertion on which it is based is incorrect. On the other hand, a general exact formula is given for the estimate $R_{n+1}^{(k)}(x)$ through $M_{n+1}[f]$, from which it is seen that there exist extremely simple examples, when the estimate (2) does not hold for one value of x , situated between the interpolation basic points.

Biharmonic Functions

62. Boundary Properties of Biharmonic Functions

"Boundary Properties of Bisubharmonic Functions," by M. N. Shafeyev; Kiev, Ukrainskiy Matematicheskiy Zhurnal, Vol 10, No 3, 1958, pp 299-317

The concepts of a bisubharmonic function and of a biharmonic majorant are introduced.

Theorems are proved on the uniform convergence of a double series of biharmonic functions, on the convergence of the family $\{f(x, y)\}$ of increasing functions, on the convergence of the sequence $\{f_{m_k, n_k}^2\}$ of a function with a limited variation, and a lemma on the existence of biharmonic majorants and other auxiliary propositions.

Further, the author examines the double integral of Poisson-Stiltjes (Natanzon, I. P., Teoriya Funkstii Veshchestvennoy Peremennoy [Theory of Functions of a Real Variable], Moscow-Leningrad, Gostekhizdat, 1950, pp 196-197, 206-208, 298) and proves that the biharmonic function $U(w, z)$, defined within a unit bicylinder and represented there by the double integral of Poisson-Stiltjes possesses, almost everywhere on the boundary frame of this bicylinder, finite radial values forming a summed function, whose boundary values coincide with the mixed derivative $\psi''_{\alpha\beta}(\alpha, \beta)$.

In conclusion, various classes of biharmonic functions are studied.

Cybernetics

63. The Mathematical Problems of Cybernetics

"Concerning the Mathematical Problems of Cybernetics," by A. A. Lyapunov, Mathematics Institute imeni V. A. Steklov of the Academy of Sciences USSR; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Matematika, No 5 (6), Sep-Oct 58, pp 166-174

Cybernetics is that new region of science developed in recent times, as a result of the initiative of N. Wiener, J. von Neumann, and C. E. Shannon. It was formed on the basis of the study by mathematical methods of control systems and processes of control.

Cybernetics is found in close contact with many sciences: the technology of automatic control, communication, computer technology, economics (the works of L. V. Kantorovich and V. Leont'yev), biology, genetics and physiology, and linguistics (the works of O. S. Kulagina, "Machine Translation From French," the above source, pp 46-52). The collaboration of scientists of various specialties was cited as important for the development of cybernetics.

The author listed the following as essential directions for the development of cybernetics:

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1. Finding of methods for describing algorithms making possible a more flexible system of formal transformation such that these methods would encompass the needs of programing and construction of the machines and be convenient for the formation of general theories; and the search for the optimum algorithmic solutions of problems of fixed classes with the help of these methods.

2. The working out of a general theory of algorithms, and application of it to rational methods evaluating the possibilities of machines.

3. Development of a general theory of control systems as unique mathematical language of cybernetics.

In the opinion of the author, the basic problem from the source of cybernetics is the problem concerning the description of the interrelation between the possibilities of a human mind and a computer. The author also was of the opinion that insufficient pure research was being conducted in this field.

Numerical Analysis

64. Numerical Method for Determining the Constants of the Christoffel-Schwartz Integral to any Degree of Accuracy

"Numerical Method for Determining the Constants of the Christoffel-Schwartz Integrals", by P. F. Fil'chakov; Kiev, Ukrainskiy Matematicheskiy Zhurnal, Vol 10, No 3, 1958, pp 340-344

Results were obtained for closed polygons, and then generalized for open polygons in the following manner:

A closed polygon may always be inscribed in a triangle such that one of their vertices coincides and such that the sides of the triangle partially coincide with the sides of the polygon. Reflecting the obtained triangle onto a half plane such that the common vertex passes into a point at infinity, we obtain for the region containing the polygon a half plane possessing a series of small exclusive regions. Following this approach the value of the constants of the Christoffel-Schwartz integral are found to any degree of accuracy with the help of the corresponding elementary reflections (see Fil'chakov P. F.,) "The Method of Consecutive Conformal Reflections and its Application to the Problems of Filtration," I, II, III. Ukr. Matem. Zh., Vol VII, No 4, 1955; VIII, No 1 and No 3, 1956).

Probability Theory

65. On Multidimensional Stationary Random Processes

"On Multidimensional Stationary Random Processes," by Ye. G. Gladyshev; Moscow, Teoriya Veroyatnostey i Yeye Primeneniya, Vol 3, No 4, 1958, pp 458-462

The necessary and sufficient conditions for the regularity as well as for "the maximum regularity" of n-dimensional stationary random processes $x_1(t), x_2(t), \dots, x(t)$ with continuous time are obtained.

Wald's development for the process is also proved.

66. Multidimensional Markov Processes

"Final Probabilities for Multidimensional Markov Processes Which Describe the Action of Some Two-Stage Telephone Busy-Signal Systems," by G. I. Basharin; Moscow, Teoriya Veroyatnostey i Yeye Primeneniya, Vol 3, No 4, 1958, pp 452-458

Final probabilities are determined for multidimensional Markov processes with continuous time and a finite number of states describing the action of a two-stage telephone system with one switch in the second stage.

It is assumed that service calls form independent Poisson streams of calls and that the service times have independent negative exponential distributions.

On the basis of these final probabilities some other probability formulas for a common number of the busy lines are determined. These formulas are extensions of the well known Erlang formulas in the multidimensional case. Common group selection and random occupation of each free connecting device are considered.

67. Distribution of Sums of Random Variables Defined on a Markov Chain

"On the Distribution of Sums of Random Variables Defined on a Homogeneous Markov Chain With a Finite Number of States," by I. S. Volkov; Moscow, Teoriya Veroyatnostey i Yeye Primeneniya, Vol 3, No 4, 1958, pp 413-429

Local and integral limit theorems are established for a nonperiodical case. The results are given in the form of asymptotic expansions taking into account various possible values of the sums under consideration.

V. MEDICINE

Bacteriology

68. Cholera Vibrio and Brucella Compared Serologically

"Serological Similarity of Cholera Vibrio and Brucella," by L. Ye. Khundanov, Ye. D. Shkurko, and V. S. Mikhno, Irkutsk Scientific Research Institute; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 29, No 12, Dec 58, pp 93-94

In connection with research on cholera serum producers, it was noted that despite careful selection and the observance of all necessary precautions during storing, brucellosis antigen agglutinated 6 out of 8 sera. No positively reacting brucellosis producers were observed in special investigations (clinical, bacteriological, pathomorphological). To explain these observations, the relationships between antigens and sera of cholera Vibrio and Brucella were studied in cross experiments. Two newly acquired producers were the objects of the investigations. One of these was immunized with cholera OH-antigen, and the other, with O-antigen. Experiments and the results therefrom are discussed in the text. Conclusions presented on the basis of these results are as follows:

"1. Investigation of the blood of horse-producers and rabbits immunized with cholera antigen showed that serum from the blood agglutinated both cholera Vibrio (in higher titers) and Brucella (in considerably lower titers).

"2. A parallel decrease in titers of both anticholera and antibrucellosis agglutinins was observed in the blood of cholera serum producers during non-production periods.

"3. The presence of positive agglutination reactions with brucellosis antigen in producers of anticholera serum does not warrant disposing of them as brucellosis carriers."

69. Luminescent Microscopy Used To Detect Ornithosis Virus and Q Fever Rickettsia

"The Use of Luminescent Microscopy for Detecting the Ornithosis Virus in the Organs of Infected Animals," by V. D. Neustroyev, Ts. Ts. Khanduyev, and V. N. Milyutin; Moscow, Voprosy Virusologii, Vol 3, No 6, Nov/Dec 58, pp 330-333

Possibilities afforded by luminescent microscopy for observing viruses and Rickettsiae in the organs of infected animals were examined in the research reported in this article. The ornithosis virus and Q fever Rickettsia

in smear-impressions from infected white mice and chick embryos were selected for study of the method. The following equipment was used: OI-17 and OI-18 luminescent microscopes and FS-1 and ZsS-18 light filters. The experimental procedure and results are described. Conclusions drawn from these results are as follows:

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"1. The method of luminescent microscopy of fixed smear-impressions from infected organs, stained with fluorescent dyes and enclosed in a moist chamber, made it possible to observe ornithosis virus particles.

"2. An aqueous solution of acridine orange (1:30,000) is the most effective dye for observing ornithosis virus particles.

"3. On treatment of the preparations by the aforementioned method, the virus particles fluoresce with a bright green light; other formations have dull luminescence. This permits photographing of the virus particles in the preparations."

70. Chinese Study Physiological Characteristics of Brucellae

"Studies on the Biological Characteristics of Brucellae I. Report on New Procedure for Differentiation of Species," by Chi Lin-cheng (季 麟 征) and Li Tsai-lien (李 在 蓮), Department of Microbiology, Shantung Medical College; Peiping, Wei-sheng-wu Hsueh-pao (Acta Microbiologica Sinica), Vol 6, No 4, 1958, pp 493-495

This article describes a procedure for differentiating *Brucella abortus*, *Br. melitensis*, and *Br. suis* by their respective fermentation patterns. The formula and preparation of a basic medium, developed by the authors, for fermentation tests are presented. To each of five portions of the basic semi-solid medium, the authors added one of the following "sugars" [authors probably meant "carbohydrates"]: glucose, mannitol, rhamnose, maltose, and sucrose. The first two served as positive and negative controls, respectively. All three species fermented glucose. *Abortus* also fermented rhamnose, *suis*, maltose, and sucrose; but *melitensis* did not ferment any other.

The authors' differential dye sensitivity test by the paper disc method, a modification of the old paper strip technique, is also described. Experimental data supporting reports on the value of the urea breakdown test are presented.

"Studies on the Biological Characteristics of Brucellae II. Agglutination and Complement Fixation Reactions," by Li Tsai-lien and Chi Lin-cheng, Department of Microbiology, Shantung Medical College; Peiping, Wei-sheng-wu Hsueh-pao (Acta Microbiologia Sinica), Vol 6, No 4, 1958, pp 501-504

The authors state that the second stage of their "Studies on the Biological Characteristics of Brucellae" involved an investigation of their antigenicity and immunogenicity. In the course of that part of the investigation, serological tests were performed on small animals which had received immune serum. The purpose of the serology was to elucidate the interrelation between complement-fixing antibodies and agglutinins and to compare the specificity and sensitivity of the agglutination and complement-fixation reactions.

This article presents comparative data which show, according to the authors, that the complement-fixation test is more specific and more sensitive than the agglutination test, that it could serve as a tool for early serological diagnosis of brucellosis, and that it may eliminate many false negatives if used clinically.

71. Chinese Find Virus Strain Suitable for Extraneural Neutralization Test for B Encephalitis

"Extraneural Neutralization Test for Japanese B Encephalitis," by Chou Ming-hsien (周明光), Sung Kan (宋幹), and Lin Yu-shun (林毓純), Department of Virology, Chinese Academy of Medical Sciences; Peiping, Wei-sheng-wu Hsueh-pao (Acta Microbiologica Sinica), Vol 6, No 4, 1958, pp 447-450

This article describes an extraneural neutralization test for Japanese B encephalitis which gives higher indexes of neutralization reaction in white mice than does the more widely practiced intracerebral neutralization test. The key factor in the test is a virus strain with high peripheral pathogenicity to white mice. This was found in the Ching-Wei-Yen Strain (京衛研株; abbreviated form for Central Institute(s) of Health, Peiping).

It was found that indexes of neutralization reaction by intraperitoneal and subcutaneous routes, using immune chick serum containing the Ching-Wei-Yen Strain, were 181,000 and 871,000, respectively. These indexes compare with only 218 for the intracerebral route using the same immune serum.

The authors state that the Ching-Wei-Yen Strain makes it possible to use the extraneural test on freshly weaned mice, 3 weeks old and limited to 7-9 grams in weight. This renders unnecessary the old practice of using suckling mice in the presence of mother mice in extraneural tests, they say.

The authors conclude that the test can be applied in the detection of latent B encephalitis infection and postimmunization antibody titers.

Epidemiology

72. Prophylaxis of Tularemia

"Epidemiology and Active-Specific Prophylaxis of Tularemia in a Foothill-Stream Type Focus," by R. S. Amanzhulov, Zdravookhraneniye Kazakhstana, No 5, 1958, pp 22-25 (from Meditinskiy Referativnyy Zhurnal, No 12, 1958, pp 60-61)

CPYRGHT

"A tularemia infection was reported for the first time in the village of Aleksandrovka in 1938 in Verkh-Ubinskiy Rayon, East Kazakhstanskaya Oblast. *Arvicola terrestris* L., *Sorex personatus*, and *Mus musculus* were carriers of the tularemia pathogen. The tularemia outbreak was concentrated in a foothill-stream focus and had a seasonal character (increase in June-July, and decrease in September-October). Persons who contracted tularemia were primarily between the ages of 15-30 years (52.5%, irrespective of profession and sex). The form of the illness was frequently anginous-bubonic (82.5%), mainly with affection of the submaxillary lymph nodes and along the thoracic-clavicular-pectoralis muscles. Basic measures of specific prophylaxis included vaccination of persons in villages threatened with tularemia by the subcutaneous method with dry live tularemia vaccine. Clinical-epidemiological observations in 1956-1957 indicated that an average of 86-91% of the vaccinations took when the subcutaneous method was used; these figures increased to 95-98% when the rules for carrying out the inoculations were observed. Cutaneous vaccination was repeated when negative results ensued."

Immunology and Therapy

73. Killed Cholera Vibrion and Live *B. pestis* in Associated Vaccine

"A Study of an Associated Vaccine From Killed Cholera Vibrion and Live *B. pestis*," by Ye. I. Korobkova, N. K. Vereninova, N. F. Kalacheva, B. Yu. Petrova, and A. N. Kraynova, Institute of Microbiology and Epidemiology of the Southeastern USSR; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 29, No 11, Nov 58, pp 38-45

The authors introduce this article by pointing out several discrepancies between their own opinions and those of other investigators concerning the expediency of combined vaccination. The purpose of the research herein described was to study a combined preparation of killed cholera and live

plague vaccines; the study was motivated primarily by the observation that areas of cholera and plague epidemics coincide in many countries. Some of the difficulties involved in combining the two types of vaccines are enumerated, after which the actual experiments performed are discussed.

In the first series of experiments, immunogenic characteristics of the combined vaccine were studied with a liquid mixture of cholera vaccine killed by heat and bivalent live plague vaccine 1-17 (a 2-day agar culture). The killed cholera vaccine was mixed with the live plague vaccine before use so that each dose contained 500 million plague microorganisms and one billion cholera Vibrio. The pigs immunized with the combined vaccine were divided into two groups after 21 days; one group was infected with 200 Dcl of virulent B. pestis strain No 708, and the other group, with 2 Dcl of virulent cholera Vibrion No 1488. Control animals immunized with the corresponding monovaccines were also infected in this manner. Cross infection experiments were performed 1 1/2 months after the first testing of immunity. All results are shown in five-tables and two graphs.

CPYRGHT The following conclusions are presented on the basis of these results:

"1. Killed cholera vaccine dried in a sucrose-gelatin medium under high vacuum maintained its immunogenic characteristics for a long time. The possibility of drying a suspension of live B. pestis mixed with killed Vibrio (an associated vaccine) without damage to its viability was established.

"2. The dry associated cholera-plague vaccine had high immunogenic characteristics and protected the animals from infection with virulent B. pestis and cholera Vibrio. Immunological reconstruction of the organism in animals inoculated with the combined vaccine and with monovaccines was almost identical. Single subcutaneous inoculation with the associated vaccine conferred immunity on animals simultaneously against plague and cholera.

"3. In pigs inoculated once with the combined vaccine, immunity against plague developed later (on the 10th day) than in pigs inoculated with the plague vaccine alone (on the 5th-6th day).

"4. Experiments on immunization of rabbits with a mixture of cholera Vibrio and live plague vaccine (1-17) showed that there was no antagonism between these antigens and no suppression of one antigen by the other. The titer of agglutinins in serum from rabbits immunized with the combined vaccine differed slightly with respect to cholera Vibrio and B. pestis from the titers of the corresponding agglutinins in serum from rabbits immunized with each antigen separately.

"5. The data obtained emphasize the principles of economic single immunoprophylaxis of plague and cholera and make it possible to raise the question of producing dry vaccines--cholera and associated plague-cholera."

74. Combined Immunization With Live Brucellosis Vaccine and Tetanus Anatoxin

"The Effectiveness of Simultaneous Immunization With Live Brucellosis Vaccine and Tetanus Anatoxin," by Chiang Shun-ch'u, Institute of Epidemiology and Microbiology imeni Gamaleya; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 29, No 10, Oct 58, pp 88-93

Results of a study of the effectiveness of simultaneous subcutaneous immunization of guinea pigs with live brucellosis vaccine (Br. abortus 19-BA) and natural tetanus anatoxin (series No 380) are presented in this article. The tetanus anatoxin was administered 20-60 days after the brucellosis vaccine. Following immunization and reimmunization at prescribed intervals, the agglutination and opsono-phagocytic reactions and the skin-allergy test were performed, after which the animals were challenged by a virulent culture of Br. melitensis. The effectiveness of tetanus anatoxin was determined by titrating serum for the presence of anatoxin and by testing immunity by introducing toxin. Results and observations are summarized in three tables.

The authors reached the following three conclusions on the basis of these results:

CPYRGHT

"1. Following the simultaneous action of brucellosis vaccine 19-BA and tetanus anatoxin on the guinea pig organism, immunological reconstruction of the organism with respect to brucellosis was the same as that demonstrated by guinea pigs immunized with brucellosis vaccine 19-BA alone, i. e, the action of tetanus anatoxin combined with the action of brucellosis vaccine did not affect the dynamics of the development and extinction of the immunological process against brucellosis. The titers of tetanus anatoxins in sera of guinea pigs immunized simultaneously with both antigens were considerably higher than in pigs immunized with only tetanus anatoxin.

"2. Guinea pigs were found to be identically resistant to the virulent Br. melitensis strain and tetanus toxin after both simultaneous immunization by introduction of the two antigens and after their separate administration.

"3. Subcutaneous inoculation of live brucellosis vaccine 19-BA can be successfully employed in combination with active immunization against tetanus."

75. Combined Immunization Against Intestinal Infections and Q Fever

"The Effectiveness of Combined Immunization Against Intestinal Infections and Q Fever," by V. D. Belyakov and A. A. Il'chenko, Military Medical Academy imeni Kirov; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 29, No 11, Nov 58, pp 29-34

The object of the investigations discussed in this article was the evaluation of the effectiveness of combined immunization against intestinal infections and Q fever. Several series of experiments were performed on guinea pigs. The first group was immunized with NIISI polyvaccine and Q fever vaccine; the second group, with tetravaccine and Q fever vaccine together; the third group, controls, were immunized with NIISI polyvaccine, tetravaccine, and Q fever vaccine separately. All three vaccines were produced by production institutes for practical use. The recommendations of the manufacturers for vaccinating humans were used as a guide for dosages and immunization schedules. Agglutination and complement fixation reactions were performed to determine the results of the experiments, which are described in detail. Five tables are given to show all results obtained.

CPYRGHT Conclusions based on analysis of these results are as follows:

"1. The effectiveness of combined immunization of animals with Q fever vaccine and polyvaccine or tetravaccine did not differ from the effectiveness of separate immunization with these same preparations.

"2. The combined introduction of polyvaccine and Q-vaccine into the organism brought about an increase in the effectiveness of tetanus anatoxin, which was observed both on introduction of tetanus toxin to immunized white mice and on investigation of antitoxin formation in immunized rabbits and guinea pigs.

"3. Further study of the conditions governing the effective use of vaccines against intestinal infections and Q fever should be carried out in epidemiological experiments."

76. Changes in Serum Protein Fractions After Immunization With Botulinus Anatoxin

"Changes in the Protein Fraction Content of Blood Serum of Mice and Guinea Pigs Following Immunization With Type A Botulinus Anatoxin," by Yu. Z. Gendon, State Control Institute of Medical Biological Preparations imeni Tarasevich; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 29, No 12, Dec 58, pp 95-98

The author studied changes in blood serum proteins by means of electrophoretic fractionation on filter paper, using only sera in which hemolysis was completely absent. Mice and guinea pigs were immunized with ordinary and cellophane type A botulinus anatoxins. The experimental procedure, dosages administered, and analysis of the electrophoregrams obtained are discussed in the text. Two tables and two graphs are included to summarize results. The following conclusions were drawn from these results:

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"1. The method of electrophoretic fractionation on filter paper permitted the study of the protein fraction content of the blood serum of mice and guinea pigs during the immunization process.

"2. A considerable increase in the gamma-globulin protein fraction and a slight increase in the beta-globulin fraction occurred in the blood serum during the immunizing process of mice with cellophane type A botulinus anatoxin.

"3. The gamma-globulin and beta-globulin protein fraction content of the blood serum increased in the process of immunization of guinea pigs with both ordinary and cellophane type A anatoxins.

"4. Changes in the protein fraction content of blood serum which occurred during the immunization process did not permit evaluation of the immunological activity of the anatoxins since these changes reflected the action of both the fractions specific for the given preparation and the ballast antigenic fractions present in the anatoxins."

77. Drying Standard Strains of Foot-and-Mouth Virus

"Methodology of Drying Standard Strains of Types O, A, and C Foot-and-Mouth Virus," by V. A. Sergeyev; Moscow, Voprosy Virusologii, Vol 3, No 6, Nov/Dec 58, pp 367-368

The viability of foot-and-mouth virus preserved by lyophilization was studied in the research described in this article. Standard strains of foot-and-mouth virus, types O, A, and C, adapted to week-old white mice, were used in the experiments. The method employed was as follows:

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"A 5% suspension prepared from bone-muscle tissue of sick mice in a buffer solution (pH, 7.6-7.8) was extracted over a period of 2 hours in the cold. The centrifuged extract was filtered through an 'SF' asbestos pad.

"The virus-containing filtrate in a pure form and in suspension with various substances was poured into one-ml ampules and was dried by cryo-chemical or lyophilic methods.

"Determination of the biological activity of the dry virus was carried out periodically by titration in week-old white mice according to the Reed-Mench method.

"The dry virus preparation was drawn out of the ampules and ground in a mortar to produce a homogeneous solution. The ground powder was dissolved in buffer solution to the initial volume."

Experiments were performed to determine effectiveness of the virus preparations for retrospective typing of epizootic strains according to convalescent serum. The experiments and results are discussed in detail. A table is included to show the effect of stabilizing substances on the biological activity of dry foot-and-mouth virus following prolonged preservation.

It was concluded that chicken egg yolk, under the conditions of the experiments, was the best stabilizer for prolonged preservation of the biological activity of types O, A, and C foot-and-mouth virus. Not as good results were obtained with milk and gelatin containing sucrose; after use of these substances, the virus preserved its biological activity at least a year. The foot-and-mouth virus dried without stabilizing substances was not particularly suited to long-term preservation. Dry standard strains of the virus were found to be convenient for typing epizootic strains.

78. Cutaneous Vaccination Against Brucellosis

"The Problem of Cutaneous Vaccination of the Population Against Brucellosis With Vaccine Strain No 19," by A. I. Kolendovich, Zdravookhraneniye Kazakhstana, No 5, 1958, pp 51-52 (from Medititsinskiy Referativnyy Zhurnal, No 12, 1958, p 60)

CPYRGHT

"Immunological reconstruction of the organism was carried out in 1957 in Akmolinskaya Oblast with dry live brucellosis vaccine from strain No 19. Persons inoculated were observed at the same time for local and general reactions. An increase in the intensity of the reaction was noted in persons who had reacted positively with respect to brucellosis before inoculation, but positive reactions developed in persons who had reacted negatively earlier. Among persons examined a second time, there was no one with three negative reactions (Burnet, Huddleson, Wright). This attested to adequate effectiveness of cutaneous inoculations against brucellosis with vaccine from strain No 19, despite the absence of general and local reactions in inoculated persons."

Pharmacology and Toxicology

79. Czechoslovak Research on Colorimetric Determination of Cholinesterase Activity

"Colorimetric Determination of Cholinesterase in Human Blood," by Maj Jiri Tulach, Department of Defense Against Biochemical Materials and Toxicology; Prague, Vojenske Zdravotnicke Listy, No 58, 1958, pp 513-515

The article describes a modified method for the colorimetric determination of cholinesterase activity in blood, red corpuscles, and plasma, and discusses the advantages of this modification.

80. Ginseng Promotes Recovery From Acute Hemorrhagic Shock and Asphyxia

"Effect of Panax Ginseng in Promoting Recovery From Critical Condition Due to Bleeding and Asphyxia in Experimental Dogs," by Chang Tsung-hsien (張宗显) and Kao Te-hua (高德华), Department of Pathophysiology, Szechwan Medical College; Peiping, Chung-hua I-hsueh Tsa-chih (National Medical Journal of China), Vol 44, No 11, 1958, pp 1040-1046

This article describes animal experiments, the results of which the authors say are in agreement with ancient Chinese experience upholding the value of ginseng in promoting recovery under critical condition in hemorrhagic shock.

In controlled experiments dogs were bled until they reached a critical condition. It was found that five of seven dogs that received intravenous injections of ginseng extract before and after bleeding were able to sustain life under critical condition for at least one hour and recovered when blood was restored. On the other hand, all dogs in the control group that received saline instead of ginseng died within 37 minutes after bleeding.

In another experiment, acute asphyxiation was caused by clamping the trachea of dogs for 3 minutes 20 seconds. Eight out of nine that received ginseng extract before and after asphyxiation responded to artificial respiration but all those that received only saline died.

The pharmacodynamics of ginseng are discussed.

Physiology

81. Polar Population Acclimatization

"Questions of Acclimatization of the Population of the Polar Region," by Prof I. Arnol'di and Candidate of Medical Sciences V. Luk'yanov, Meditinskiy Rabotnik, 13 Jan 59, No 4 (1752), p 2

CPYRGHT

"The climatic conditions of the polar region are harsh. They are characterized by long winters and intense frosts, winds, snowstorms, and drifting snow. Summers are short and are characterized by rain, fog, abrupt changes in weather, and significant fluctuations in atmospheric pressure. Solar radiation is very intense during the spring-summer period. Solar radiation is inadequate during the long winter, particularly during the polar night. During the winter months the human organism experiences a light deficiency. Inadequacy of exposure to ultraviolet light has an adverse effect on the human organism.

"A group of scientists from the Moscow Scientific Research Institute have, during the past 2 years, been studying the questions of the acclimatization of the population of the polar region. A large group of scientific workers took part in expeditions to Taymyr and some parts of the Kola Peninsula. The group consisted of hygienists, physiologists, and clinicians.

"Results of their observations made it possible to conclude that insufficient solar radiation is the most important of many climatic factors that affect the human organism. Deficiency in the amount of ultraviolet rays and other elements of solar radiation results in insufficient vitamin satiation by the organism (presence of hypovitaminosis), low resistance to many infections, susceptibility to colds (against a background of low convective temperatures), and a decrease in physical and mental efficiency encountered especially during the long polar nights.

"Low temperatures, staying within so-called 'subnormal' levels as -5° , -10° , or $+5^{\circ}$, $+10^{\circ}$, are characteristics of many zones of the Far North. In some parts of the Kola Peninsula the average number of days per year that have such a temperature ranges between 228 and 324.

"Such 'subnormal' temperatures act as mild climatic irritants, conducive to frequent overcooling of the organism. The maximum incidence of catarrhal infections among miners of Noril'sk has been found to occur not when the frost is very great, but when the weather is mild (0° - 7°) and the wind strong.

"It is also necessary to take into consideration other elements of weather in addition to the principal meteorological components (radiation, temperature, wind) in as much as they have a known effect on the acclimatization of the population.

"Relative humidity in the Far North regions reaches 80%. Extreme changes in atmospheric pressure are peculiarly abrupt and occur within brief periods of time (sometimes within a single day). The frequency of variations and the abrupt dynamics in atmospheric pressure as well as aeroionization and vitamin deficiency cause dyspneic symptoms in some people. Shortness of breath very rarely manifests itself during a snowstorm.

"A living organism is in constant interaction with its environment and climate which modify its physiological functions by means of a whole series of adaptive regulating mechanisms that ensure its resistance and vitality. A man can be considered acclimated if his organism is able to maintain a normal level of mental and physical health and work capacity, and to assure the viability of offspring.

"The active type of acclimatization, when the organism is trained in accordance with the new climatic conditions, thereby acquiring new physiological qualities, is the most effective. Intensive physical activity speeds up that process.

"An individual may become mentally depressed and confused if he spends a winter in the polar region without previously undergoing conditioning and a properly organized period of training. Active training for life in the climate of the extreme north and a well organized regimen of work and rest strengthen the human organism and help to increase its endurance.

"Thermoregulation under the conditions that exist in the regions of the Far North improves the thermoregulating mechanisms, thereby increasing blood flow to the skin which protects the organism from chillblains and frostbite. More rapid restoration of skin temperature was noted in miners who had been working for a long period of time under continuous freezing conditions than in newly arrived workers.

"Results of investigation of vitamin metabolism showed that in the native population of the polar region, the ascorbic acid content in biological substrates is higher than in the non-acclimated population. The vitamin C content in the blood of the native population of polar regions was found to be 0.60-0.62 milligrams/percent; in new arrivals the vitamin C content was found to be half as large.

"The drinking water in polar regions has very little mineral content and its hardness is within the 2°-5° range. The water contains little fluorine and iodine. This, together with absence of fluorine and iodine in food products, is conducive to the spread of dental caries (particularly in children) and goiter among the population. Solution of the problem of rational distribution of drinking water, fluorination of water, and iodization of salt are of great significance and may help to speed up the process of acclimatization.

"Results of observations of physicians of the Noril'sk and Murmansk areas revealed that some illnesses, particularly pneumonia, persist longer; bone tissue in fractures consolidates slowly; hemorrhage lasts longer; toxic disturbances and eclampsia occur during pregnancy; etc. Many illnesses and physiological reactions develop with greater intensity among residents of polar regions during the first few years after their arrival, particularly during the first half year.

"Acclimatization by humans is not an elemental factor. The geographic environment does not act directly, on man as is the case with animals, but through socioeconomic relationships. Favorable social conditions create the prerequisites through which not only humans but nature can be changed. Consequently, acclimatization by humans can be regulated by changing sanitary-hygienic conditions, living conditions, food, customs, types of clothing, and certain physical agents which increase the resistance of the organism. Solution of all these problems requires much effort.

"It is particularly necessary to take extensive measures to guarantee mass exposure of the population of polar regions to ultra-violet light by organizing photariums in places of employment, schools, kindergartens, and nurseries, and by utilizing erythemic and fluorescent lamps in everyday life. Because the amount of natural solar radiation in the Far North is limited, it is necessary that great attention be given to city planning and to construction of proper housing. Houses must receive maximum exposure to sunlight. Fluorination of drinking water, iodization of salt, vitaminization of food, and drastic improvement in supplying the population with food substances that are rich in vitamin content (fruit, vegetables, and dairy products) are of great significance in improving the health of residents of polar regions. The time is ripe for efforts to be made to promote northern agriculture and animal husbandry."

Public Health, Hygiene and Sanitation

82. Chlorine-Resistant Microorganisms in Donbassvodtrest

"Development of Microorganisms Resistant to Chlorine in Donbassvodtrest Water Mains," by T. L. Natanson, Central Control-Research Water Laboratory of Donbassvodtrest; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 29, No 11, Nov 58, pp 112-113

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"Water which had passed through all stages of purification and disinfection but did not meet GOST [Gosudarstvennyy Standart, State Standard] 2874-54 according to number of bacteria per ml was observed for a number of years in four water mains of Donbassvodtrest at a definite time of year -- in the winter during thawing -- and in the spring after floods (January, February, March, and particularly April). The departure from the permissible norm (not more than 100 bacteria per ml) varied within a considerable range -- from 120 to 600 bacteria. The water which did not meet the standard was supplied for 1-4 1/2 months of the year.

"The water at the time of such variation was always disinfected with increased (double) doses of chlorine. The primary chlorination of the water in horizontal-type sedimentation tanks was performed with doses of 7-8 mg per liter, taking into account retention of residual chlorine within the limits of 0.4-0.5 mg per liter after 2-hour contact of the water with the chlorine in the process of settling and filtration through rapid gravity-flow sand type filters. The second chlorination, which is essentially supplementary chlorination, was carried out within the range of the residual dose, which is equal to 1.8-2.0 mg per liter.

"Chlorination was done together with ammonization in certain cases. Doses of coagulant (technical $Al_2(SO_4)_3$) were increased during the aforementioned periods to the limits determined by the low temperature of the water (2-4°) and by the transparency within the range of 15-16 cm (determined according to the Shnellen scale) and reached as much as 120 mg per liter, whereas deficit doses of 5-20 mg per liter are ordinarily used.

"All the aforementioned measures on chlorination and changes in the technological regime of purification installations did not, however, guarantee a reduction in the bacterial count to the required norm during the period in question, thereby creating a number of difficulties in the process of operating the purification installations and lowering the taste quality of the water. After such treatment, the water assumes an acrid chlorine odor (2 points or more); doses of residual chlorine at the point of consumption nearest the pump station were considerably higher (3 or more times) than the established GOST norm (not more than 0.5 and not less than 0.3 mg per liter). An increase in the doses of coagulant at a low

temperature and good transparency of the water did not facilitate improvement in flocculation, but caused the coagulant to be carried out to the filter, which considerably complicated the water purification process; the duration of the filtration cycle was diminished 6-8 times; as a result, more than 1,000.M³ of water a day was consumed for washing each filter; the chlorine and coagulant were expended unproductively; a number of difficulties concerning the scheduling of service personnel arose.

"Investigations carried out at the Central Control-Research Laboratory of Donbassvodtrest and the Dnepropetrovskiy Institute of Microbiology, Epidemiology, and Hygiene demonstrated that microorganisms which survive in the water after all stages of purification and decontamination are nonpathogenic spore soil saprophytes--B. subtilis, mesentericus, megatherium, mycoides. On study of these microorganisms, a significant difference in resistance of the vegetative cells and the spores to chlorine was established: on introduction of 5 mg per liter of chlorine resulting in a residual dose in the range of 2.2-2.7 mg per liter, after 2 hours of contact the vegetative cells died completely or almost completely (90%), and the spores were reduced to 40-50% of their original numbers. The asporous bacilli, including intestinal, expired completely under these conditions. Sporogonic bacteria which survived single and repeated chlorination assumed greater resistance to chlorine, and the lethal dose of chlorine for them was increased.

"Of the spore bacteria isolated from the water before treatment, 1-10 microorganisms per ml survived after chlorination of the culture washing for 2 hours with residual chlorine content equal to 4.7-10 ml, while microorganisms isolated from the water after treatment and decontamination with the doses ordinarily employed on water mains survived in considerably higher numbers -- 88-220 per ml. The least resistant was a B. mycoides culture, which died completely after 2 hours' contact in water with a 2 mg per liter residual chlorine content in the water. By gradually increasing the dose of chlorine and successive seeding of the microorganisms surviving chlorination, it was possible to obtain a high resistance to chlorine: absolute sterility of the culture washing was achieved only with 40 mg per liter of residual chlorine after 2 hours of contact.

"On comparison of the flow volume into the tanks with the quantity of microorganisms in the tanks and reservoirs of purified water, a direct connection between these figures during the cold part of the year was seen. During warm periods of the year, a relationship between the flow and the quantity of microorganisms in the water entering for purification was observed, but not between the flow and the amount in the purified and decontaminated water. Data on the spore count in the water of various tanks used by Donbassvodtrest showed that during warm periods of the year (May-October) the number of spores comprised 2-20% of the total number of saprophytic microorganisms, determined on meat-peptone agar at 37°

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after 24 hours of incubation. In the winter this amount increased, and during the period of thaws and floods the amount reached up to 50-70% and more. If the number of spores in the water which entered the purification installations exceeded 40-50%, the number of microorganisms in the purified water was increased. Where the increase in microbial numbers did not exceed 100, this phenomenon remained insignificant in the majority of cases, but in certain Donbassvodtrest water mains the water supply with a bacterial count of more than 100 continued for a rather long time.

"The extent to which the microorganisms died after single and double chlorination was studied in experiments with reservoir water after coagulation and filtration through a sand filter and with purified water main water after secondary contamination of it with sporogenic bacteria. The experiments showed that a considerable number of microorganisms survived on introduction of sporogenic bacteria at the rate of several thousand per ml of water and simultaneous single chlorination with 3.0-3.5 mg of chlorine per liter resulting in a residual dose of 0.7-2.4 mg per liter. On introduction of the same numbers of microorganisms into purified chlorinated water which contained 0.1-0.15 mg per liter of residual chlorine, and subsequent supplementary chlorination with a dose of 2 mg per liter, contact for one hour after the secondary chlorination was also found to be inadequate. The use of ammonization in ratios of 1:4, 1:2, 1:1, (ammonia and chlorine) did not improve the situation, but in certain cases even made it worse."

83. Kiev Hygienists Hold Conference; Report on Bacterial Aerosols Presented

"The Activities of the Kiev Section of the All-Union Scientific Society of Hygienists," by Docent I. M. Trakhtenberg; Gigiyena i Sanitariya, No 12, 1958, pp 83-86

After the 23d All-Union Conference of Hygienists, Epidemiologists, Microbiologists, and Infectionists, a series of plenary sessions of the Kiev Society of Hygienists, together with the Sanitary Hygiene Faculty of the Kiev Medical Institute, was held. In some of these sessions, members of the Society of Epidemiologists and Infectionists also took part.

Among the reports heard at these conferences was one by Prof S. S. Rechmenskiy entitled "Contemporary Studies Concerning Bacterial Aerosols in Atmospheric Air." The report concerned problems of methodology, problems of detecting bacterial aerosols, dispersion systems, construction of instruments for collecting of samples, etc.

In addition, the Kiev society has over the years heard many reports involving practical work in the field of public health and hygiene involving such subjects as the use of radioactive isotopes.

84. Conference on Sanitary Inspection of Food Products

"Scientific-Practical Conference on the Sanitary Inspection of Food Products (Meat, Milk, and Fish)," by L. N. Krapivner; Moscow, Voprosy Pitaniya, No 6, Nov-Dec 58, pp 83-87

Between 23 and 29 June 1958, an all-union conference for reviewing the proposed regulations for the veterinary-sanitary inspection of meat, meat products, milk, milk products, fish, and fish products was held in Moscow. The conference was called by the Main Veterinary Administration, the Scientific-Technical Soviet of the Ministry of Agriculture USSR, the Section of Animal Husbandry of the All-Union Academy of Agricultural Sciences imeni V. I. Lenin, and the All-Union Scientific Research Institute of Veterinary Sanitation and Ectoparasitology.

A total of 280 people from 43 cities in the Soviet Union took part in the conference. These people included scientific workers of the scientific research institutes and chairs of higher educational institutes, practical workers in the meat industries, poultry industries, refrigerator distributors, meat control and meat-dairy stations, veterinary-sanitary laboratories, veterinary personnel of the Soviet Army, doctors from sanitary-epidemiological stations, and representatives of the Ministries of Health USSR and RSFSR. This conference was the first of its kind and the importance of the many problems dictated the necessity of a wide exchange of views.

The basic tasks of the scientific research institutes and practical veterinary sanitary workers in developing new regulations for the sanitary inspection of meat, milk, and fish were elucidated in the report of A. A. Boyko, Chief of the Main Veterinary Administration.

The following is a resume of some of the reports given at the conference:

The report by A. N. Mironov (All-Union Scientific Research Institute of Veterinary Sanitation and Ectoparasitology, Moscow) and D. M. Teternik (Chemical Technological Institute of Meat Industry, Moscow), concerning practical problems in veterinary sanitation examinations, received great attention at the conference. The institute with which Mironov is affiliated is coordinating all the work on reviewing the regulations for inspecting meat, milk, and fish. According to Mironov, the regulations, GOST 7269-54 and 77-2-55, should be reviewed and new methods of inspection included in them to meet actual problems in practice.

Ye. S. Krasnitskaya (Ministry of Health RSFSR) presented information concerning food poisoning in the RSFSR during 1957. The number of salmonellosis outbreaks was slightly lower than in former years. Approximately 65-75% of the food poisoning is of bacterial etiology. The greater percent of these were meat toxin infections. Food poisoning caused by milk products was next, half of the outbreaks being connected with the use of raw and sour milk.

I. V. Shur (Moscow) presented material on the problem of protecting food from toxin infections and preventing toxicosis produced by aerobic microflora. The scientific investigation of the problems of the etiopathogenesis and epidemiology of food toxicoinfections should be conducted by the veterinary scientific research establishments and by the Chairs of Sanitary Veterinary Inspection of vuzes (higher educational institutions) according to a unified central plan in close cooperation with medical scientific research establishments.

Ye. V. Kiselev (Moscow Veterinary Academy) stated that in the bacteriological investigations of the carcass and organs of slaughtered animals, an atypical strain of a bacteria of the paratyphoid group is occasionally isolated which complicates the sanitary evaluation of the meat. In the observations of the reporter, certain atypical cultures of bacteria of the paratyphoid group, after being passed through the organism of an animal, present a heterogeneous population picture according to their antigenic and pathogenic properties while preserving the biochemical properties of the original culture. Investigations of the atypical strains of the bacteria of the paratyphoid group by a chromatic reaction and for microbial toxins (according to G. B. Kolobotskiy) permitted a determination of their relationship to the typical bacteria of the paratyphoid group.

A. M. Akhmedov (Azerbaijan Agricultural Institute, Baku) reported on food toxicoinfections having a paratyphoid nature in various areas of the Azerbaijan SSR. Of the total number of outbreaks, 75% were connected with beef, 8.7% with veal, 3.1% with pork, and 8.1% poultry.

L. L. Kukharkhova (All-Union Scientific Research Institute of the Meat Industry, Moscow) reported on experimental investigations of listerellosis. The observations indicated that with septic forms of the listerellosis infection, the vector is found in the parenchymal organs and muscle tissue. Serological methods (agglutination and precipitation reactions) are a great aid in diagnosing listerellosis.

A. G. Ostashevskiy (Kharkov Veterinary Institute) presented data concerning the comparative sensitivity of certain types of animal species to an enterotoxin of pathogenic staphylococci.

V. I. Ivanova (All-Union Scientific Research Institute of Veterinary Sanitation and Ectoparasitology) presented material on the problem of the survival of Brucella in meat which has been salted or frozen. The investigations conducted indicated that Brucella melitensis remain virulent to guinea pigs more than 113 days in artificially infected pieces of lamb's meat which had been salted and kept at +6 - +8°C. According to the reporter, the method of salting and the subsequent maintenance of the salinity for 60 days at the temperatures mentioned above cannot be recommended for decontaminating meat infected with brucellosis.

In addition to these reports, many other reports are mentioned concerning the problems involved in disinfection and the use of ionizing radiation for preserving meat or meat products, as well as a report concerning the toxic characteristics of animal meat poisoned with certain chemical poisons.

Furthermore, in the opinion of most of the scientists and practical workers in the veterinary sanitation fields at the conference, a special journal should be published entitled Veterinary Sanitation.

85. Review of Dissertations on Industrial Hygiene

"A Review of Dissertations in the Field of Industrial Hygiene Presented Between 1949 and 1957," by Yu. L. Yegorov, Chair of Labor Hygiene, First Moscow Order of Lenin Medical Institute imeni I. M. Sechenov; Moscow, Gigiyena i Sanitariya, No 12, Dec 58, pp 49-53

This review presents certain dissertational work presented by candidates for degrees in medical and biological sciences relating to labor hygiene and similar subjects (physiology of labor, occupational pathology, industrial traumatism, sanitary chemistry, and others).

The dissertations are broken down according to the various disciplines as follows.

Physiology of labor, 33 reports; basic problems in labor hygiene -- microclimate 25 reports, industrial dust (including problems with pneumoconiosis) 33 reports, industrial poisons (including the clinical aspects of occupational poisonings) 101 reports, increased and lowered atmospheric pressure 7 reports, and industrial noise and vibration 7 reports; methods of hygiene research, 3 reports; diseases of industrial workers, 4 reports; industrial traumatism, 15 reports; hygienic problems of industrial sanitary technology, 2 reports; and other reports, 13.

Most of the dissertations involving the study of microclimatic conditions were completed at the Kiev Institute of Labor Hygiene and Occupational Diseases. Among these dissertations, the following should be noted: the investigation of the effect of high air temperature on the functional analysors and on the motor sensory reactions of humans (by N. P. Savenko); the effect of infrared radiation and various parts of its spectrum on an organism (by G. E. Zhirnova); and the determination of moisture loss by humans due to evaporation while at rest and after doing physical work, depending on the conditions of the microclimate (K. V. Voldina). In the first report mentioned in this group, a special chronoesthesiometer, which permitted the determination of temperature, visual and auditory sensitivity of the analysors not only with regard to sthenia and time, but also with regard to the rate of visual-motor or acoustical-motor reaction, was constructed by the author together with Prof N. K. Vitte.

The effect of infrared radiation on certain physiological functions was described in a dissertation by L. T. Yelovskaya, while working at the Leningrad Sanitary Hygiene Medical Institute.

I. F. Kovaleva, working in Odessa, presented interesting data concerning the problem of the antagonism of various parts of the radiant energy spectrum on biological action. In this work, it was shown that the pathogenic action of harmful doses of short-wave ultraviolet radiation can be attenuated or eliminated entirely by single or repeated radiation from cyano-violet rays.

More than 101 reports, approximately 40% of all the dissertations reviewed, concerned the problem of industrial poisons. Classifying these works according to the toxic substance investigated, they can be divided into the following groups: study of inorganic substances -- 47 dissertations, of these, lead and its compounds 10, rare earth metals and alloys 12, manganese 4, mercury 4, carbon bisulfide 4, and other inorganic substances 13; organic substances, mostly petroleum and its by-products, -- 54 dissertations; of these, shale gasoline 20, chlorine hydrocarbon derivatives 8, nitro- and amino- aromatic derivatives 8, synthetic resins and plastics 2, complex esters 3, insecticides 3, and other organic substances 10. These include works on the problem of the toxic action of rare earth metals and their alloys on an organism, eight of which were completed at the Chair of Industrial Hygiene, First Moscow Order of Lenin Institute imeni I. M. Sechenova. In addition, the toxic properties of selenium, cadmium, vanadium, titanium, wolfram, cobalt, barium, and ferroalloys were also investigated by broad application of physiological methods and by simultaneous investigations of the sanitary conditions of labor and industrial diseases in the appropriate industries.

B. D. Karpova, Sil'viya and Gabor, and V. D. Barteneva presented dissertations on the toxicology of acrylates, metacrylates, and vinyl acetate.

Among the works on toxicology, the dissertations devoted to the study of the toxic properties of the following insecticides should be noted: hexachlorane, (Ye. N. Burkatskaya, A. P. Volkova) and anabasine sulfate (L. N. Proitskaya). It is unfortunate, according to the author, that even though a rapid growth in the production of insecticides is required by the economy, these three dissertations were the only ones devoted to the study of their toxicity.

New methods for sanitary hygiene investigations were presented in three dissertations: the nephelometric method of investigating smoke (I. B. Shagin), experimental method of determining nitrogen oxides (M. T. Lukina), and the photometric method of determining carboxyhemoglobin in blood (V. V. Popov).

In addition to these works, many works were devoted to problems involving the use of statistics, traumatism in mines, the metal industries, forestry, transportation, and agriculture.

Miscellaneous

86. Ministry of Health USSR Has New Functions

"New Structure of the Ministry of Health USSR" (unsigned article); Moscow, Meditsinskiy Rabotnik, 20 Jan 59

By decree of the Council of Ministers USSR the function and structure of the Ministry of Health USSR have been changed. This was done to expand the rights and increase the responsibility of union republics for directing public health and to improve the structure and curtail the number of subordinate units of the Ministry of Health USSR.

The Ministry of Health USSR is now required to work out basic directions for the prospective planning of public health; render methodological assistance to republic ministries of health in the organization of specialized therapeutic aid, sanitary-antiepidemic work, and the training of cadre; it will also be required to coordinate scientific research in medicine and help republic ministries of health apply medical research to general use.

The Ministry of Health USSR will now have the following organizations: Administration of Specialized Medical Aid (in oncology, cardiovascular diseases, tuberculosis, and in mother and child care); the Division of Medical Radiology; the Administration of Drugs and Medical Technology

including Quality Inspection; the State Sanitation Inspectorate; the Main Administration of Interrepublic Medical Supplies and Sales; Division of External Affairs; Division of Medical Educational Institutions and Cadre; Plans and Finance Division; Management Division; and other units.

Numerous organizations are under the Ministry of Health USSR, among them is the Academy of Medical Sciences USSR, the State Publishing House for Medical Literature, and the Trust for the Growing and Preparation of Galenical Materials.

87. Institute of Labor Hygiene and Occupational Diseases Planned for Irkutsk

"An Institute of Labor Hygiene Is Needed," by I. Olyunin, Head, Chair of Labor Hygiene, Irkutsk Medical Institute; Moscow, Medit-sinskiy Rabotnik, 19 Dec 58

Because of the rapid industrial growth of Irkutskaya Oblast, especially the gas, petroleum, coal mining, cellulose, and machine building industries, a need has arisen for the establishment of a Scientific Research Institute of Labor Hygiene and Occupational Diseases (Nauchno-Issledovatel'skiy Institut Gigiyeny Truda i Professional'nykh Zabolevaniy) in Irkutsk. The institute will have well-equipped laboratories, vivariums, clinics, and polyclinics, and will serve Irkutskaya Oblast, Eastern Siberia, and the Far East.

88. New Medical Scientific Research Institutes in Georgian SSR

"Four New Institutes," by K. Eristavi, Active Member of Academy of Sciences Georgian SSR; Moscow, Medit-sinskiy Rabotnik, 6 Jan 59

During 1958 four new medical scientific research institutes were established in the Georgian SSR. These institutes were the Scientific Research Institute of Roentgenology and Radiology (Nauchno-Issledovatel'skiy Institut Rentgenologii i Radiologii), the Scientific Research Institute of Neurology (Nauchno-Issledovatel'skiy Institut Nevrologii), the Scientific Research Institute of Skin Diseases (Nauchno-Issledovatel'skiy Institut Kozhnykh Zabolevaniy), and the Scientific Research Institute of the Physiology and Pathology of the Female (Nauchno-Issledovatel'skiy Institut Fiziologii i Patologii Zhenshchiny). In addition, there was established in Tbilisi the first Soviet specialized Urology Dispensary (Dispensar).

89. Institute of the Biology of Water Reservoirs

"From the Editorial Board" (unsigned article); Moscow/Leningrad, Trudy Biologicheskoy Stantsii "Borok" (Works of the Biology Station "Borok"), No 3, 1958

In September 1956 the Scientific Research Biological Station "Borok" imeni N. A. Morozov was reorganized by decree of the Presidium of the Academy of Sciences USSR into the Institute of the Biology of Water Reservoirs (Institut Biologii Vodokhranilishch). Issue No 3 of Trudy Biologicheskoy Stantsii "Borok" (Works of the Biology Station "Borok") is devoted to the study of the Rybinsk Reservoir in Yaroslavskaya Oblast and gives two full-page detailed maps of Rybinsk Reservoir.

90. Epidemiologists and Microbiologists Hold Theoretical Conference in Chita

"Theoretical Conference in an Institute," by Docent V. Kozlov, Chita Medical Institute; Moscow, Meditsinskiy Rabotnik, 23 Dec 58

The Chita Scientific Research Institute of Epidemiology, Microbiology, and Hygiene and the Chita Branch of the All-Union Society of Microbiologists organized a theoretical conference on the philosophic problems of biology and medicine.

Several of the speakers spoke on dialectical materialism and the problems of biology and medicine. Among the speakers were A. S. Petrova, B. V. Novokreshchenov (Candidate of Medical Sciences), and A. Ye. Essel'.

91. Conference of Microbiologists of Siberia and the Far East

"Conference of Microbiologists of Siberia and the Far East (unsigned article); Moscow, Meditsinskiy Rabotnik, 9 Jan 59

An interoblast conference of microbiologists and epidemiologists of Siberia and the Far East was recently held in Irkutsk. Representatives of over 20 oblasts, krays, and republics discussed the problems of the prophylaxis of infectious diseases and the aims of medical science in light of the theses of Khrushchev's report to the 21st Congress of the CPSU, which calls for greater research in biochemistry, biophysics, and microbiology.

The following speakers were identified: I. V. Domaradskiy, P. Pletnikova, N. Busoyedova, N. Nekipelov, A. Pinigin, and V. Alifanov.

92. Handbook on Bulgarian Academy of Sciences Published

B'lgarskata Akademiya na Naukite Sled 9 Septemvri 1944 (Bulgarian Academy of Sciences From 9 September 1944), published by Bulgarian Academy of Sciences, Sofia, 1958

The handbook, B'lgarskata Akademiya na Naukite Sled 9 Septemvri is a 323-page work describing in complete detail the organizational break-down of the academy and its component parts. Also included are biographic data with photographs of the leading members of the academy and a substantive account of the work done by the academy since 1944.

The material is presented by chapters describing each of the academy's departments and the institutes and institutions subordinate to the respective department.

93. Czechoslovak-Soviet Agreement on Scientific Cooperation

"Scientific Cooperation Plan" (unsigned article); Prague, Obrana Lidu, 26 Nov 58, p 1

On 25 November, a scientific-cooperation plan for 1959 between the Czechoslovak Academy of Sciences and the Academy of Sciences USSR was signed in Prague.

The plan defines to what extent scientific workers will be exchanged for study trips in both countries and includes an agreement on the mutual sending of scientists to lectures, consultations, seminars, and scientific conferences. The plan also includes a list of the scientific projects which the two countries will work on together and which will be coordinated.

For example, Czechoslovakia and the USSR will work together on some geophysical problems, such as the electromagnetic probing of the earth's crust, investigation of solar activity, and optical observation of artificial satellites. In the chemical sciences, cooperation will be devoted mainly to basic problems in research on plastic materials and proteins and to the theory of chemical bonding and reactions.

94. Soviet Biologist in Czechoslovakia

"Eminent Soviet Scientist in Czechoslovakia" (unsigned article); Prague, Obrana Lidu, 23 Nov 58, p 2

On 21 November 1958, Prof Kovalski, Doctor of Biological Sciences and a leading worker of the Academy of Sciences USSR, arrived in Czechoslovakia. He will lecture in several places on the chemical influences of the environment on a living organism.

95. New Optical Camera Used in Czechoslovakia

"Local and Foreign News" (unsigned article); Prague, Obrana Lidu, 3 Dec 58, p2

The optical clinic of the Medical Faculty (Lekarska fakulta) in Hradec Kralove recently obtained a new Zeiss camera, the most modern of its kind, with which it is possible to take color pictures of the inner parts of the eye. In the past, it was not possible to diagnose eye diseases accurately because of imperfect equipment for observing the eye.

96. Scientific Works of Students of Moscow Pharmaceutical Institute

"Scientific Works of Students," No 1, published by the Moscow Pharmaceutical Institute, 1957; Moscow, Aptechnaya Delo, No 6, Nov-Dec 58, pp 85-86, by Prof V. P. Kalashnikov

This is the first publication of the scientific works of the students of Moscow Pharmaceutical Institute. The publication contains 22 works completed by 36 students. The publication is divided into four parts: medicinal preparations (4 works), galenical raw material (6 works), medicinal-forms (3 works), and the analysis of medicinal preparations and patent medicines (9 works).

In general, the publication is well prepared. Most of the work presented by students and their professors should be praised for the content, form, method of investigation, and the results produced.

97. New Chinese Medical Periodical

Chung-hua Chi-sheng-ch'ung-ping Ch'uan-jan-ping Tsa-chih (Chinese Journal of Parasitic and Infectious Diseases). No 4, 1958,

Beginning January 1959, Chung-hua I-hsueh Tsa-chih (National Medical Journal of China) and Yu-hsueh-shih yu Pao-chien Tsu-chih (History of Medicine and Organization of Health Services) will be combined under a new title, Jen-min Pao-chien (人民保健). The new periodical will carry articles on the organization of health services, fundamental and clinical medicine (including Chinese traditional medicine), and the history of medicine. It will also present book reviews, abstracts from other periodicals, news items, etc. It will be published monthly with 96 pages per issue.

VI. METALLURGY

98. Intricate, Thin-Wall Aluminum-Magnesium Alloy Pressing

"New in Technology," Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 4 Jan 59, p 3

Intricate parts from aluminum-magnesium alloys are series produced on a 15,000-ton hydraulic press constructed at the Novo-Kramatorskiy Plant. Products have a wall thickness of only several millimeters and do not require subsequent machining. The press is equipped with an apparatus for controlling stresses in basic components and a device for checking overloading. No technical specifications are given.

99. Alloy "Superductility"

"X-Ray Examination of the 'Superductility' Effect of Cast Eutectic Al-Cu," by A. A. Presnyakov and V. V. Chervyakov; Alma-Ata, Vestnik Akademii Nauk Kazakhskoy SSR, No 12, Dec 58, pp 76-80

Microstructure and X-ray investigations of freshly cast, homogenized and deformed eutectic Al-Cu alloys were conducted during systematic investigations of the ductility of alloys of aluminum contain'ng different amounts of copper. Results confirmed an earlier hypothesis that the presence of metastability in the initial condition of an alloy and dissociation processes with speeds commensurate with the speed of deformation are necessary for the appearance of "superductility." Results also confirmed an earlier opinion of A. A. Bochvar (Bochvar, A. A., Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, No 5, 1948) that any mechanism of plastic deformation can be reduced to the diffusion mobility of atoms.

100. New High-Quality Ore Grinder

"Vibro-Inertial Grinder," by S. M. Dal'nov; Alma-Ata, Vestnik Akademii Nauk Kazakhskoy SSR, No 12, Dec 58, pp 71-75

Ore grinding tests were conducted at the Laboratory of Concentration of the Institute of Metallurgy and Concentration, Academy of Sciences Kazakh SSR, with a specially designed vibro-inertial grinder. Grinder contains a suspended spindle which is actuated inertially by a motor-driven vibrator within the spindle. Water enters the annular grinding space

through an opening near the shell base and pulp is discharged through an opening directly opposite the water inlet by an impeller on the underside of the spindle. A vertical discharge canal continues from the discharge opening and serves to maintain the working level of pulp within the grinder. Vibratory motion of the pulp within the vertical discharge canal assists in separation of the heavy mineral fraction into a hydraulic trap.

Tests with ores of different hardness showed that a larger percentage of uniform size grains and less overgrinding is possible with the new-type grinder than with standard types. Results from these experiments are claimed to warrant further study of the vibro-inertial grinder for possible introduction into industry.

[For additional information on metallurgy, see Item No 14.]

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VII. PHYSICS

Atomic Energy

101. Study of Fission Neutrons

Moscow, Atomnaya Energiya, Vol 5, No 6, Dec 58, pp 649-659

Experimental studies of fission neutrons were carried out in the USSR by several scientists, as described below.

V. P. Kovalev and V. S. Stavinskiy worked on "Prompt Fission Neutron Spectra Systematization," attempting to generalize experimental data on the basis of an evaporation model.

N. N. Flerov V. M. Talyzin, and Ye. A. Tamanov worked on the determination of the neutron number in uranium fission: N. N. Flerov and V. M. Talyzin -- "Average Neutron Number $\bar{\nu}$ in Fission of U-235 and U-238 by 14-Mev Neutrons"; the average neutron number found for U-238 was 4.45 ± 0.35 ; N. N. Flerov and Ye. A. Tamanov -- "Average Neutron Number $\bar{\nu}$ in Fission of U-238 by 14 Mev Neutrons"; the number $\bar{\nu}$ was determined by double coincidence of neutrons originating in one fission event; the obtained result, $\bar{\nu} = 4.50 \pm 0.32$, agrees well with results obtained in the preceding article.

The cross section of uranium fission by neutrons was analyzed by using the results from the preceding articles: N. N. Flerov, A. A. Berezin, and I. Ye. Chelnokov -- "Cross Sections of the U-238 Fission by 14.6-Mev Neutrons"; the cross section was found to be 1.13 ± 0.05 barn and in good agreement with available data.

N. N. Flerov and V. M. Talyzin: "Measurement of Cross Section of (n, 2n) Reaction by 14 Mev Neutron Interaction With Be, Pb and Bi." A graphite prism, described by the authors (*ibid.*, III, 291, 1957), was used for measuring the cross section of (n, 2n) reactions on Be, Pb, and Bi; A. A. Berezin, G. A. Stolyarov, Yu. V. Nikol'skiy, and I. Ye. Chelnokov, "Cross Section of U-235 and Th-232 by 14.6 Mev Neutrons." Experimental results showed a cross-section ratio for U-235 : U-238 = (2.03 ± 0.09) . For Th-232 the cross section was (0.37 ± 0.02) .

102. A Pulsed Reactor

"A Pulsed Reactor," by T. N. Zubarev, Atomnaya Energiya, Vol 5, No 6, Dec 58, pp 605-618

A schematic design of a pulsed reactor is presented. The reactor operates on ordinary water and enriched uranium. The computation of its physical and thermal parameters is presented. It is shown that under certain circumstances a high stability of thermal exchange during neutron bursts may be secured. It is possible to realize in the discussed mode of construction of a pulsed reactor, as proved by computations, a thermal power of over 5,000 KW at an average thermal neutron flux in the active zone of over 10^{14} neutrons/cm².sec and a maximum of about 10^{17} neutrons/cm².sec during a neutron burst.

103. Summary of Soviet Experimental Work in Magnetohydrodynamics

"Research on Controlled Thermonuclear Reactions in the USSR," by L. A. Artsimovich; Moscow Uspekhi Fizicheskikh Nauk, Vol 66, No 4, Dec 58, pp 545-570

[SIR Note: The report summarized below was originally presented by Artsimovich at the Second International Conference on Peaceful Uses of Atomic Energy, Geneva 1958.]

A review of the present state of knowledge of thermonuclear reactions is outlined from the Soviet point of view. It is stated that progress was facilitated by the lowering of secrecy barriers in 1956, first by the USSR announcing its progress in the domain of controlled thermonuclear reactions. Thereafter Britain and the US published material on their investigations.

At present the problem is still in a preliminary stage and, essentially, it is reduced to the proper choice of a method of magnetic thermo-insulation. Thermoinsulation methods may be divided into two basic groups: acceleration of plasma by electrodynamic forces and the obtaining of a balanced plasma configuration, in which the plasma pressure is compensated by magnetic pinch.

Data on theoretical and experimental thermonuclear reactions accumulated in the USSR during recent years are described with special emphasis on the most recent work, which has not yet been fully discussed.

Studies of powerful discharges of very short duration were carried out at the Institute of Atomic Energy of the Academy of Sciences USSR, while the Physics Faculty of Moscow State University was charged with solution of particular problems pertinent to the subject. Experimental research on other types of pulse processes in which the plasma undergoes reaction from very strong magnetic fields was carried out simultaneously at the Institute of Atomic Energy of the Academy of Sciences USSR, at the Ukrainian Physicotechnical Institute, and the Sukhumi Institute of Electronic Physics.

The Institute of Atomic Energy also investigated another method of obtaining plasma pinches. It consists in the formation of a preliminary toroidal plasma coil with a current in an alternating external magnetic field, having its lines of force directed perpendicularly to the coil. This coil is formed due to gas by a vortex electric field under condition of rising magnetic field strength. A certain time after the coil has been formed, it rapidly condenses toward the axis transforming itself into a plasma pinch. It was shown experimentally that plasma pinches with a particle concentration up to 10^{16} and an initial temperature not below 100-200 ev can be obtained in this manner. A practical consequence of these tests may be the devising of a method of injecting hot plasma into magnetic traps.

Besides powerful short duration discharges slow pulse discharges in toroidal chambers are also under investigation in the USSR. It is to be expected that in slow discharges the electrodynamic forces will be balanced by the gas-kinetic pressure of the plasma and the temperature in the linear pinch will increase on account of Joule heat formation. To be able to use such a balanced state for the purpose of heating plasma to very high temperatures, the following conditions are required: the linear pinch should be detached from the walls; its state should not only be balanced, but also stabilized. These conditions were the subject of research at the Institute of Atomic Energy under the guidance of M. A. Leontovich. This research succeeded in establishing for the first time that the stability of the linear pinch may be achieved only if the discharge chamber is enclosed in a conducting casing adjacent to its walls) and, besides the electric field of the plasma, there is also a stabilizing magnetic field created by external coils and directed along the linear pinch. Two different stable states were found. The first occurs when the condensing linear pinch entrains with it the major part of the magnetic flux of the longitudinal field previously initially created within the chamber ("paramagnetic pinch"). This process was thoroughly studied by British physicists using the Zeta apparatus.

From a magnetohydrodynamic point of view, another stabilized state is attainable by applying to the linear pinch a strong longitudinal field of strength H_z , everywhere much higher than H_{f1} . As is known from theory, the following condition should be satisfied: $H_z/H_{f1} > L/2\pi a$. where L is the length of the linear pinch. ($L = 2\pi R$ for a circular pinch in a toroidal chamber of radius R .)

The study of the effect of a longitudinal magnetic field on the properties of slow discharges showed that a slow increase of current in the plasma also creates the paramagnetic effect, previously observed by Soviet physicists in the case of pulse discharges of short duration. At a small H_z the effect leads to compression of the plasma pinch. Such experiments were first carried out in chambers with insulating walls of glass, quartz, or porcelain. Later, the Institute of Atomic Energy tested equipment with metallic toroidal wall chambers. This equipment is still in an experimental stage and the first results showed that discharges in hydrogen or deuterium under $3 \cdot 10^{-3}$ or $3 \cdot 10^{-4}$ mm Hg and a duration of from 300 to 1,200 microseconds the current strength rises proportionally to the discharge potential. But even if, according to theory, the pinch should be completely insulated from the wall, the energy losses run high for reasons still unexplained.

The first magnetic trap construction is ascribed to A. D. Sakharov and I. Ye. Tamm in 1950. Although their first design was somewhat deficient, it was later much improved. Two different types of magnetic traps were studied: traps with magnetic mirrors and traps with limited drift. Large experimental equipment with magnetic mirrors was completed at the Institute of Atomic Energy during the summer of 1958. This equipment will use external injection of particles. For the accumulation of D^+ ions, a dissociation process of molecular D_2^+ will be applied. The molecular ions D_2^+ , injected in the middle of the trap, will be dissociated either by collisions with molecules and atoms of the residual gas or at interaction with the ions of rarefied deuterium plasma preliminarily created in the chamber space.

Traps with limited drift are also under study at the Institute of Atomic Energy and, although some difficulties are still involved in the design of the new equipment, improvements are expected.

New theoretical analysis pointed to some practical possibilities of plasma retention and insulation by means of application of high-frequency electromagnetic fields. This theory was experimentally confirmed on a small-size apparatus at the Institute of Atomic Energy. For the time being, practical prospects are not bright, due to the high cost of energy losses for the maintenance of such fields. Nevertheless, the study of various variations of high-frequency thermoinsulation is of great interest.

Particular attention, according to the writer, should be paid to the study of ion cyclotron resonance. Studies under way in this domain in the USSR are described in a report of the Ukrainian Physicotechnical Institute at the Geneva conference of 1958.

The writer is rather optimistic about the future of controlled thermonuclear reactions and he emphasizes the importance of international cooperation by stating: "The unification of research on the problem of controlled synthesis reactions on an international scale should certainly shorten the time required to achieve the purpose."

104. A Nonstationary Thermonuclear Reactor

"A Possibility of a Nonstationary Thermonuclear Reactor," by E. Larish, Institute of Applied Mechanics, Bucharest; Moscow, Atomnaya Energiya, Vol 5, No 6, Dec 58, pp 646-647

A model is suggested, consisting of a cylindrical or toroidal plasma column undergoing forced radial oscillations under action of an external variable axial magnetic field. The temperature of the plasma fluctuates around T_e at which the energy emitted by nuclear reactions compensates the radiation. The condition of the periodicity of oscillations is derived and it is shown that if this condition holds the nuclear energy emitted during one cycle considerably exceeds the radiated energy. The difference between the energies should feed the outer coil, creating the magnetic field.

105. Insulation of Plasma Bursts

"The Behavior of a Small Plasma Burst in a Waveguide and Its Interaction With Conductive Walls," by G. A. Askar'yan; Moscow, Atomnaya Energiya, Vol 5, No 6, Dec 58, pp 644-646

Conditions securing the insulation and repulsion of bursts of quasi-neutral plasma from the waveguide walls are examined in connection with V. I. Veksler's method (Atomnaya Energiya, Vol 2, No 5, 1957, p 427) of radiative plasma acceleration. For this purpose the radial force acting on a small plasma burst in fields of the simplest wave types during its shift to arbitrary distances exceeding the size of the burst is computed. The interacting force of the burst with the conducting walls is evaluated, and some possibilities of a variety of waveguides and reflectors of current carrying bursts are indicated.

106. Equilibrium of Current Density of Discharge

"Current Density Equilibrium Distribution in Straight Strong Current Discharges," by L. M. Kovrizhnykh; Moscow, Atomnaya Energiya, Vol 5, No 6, Dec 58, pp 648-649

A balanced distribution of electrons and ions densities in a straight discharge tube was obtained by passing a complementary current along the axis of the chamber. It was found that a reversed current, $1/k$ part of the discharge current, but still sufficiently strong, pinches the discharge inside the chamber within a radius, the size of which depends on the magnitude k . The discharge remains insulated from the walls and forms a hollow cylinder.

107. Plasma Oscillations

"A Resonance Method of Localization and Heating of Plasma by Variable Electromagnetic Pressure," by G. A. Askar'yan and M. S. Rabinovich; Moscow, Atomnaya Energiya, Vol 5, No 6, Dec 58, pp 643-644

A test is carried out in an attempt to reach high pulse temperatures and pressures of plasma required for thermonuclear processes at a limited amplitude peak of the electromagnetic field. For this purpose resonance oscillation of plasma bursts under action of an amplitude-modulated electromagnetic field creating an evenly pulsating density distribution on the plasma surface is analyzed. The modulated isotropic pressure on the surface of the quasispherical burst may be realized by reaction of the plasma burst to a modulated intensive short-wave emission, modulated by a magnetic field moving rapidly at random in the burst region, created or modulated by a superposition of three fast varying magnetic fields.

108. Structure and Use of China's Atomic Reactor and Accelerator Described

"Our Country's First Atomic Reactor," by Chiang Cheng (程), Institute of Atomic Energy, Academia Sinica; Peiping, K'o-hsueh Hua-pao (Pictorial Science), No 8, 1958, pp 281-282

This article presents the general principles of the structure and operation of an atomic reactor and its applications. It includes the following specific information on the first reactor set up in China through Soviet aid.

"China's first atomic reactor, which 'recently' went into operation, is called an experimental reactor. Its fuel is natural uranium; its moderator, heavy water. It produces 7 million watts of heat. When necessary this output could be raised to 10 million watts. The reactor has two principal circulation systems: one for heavy water and the other for helium. The heavy water acts as a heat carrier as well as a neutron moderator. As it passes the heat exchanger, it transfers the heat to a coolant circuit of ordinary water. Steam from the heavy water and explosive gases collect in the upper part of the active area. These are removed by the circulating helium, converted into heavy water, and returned to the reactor.

"China's first experimental reactor is used to produce isotopes for the needs of various fields of industry and scientific research agencies. In addition, it will be used to investigate scientific problems in nuclear physics, radiochemistry, radiobiology, and the properties of metal construction materials. This reactor will help China toward building its own atomic industry. Eventually, every province and municipality in the country will have an atomic reactor and an accelerator, and the peaceful use of atomic energy will become a mighty stanchion in national economic construction."

The article is accompanied by a schematic representation of the heavy water atomic reactor. The drawing shows the following parts: aluminum reactor active tank containing heavy water and uranium rods; reflective layer of graphite on all sides except top of reactor tank; lead shield and hermetically sealed stainless steel lid; control and recording system, including neutron detector, power indicator, and cadmium control rod; helium circulation system with degassing tank, condenser, and blower; heavy water circulation system with heavy water storage, pump, and heat exchanger; and ordinary water circuit.

China Has Taken First Strides in the Atomic Age" (unsigned article); Peiping, K'o-hsueh Ta-chung (Popular Science), No 8, 1958, inside front cover

Announcing the inauguration of China's first atomic reactor and the completed construction of a cyclotron and a pressurized electrostatic accelerator, this article states that the electrostatic accelerator is capable of accelerating protons to 2.5 million electron volts. General descriptions of the equipment are given.

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**UNCLASSIFIED SCIENTIFIC INFORMATION
REPORT**

20 FEBRUARY 1959

2 OF 2

109. Construction of the Czechoslovak Atomic Electric Power Plant

"Technological and Economic Aspects of the Construction of the Atomic Electric Power Plant in Czechoslovakia," by Augustin Sevcik; Prague Jaderna Energie, No 10, Oct 58, pp 278-283

Selection of the power plant type, a brief outline of the installation, construction characteristics of the plant, and economic and technological characteristics, and the prospects for future development are discussed.

VIII. MISCELLANEOUS

110. Organization of All-Union Society of Biochemists

CPYRGHT

"The Organization of an All-Union Society of Biochemists," by Ye. V. Bubnitskaya; Moscow, Biokhimiya, No 6, Nov/Dec 58, p 953

"In accordance with a decision of the Presidium of the Academy of Sciences USSR, dated 7 February 1958, an All-Union Society of Biochemists has been organized.

"The following members were confirmed for the organizational committee of the All-Union Society of Biochemists:

"A. I. Oparin (chairman), A. Z. Babayev (Academy of Sciences Azerbayd-zhan SSR), A. N. Belozerskiy, Ye. V. Budnitskaya (corresponding secretary), V. N. Bukin, Kh. G. Bunatyan (Academy of Sciences Armenian SSR), A. Ye. Braunshteyn, G. Ye. Vladimirov (Biochemical Section of the Society of Physiologists), P. I. Godnev (Academy of Sciences Belorussian SSR), P. B. Dark-anbayev (Academy of Sciences Kazakh SSR) S. V. Durmishidze (Academy of Sciences Georgian SSR), N. D. Iyerusalimskiy (Microbiology Society), A. L. Kursanov, V. N. Orekhovich, A. V. Palladin (Academy of Sciences Ukrainian SSR), S. Ye. Severin (deputy chairman), N. M. Sisakyan, B. I. Tovarnitskiy, R. V. Feniksova, M. M. Shemakin (Mendeleev Society), A. A. Schmidt (Academy of Sciences Latvian SSR), V. A. Engl'gardt, S. Yu. Yunusov (Academy of Sciences Uzbek SSR), V. V. Yurkevich (Sverdlovsk University), and V. G. Yakolev (Academy of Sciences Kirgiz SSR).

"The organizational committee was commissioned to prepare the society regulations, to work out rules for admitting members to the society, and to call a meeting of the All-Union Delegate Conference.

"The convocation of the delegate conference, at which a Central Soviet of the All-Union Society of Biochemists will be selected, will be timed to coincide with the convocation of the Mendeleev conference and will take place between 15 and 17 December 1958.

"At present, the initial organization of the Society of Biochemists has been completed in all the union republics. The soviets of the Society of Biochemists have been selected, the membership has been organized and work plans have been prepared in the Armenian SSR, Azerbaydzhian SSR, Belorussian SSR, Kirgiz SSR, and Moldavian SSR, as well as in Moscow, Leningrad, Gorkiy, Sverdlovsk, and Rostov-na-Donu.

"The All-Union Society of Biochemists already has 1,500 members.

"The Moscow Society of Biochemists will comprise approximately 300 members. S. Ye. Severin has been elected chairman of the Soviet of the Moscow Society; deputy chairmen, A. N. Belozerskiy, A. Ye. Braunschtein, V. N. Bukin, and B. N. Stepanenko; and secretary, I. B. Zbarskiy.

"At the First Meeting of the Moscow Society of Biochemists held 2 October 1958, reports were presented by M. M. Sisakyan, A. Ye. Braunschtein, A. N. Belozerskiy, V. L. Kretovich, V. N. Bukin, G. F. Gauz, and S. Ye. Severin concerning the Fourth International Conference of Biochemists in Vienna."

111. First National Pharmaceutical Conference of Rumania

"The First National Pharmaceutical Conference of the Rumanian People's Republic," by A. M. Stetsyuk, N. G. Koroleva, Ye. and Kutumova, and P. L. Senov; Moscow, Aptechnoye Delo, No 6, Nov-Dec 58, pp 71-76

Twenty-five representatives of scientific and practical pharmaceutical workers from 12 nations the (USSR, People's Republic of China, Bulgaria, Czechoslovakia, Poland, Hungary, East Germany, West Germany, the US, France, Belgium, and Greece) attended the first national pharmaceutical conference of the Rumanian People's Republic held in Bucharest between 29 June and 2 July 1958. The Soviet delegation was represented by the authors of this article.

The conference was divided into four sections: I Problems in Pharmaceutical Chemistry; II The Technology of Medicinal Forms and Preparations; III Medicinal Plants; and IV Pharmacodynamics and Microbiology.

The Soviet delegation conducted a series of meetings on problems concerning the Structure and Organization of the Pharmaceutical System in the Rumanian People's Republic, and on problems concerning scientific research in fields involving the control of medications.

The pharmaceutical system of the Rumanian People's Republic consists of private pharmacies (hospital and polyclinic pharmacies) and the public pharmacies (serving the population). These pharmacies are subordinate to the pharmaceutical administration.

There are in the Rumanian People's Republic 1,100 public-type pharmacies and 540 private pharmacies. There are approximately 4,000 pharmacists in the Rumanian People's Republic, 800 of whom have had advanced education.

The Rumanian People's Republic is divided into 16 areas which have an average of 60 pharmacies and analytical control laboratories.

In addition, the Pharmaceutical Institute for the Research and Control of Medications of the Ministry of Health, Rumanian People's Republic, is conducting scientific research to improve the technology of preparing medicines and galenical preparations and develop new methods of analysis for pharmaceutical preparations (chemical, physicochemical, biological, bacteriological); studying medicinal plants; and organizing pharmaceutical work and scientific information (concerning problems of scientific and practical pharmacology). The pharmaceutical organization, however, does not receive much attention at the institute. This institute is responsible for controlling the quality of the medications used in the medical and the pharmaceutical system received by the system from industry. The institute is a scientific base and consultation organ for problems related to the quality of medications.

The pharmacopeia committee conducts its work at this institute and is directed by the director of the institute, Prof P. Ionesku-Stoyan. The laboratories of the institute are located in well-lighted, modern buildings.

The Chemical-Pharmaceutical Scientific Research Institute of the Ministry of Petroleum and Chemical Industry, Rumanian People's Republic, conducts work on the synthesis of new therapeutic preparations, the synthesis of antibiotics, the technology of certain galenical preparations for industrial production, etc. It also has fine buildings which are well equipped.

There is no separate scientific pharmaceutical society in the Rumanian People's Republic; however, there is a pharmaceutical section in the scientific medical society.

112. Five Major Laboratories of Joint Institute of Nuclear Research Identified

"With the Explorers of Atomic Resources," by V. Shvanev; Moscow, Trud, 25 Dec 58

The current activities of the Joint Institute of Nuclear Research in Dubna are discussed, and it is mentioned that the institute consists of five laboratories which are themselves equivalent to major scientific research institutes. The five laboratories identified are: the Laboratory of Nuclear Problems (Laboratoriya Yadernykh Problem), Prof V. P. Dzhelepov, director; Laboratory of High Energies (Laboratoriya Vysokikh Energiy),

Prof V. I. Veksler, director; Laboratory of Theoretical Physics (Laboratoriya Teoreticheskoy Fiziki); Laboratory of Neutron Physics (Laboratoriya Neytronnay Fiziki)-- the laboratory also has a reactor; and the Laboratory of Nuclear Reactions (With an Accelerator of Multicharged Ions) (Laboratoriya Yadernykh Reaktsiy [s Uskoritelem Mnogozaryadnykh Ionov]).

113. Czechoslovak Radiation Laboratory

"Radiating Atoms Go Into the Service of Humanity," (unsigned article); Prague, Obrana Lidu, 27 Nov 58

Article states that construction work was recently begun on the Dosimetric Department of the Institute of Nuclear Physics of the Czechoslovak Academy of Sciences (Dosimetricke oddeleni Ustavu jaderne fyziky Ceskoslovenske akademie ved), which will be located behind the "Na Bulovce" Hospital in Prague. The article states that the following information about the new "dosimetric institute" was obtained in an interview with Dr. F. Behounek, who will head the institute, and two of his colleagues, Candidate of Sciences Spurny and Dr Klumpēr.

Behounek' said that a quantity of radiation cannot yet be measured with less than 8-10 percent variance in accuracy. Therefore, the basic research goal of the "dosimetric institute" will be to study methods for precise measurement of radiation. In addition, the institute will conduct controlled measurements for other working areas of the Institute of Nuclear Physics and the Oncological Institute (Onkologicky ustav). The "dosimetric institute" has also been assigned the task of working out a standard unit of measure for radiation. One scientific team of the institute will devote itself to the complicated preparation of special, very fine photo-graphic emulsions, by means of which it will be possible to measure very weak radiation. A great deal of attention will be devoted to the detection of radioactivity in the atmosphere and biosphere, which will be very important if international agreements on banning nuclear weapons are reached.

Behounek stated that work is already being done on all of these tasks but that cramped space makes it impossible to do adequate research. In the new building, the radiating bodies will be placed in cells with walls 60 centimeters thick. The radioactive substances will be handled by remote control and the control cables will lead through a system of labyrinthian channels. Waste products from the laboratory will be disposed in special ditches, which will be constantly monitored by automatic devices. Safety measures are such that even in the event of a breakdown there will be no threat whatsoever to the surrounding area.

114. Czechoslovak Radiologist 60 Years Old

"Prof Dr Frantisek Behounek Sixty Years Old," by Z. Spurny;
Prague Jaderna Energie, No 10, Oct 58, pp 300-302

Article gives brief biography of Frantisek Behounek, Doctor of Natural Sciences, Doctor of Physicomathematical Sciences, professor at Charles University, and distinguished Czechoslovak radiologist, who was 60 years old on 28 October 1958.

A list of his original experimental and theoretical scientific efforts, addresses, translations, popular writings, etc. and his photograph are included in the article.

115. Training of Czechoslovak Nuclear Specialists

"Training of Nuclear Specialists in Czechoslovakia," by B. Kvasil;
Prague, Jaderna Energie, No 10, Oct 58, pp 287-290

Kvasil describes the prospectus of courses and work time in the Faculty of Technical and Nuclear Physics in Charles University in Prague, the training of graduate students and nongraduate technicians, and study of Czechoslovak personnel abroad.

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