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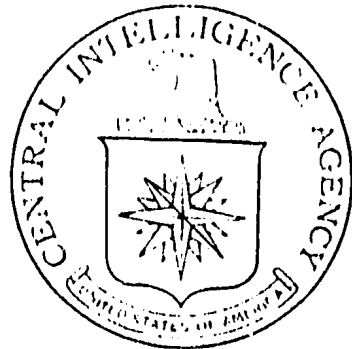
**SCIENTIFIC INFORMATION  
REPORT NUMBER 6**

**5 MAY 1958**

**1 OF 2**

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# SCIENTIFIC INFORMATION REPORT

Number 6

5 May 1958

Prepared by

Foreign Documents Division  
CENTRAL INTELLIGENCE AGENCY  
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PLEASE NOTE

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

SCIENTIFIC INFORMATION REPORT

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NOTE: Items in this report are numbered consecutively.

I. BIOLOGY

1. New Type Animal Reflex Reported in Czechoslovak Press

"New Type of Animal Reflex Discovered," unsigned article, Prague, Rude Pravo, 14 Feb 58, p 1

Prof L. Krushinskiy, physiologist and professor of Moscow University, has announced that in his studies of reflex activities of animals he has succeeded in discovering a new type of reflex. On the basis of scientific experiments he has arrived at the conclusion that animals, in addition to the conditioned and unconditioned reflexes discovered by Pavlov, have a third type of reflex, which he calls an "extrapolative" research.

In his opinion this type of reflex is the basis for rational acts, i.e., the ability of highly organized living beings to form a picture of a whole process, to compare individual phenomena and to foretell future events on the basis of perceptions by the sense organs. Krushinskiy expresses the opinion that the recognition of these new reflexes makes possible a more effective fight against nervous diseases.

Nadezhda Ladyginova, doctor of biology, in a conversation with a TASS reporter, announced that Krushinskiy's research has great scientific and practical importance. Professor Krushinskiy, she stated, submits a new, very "witty" and very simple method of studying the behavior of animals and provides a positive answer to the question of whether or not animals have ideas.

2. Czechoslovak Article on Soviet Observation of Extrapolated Reflexes

"On the New Discovery of Extrapolated Reflexes," (unsigned article), Prague, Mlada Fronta, 22 Feb 58, p 1

After seeing a report on the discovery of extrapolated reflexes by Prof Leonid Krushinskiy of Moscow University in the press around 15 February, the daily newspaper of the Czechoslovak Federation of Youth tele-CPYRGHT phoned Krushinskiy for more information. He was reached at Moscow University, Laboratory No 8, telephone No V 92056. The three questions asked were: "What type of reflex is this and what is the manner of its appearance?" "How and when did the idea of the existence of a third type of reflex come to you?" and "What is the scientific and practical significance of your discovery?"

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"Animals have the ability to react to a position where an impulse [stimulus] will occur in its ordered movement at a definite point in time. That is, they are able to predict where the moving impulse (perhaps another animal) will occur at a definite time. This ability is developed to a different degree among various animals -- for example, weakly in pigeons and ducks, and very weakly in rabbits. Conversely, it is very well developed in magpies and crows, and readily observable in horses and dogs. I am of the opinion that these extrapolated reflexes are the basis of a primitive intellect. Our tests confirm Engels' hypothesis concerning the appearance of the initial elements of rational activity in animals," Krushinskiy stated.

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Krushinskiy continued, "I first had this idea in 1945. In 1948, I started to perform experiments in this direction. I considered this possibility while I was observing animals under natural conditions. Then the idea of the existence of extrapolated reflexes among animals was proven experimentally."

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He concluded, "The recognition of the third type of reflexes enables us to study the laws of the extrapolative activity of animal nervous systems. Concerning man, this discovery can aid work in mental hygiene."

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### 3. Czechoslovak Parasitologists Meet

"First Convention of Czechoslovak Parasitologists," by Dr Bohumir Rosicky, Prague, Vestnik Ceskoslovenske Akademie Ved, No 1/2, Jan/Feb 58, pp 45-53

The first convention of Czechoslovak parasitologists, was held in Prague on 6 to 9 October 1957. The participants included 200 from Czechoslovakia and others from foreign countries including: Academician Skryabin, and Professors Shults, Tiflov, Zasukhin, Spasskiy, Babyanskas, and Asadov from the USSR, Academician Stefanski, Professors Ziarnowski and Wisniewski, and Docents Gerwel and Kozar from Poland; Academician Kotlan, Docents Kobulej and Zoltai, and Dr Mihalyi from Hungary; Professors Borcherth and Wildfuehr from East Germany; Professors Matov [Mateev?] and Pavlov from Bulgaria; Prof Feider from Rumania; Prof Simic from Yugoslavia; Prof Dollfus from France; Prof Biocca from Italy; Professors Enigk, Plekarski, Sprehn, and Westphal from West Germany; Dr Siim from Denmark; and Prof Van Thiel from the Netherlands. The resolution of the convention is included in the article.

4. Biological Institute in Yugoslavia Develops Research Work

"Sarajevo Biological Institute Exchanges Publications with over 30 Countries," (unsigned article), Sarajevo, Oslobodjenje, 25 Jan 58, p 4

During 1957, the Sarajevo Biological Institute (Bioloski institut u Sarajevu) developed experimental research in the fields of ecology, biogeography, and other subjects. Most of the institute's work has been on an inventory of the flora and fauna in Bosnia-Herzegovina. The institute has assisted the students of the Faculty of Philosophy (Filosofski fakultet) and the Upper Pedagogical School (Visa pedagoska skola) in Sarajevo in the study of the classification of plants and animals. By means of short courses the institute has enabled the students to work independently. The institute also determines the classification of plants and animals for other scientific institutions.

During 1957, the institute arranged an exchange of periodicals and books with approximately 30 scientific institutions throughout the world. Under this system, the institute has received approximately 36 periodicals and over 50 scientific books. Cooperation with the academies of sciences of the USSR and of Poland has been especially successful.

Specialists of the institute assisted the Zagreb biocenologist Doctor Ivo Horvat and the classifier of plants, Dr Pavlovskiy of the USSR in their investigations of vegetation on the Vranica mountain.

5. Soviet Biologist in Czechoslovakia

"Local News in Brief," (unsigned article), Prague, Rude Pravo, 11 Feb 58, p 2

Prof V. N. Stoletov, first deputy minister of Higher Education USSR and Candidate of Biological Sciences, arrived in Prague on 9 February. The Soviet guest will remain in Czechoslovakia for about a week and will negotiate a concrete plan for mutual contacts between Czechoslovakia and the Soviet Union in the area of advanced schools for 1958. He will negotiate with representatives of the Czechoslovak Ministry of Education and Culture.

6. Czechoslovak Agriculture Specialist Has Birthday

"From the Day," (unsigned article), Prague, Prace, 14 Feb 58, p 3

Academician Vaclav Novak will be 70 years old today. During his almost 50 years of scientific and pedagogic activity he wrote several hundred technical treatises, published 22 books, trained thousands of agriculture and forestry workers and made Czechoslovak agrology and agricultural bioclimatology famous abroad.

## II. CHEMISTRY

### Biochemistry

7. Desoxyribonucleoproteins as One of the Substrates of the Action of Ionizing Radiation

"On Nucleoproteins as One of the Substrates of the Biological Action of Ionizing Radiation," by L. F. Larionov, Voprosy Radiobiologii (Problems of Radiobiology), Leningrad, 1956, pp 268-279 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 1, 10 Jan 58, Abstract No 87, p 10)

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"On the basis of his own and other data, the author reaches the conclusion that desoxyribonucleoproteins are one of the substrates of the primary biological action of radiations. Possibly, as a result of their injury the synthesis of DNA (desoxyribonucleic acid), found in large amounts in radiation-sensitive tissues, is also inhibited."

8. Shifts of Blood Plasma Protein Fractions Noted in Hypothermia

"Blood Plasma Proteins in Experimental Hypothermia in Dogs," by Stanislaw Bober, Jan Nielubowicz, Mieczyslaw Justyna, Izabela Krzeminska-Lawkowiczowa, and Boleslaw Marzinek, Polski Tygod. Lekar., Vol 12, No 15, pp 543-545 (Polish) (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 1, 10 Jan 58, Abstract No 851, p 95)

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"Shifts in different protein fractions of dogs were noted in experimental hypothermia. The total amount of protein and albumins increases slightly at a temperature of 28° and drops at a temperature of 20°. The alpha- and beta-globulin fractions noticeably increase in proportion to cooling, whereas the gamma globulins decrease."

Industrial Chemistry

9. Apparatus for Analysis of Oxygen-Nitrogen-Argon Mixtures

"An Installation for the Analysis of Oxygen-Nitrogen-Argon Mixtures," by L. I. Kazarnovskiy, N. M. Dykhno, and G. B. Narinskiy, All-Union Scientific Research Institute of Oxygen Machine Building; Moscow, Zavodskaya Laboratoriya, Vol 23, No 11, Nov 57, pp 1387-1388

An apparatus for the analysis of oxygen-nitrogen-argon mixtures is described. The unit was designed at the All-Union Scientific Research Institute of Oxygen Machine Building. In this apparatus the oxygen is taken up by copper and the nitrogen by calcium. Between the absorption of oxygen and that of nitrogen the pressure of the residual gas consisting of argon and nitrogen is measured. When the content of argon and nitrogen in the mixture is lower than 3-5%, these gases can be determined by means of the apparatus with a precision reaching 0.02-0.05%. Oxygen-nitrogen-argon mixtures can be analyzed in a wide range of concentrations up to an 80% content of nitrogen and argon; however, the precision of the determinations becomes somewhat lower at these high concentrations. The time necessary for one determination of the composition of a mixture comprises 1-2 hrs.

10. USSR Developments in Field of Chromatography

"The Chromatographic Method and the Prospects of Its Development," by K. V. Chamitov; Moscow, Zavodskaya Laboratoriya, Vol 23, No 9, Sep 57, pp 1019-1022

"The chromatographic method has been firmly introduced into physico-chemical research and is being applied extensively in analytical chemistry. CPYRGHT

"Chromatography is usually associated with the movement of a gaseous or liquid medium containing a mixture of the substances being separated. This movement proceeds through an immovable layer of an adsorbent which consists of individual particles or other discrete elements. The separation of substances takes place because of minute differences in the adsorbability or in the kinetics of adsorption and desorption of the components of the mixture; ordinarily, differences in both adsorbability and the kinetics exist. The acts of adsorption and desorption are repeated tens of thousands of times in ordinary laboratory chromatographic columns. They take place in every subdivided medium, whether it consists of grains of an adsorbent, paper fibers, particles of an emulsion, or other discrete elements. Not being associated with any definite mechanism of adsorption or restricted to any definite field of application, the chromatographic method is universal in this sense.



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"The resolving power and the capacity of the method are unusually great when the method is applied for quantitative determination under appropriately selected conditions. This applies particularly to colored column and paper chromatograms when the spots or layers are examined visually, because the finest differences in coloration can be distinguished in this manner. In some cases, the chromatographic method matches spectrographic methods with respect to sensitivity, because chromatographic separation makes it possible to accumulate perceptible quantities of substances present in trace quantities. In some cases, the sensitivity of the chromatographic method exceeds that of mass-spectrography, for instance, in the investigation of new elements of the periodic system.

"The combination of physicochemical methods of investigation with a chromatographic procedure of separation or concentration makes it possible to obtain quantitative results. This refers to colorimetric, refractometric, radiometric, and other methods of the analysis of eluates obtained from columns and to direct spectrometric and radiometric methods of measuring the distribution of components along the length of a column, the density of spots on paper, etc.

"The task of the theory of chromatography consists in the development of a system of equations which would make it possible to describe mathematically the process of the adsorption of molecules or ions under dynamic conditions, because the process of separation takes place only under these conditions. An adequate theory can and must yield as a final result the possibility of calculating at least the elementary processes involved in separations.

"The dynamics of the process involved include elements of statics, kinetics, and hydrodynamics. In the case of the separation of vapor-air mixtures, Langmuir's concepts in regard to molecular adsorption and Henry's isotherm satisfy investigators in this field. However, much attention has been paid lately to the correlation of the process with the form of the adsorption isotherm, which may be linear, concave, or convex. The shape of the isotherm determines whether washing out or sharpening of the boundaries of adsorption zones and zones of displacement takes place. These problems were studied in theoretical work done by A. A. Zhukhovitskiy, S. Ye. Bresler, O. M. Todes, V. V. Rachinskiy, and others. Cases of molecular adsorption from solutions generally correspond to variants of adsorption from vapor-air mixtures which have been studied and can under the simplest conditions be described by the well-known Freundlich isotherm as far as statics are concerned and by Shivlov's equation as far as the dynamics of the process are concerned. The mechanism of ion exchange can be considered from different standpoints; on crystalline substances, such as naturally occurring aluminosilicates, the ion exchange is analogous to that taking place when solutions of electrolytes are mixed. However, this analogy is very incomplete, because energy barriers and sterical hindrances which are characteristics for crystal lattices do not exist in solutions.

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"The classical theory of the Helmholtz layer is being applied to some colloidal systems, for instance, aluminum oxide or ferric hydroxide. Here, apparently, one must get away from concepts in regard to strictly stoichiometric ratios between the ions being exchanged. The surface of the swollen resin is assumed to be a membrane and the usual Donnan equilibrium is regard to the distribution of ions on both sides of the membrane is then considered. The existence of a great number of ion exchangers with diverse structures prevents the formulation of a universally applicable theory concerning the exchange mechanism. Experimental investigation of the statics of adsorption and ion exchange leads only to a definition of the optimum conditions for adsorption and determination of the maximum capacity of the adsorbent with respect to an individual substance. Investigations of this type do not form a basis for general conclusions in regard to the possibility of separating substances the adsorbabilities of which differ only by a small amount. Definite conclusions in regard to this will be possible only on the basis of kinetic and dynamic experiments.

"Independently of the mechanism which underlies the kinetics of adsorption, these kinetics determine the dynamics of the process. At present the kinetics of adsorption and of ion exchange are treated by the majority of investigators as a diffusion process. This applies both to extracrystalline adsorption with diffusion taking place in the Nernst layer and intracrystalline adsorption, in connection with which the diffusion may take place in the crystal lattice or in the gel structure of a resin. The possibilities of the occurrence of processes in diffusion regions as compared with kinetic regions are considered in work done by N. N. Tunitskiy, A. N. Kharin, I. A. Myasnikov, S. Yu. Yelovich, and others. In the case of ion-exchange resins the diffusion kinetics depend on the structure of the resin grains or particles. The structure of the resins is mobile; it depends on the number of cross links in the polymer which affect swelling in solutions. This introduces still greater difficulties into the formulation of equations which describe the kinetics (G. V. Samsonov). The theory of the underlying process has progressed far since the semiempirical equations of the dynamics of adsorption formulated by Shilov. The principal method of research at present is investigation of the deformation of zones in the column as these zones move or are washed out by the eluant. As an example of a useful application of theory, one may cite the chromathermographic method which has been developed by A. A. Zhukhovitskiy and N. M. Turkel'taub. In chromathermography a temperature field is employed which moves along the column and promotes sharpening of the boundaries between the zones being separated.

"At present the principal obstacle to the development of theories is formed by the fact that it is impossible to solve systems of differential equations. Much can be done in this respect by using electronic computers, although these computers are not yet being used to an adequate extent. It is of interest that the facility with which chromatographic experiments can

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be conducted leads in the great majority of cases to the application of purely empirical methods. Practical workers in this field have for a long time been experimentally solving problems of this type pertaining to the dynamics of adsorption which cannot be approached by theoretical research. This facility of conducting experiments often makes preliminary calculations impractical; one should rather construct a great number of nomographs for rapid approximate computations. The first successful attempts to construct nomographs for cases involving the adsorption of monovalent and divalent ions were made by R. N. Rubinshteyn.

"As far as methods are concerned, chromatography is developing in several directions, which are ordinarily distinguished according to the mechanism of the formation of the chromatogram. One differentiates between adsorption, ion-exchange, distribution, and precipitation chromatography.

"Lately, distribution chromatography with the application of an electric field, i.e., electrophoretic chromatography, has been applied to an increasing extent. The method on which emphasis is placed at individual scientific research laboratories depends entirely on the special type of work being done at the laboratory in question. However, not all methods are being introduced to an equal extent into the industry.

"Molecular and ion-exchange chromatography in columns have been applied in the industry most extensively. The processes of the recovery of vapors and of hypersorption and adsorption on fluidized solids are being applied to an ever-increasing extent in industrial procedures that involve the employment of volatile solvents. As a result of research conducted for many years by F. G. Prokhorov, K. A. Yankovskiy, and Yu. M. Kostrikin, ion exchange in columns is being applied on a large scale in the USSR in the treatment of water for high-pressure and high-temperature boilers. A promising application is also the use of selectively acting ion-exchange diaphragms for the electrolytic desalting of water (V. A. Klyachko and Ye. B. Trostyanskaya). In view of the fact that the desalting of industrial wastes can be done at a lower cost than the evaporation of these wastes, the method in question is of advantage when the salt content is not too high.

"Paper distribution chromatography in the form of ordinary chromatography in one or two dimensions or as an electrophoretic method is being applied as an analytical procedure of the highest precision, particularly in biological work (G. S. Pashkina). It is assumed that paper chromatography will replace chromatographic separation in columns for this type of application. Systematic work on the separation of inorganic ions by paper chromatography has been conducted by G. D. Yeliseyeva and other investigators. The sensitivity of the electrophoretic method can be illustrated on the example of the separation of the isotopes  $\text{Na}^{22}$  and  $\text{Na}^{24}$  from each other.

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"Distribution chromatography in columns, particularly the so-called gas-liquid chromatography, has been applied on an extensive scale lately in the technology of the separation of gas mixtures. An inert material, for instance, silica gel, is used ordinarily as a carrier when this method is applied. A stationary solvent consisting of a liquid with a high boiling point or even a low-melting hydrocarbon is deposited on this carrier; the process is conducted at a relatively high temperature.

"Precipitation chromatography, which was used a short time ago successfully by K. M. Ol'shanova for analytical reactions in the laboratory, is being introduced into the industry. In this type of procedure the chromatographic zone is formed in the column as a result of the formation of a difficultly soluble precipitate on an impregnated adsorbent. This method is being applied for the thorough purification on an industrial scale of some salts from impurities consisting of heavy metals. Because of its simplicity, this method is preferable to the commonly used chemical methods of purification and appears promising as far as applications in the nonferrous metal industry are concerned. Of great interest is the work by A. M. Gurvich and T. B. Gapon on the purification of salts used in the preparation of luminophores.

"Finally, one must mention the type of column chromatography which involves the formation of complexes. This type of chromatography comprises the application of a complex-forming eluant which makes it possible to wash out successively at different values of the pH components that have been adsorbed in the upper part of the charge; the order in which the components are washed out depends on the dissociation constants of the complexes that are formed. This method is being used successfully in the industrial separation of rare-earth elements (M. M. Senyavin, D. I. Ryabchikov, and others), the laboratory analysis of products of the fission of uranium, the identification of artificial transuranium elements, etc.

"The directions along which the chromatographic method develops have become stabilized during the 50 years of the existence of chromatography. Although the USSR is in the forefront of world science as far as theory and laboratory research are concerned, we lag considerably with respect to the introduction into the industry of our own discoveries and achievements. Lack of publicity on behalf of the chromatographic method and shortcomings as far as coordination of work in this field is concerned, which existed during the early period of the development of chromatography, can no longer be regarded as an objective cause of backwardness in this field. The present obstacles to the introduction of chromatography consist of a weakness of the material base, insufficient interest evinced by industrial organizations, lack of adaptability on the part of the commercial organization which supplies adsorbents, reagents, and equipment, and absence of a designing bureau which would plan industrial installations on a high scientific level under application of modern methods of automatic control.

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"These difficulties, which in the majority of cases are temporary and of a departmental origin, can be overcome by the mutual efforts of scientists and engineers so that an extensive chromatographic technology will develop in the USSR, where this method was discovered."

### 11. Classification of Chromatographic Procedures

"On the Nature of the Chromatographic Method," by S. G. Mokrushin, Ural Polytechnic Institute imeni S. M. Kirov (Sverdlovsk); Moscow, Kolloidnyy Zhurnal, Vol 19, Nov-Dec 57, pp 759-760

The chromatographic method is based on relative movement with reference to each other of phases consisting of the adsorbent on the one hand and of the liquid or gaseous mixture on the other hand. In the classical Tsvet method the liquid or gaseous mixture flows through a solid adsorbent, but in the inverted method, on the contrary, it is the dispersed adsorbent that moves (rises or settles) through a liquid or gaseous mixture. All chromatographic procedures accordingly may be divided into two groups: procedures in which the flow method (classical Tsvet method) is applied and procedures in which the sedimentation or rising adsorbent method (inverted Tsvet method) is applied.

It follows from this that the following variants of chromatographic separation should be added to those generally recognized: suspension, emulsion, and foam chromatography. In suspension chromatography particles of a finely dispersed solid adsorbent move in a fixed direction (e.g., settle) through an immobile layer of liquid or gas. Suspension chromatography has been applied by Shveykina and S. G. Mokrushin for the separation of ferric chloride, copper nitrate, and cobalt nitrate dissolved in water by letting aluminum oxide settle in a tube containing the solution.

In emulsion chromatography droplets of liquid which rise through a solution serve as an adsorbent. This type of procedure has not yet been investigated adequately.

In foam chromatography small bubbles of air rise through a layer of liquid. The term foam chromatography has been suggested by A. F. Yermolenko. Separation of surface-active substances from solutions with the aid of foam was proposed by A. V. Dumanskiy, Wo. Ostwald and A. Siehr, and F. Schuetz. S. G. Mokrushin proposed that colloids be separated by this method.

12. Transportable Installation for Desalting of Water

Peredvizhnaya Opresnitel'naya Ustanovka VNIIGs (The Transportable VNIIGS Installation for the Desalting of Water), by A. S. Moiseyev and I. V. Vol'f, Information on Scientific Research Work, Institute of Technicoeconomic Information, Academy of Sciences USSR, Subject 25, No I-56-71, Moscow, 1956, 16 pp

The All-Union Scientific Research Institute of Hydraulic Engineering and Sanitary-Engineering Works (VNIIGS), Ministry of Construction USSR, has conducted research on the desalting of saline and bitter waters (with a salt content up to 7 grams per liter) by ion-exchange procedures for the purpose of making the water drinkable. As a result of the work which has been done, a transportable installation of small capacity has been developed which is suitable for the treatment of water to be used for drinking and technical purposes.

The installation consists of a duraluminum stand and housing (or a stand and housing made of some other material). Six filter tubes 700 mm high and 80 mm in diameter are arranged in parallel in the housing, which forms the bottom part of the assembly. They are connected in series during filtration, which proceeds by hydrostatic pressure flow. The filter tubes, which are made of glass or a transparent plastic, are filled with the following materials: sand (one tube), cation-exchange resin (3 tubes), anion-exchange resin (one tube), and activated carbon (one tube). The housing containing the filters has the dimensions 0.8 x 0.75 x 0.4 meters. The dismantlable stand or rigging, which projects above the filter housing and supports vats for the water to be treated, treated water, and solutions for the regeneration of the ion-exchange filters, has a height of 2.1 meters above the ground without the vats and of 2.5 meters with the vats. The total weight of the installation including the vats comprises 100 kg; the weight of the housing containing the filters charged with air-dry filtration materials comprises 50-55 kg. The installation can be transported by motor vehicle or plane.

The cation-exchange resin KU-1 [a product obtained by the condensation of phenol sulfonic acid with phenol and formaldehyde] and the anion-exchange resin EDE-10 [a product of the condensation of polyethylenopolamine with epichlorohydrin] are used. The amount of desalted water obtained by treatment in the installation is shown in the following table (cf. Table 2, p 11):

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Output of Desalted Water Depending on the Initial Salt Content			
<u>Initial Salt Content</u>		<u>Output During 24 Hours of Desalted Water in Liters</u>	
<u>Grams per Liter</u>	<u>Milligram-Equivalents per Liter</u>	<u>Total Quantity</u>	<u>Total Quantity Less Quantity Used for the Installation</u>
3	50	615	574
4.5	75	525	446
6.0	100	480	372
10.0	165	360	216

Any degree of desalting can be obtained by treating the water with ion-exchange resins. In experiments on the treatment of saline water conducted in the central part of the Kara-Kum desert, it was found that when filtration is stopped after the passage of 45 liters of filtrate per cycle through the installation, water is obtained which is almost devoid of cations. However it is not desirable to desalt water to this extent, because it becomes tasteless, so that filtration is continued until 65-70 liters of filtered water per cycle has been obtained. Ordinarily, filtration at transportable VNIIGS installations is continued until the acidic reaction of the H-cationized water toward methyl orange ceases, i.e., up to the point of complete passage of the salt through the cationite filters. When filtration has been continued to this point, water results which has a content of approximately one gram of salts per liter. This salt content corresponds to the GOST 2761-41 and 2874-54 standards for drinkable water.

The cationite is regenerated with a 5% solution of hydrochloric acid and the anionite with a 4% solution of sodium hydroxide (or a 5% solution of calcined soda).

When cationite KU-2 [a sulfonated styrene-diolefin copolymer] is used instead of the cationite KU-1, the efficiency of the VNIIGS installation is increased by a factor of approximately two. By using the cationite KU-2 and the anionite EDE-10, Caspian sea water could be desalted in a VNIIGS installation with a yield of 8-9 volumes of desalted water per volume of the ion-exchange resin charge. After the treatment, this water had a content of solids amounting to 840 milligrams per liter at 180°, as compared with an original content of 13,400 milligrams per liter. The original hardness of 215° was reduced to 8° by the treatment.

[SIR Note: Although the desalting of saline waters and sea water on a large scale by filtration through ion-exchange resins is not considered economical and efficient in the USSR (cf. F. G. Prokhorov, "Principal Schemes of the Chemical Demineralization of Water and Regimes of Their Application " Teploenergetika, Vol 4, No 10, October 1957, pp 3-9) and the method of electrodialysis with ion-exchange diaphragms in preferred, desalting by the filtration method in transportable installations would obviously be expedient wherever electric power is not available and drinking water is required (i.e., in deserts, under emergency conditions at sea, in arid regions on the seashore, etc). Ion-exchange filters also ought to prove useful for the decontamination of water from radioactive substances.]



13. Hungarians Develop Industrial Procedures For the Conversion of Methane

"Rumanian-Hungarian Joint Pilot Plant at Buciumeni," by Pal Benedek, Budapest, Flet es Tudomany, No 34, 25 Aug 57, pp 1059-1062

The Hungarian Petroleum and Natural Gas Experimental Institute (Magyar Asvanyolaj es Foldgaz Kiserleti Intezet), Veszprem, has developed chemical procedures for obtaining acetylene from methane and for converting acetylene into acetone. The essence of the processes is as follows:

Analysis has shown that when the proper mixture of methane and oxygen is burned in a tube, a certain narrow section of the flame contains a considerable quantity of acetylene. Therefore, a system has been evolved whereby the flame is cut off by a spray of atomized water at the point at which it contains the greatest amount of acetylene. The sudden reduction in temperature keeps the acetylene from decomposing. Through the selections of a proper mixture of oxygen and methane and the establishment of the correct ratio between exothermic and endothermic conversion, a maximum amount of acetylene can be produced.

The cold gas resulting from the partial combustion of methane, as discussed above, contains hydrogen, carbon monoxide, carbon dioxide, and unconverted methane, as well as acetylene. Usually the practice is to separate the synthesis gas (a mixture of carbon monoxide and hydrogen) from the acetylene at this point before converting the acetylene to acetone. However, the Hungarian procedure consists of passing the entire foregoing mixture of gases plus steam through a reactor containing zinc oxide in tablet form which acts as a catalyst. During this process, the acetylene is converted into acetone at a temperature of 400-500 C while the synthesis gas remains unchanged. Subsequently, the acetone is washed out of the synthesis gas. The practice of putting the entire mixture through the reactor without first separating the acetylene from the synthesis gas eliminates an entire step.

The processes described above are now being tested at the Rumanian-Hungarian Joint Pilot Plant (Roman-Magyar Kozos Kiserleti Uzem), Buciumeni, Rumania. The units built for carrying out these processes at Buciumeni are scaled for full plant production, but are temporarily being used for experimental purposes. These installations are actually prototypes.

Hungary will utilize the experience gained at the pilot plant in processing Rumanian methane at the Tisza Region Chemical Combine (Tiszavideki Vegyi Kombinat). Rumania plans to enlarge the pilot plant and begin full-scale production.

[SIR Note: According to the description given, the method used for the conversion of the methane-oxygen mixture to acetylene appears to be essentially the same as that applied at the Oppau plant of the I. G. Farbenindustrie during World War II.]

14. Hungarians Developing New Oil Refining Process

"Experiments at Budapest Technical University," by Z. L.; Budapest, Muszaki Elet, 12 Dec 57, p 10

The Department of Chemical Technology, Budapest Technical University, in cooperation with the High Pressure Research Institute (Nagynyomasu Kiserleti Intezet) is evolving a process for extracting asphalt from petroleum before the petroleum is subjected to hydrocracking.

Assistant Professor Miklos Szabo of the same department is attempting to produce a highly effective domestic carbon catalyst to be used in the process mentioned above. These experiments are of long-range significance and will apply when hydrocracking is generally adopted in Hungary. Assistant Professor Laszlo Akkermann of Budapest Technical University is in charge of the experiments.

Inorganic Chemistry

15. Determination of Traces of Low-Melting Metals in Refractory Alloys

"Application of Coprecipitation for Obtaining in the Analysis of Alloys Concentrates of Cd, Pb, Bi, and Zn That Are Analyzable," by A. K. Babko and P. V. Marchenko, Institute of General and Inorganic Chemistry, Academy of Sciences Ukrainian SSR, Moscow, Zavodskaya Laboratoriya, Vol 23, No 11, Nov 57, pp 1278-1283

Procedures have been developed for the preparation of analyzable concentrates of zinc, cadmium, bismuth, and lead when these metals are present as minute impurities (in quantities as low as  $10^{-4}\%$ ) in refractory molybdenum-nickel and tungsten-nickel alloys. The impurities are coprecipitated as sulfides. To bring about complete precipitation of Pb, Cd, and Bi when large quantities of the principal components are present, pyridine (which acts as a complex-forming agent) and thioacetamide (which precipitates sulfides as a result of the formation of hydrogen sulfide from it, but acts much more slowly than gaseous hydrogen) were used.

[For additional information on inorganic chemistry, see Item No 36.]

Insecticides

16. Antidotes for Organophosphorus Insecticides

"Scientific Conference on Hygiene and Toxicology of Insectofungicides," by O. A. Aleshina, Moscow. Vestnik Sel'skokhozyaystvennoy Nauki, No 9, 1957, pp 154

At a conference on insecticides held at Kiev, 25-29 June 1957, the health of workers connected with the production and use of poisonous chemical was discussed. Therapeutic methods were developed for use in cases of intoxication of individual chemicals using such therapeutic agents as unitol and pentaphen. For eliminating the toxic action of organophosphorus

insecticides on the surface of the skin, good results were obtained using either a 3-5% aqueous ammonia solution, a 2-5% solution of chloramine, or a suspension of chlorate of lime.

17. Aerosol Generators

"The Fight Against Blood-Sucking Insects," by N. A. Shibayev; Moscow, Fel'dsher i Akusherka, No 2, Feb 58, p 48-49

In the summer of 1957, DDT and hexachlorane were sprayed by an AG-L6 aerosol generator on 50 Pioneer camps, 7 sovkhoses, 6 rest homes, 4 sanitariums, and 17 hospitals in the Moskovskaya Oblast. The AG-L6 aerosol generator, mounted on a truck, can form a cloud in which the droplets are no larger than one micron in diameter. In one minute, the AG-L6 aerosol generator can spray 6 liters of insecticide which will cover 0.5 hectare of forest area.

In addition to the AG-L6, other generators were used, for example, a light aerosol apparatus which works on a thermopneumatic principle and which was constructed by a group of workers of the Central Scientific Research Disinfection Institute.

In 1955, a medical expedition set out from Moscow to Orekhovo-Zuyevo, where they experimented with a new spraying apparatus modified for the MI-4 helicopter. This progressive method, will increase the effectiveness of the fight against insects by lowering the dose of insecticide which is required to exterminate them.

18. Soviet Insecticides and Fungicides

"Chemistry in the Service of Plant Protection," by N. N. Melnikov; Moscow, Zashchita Rasteniy ot Vrediteley i Bolezney, No 6, Nov/Dec 57, pp 41-44

After a brief discussion of the role of Soviet chemistry in agriculture before and after World War II, the author says: "A short while ago agriculture began receiving such preparations as concentrated emulsions of anthraceneoil and phenolate of dinitroorthocresol; at present agriculture is receiving a new group of very effective organophosphorus insecticides which have both contact and systemic (intraplant) action. Of

these compounds, the most practical for field use are thiophos (O,O-diethyl-0,4-nitrophenylthiophosphate), mercaptophos (O,O-diethyl-2-ethylmercaptoethylthiophosphate), and octamethyl (octamethyltetraamide pyrophosphoric acid). CPYRGHT

"At the same time, work is being continued in many organophosphorous insecticides which are less harmful to humans and domestic animals than the above-mentioned compounds. Now under investigation are methylmercaptophos (O,O-dimethyl-2-ethylmercaptoethylthiophosphate), methylethylmercaptophos (O-methyl-O-ethyl-2-ethylmercaptoethylthiophosphate), methylethylthiophos, preparation M-81 (O,O-dimethyl-2-ethylmercaptoethyldithiophosphate), and others.

"Methylethylthiophos has received favorable evaluations from agriculture and will be placed in production sometime within the next 5 years. This preparation does not excel thiophos as an insecticide, but it is less toxic to animals and will be 15-20% cheaper. Methylmercaptophos, which is much less toxic to humans and animals, may replace mercaptophos in the future.

"The chemical industry has delivered the first consignment of such insecticides and acaricides as carbophos which, because of its comparatively low toxicity to warm-blooded animals and humans, can be utilized in private gardens.

"An interesting insecticide for the fight against the gadfly appears to be chlorophos. It is now being experimentally tested on tens of thousands of cattle. Undoubtedly, this preparation will eventually be used in the fight against plant pests."

The author also discusses the use of various mordants (mercuran, ethylmercurochloride, the gamma isomer of hexachlorocyclohexane, tetramethylthiuramdisulfide, and 2,4,5 trichlorophenylate of copper, as well as the combination of the gamma isomer of hexachlorodichlorhexane with aldrin, dieldrin, and heptachlor) and herbicides (the sodium salts of 2,4-dichlorophenoxy acetic acid, the ammonium salts of 2,4-dichlorophenoxy acetic acid, and the butyl ester of 2,4-dichlorophenoxy acetic acid).

Investigations, the author adds, are being continued on the esters of 2,4-dichlorophenoxy acetic acid, sodium trichloracetate, dichloral urea, the isopropyl esters of 3-chlorophenylcarbamic acid, and tetrachlorbenzol.

19. Results of Using Various Insecticides in Forest Region in Uzbek

"Effective Poisons for Forest Regions; by B. V. Romanevich, scientific worker in the Uzbek Affiliate of the Institute of Gardening and Wine Making; Moscow, Zashchita Rasteniy ot

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"Experiments were conducted on forest areas in Uzbek using a 30% solution of methylethylthiophos, a 3-5% solution of thiophos and wofatoks, and a 10-15% suspension of thiophos. Best results against catapillers were obtained by the 3% solution of thiophos and methylethelthiophos. Although the experiments were conducted in June and August with a maximum temperature of 40 degrees, the insecticides retained their toxicity for 4 months and produced 100% effective results."

Nuclear Chemistry and Technology

20. Dissociation Constants of Plutonium Oxalate Complexes

"Determination by the Ion-Exchange Method of the Dissociation Constants of Complex Compounds of  $\text{Pu}^{3+}$ ," by A. D. Gel'man, N. N. Matorina, and A. I. Moskvina; Moscow, Atomnaya Energiya, Vol 4, No 1, Jan 57, pp 52-56

By using the method of ion exchange, the formation of complex  $\text{Pu}^{3+}$  ions in oxalate solutions was investigated in the  $p_{\text{H}}$  range of 1.4-3.0. It was established that in this  $p_{\text{H}}$  range the complex ions  $[\text{Pu}(\text{C}_2\text{O}_4)_2]^-$  and  $[\text{Pu}(\text{HC}_2\text{O}_4)_4]^-$  are formed and that these ions have the dissociation constants  $K_{\text{H}}' = 7.1 \times 10^{-10}$  and  $K_{\text{H}}'' = 1.1 \times 10^{-11}$ , respectively. The value of the dissociation constant of the complex ion  $[\text{Pu}(\text{C}_2\text{O}_4)_2]^-$  found by the ion-exchange method agrees satisfactorily with that determined by the solubility method. The ion-exchange resin Ku-2 [a sulfonated styrene-diolefin copolymer] was used in the experiments described.

21. Oxidation of Plutonium Ions Under Effect of Radiation

"The Effect of Radiation on the Valency State of Plutonium in Nitric Acid Solutions," by N. I. Popov, V. I. Medvedovskiy, and N. A. Bakh; Moscow, Atomnaya Energiya, Vol 4, No 2, Feb 58, pp 154-160

The effect of irradiation with X rays on the valency state of plutonium in 0.3-2.0 M nitric acid solutions was investigated. This effect was also investigated in 0.3 M nitric acid solutions containing different amounts of  $UO_2(NO_3)_2$  and  $K_2Cr_2O_7$ . In nitric acid solutions that do not contain  $UO_2(NO_3)_2$  radiation brings about only oxidation of the plutonium.

When plutonium is oxidized in this manner, the yield of the oxidation products drops with increased concentration of nitrate ions and increased acidity of the solution. It is assumed that oxidation takes place as a result of the action of OH radicals. When  $UO_2(NO_3)_2$  is present, reduction of the plutonium may occur under definite conditions. This reduction is apparently brought about by  $UO_2^+$  ions rather than atomic hydrogen. Although potassium bichromate has the effect of accelerating the radiation-chemical oxidation of plutonium, its presence under certain conditions does not prevent reduction of this element.

22. Oxalate Complexes of Plutonium

"Polarographic Investigation of Complex Plutonium Oxalates," by V. V. Fomin, S. P. Vorob'yev, and M. A. Andreyeva; Moscow, Atomnaya Energiya, Vol 4, No 1, Jan 58, pp 57-62

The composition and stability of complex ions of trivalent and quadrivalent plutonium in oxalate solutions was investigated polarographically.

It was established that the complex ions  $Pu(C_2O_4)_4^{-4}$  (predominantly) and  $Pu(C_2O_4)_4$  (to a lesser extent) are formed in potassium oxalate solutions at  $p_H = 3.5-6$ . Under these conditions  $Pu^{4+}$  yields a well-expressed reaction wave which is suitable for the quantitative polarographic determination of plutonium. The redox potential of this reaction in one M potassium oxalate equals - 0.205 volt with reference to a standard calomel electrode at 25°. At  $p_H = 6-8$  two  $Pu^{4+}$  complexes are present simultaneously in the solution.

On the basis of data in regard to the solubility of  $\text{Pu}(\text{C}_2\text{O}_4)_3$ , the dissociation constants of the complex ions  $\text{Pu}(\text{C}_2\text{O}_4)_3^{3-}$  and  $\text{Pu}(\text{C}_2\text{O}_4)_4^{5-}$  were found to be equal to  $2.4 \times 10^{-12}$  and  $2.2 \times 10^{-11}$ , respectively. On the basis of polarographic data, the dissociation constant of the ion  $\text{Pu}(\text{C}_2\text{O}_4)_4^{4-}$  was found to be equal to  $3.3 \times 10^{-28}$ .

23. Method for Spectrochemical Determination of Small Quantities of Uranium in Minerals and Ores

"Spectrochemical Determination of Small Quantities of Uranium in Natural Objects," by T. M. Moroshkina, V. K. Prokof'yev, and M. N. Smirnova, Leningrad State University; Moscow Zavodskaya Laboratoriya, Vol 23, No 11, Nov 57, pp 1324-1327

A spectrochemical method is described by which uranium that is present in ores and minerals in concentrations of  $10^{-4}$  -  $10^{-3}\%$  can be determined with a precision of  $\pm 6\%$ .

24. Review of Work on Analytical Chemistry of Beryllium

"The Present Status of the Analytical Chemistry of Beryllium," by V. G. Goryushina; Moscow, Zavodskaya Laboratoriya, Vol 23, No 11, Nov 57, pp 1300-1307

Progress of work on the gravimetric, volumetric, and colorimetric analysis of beryllium is reviewed in considerable detail with particular attention to USSR research and practices. A bibliography consisting of 33 USSR references and 53 non-USSR references is appended. The use of complex-forming compounds (chelating agents) is stressed. The article is concluded with the statement that methods of physical analysis (emission spectroscopy and radioactivation analysis) are acquiring increased importance in the analytical chemistry of beryllium.



25. Spectrochemical Determination of Impurities in Beryllium

"The Spectral Analysis of Beryllium," by P. M. Polyakov, A. K. Rusanov, and I. M. Blokh, Moscow, Zavodskaya Laboratoriya, Vol 23, No 11, Nov 57, pp 1320-1323

Spectroanalytical methods for the semiquantitative and quantitative determination of impurities in beryllium are described which were developed in 1948-1951 and are now being applied extensively at laboratories and plants for the control of the production of beryllium and its compounds.

26. Method for Spectroanalytical Determination of Boron in Ores and Minerals

"Spectral Semiquantitative Determination of Boron in Ores and Minerals," by B. M. Maslennikov and V. L. Romanova, State Scientific Research Institute of Mineral Chemical Raw Materials; Moscow, Zavodskaya Laboratoriya, Vol 23, No 11, Nov 57, pp 1327-1328

The methods for the spectroanalytical determination of boron which were applied hitherto could not be used in the case of carbonate and silicate rocks or tourmalines. A procedure has been developed by means of which boron can be determined in these materials down to a content of 0.001% of B with an arc current of 5 amperes and down to 0.0001% of B with a current of 8 amperes.

27. Procedure for Determination of Tantalum in Zirconium and Niobium

"Analysis of Pure Metals; Determination of Tantalum Present in Zirconium and Niobium," by V. A. Nazarenko and M. B. Shustova; Moscow, Zavodskaya Laboratoriya, Vol 23, No 11, Nov 57, pp 1283-1286

It was established that derivatives of 2,3,7-trioxy-6-fluorone are sensitive reagents for the determination of tantalum present in zirconium and niobium. Quantitative methods for the determination of titanium with the aid of reagents of this type are described.

28. Procedure for Spectrochemical Determination of Small Quantities of Niobium in Ores

"Spectrochemical Determination of Small Quantities of Niobium in Ores and in Products of Their Treatment," by V. V. Nedler, Nigrizoloto Institute; Moscow, Zavodskaya Laboratoriya, Vol 23, No 11, Nov 57, pp 1336-1337

A procedure for the spectrophotometric determination of niobium is described in which the sample is introduced into the arc by a special method which eliminates the shortcomings connected with the blowing of samples into the arc with a stream of air. Before analysis the samples are subjected to a chemical treatment which ensures uniformity.

29. Process for Sintering of Niobium Powder

"Investigation of the Process of Sintering Niobium Powder," by O. P. Kolchin and N. P. Chuveleva; Moscow, Tsvetnyye Metally, Vol 30, No 12, Dec 57, pp 65-70

Because of the advantageous characteristics possessed by it, niobium can be applied in metallurgy (for the production of refractory and other alloys), in the chemical industry (as a material for corrosion-proof equipment), in electronics, and in the nuclear energy industry (as a construction material).

The production of pure ductile niobium has certain difficulties because of the high melting point of this metal ( $2,470^{\circ}$ ) and its considerable reactivity at elevated temperatures. One of the methods by which pure ductile niobium can be prepared is pressing of niobium powder into rods followed by sintering. The method of sintering must be such that a high density of the metal is achieved and the pores are closed; otherwise cavities may form as a result of the pressure exerted by gases and vapors of impurities contained in the metal. The process of sintering has been investigated in detail and the conditions which affect it studied. On the basis of the results obtained, single-stage sintering in vacuum is recommended as distinguished from the two-stage sintering advocated by W. G. O'Driscoll and G. L. Miller, Journal of the Institute of Metals, Vol 85 (8), April 1957, pp 379-384, and L. R. Williams, Journal of the Institute of Metals, Vol 85 (8), April 1957, pp 385-392.

30. Constitution Diagram of Zr-Ta-Nb System

"Investigation of the Zirconium Corner of the Zr-Ta-Nb Constitution Diagram," by V. S. Yemel'yanov, Yu. G. Godin, and A. I. Yevstyukhin; Moscow, Atomnaya Energiya, Vol 4, No 2, Feb 58, pp 161-168

By using the methods of metallographic and thermal analysis and measuring the electric resistance, the zirconium corner of the ternary system Zr-Ta-Nb was investigated up to a content of 82% of zirconium and to the temperature of 1,200°. This system exhibits a limited solubility of tantalum and niobium in alpha-zirconium (the gamma-phase), limited solubility of tantalum and complete solubility of niobium in beta-zirconium with an eutectoid breakdown of the beta solid solution, and a three-phase eutectoid equilibrium  $\beta = \alpha + \beta$  between alpha- and beta-zirconium. It was established that in the part of the ternary Zr-Ta-Nb constitution diagram subjected to investigation there are the following phase regions: (a) two single-phase regions  $\alpha$  and  $\beta$ ; (b) three two-phase regions  $\alpha + \beta$ ,  $\beta + \gamma$ , and  $\alpha + \gamma$ ; and (c) one three-phase region  $\alpha + \beta + \gamma$ . When the temperature is reduced in the region below 1,200°, the beta-region narrows down.

The solubility of tantalum and niobium in alpha-zirconium in the system Zr-Ta-Nb comprises about 0.5%. In the direction from Zr-Ta to Zr-Nb the regions  $\alpha + \beta$  and  $\beta + \gamma$  are displaced toward lower temperatures and higher concentrations of niobium; the boundaries of the regions  $\alpha + \beta$  and  $\alpha + \beta + \gamma$  drop from 790° for Zr-Ta to 612° for Zr-Nb. Between the regions  $\alpha + \beta$  and  $\beta + \gamma$  passes a binary eutectoid line, which is displaced in the direction from Zr-Ta to Zr-Nb toward lower temperatures and higher concentrations of niobium. The solubility of niobium in alpha-zirconium in the system Zr-Nb amounts to approximately 0.5% by weight. The eutectoid breakdown in the system Zr-Nb takes place at  $612 \pm 13^\circ$ . Addition of niobium to alloys of the system Zr-Ta displaces the maximum of a transformation of the martensite type to the left and leads to increased stability of the beta-phase at room temperature in quenched alloys.

31. Iodide Method of Purifying Zirconium

"Concerning the Iodide Method of Purifying Zirconium," by K. D. Sinel'nikov, F. I. Busol, and G. I. Stepanova; Moscow Atomnaya Energiya, Vol 4, No 2, Feb 58, pp 169-174

A method is proposed for the determination of the equilibrium constants  $k$  and  $k'$  of the reactions  $Zr + 2 I_2 - ZrI_4 = 0$  and  $2 I - I_2 = 0$  which is based on determination of the quantities of zirconium or iodine formed at a heated surface during the process of the development of the equilibrium. The decomposition of the tetraiodide was carried out on a tungsten filament at 900-1,600°. The temperature gradient between the filament and the walls of the vessel was not considered.

The dependence of the sum of the pressure of atomic and molecular iodine  $p_I + p_{I_2}$  on the zirconium tetraiodide pressure  $p_{ZrI_4}$  at 1,430° and on the temperature was determined at  $p_{ZrI_4} \approx 50$  mm Hg. On the basis

of the results that were obtained, it was found that  $kk'^2 \approx 35$  (mm Hg)<sup>3</sup> at 1,430° and the  $k \approx 0.07$  mm Hg at 400°. These values differ considerably from those calculated on the basis of known thermodynamic data and assure good agreement with experimental data of the formulas developed by the authors of the article earlier (cf. G. I. Stepanova and F. I. Busol, Atomnaya Energiya, Vol 3, No 10, October 1957, p 344).

32. Chemical Processing of Uranium-Bearing Rock in Hungary

"Chemical Processing of Uranium-Bearing Rock," by Elek Szabo, Candidate of Technical Sciences, Department of Chemistry of the Experimental Atomic Reactor, Central Physics Research Institute; Budapest, Energia es Atomtechnika, No 11-12, Nov-Dec 57, pp 592-597

The author describes the methods used in the chemical processing of uranium ores: acidic and alkaline digestion of the rock; and further processing of the resulting solutions by precipitation, ion-exchange, and extraction.

Organic Chemistry

33. Diphenyldithiophosphoric Acid and Its Salts Synthesized

"Dialkyl and Diaryldithiophosphoric Acids as Analytical Reagents. Communication 2. Concerning Diphenyldithiophosphoric Acid and Certain of Its Salts," by A. I. Busev, M. I. Ivanyutin, and M. F. Turchinskiy, Chair of Analytical Chemistry, Moscow State University, Moscow, Vestnik Moskovskogo Universiteta, No 2, 1957, pp 177-182

Diphenyldithiophosphoric acid was synthesized from phenol and penta-valent phosphorus. The impure acid can be stored in a closed can for a rather long period of time without decomposition. It is readily soluble in water and most organic solvents. The aqueous solutions are completely stable and behave as strong acids causing the same type of burns as strong mineral acids. The pyridine and five metal salts of the acid were also prepared and their structure determined analytically.

34. Intermediate Product in Arbuzov Rearrangement Studied

"Studying the Interaction of Esters of Phosphorous Acid with Alkyl Halides by Methods of Physicochemical Analysis," by Academician B. A. Arbuzov and A. V. Fuzhenkova, Kazan State University, Moscow, Doklady Akademii Nauk SSR, Vol 113, No 6, 21 Apr 57, pp 1269-1271

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"The mechanism of Arbuzov's rearrangement has served as a subject for investigation for over 50 years. A. Ye. Arbuzov [1] [refers to appended bibliography] believes that the rearrangement of phosphites into esters of alkylphosphonic acids consists of a two-stage process with the formation of an intermediate product of the phosphonium type. He was able to prove the existence of such a mechanism experimentally for the case of aromatic phosphites. The idea exists that for the case of aliphatic phosphites, the intermediate product immediately decomposes and as such is incapable of existing [2]. A number of investigators, however, believe that the rearrangement can take place by an ionic mechanism without the formation of an intermediate addition product of alkyl halide to phosphite [3, 4].

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"In the present report, we present data obtained from investigating Arbuzov's rearrangement using methods of physicochemical analysis. The basic purpose of the investigation was to clarify the possibility of using composition-property diagrams for studying the question of the formation of an intermediate product during the rearrangement of aliphatic phosphites into esters of phosphonic acids.

"We studied the interaction of triethylphosphite with ethyl iodide ethyl bromide, and dibromodiethyl ether, as well as triphenyl phosphite with methyl and ethyl iodide at various temperatures. The constants were measured at 20° after preliminary heating in thermostats at the given temperature. The measuring temperature of 20° was selected because of the volatility of one of the components.

"Figures 1 and 2 (below) contain data on measuring the constants for composition-property diagrams for the system triethyl phosphite - ethyl iodide at various temperatures.

"The refractive index and density curves diverge near the composition axis, and therefore do not represent chemical interaction.

"The isotherms for specific conductance  $\kappa$ , spontaneous compression  $D_H$ , and, especially, the viscosity  $\eta$  attest to the interaction of the components. A shift to the left in the maximum for the isotherms  $\eta$ ,  $D_H$ ,  $\kappa$  with increasing temperature is characteristic.

"The above isotherms, reflecting the chemical behavior between the components, does not make it possible to make a conclusion regarding the absence or the formation of an intermediate product. Apparently, the composition of the system is more complex, and the intermediate product, if it does form, partially decomposes to an alkyl halide and an ester of phosphonic acid.

"The results of investigating the system triethylphosphite - alpha, beta-dibromodiethyl ether present significant interest. According to V. S. Abramov's [5] data, the interaction of components in this system begins at room temperature and leads to the formation of an intermediate product of Arbuzov's rearrangement.

"As seen in Figures 3 and 4, the isotherms,  $n_D^{20}$  and  $d^{20}$ , as in the case of ethyl iodide, diverge near the composition axis, but the leaning from the additive linear is significantly less here, especially for the density isotherm where the bulging is insignificant.

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"The specific volume isotherm  $\Delta v_{sp}$  and the spontaneous compression isotherm  $D_{II}$  calculated by Byron's method distinctly indicate a compression maximum for a mixture of a 1:1 composition. The viscosity isotherm is distinguished by certain characteristics in its form. Its S-shape together with the presence of an inflection point of a singular type at the 1:1 component ratio attests not only to the interaction of the components, but also to the association of one of the components, apparently the alpha, beta-dibromodiethyl ether.

"Thus, data from composition-property diagrams of the system triethyl phosphite-alpha, beta-dibromodiethyl ether confirm the presence of chemical interaction in the system and in conjunction with V. S. Abramov's [5] data serve as a proof for the formation of an intermediate addition product in the rearrangement process of triethyl phosphite into an ester of ethoxybromophosphonic acid.

"That the composition-property diagrams reflect the formation of an intermediate product in this case and not an end product of rearrangement is supported by the departure of the viscosity of the system from additivity, which for equimolecular mixtures is two times greater than the departure for the mixture triethyl phosphite-ethyl iodide in a 1:1 ratio after heating at 50°.

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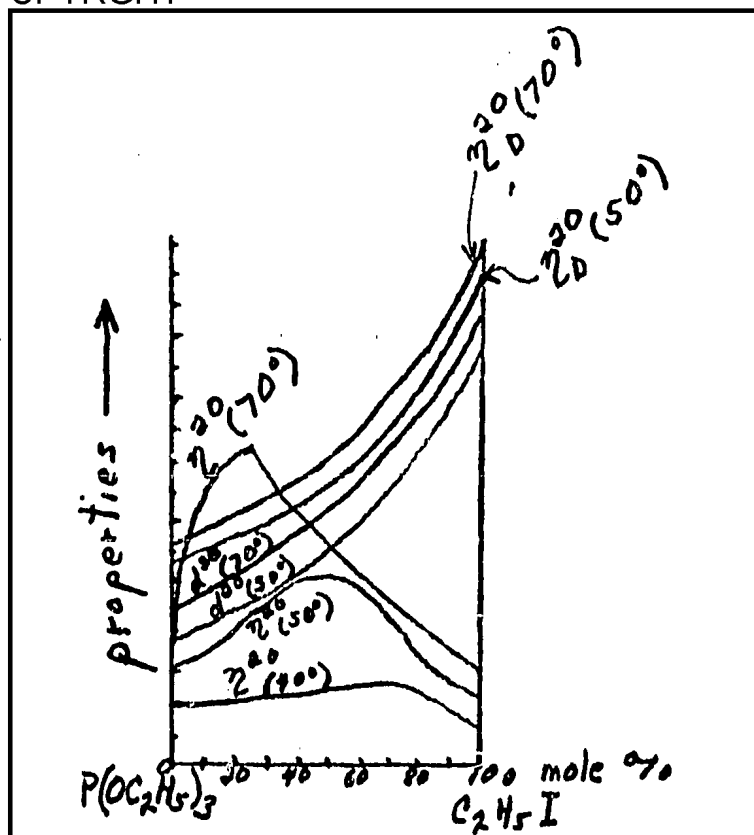
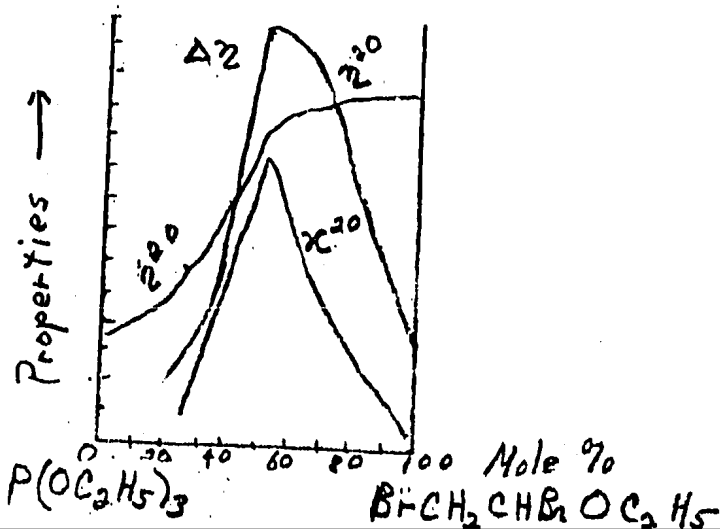
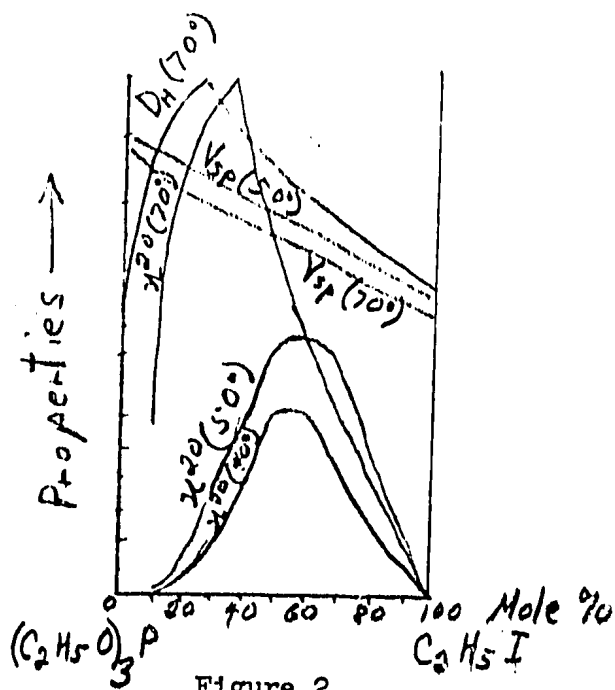


Figure 1



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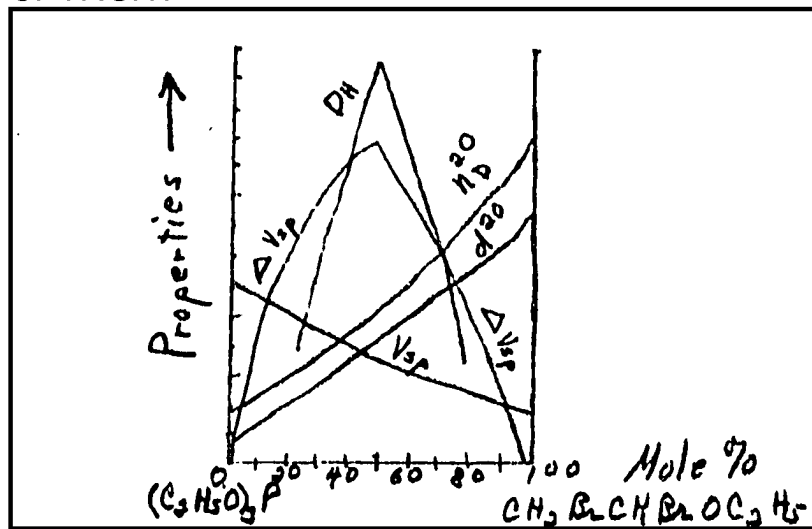


Figure 4

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Radiochemistry

35. USSR Papers Presented at UNESCO International Conference on Application of Radioactive Isotopes

"Application of Radioactive Isotopes in Scientific Research," by P. Savitskiy, E. Finkel', V. Serenko, and N. Bulatova; Moscow, Atomnaya Energiya, Vol 4, No 1, Jan 58, pp 92-96

An international conference on the application of radioactive isotopes in scientific research was held under the auspices of UNESCO, 9-20 September 1957 at Paris.

Forty-nine USSR papers were presented at this conference. Thirty-eight papers were given by French scientists, 31 papers by US scientists, and 29 papers by British scientists. The total number of papers presented at the conference was 206.

In the section of physical sciences, reports were given on the production of isotopes, dosimetry, the production and use of powerful sources of gamma radiation, the application of isotopes in metal physics, the science of metals, metallurgy, chemical research, geophysics, etc.

The following reports on work by USSR scientists were given in the section of physical sciences:

M. S. Petrova, K. G. Shvebel'blit, D. M. Ziv, and others reported on new and original methods for the production of sources of alpha, beta, and gamma radiation by utilizing the high adsorptive capacity of aluminum oxide films and introducing radioisotopes of strontium and other

elements into enamels that are applied to samples. The methods in question make it possible to produce sources of different shape which are reliable in operation and exhibit minimum losses as far as self-adsorption of radiation is concerned.

The extraction of  $Cs^{137}$  from solutions of fission products was discussed in a paper by V. I. Spitsyn (USSR) and also in a report by Sadington (England). While in England  $Cs^{137}$  is precipitated in the form of its sulfate with phosphotungstic acid, this isotope is concentrated in the USSR in the form of its chloride by the ferrocyanide method. By using the latter method, a  $Cs^{137}$  source with an activity of 1,000 curies was obtained.

Great interest was shown in a report presented by A. Kh. Breger, V. L. Karpov, V. A. Belynskiy, and others in regard to the construction in the USSR of a powerful gamma installation with a  $Co^{60}$  source that has an activity equal to 21,000 gram equivalents of radium. This installation is designed for radiation-chemical investigations and has a chamber with a volume of one cubic meter. The intensity of the doses achieved can be as high as 1,000 roentgens per second. The installation in question is the most powerful of all known to be in existence.

In the fields of metal physics, metallurgy, the science of metals, thermophysics, research on the mechanism and kinetics of chemical reactions and plant metabolism, the greatest number of papers was presented by USSR participants in the conference.

The application of radioactive isotopes for the solution of some problems of the theory of diffusion in metals made it possible to establish a number of general relationships. For instance, it has been possible to measure the thermodynamic and diffusion characteristics of solid solutions, to investigate the coefficient of self-diffusion of dissolved silver at positive and negative deviations from Raoult's law, and to investigate diffusion in heterogeneous systems (A. A. Zhukhovitskiy, M. Ye. Yanitskaya, and A. D. Sotskov).

Investigation of the mobility of atoms and of the interactions between atoms in alloys by the method of radioactive tracers made it possible to explain a number of phenomena pertaining to the physical and chemical behavior of iron and nickel alloys. Thus, it has been shown that the structural factor has an effect on the diffusion of carbon in iron-nickel alloys (P. L. Gruzin and others).

Investigations by the autoradiography method of the effects which the composition and the structure of metals have on the diffusion of components along grain boundaries established that small additions of various elements may significantly change the rate of diffusion along the grain boundaries; the rate of intercrystalline diffusion increases with the size of the grains. It was furthermore established that there is a correlation between the process of recrystallization and the local type of diffusion as well as some other conditions (S. Z. Bokshteyn, S. T. Kishkin, and L. Mo Moroz).

Deserved praise was given to a paper on electric transfer in solid solutions. In the investigation in question the radioisotopes  $C^{14}$ ,  $Fe^{59}$ ,  $Cr^{51}$ ,  $Mo^{99}$ , and  $W^{185}$  were used. The method that has been developed makes it possible to determine the velocity and direction of the transfer of individual components of binary alloys under the effect of a direct current at different temperatures. New data have been found concerning the interaction between atoms in alloys (I. N. Frantsevich).

Of great practical and scientific importance is research that has been done on the solubility of nonvolatile substances in high-pressure steam. The use of radioisotopes made it possible to detect very small concentrations of dissolved substances (down to  $10^{-5}$  milligrams per kilogram). The investigation was conducted in an extensive range of temperatures and pressures (M. A. Styrikovich).

Great interest was elicited by a report on the action of substances modifying flotation, and a lively discussion, followed the presentation of the report. The work described was done with the use of the isotopes  $S^{35}$ ,  $C^{14}$ ,  $P^{32}$ ,  $Cu^{64}$ ,  $Fe^{59}$ ,  $Zn^{65}$ , and  $Ca^{45}$ . It was established that the nature of the interaction between flotation reagents and minerals differs and that only a partial activation of the surface (amounting to 20-40% of a monolayer) is required for the efficient flotation of minerals (O. S. Bogdanov, V. R. Khayman, N. A. Yanis, and A. K. Podpek).

Two papers dealing with the action of nuclear radiation on semiconductors were very well received. One of them discussed defects in the structure of single crystals of germanium which arise under the action of beta particles and of fast neutrons (V. S. Vavilov, L. S. Smirnov, A. V. Spitsyn, V. M. Patskevich, and M. V. Chukichev). The other dealt with the action of beta particles on crystals of germanium and silicon (V. S. Vavilov, L. S. Smirnov, and V. M. Patskevich).

Of interest from the practical standpoint is work on the measurement of the relative mobility of cations in mixtures of molten oxide (V. I. Malkin and L. A. Shvartsman), on the thermodynamics of metallurgical reactions (L. A. Shvartsman), and on processes of the migration of ions of the principal components and ions of impurities in crystals of silver, alkali metal, and alkaline earth metal salts (A. N. Murin).

Also of practical interest is work on the movement of materials composing the charge in blast furnaces. According to a paper presented at the conference by French investigators, the ore is tagged by moistening it with aqueous solutions of radioisotopes: this is different from the method used in the USSR. Of great importance for the selection of the conditions under which various materials should be dried are results of the investigation of phase transformations and of the movement of moisture within capillary-porous and colloidal materials. Work on this subject has been reported by A. I. Veynik.

Of both theoretical and practical importance is work on the investigation of the order in which intermediate products are formed during the oxidation of hydrocarbons (A. V. Nalbandyan, M. B. Neyman, and N. M. Emanuel') and also on the exchange of sulfur isotopes and the mechanism of reactions undergone by sulfur compounds (A. I. Brodskiy and G. P. Miklukhin).

Among papers in the field of analytical chemistry, one may mention the following:

An investigation on the use of radioactive isotopes in spectral analysis was of interest (Ye. Ye. Vaynshteyn, L. I. Pavlenko, and Yu. I. Belyayev).

Of great interest was a report on the application of organic reagents acting as coprecipitants in the separation of minute quantities of admixtures. This method is of very great importance in connection with the development of methods for the control of the purity of semiconductors, alloys, and other materials. The method proposed in the report makes it possible to determine quantities of substance as low as  $10^{-10}$  grams per liter of solution (V. I. Kuznetsov).

At three meetings on the application of radioisotopes in physical chemistry, the following papers were presented. A paper by A. A. Balandin and others dealt with an application of the kinetic isotope method in an investigation of the mechanism of catalytic dehydrogenation of butane to butadiene.

A paper by S. Z. Roginskiy discussed problems of catalysis and reported results of an investigation on the mechanism of catalytic processes. The data obtained explain these processes and indicate that it is necessary to review the current ideas on the mechanism of a number of phenomena involved in catalysis. The paper in question reported the results of the application of isotopes in the investigation of the structure of the surface of solid catalysts.

New data on the application of isotopes in the investigation of the structure and properties of heteropolycompounds were presented in a paper given by V. I. Spitsyn.

Among papers on the dosimetry of ionizing radiation, a report by K. K. Aglintsev, V. P. Kasatkin, and V. V. Smirnov was of interest. This paper described an investigation of active electron spectra and of the spectral sensitivity of ionization chambers, counter tubes, and photosensitive films. The methods in question make it possible to devise efficient methods for the calibration of instruments used in the determination of beta and gamma radiation.

Among papers in the field of geophysics great interest was elicited by a report of A. P. Vinogradov on the isotopic composition of meteorites and of the earth and on the ratio of  $S^{32}$  to  $S^{34}$  in them. This paper was followed by a productive discussion of the subject. In the investigation described, magmatic and volcanic rocks as well as stone and iron meteorites were investigated. Significant differences in the isotope ratios in these experimental objects were established, thus indicating differences in origin.

Another paper in the field of geochemistry was presented by V. I. Baranov and L. A. Kuz'mina, who determined the rate of the accumulation of sediments by subjecting deep-sea deposits to radiochemical analysis.

At the combined meeting of the section on methods for the application of isotopes and of the section on procedures for measuring radioactivity, a report on the application in nuclear research of emulsions with a very fine grain size elicited the greatest amount of interest. While in commonly used emulsions the grain size is approximately 0.28 micron, the newly developed emulsion contains microcrystals with dimensions from 0.04 to 0.08 micron. This considerably extends the possibility of using emulsions in this type of experimental work (N. A. Perfilov, N. R. Novikova, and Ye. I. Prokof'yeva).

In the section of biological sciences reports on the applications of isotopes in medicine, agricultural engineering, and biology were presented. Among the work reported in this section, one may note research by the Soviet biochemists A. V. Palladin, Ye. M. Kreps, M. N. Prokhorova, and G. Ye. Vladimirova, who investigated with the aid isotopes the metabolism of proteins, nucleic acid, glycogen, and other compounds at different functional states of the brain. It was established in this work that the rate of metabolism is more rapid in organisms that are further advanced on the scale of evolution. At meetings in the subdivision of physiology and biochemistry of plants, those participating in the discussion agreed with the basic precept of A. L. Kursanov that in plants, in addition to the circulation of organic substances, an uninterrupted circulation of phosphorus takes place. From 20 to 30 percent of the total content of phosphorus and 20-50% of the total amount of the products of photosynthesis participate in this circulation. The rate of the displacement of organic substances in plants is 80-100 centimeters per hour on the average.

A lively discussion followed a paper by Z. N. Zhurbitskiy and D. V. Shtrausberg on the effect exerted by the temperature of the soil and of the air on the assimilation by plants of various fertilizers tagged with  $P^{32}$ ,  $S^{35}$ , and  $Ca^{45}$ . The results of the investigation in question make it possible to select judiciously the conditions under which nourishment should be supplied to plants in different climates.

The isotopes  $P^{32}$  and  $C^{14}$  are used in the US, Japan, and other countries for the investigation of phosphorylation processes connected with photosynthesis. By means of this method, the finest details of the mechanism by which light energy is captured at chemical bonds can be investigated. A report on this problem was also given the by USSR investigator A.A. Nichiporovich.

Yu. I. Sorokin conducted original work on the determination with the aid of  $Ct^{14}$  of the primary productivity of bodies of water with respect to photosynthesis and chemical synthesis and also on the processes of nutrition of aqueous invertebrates which serve as nourishment to fish.

Of interest was a meeting dealing with the behavior of fission products in the soil, plants, and animal organisms. At this meeting, V. M. Klechkovskiy and I. V. Gulyakin presented an extensive report in which, among others, a new phenomenon was described, namely, that of the different distribution of yttrium in plants after introduction from the outside as compared with the distribution after its formation inside the plant as a result of the decay of  $Sr^{90}$ .

The conference was officially closed on 17 September 1957.



On 19 September 1957, the Soviet delegation conducted a press conference, at which the present status and prospects of the application of isotopes in the USSR were discussed. The head of the Soviet delegation announced the construction in the USSR of large enterprises for the production of isotopes.

During the conference, the members of the Soviet delegation had numerous contacts and conversations with scientists of other countries, in the course of which the possibilities of establishing closer relations between Soviet scientists and American, British, French, and other scientists were discussed. During the conference, 12 public lectures were held by participants in the conference. Two of them were given by Soviet scientists, one by A. P. Vinogradov entitled "The Isotope Composition of the Earth and of Meteorites" and one by A. A. Nichiporovich entitled "The Method of Tracer Atoms and the Problem of Photosynthesis."

The members of the Soviet delegation visited more than 20 scientific institutions and industrial organizations in France, thus establishing closer contacts with scientific and business circles and familiarizing themselves with the organization of scientific research and with the equipment and design of laboratories.

36. Determination of Constitution of Phosphotungstic Acid With Aid of Radioactive Isotopes

"Application of Radiometric Analysis in Chemical Research," by N. B. Mikheyev, Atomnaya Energiya, Vol 4, No 2, Feb 58, p 213

At the Institute of Physical Chemistry, Academy of Sciences USSR, V. I. Spitsyn and N. B. Mikheyev developed a method of radiometric analysis with the use of two radioactive tracers.

This method is based on the following principle. The compound being investigated is prepared from substances which contain radioactive isotopes of two different elements. The half lives of the two isotopes must be different. The specific radioactivities of the initial substances and of the compound being investigated are determined. After most of the isotope with a shorter half life has decayed, the radioactivities of the same substances are determined again.

On the basis of the data obtained in this manner, one can calculate the initial radioactivities of both isotopes in the compound by solving the following system of equations:

$$\begin{aligned} I_1 + I_2 &= I_{1+2}, \\ k_1 I_1 + k_2 I_2 &= i_{1+2}, \end{aligned}$$

where  $I_1$  and  $I_2$  are the activities to be determined of the elements 1 and 2 in the analyzed compound at the time of the first measurement;  $I_{1+2}$  and  $I_{1+2}$  the radioactivities of the compound being investigated at the moments of the first and second measurement; and  $k_1$  and  $k_2$  coefficients which indicate by what factor the radioactivities of the elements 1 and 2 have diminished between the first and the second measurement. Knowing  $I_1$ ,  $I_2$ , and the specific activities of elements 1 and 2, one can calculate the ratio of the two elements in the compound by weight or by the number of atoms. Thus the method of radiometric analysis which has been described makes it possible to determine the ration between two elements in a compound without separating these elements chemically.

By using  $P^{32}$  and  $W^{187}$ , the ratio between P and W in sodium phosphotungstate was determined. In this case the precision of the radiometric analysis ( $\pm 2.5\%$ ) proved to be superior to that of the chemical analysis.

The method of radiometric analysis that has been proposed was applied for the determination of the ratio between K and P in potassium phosphotungstate precipitated from solutions of different acidity. It was established that there is formation of solid solutions of phosphotungstic acid with its potassium salt. For this reason, phosphotungstic acid be regarded as an oxonium salt of the composition  $(H_3O)_3PW_{12}O_{40} \cdot 26H_2O$ .

[SIR Note: An unscheduled paper dealing with heteropolyacids of this type and related to the subject matter of this investigation was presented by V. I. Spitsyn of 19 March 1958 at the Fourth Nuclear Engineering and Science Conference in Chicago.]

[For additional information on radiochemistry, see Item No 10.]

### Safety Engineering

#### 37. Acoustical Method of Air Purification

"The Acoustical Method of Purifying Dust-Bearing Gases", by N. V. Lavrov and Ye. P. Mednikov; Moscow, Gazovaya Promyshlennost', No 7, Jul 57, pp 13-21

The pros and cons of the acoustical method of gas purification are discussed. Contemporary dust-catching devices based on this principal are apparently incapable of coagulating particles of less than one micron.

However, the author feels that with more research this method can be perfected to the point where an acoustical unit, including the cost of sound insulation, will be more economical than electrofilters and will be used in industrial metallurgical plants and other places requiring air purification.

30. Airtightness of Material Determined by Formula

"Airtightness of Cotton Fabrics," by N. S. Poroshin, Candidate of Technical Sciences; Moscow, Tekstil'naya Promyshlennost', No 9, Sep 57, pp 39-41

Two formulas are proposed that can be used to determine the degree of airtightness of a large number of fabrics.

$$V = \frac{a}{O_n^x}$$

$$V = \frac{a}{O_v^x},$$

where V is degree of airtightness,  $O_n$  is volume of threads in fabric,  $O_v$  is volume of fibrous material in  $\text{cm}^3$ . x and a are determined from the two equations simultaneously on the same fabric having a maximum and minimum degree of airtightness measured on an apparatus. This method for determining the degree of air-tightness is used by the laboratory of special clothing of the All-Union Scientific Research Institute of Labor Protection. On the basis of these formulas, requirements were developed for fabrics to be used in the manufacture of clothing to be worn by workers occupied in the production and handling of poisonous dusts and in metallurgical plants.

Miscellaneous

39. Problem Laboratory on Organic Catalysis Formed at Kazakh State University

"In the Laboratories of Scholars" (unsigned article), Alma-Ata, Kazakhskaya Pravda, 15 Jan 58

A Problem Laboratory on Organic Catalysis (Problemnaya Laboratoriya po Organicheskomy Katalizy) has been formed in the Chair of Catalysis and Technical Chemistry, Kazakh State University. The laboratory will be equipped with instruments from East Germany and Hungary, which include an ultrathermostat, an autoclave, and other electronic instruments.

40. Reduction of Training Period for Chemical Workers

"Reduction Proposed in Training Period of Skilled Chemical Workers" (unsigned article), Zagreb, Borba, 9 Feb 58, p 2

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"At a conference begun today in Belgrade concerning the role and position of secondary-school trained technicians in the Serbian chemical economy and their prospective status, the technical education of chemical technicians was discussed, and the possibility of their more rapid education was considered."

It was proposed at the conference that, to train personnel more rapidly, the education of skilled chemical workers be reduced to 2 years. It was also proposed that faculty-trained chemists receive the title of graduate engineer.

III. EARTH SCIENCES

41. Unsteady Electromagnetic Field in Heterogeneous Media

"Calculation of Unsteady Electromagnetic Fields in Heterogeneous Media," by D. N. Chetayev; Trudy Geofizicheskogo Instituta, No 32(159), 1956, pp 3-25

This work considers the formation of an electromagnetic field, excited by elements of a direct current in a two-layer medium, in a case when the conductivity of the layer and the base are sufficiently close, and in a case when the conductivity of the base is sufficiently small. In addition, the initial states of the formation of the vertical components of the magnetic field are calculated.

42. Rare-Element Minerals in Siberia

"Mineral-Ore Base for USSR Nonferrous Metallurgy at the Fortieth Anniversary of the Great October Socialist Revolution," by P. Ya. Antropov; Moscow, Tsvetnyye Metally, No 10, Oct 57, pp 9-14

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The article includes the following passage: "In certain regions of the Transbaykal [Chitinskaya Oblast] an unusual deposit of rare and dispersed elements which for a long period of time can serve as a base for the growing industry of rare metals was discovered."

43. New Light Rangefinder Exhibited

"Precision Optical Rangefinder," (unsigned article); Bucharest, Pentru Apararea Patriei, Feb 58, p 24

At the Union Exposition [All-Union Industrial Exhibition] the Soviets have displayed a new light rangefinder which can measure distances up to 17 kilometers with an accuracy of plus-or-minus 8 centimeters. The device sends a flash of light at a distant object, measuring the distance to the object on a special scale on the projector according to the time interval between the launching of the light flash and the receipt of its reflection.

IV. ELECTRONICS

Communications

44. Automatic Phase Regulation of Scanning Generators

"Investigation of a Television Synchronization 'Flywheel' System," by Yu. N. Bakayev; Moscow, Radiotekhnika i Elektronika, No 2, Feb 58, pp 227-236

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"A system of automatic phase regulation of television scanning generators was examined. Equations for the process of synchronization by pulse signals are presented in a generalized form. The cases of sawtoothed and sinusoidal voltage generators are examined in detail. Also considered is the synchronization of sinusoidal generators by continuous signals. Methods of computation are suggested."

The "flywheel" system of synchronization has considerably greater freedom from noise. The synchronizing signal is averaged (usually, for several tenths of the period), and due to their irregular nature, the noises are weakened.

45. Recent Soviet Patents in Field of Electronics

"Authorship Certificates," (unsigned article); Moscow, Elek-trosvyaz, No 2, Feb 58, p 78

Class 21a<sup>1</sup>, 601. No 107611. B. Yu. Kravchenko and A. M. Kashcheev. A Method of Semiautomatic Accounting for the On-Hand Messages at the Telegraph Junctions With the Code Commutation of Channels.

Class 21a<sup>1</sup>, 1304. No 107390. N. V. Dobrozhanskaya and D. Z. Kolesova. Device for Synchronizing Facsimile Instruments with Variable Scanning Speed.

Class 21a<sup>1</sup>, 36. No 107544. B. M. Yegorov. Device for Shaping Electric Pulses.

Class 21a<sup>2</sup>, 3. No 107501. N. A. Denina. Unidirectional Capacitor Microphone.

Class 21a<sup>4</sup>, 7. No 107543. M. M. Veysbeyn and E. M. Rubchinskiy. A Method of Registering the Instantaneous Values of Frequency.

Class 21a<sup>4</sup>, 10. No 107498. P. G. Pozdnyakov. A Method of Frequency Tuning of Piezoelectric Resonators.

Class 21a<sup>4</sup>, 10. No 107572. I. G. Vasin. A Method of Depositing Silver Coating on the Surface of Quartz Plates.

Class 21a<sup>4</sup>, 10. No 107575. G. N. Faliy. A Device for Frequency Stabilization.

Class 21a<sup>4</sup>, 48<sub>05</sub>. No 107566. B. L. Burdo. A Method for Measuring the Phase Shift.

Class 21a<sup>4</sup>, 53. No 107564. A. A. Shenogin. Electronic Noise Generator.

Class 21a<sup>4</sup>, 68. No 106803. V. A. Solov'ev and I. Ye. Prudnikov. Delay Line With Distributed Constants.

Class 21a<sup>4</sup>, 68. No 107251. A. P. Borisov. A Method of Determining the Winding Nonuniformity of the Focusing Devices in Traveling Wave Tubes.

Class 21a<sup>4</sup>, 71. No 107344. I. A. Kovalenko. A Method of Impedance Measurement in the Superhigh-Frequency Range.

Class 21c, 55<sub>01</sub>. No 107573. Ye. A. Chekharev. Wide-band Loading Resistance.

Class 21e, 11<sub>20</sub>. No 107435. G. V. Voyshvillo and V. S. Davydov. Low Frequency Spectrum Analyzer.

Class 21e, 12. No 107366. D. D. Voyeykov. Device for Measurement of Magnetic Field Intensity.

Class 21e, 12. No 107367. L. N. Gertsiger. Device for Measurement of Magnetic Field Intensity.

Class 21e, 12. No 107533. P. K. Davidovich. Device for Determining Operation and Release Time of Electromagnetic Relay.

Class 21c, 36. No 107634. A. M. Melik-Shakhnazarov. Device for Maintenance of Steadiness of AC Current in Magnetic Circuits.

Class 21f, 84<sub>03</sub>. No 107586. M. A. Dubas. Device for Firing Gas-Discharge Electro-Vacuum Devices.

Class 21c, 8<sub>03</sub>. No 107155. M. A. Klimov. Mobile or Manually Propelled Machine for Removing Ice Formations From the Wires of Bracket Suspended Overhead Communication Line.

Class 21c, 20. No 106870. D. V. Fetisov and A. N. Kabanov. A Method of Insulating High-Voltage Cables With Rubber Insulation at the Armored Inlets and Splice Boxes.

Class 21e, 25<sub>01</sub>. No 106172. N. K. Miloslavskaya. A Shield for Protection of Measuring Instruments for the Extraneous Magnetic Field.

Class 21g, 11<sub>02</sub>. No 107170.. S. G. Kalashnikov and N. A. Penin. Solid Rectifier.

Class 21g, 13<sub>17</sub>. No 106142. I. M. Vigdorichik. A Method of Millimeter and Submillimeter Range Wave Generation.

Class 21g, 13<sub>50</sub>. No 106625. V. A. Dvinskikh. A Method of Measuring the Steepness of Plate-Grid Characteristics of Electron Tubes.

Class 21g, 15<sub>01</sub>. No 106419. N. S. Shestov, D. P. Shabrov and V. P. Polyakov. Mechanical Rectifier of Electric Current.

Class 21g, 15<sub>02</sub>. No 106417. S. A. Mayevskiy. Installation for Rectification of Multiphase Current Into DC Current.

Class 21a, 36. No 106143. D. Ya Svet. A Method of Measuring the Voltage Amplitude Ratio of Two or Several Pulses of Exponential or Bell Shape.

Class 21a, 77. No 107854. Ye. K. Iordanishvilli, L. G. Tkalich and D. V. Shtepan. Thermostat for Quartz Generator Built With Semiconductors.

Class 21a, 18<sub>08</sub><sup>2</sup>. No 107984. A. G. Pinchuk. A Converter of AC into DC or DC into AC.



Class 2La<sup>4</sup>, 8<sup>07</sup>. No 107445. S. D. Gvosdover and S. A. Akhmanov. Device for Oscillation Generation With Low Coefficient of Noise Modulation.

Class 2La<sup>4</sup>, 35<sup>14</sup>. No 107940. Ya. Ye. Gorskiy. Stabilized Source of High Voltage.

Class 2La<sup>4</sup> 4<sup>8</sup> 05. No 108009. L. L. Barvinskiy. A Method of Automatic Fine Tuning of Input Circuit Frequency for the Receiver of a Pulse Radar Station.

#### Wave Propagation and Antennas

##### 46. Design of Periscopic Antennas

"Selection of Size Ratio for Radiator and Reradiator Aperture in Periscopic Systems," by A. M. Pokras; Moscow, Elektrosvyaz', No 2, Feb 58, pp 20-24

This article presents information on a quantitative investigation of periscopic antennas having "inverse ratio" (the radiator has greater dimensions than the lower radiator) and their comparison with antennas having a "common ratio" (the reradiator [top radiator] has greater dimensions than the lower radiator).

It was shown that a decrease in reradiator dimensions, when not compensated by an increase in the size of the lower radiator, results in a decided reduction of antenna gain. Systems with parabolic and elliptical radiators and reradiators were compared.

It was shown that improvement in antenna gain with the parabolic reradiator is rather small and is apparent only for relatively small distances between the radiator and reradiator.

A substantial antenna gain can be expected only when the dimension of the reradiator is considerably greater than that of the radiator, and the distance between the two is relatively small.

##### 47. Effect of a Disturbed Sea Surface on Radio Wave Transmission

"On the Statistical Nature of Scattering of Centimeter Waves on a Disturbed Sea Surface," by S. Ya. Braude, N. N. Komarov, and I. Ye. Ostrovskiy, Institute of Radiophysics and Electronics, Academy of Sciences Ukrainian SSR, Kar'Kov; Moscow, Radiotekhnika i Elektronika, No 2, Feb 58, pp 172-179

The propagation of a signal over a disturbed sea surface is considered as consisting of the direct wave, the coherently reflected wave and the sum of the elemental reflected waves with random phases and

amplitudes. Next, the authors determine the probable distribution of amplitudes and phases, the low-frequency spectrum envelope of signal fluctuation and the constant and RMS rate of movement of sections of a disturbed sea surface.

In actual experiments a 3.2-cm wave was used. Measurements were made with the transmitter at a height of 6 meters and receiver at a height of one meter, and with the transmitter at 7.5 meters and receiver at 16 meters. The transmission path was 750 meters long and located entirely over water.

A continuous photographic record of the signal was made at the receiver. Two photographs show signal amplitude compared with time and signal amplitude compared with height of receiver.

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"It is suggested that this method may be used in the study of a series of different problems concerning the propagation of radio waves in the troposphere, and in particular, for collecting data on the nature of heterogeneity caused by tropospheric dispersion."

#### 48. Ferrite Cored Antennas

"Selection of Optimum Size and Calculation of Ferrite Antennas," by B. I. Ryazanov; Moscow, Elektrosvyaz', No 2, Feb 58, pp 25-28

Formulas and charts for the calculation of effective height and inductance of ferrite antennas with round cores are given. The figure of merit of a ferrite antenna with a ferromagnetic core depends on the effective resistance of the coil and core. The effective resistance can be reduced by selection of proper diameter of the coil wire, by increasing the size of the coil or the "relative magnetic permeability" of the coil.

A table permits the selection of correct size of the antenna, and formulas and curves permit calculation of the number of turns and effective height for a given inductance. For long and medium waves the ferrite antennas give satisfactory performance when the relative initial magnetic permeability is about 500 to 1,000, and for short waves about 100.

For common radio receivers good reception is obtained with ferromagnetic cores 150 mm long and 8 mm in diameter, and a figure of merit of about 100.

Dielectric, Magnetic, Semiconductor Materials

49. New Semiconductor Laboratory in Tbilisi

"Chronicle of Our Days," (unsigned); Moscow, Gudok, 7 Jan  
58

A Scientific Research Laboratory for Semiconductors (Nauchno-Issledovatel'skaya Laboratoriya Poluprovodnikov) was established in Tbilisi. It is being equipped with new instruments. New laboratories are also being equipped at some other schools. At the Tbilisi Institute of Railroad Transport Engineers demonstration civil engineering, welding, forging and casting laboratories have begun functioning."

Instruments and Equipment

50. Electromicrometer for Continuous Measurement

"A Contactless Induction Electromicrometer," by N. Ya. Zaslavskaya; Moscow, Izmeritel'naya Tekhnika, No 1, Jan/Feb  
58, pp 19-20

A contactless electromicrometer for continuous measurement of brass tapes 50-250 microns thick was developed in the Institute of Power Engineering of the Academy of Sciences Kazakh SSR in December 1954.

This instrument operates on the following principle: "The primary winding of an air core transformer is connected to a high-frequency voltage source. The metallic tape which is to be measured is inserted into the gap between the coils of the transformer. The magnetic flux of the primary coil induces eddy currents in the tape which create a magnetic flux, weakening the primary. As a result, the induced emf in the secondary coil of the transformer decreases inversely as the thickness of the tape."

The instrument consists of a transmitting element composed of two brass cylinders connected to the stationary coils of the transformer, and a compensating and signaling circuit mounted in a box. A milliammeter and controls are located on the face panel of this box. The voltage source is an audio frequency vacuum tube oscillator.

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"Tests have shown that the electromicrometer is highly sensitive, permitting measurements of deviations in thickness of tapes on the order of one to two microns. A curve of the sensitivity as a function of thickness maintains approximately the same magnitude in almost all ranges of variations in thickness (50-250 microns), so that uniform precision of measurement is achieved for thin as well as thick tapes."

"Maximum variation in the chemical content of L62 tape (0.5% in copper and 0.003% in iron) produce errors in the measurement of deviation of 0.3 microns in 20 microns and in absolute thickness of tape - 1.5 microns in 160 microns."

Increases in temperature of tapes by 10 degrees caused a displacement from zero of approximately 0.4 microns. Readings may be corrected by calibration of the instrument for various temperatures.

51. Use of Optical Converters in Electronics

"On Some Properties of Optical Converters in Radio Engineering," by S. I. Borovitskiy, Moscow, Radiotekhnika i Elektronika, No 2, Feb 58, pp 237-243

The author notes the use of optical converters for performing simultaneous analyses of signals in radio engineering. Research on the statistics of television pictures "may be performed by means of ordinary radio equipment, but the procedure is complicated and the time consumed in making measurements is great. Simplification of the measuring procedure by a new method is, apparently, explained by the fact the optical objects (in a given instance the picture frames) have a very great information capacity, and optical methods make it comparatively easy to accomplish the operation of multiplication of two signals and averaging of the product obtained."

The article also suggests the use of a converter with a horizontal mask for the codification of certain forms of generalized quantization of information. Optical methods may also be applied to television projection on large screens.

52. New Ammeter for High-Frequency Current

"Electrodynamic Ammeter for Measurement of High-Frequency Currents," by V. R. Lopan', Moscow, Izmeritel'naya Tekhnika, No 1, Jan/Feb 58, pp 71-74

The All-Union Scientific Research Institute of Physicotechnical and Radio Engineering Measurements has developed an electrodynamic ammeter for measuring current of 5 to 100 amperes at frequency levels of 1 to 100 mc.

Principle of operation: The current to be measured passes through a primary loop, inducing current in a short-circuited secondary loop. The forces of interaction which develop tend to rotate the secondary loop around its vertical axis.

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Construction: "The current-carrying portion of the instrument is made of a section of double coaxial line. The length of the line is 200 mm, the diameter of the inner conductor is from 2 to 12 mm and the diameter of the outer cylinder is 3 to 80 mm. The inner conductor is held in place by polystyrene discs."

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The oscillating or secondary coil of the ammeter is ring-shaped, having a diameter of 20 mm, while the diameter of the conductor is 0.5 mm. "The ring is made of aluminum, copper and gold, corresponding to the sub-bands of 5-15a, 15-50a, and 50-100a."

CPYRGHT

CPYRGHT

"Errors in reading are estimated to be  $\pm 0.1\%$ ," while errors in measuring current with this ammeter lie in the limits of 1%.

"The electrodynamic ammeter is designed for conducting government and standardization tests of high-frequency ammeters. With the help of this instrument experiments were conducted on thermoammeters T-12, T-4, and T-5 and on frequency errors of high-frequency current transformers."

### 53. New Soviet Devices Displayed at the Brussels Exposition

"Devices With Cold Cathode Tubes," (for the Brussels Exposition), by V. Bezuglyy; Moscow, Promyshlennno-Ekonomicheskaya Gazeta, 12 Mar 58

The Moscow "Fizpribor" plant is sending to the World's Fair at Brussels two unique devices: the GK-7 hodoscope device and the MSK-2 chronograph. These instruments were developed at the Physics Institute imeni P. N. Lebedev, Academy of Sciences USSR, by L. Korablev in cooperation with experts from the "Fizpribor" plant.

The main feature of both devices is that they are built with miniature cold cathode tubes. The GK-7 hodoscope registers the flight trajectories of cosmic radiation particles, which pass through its 384 counters of elementary particles. The GK-7 device has 384 coincidence cells which permit registering only certain kinds of particles. The process is carried out with the aid of a control pulse which engages the cells for a period of several microseconds. Such a hodoscope

is useful for the study of cosmic rays. The GK-7 device permits the determination of space distribution, density, trajectory and the number of cosmic particles, as well as the picture of the shower development.

The MSK-2 chronograph is designed for measurement of small intervals of time (from 0.1 millisecond to 10,000 seconds without dial switching), also for counting pulses or marking the time for each 0.1 millisecond or greater interval.

54. Nonlinear Equations for Oscillation in a Backward-Wave Tube

"Preliminary Results of Nonlinear Theory of Oscillation in a Backward-Wave Tube With Longitudinal Field," by G. N. Rapaport; Moscow, Radiotekhnika i Elektronika, No 2, Feb 58, pp 249-254

The author presents a series of nonlinear equations for the "O"-type LOV (backward-wave tube) for the case of small space charge and loss.

An examination is made of electron bunching in the LOV and the reasons for decreased efficiency of the backward-wave oscillator compared with the ordinary traveling-wave tube. "The relationship of output to oscillator parameters and maximum efficiency are computed."

"Numerical integration of the equations for the LOV was carried out on the high-speed electronic computer (BESM) of the Academy of Sciences USSR by means of the computation of unknown functions in consecutive intervals by the central difference method."

55. A Device for Increasing the Efficiency of a Backward-Wave Oscillator

"Concerning the Mechanism of Increasing the Efficiency of a Backward-Wave Oscillator ('Carcotron-0') by Increasing the Space-Charge Parameter," by G. N. Rapaport; Moscow, Radiotekhnika i Elektronika, No 2, Feb 58, pp 255-261

The article explains a device for increasing the efficiency of a type-0 backward-wave oscillator by means of increasing the space-charge parameter. The author uses a special model oscillator with adaptations for creating a higher field strength in the collector zone than in the

power output zone. The retarding system consists of a longer section with a small coupling impedance and a short section with a greater coupling impedance. Between the two sections is a phasing section which further retards the phase of the backward wave.

Curves are provided showing the relation of electron efficiency to various lengths of the collector, the relation of first harmonic amplitude to the collector coefficient, and others.

56. Relative Frequency Stability of Molecular Amplifiers

"Concerning the Relative Frequency Stability of Molecular Amplifiers," by N. G. Basov and A. P. Petrov, Physics Institute imeni P. N. Lebedev, Academy of Sciences USSR; Moscow, Radiotekhnika i Elektronika, No 2, Feb 58, pp 298-299

The results of a comparison of the frequencies of two molecular amplifiers are given. The article provides a block diagram of the system, showing three molecular amplifiers, a quadrupole capacitor, hybrid rings, balancing miscer, etc.

The 3-cm - long amplifier cavities, made of invar, were thermally isolated from the amplifier bodies and were not, therefore, provided with special thermostatic controls. Liquid nitrogen was used for cooling.

A curve shows the changes in the difference between frequencies CPYRGHT of the first and third amplifiers as a function of time.

"The natural frequency of the cavities was first tuned to the minimum variation of oscillation frequency in relation to change in potential difference of the quadrupole capacitors (at changes in potential difference from 16 kv to 24 kv the frequency of each amplifier did not change more than 10 cps).

"The frequency differential was determined by the number of oscillations per 5 seconds. As shown by the curve, the absolute value of frequency differential for a period of approximately 16 minutes did not change more than  $\pm 0.4$  cps, that is the relative frequency stability of the amplifiers for the given time had a value of  $10^{-11}$ ."

57. Periodic Pulse Train for the Synchronization of Oscillators

"On the Synchronization of Oscillators by Periodic Sequence of Pulses," by P. N. Zanadvorov, Leningrad State University imeni A. A. Zhdanov; Moscow, Radiotekhnika i Elektronika, No 2, Feb 58, pp 202-213

The author explains a system for studying the synchronization of oscillators by periodic sequence of pulses. The method used is that of functions of phasing. Synchronization of low amplitude radio pulses by polyharmonic pulsing is shown to be possible. The ranges for stable synchronization and establishment of a steady-state process are given.

An arrangement is mentioned which permits direct observation of phasing functions for a given action and the measurement of its parameters. "A description of this system, as well as the results of several measurements, may serve as material for another article."

58. Regenerative Frequency Divider

"Investigation of Steady Operation of a Regenerative Frequency Divider," by V. S. Andreyev; Moscow, Radiotekhnika i Elektronika, No 2, Feb 58, pp 214-236

By means of a series of equations the author develops a circuit for a regenerative frequency divider with a ring converter. Various correlations and characteristics which are derived make possible the use of a transformer with or without a core. The unusualness of frequency characteristics is explained. In one circuit a greater selectivity is obtained and in another -- high phase stability.

In the regenerative frequency divider (RDCha) the output signal occurs only in the presence of an input signal, so that there is always a fixed relationship between the frequency of the output signal and the frequency of the input signal.

Circuit diagrams are given for the frequency divider and the ring converter.

The article compares the solid-core transformer of the plate circuit with an air-core transformer. In the former the frequency characteristic passband of the frequency divider is twice as wide as the passband of the plate circuit with by-pass modulator. In the latter, near-harmonic vibration is obtained at the output and the width of the frequency divider passband may be equal to or less than the width of the plate circuit passband.



Twice the selectivity may be obtained with an air-core transformer, while a high degree of phase stability is obtained with an air-core transformer.

Some of the problems not discussed in this article -- self-excitation and operation of the frequency divider for frequency division by greater numbers -- will be considered by the author in subsequent articles.

59. New East German Small Electron Microscope

"Report On the New Small Electron Microscope of VEB Werk fuer Fernmeldewesen, Berlin," by B. Schramm; Berlin, Experimentelle Technik der Physik, Vol 5, No 5, 1957, p 236

This Berlin plant has developed a small electromagnetic electron microscope suitable for most electron optical studies and designed for wide usage. The column is arranged at an angle on a desk-like frame containing the electronic stabilizer for the lens currents and high voltage, the vacuum installation with controls and oil diffusion pump, as well as the high-frequency high-voltage equipment. The high voltage is supplied to the instrument in three adjustable stages: 40, 50, and 60 kv.

All the electrical operations can be carried out, and monitored, from the switch panel. Program switches prevent incorrect operation.

The prevacuum pump is the only accessory attachment required.

The instrument operates with a three-lens system, with the middle lens used for both enlargement and reduction. The electron optical magnification is adjustable in eight stages from 1,000 to one to 30,000 to one, whereby the 100-mm translucent screen remains fully illuminated. A telescope lens, 10:1 or 20:1, is used for sharp focus. The resolution is about 5 millimicrons. In addition to the transmission method in the bright field, dark-field, stereo, and refraction photographs can also be produced.

Microfilm is used, on which 50<sup>1</sup> photographs can be made at 1/3 final enlargement on a 24 x 24 mm<sup>2</sup> format.

During operation, a choice of three contrast shutters can be inserted into the beam by means of controls outside the instrument. The illuminating device consists of condenser, magnetic beam centering and triode system. The instrument weighs about 250 kg and has a power input of about 1.5 kva.

60. Counter-Tube Device for Recording X-Ray Diffraction Diagrams

"A Counter-Tube Device for Recording X-Ray Diffraction Patterns," by G. Becherer and G. Lennig, Institute of Experimental Physics, Martin-Luther University, Halle-Wittenberg; Berlin, Experimentelle Technik der Physik, Vol 5, No 5, 1957, pp 206-217

A photograph, block diagram, and description is given of an apparatus which employs the integrator method to produce diffraction patterns using an ink recording mechanism. For nonstabilized X-ray devices, the monitor method can be used, whereby the patterns are produced as a series of points.

Components

61. East German Printed Circuits

CPYRGHT "Printed Circuits," Berlin, Radio und Fernsehen, No 4, Feb 58, p 102

"Research work at VEB Elektrogeraetewerk Gronsdorf on the production of copper-coated base material for printed circuits has progressed to the point where all the conditions have been established which are required for series production. The voltage and current stability of this base material is extraordinarily favorable. The material was given a rating of [Class] "1" by Testing Station 331 of the DAMW (German Office for Material and Commodity Testing) at Dresden. VEB Elektrogenaetewerk Gronsdorf will exhibit samples of its printed circuits in Leipzig [Spring Fair]."

Computers and Automation

62. Electronic Computer Used by Soviets in Weather Forecasts

"Experience in Using the Electronic Computer 'Pogoda' in Forecasting Mean-Monthly Air Temperature Anomalies," by Sh. A. Musayelyan and Ya. M. Kheyfets; Moscow, Meteorologiya i Gidrologiya, No 2, Feb 58, pp 3-9

One of the smaller, specialized computers designed for the solution of a definite range of problems arising in meteorology is the Pogoda. This electronic computer, recently placed in operation at

the Central Institute of Forecasting, is simpler in design and operation than the larger universal electronic computers, and is almost as efficient in the solution of the specified range of problems.

The Pogoda is designed for the calculation of products of sums having the form

$$\sum_n \sum_m P^n q^m$$

The instructions for the calculation of the mean-monthly temperature anomaly on the Pogoda are given. A forecast map based on the results of the calculations and a map showing the actual temperature anomaly for June 1957 are given. The forecast was compiled according to initial data for 19-21 April 1957.

V. ENGINEERING

63. New-Type Computer Planned and Built by Czechoslovak Academy of Sciences

"New-Type Calculating Machine" (unsigned article); Bratislava, Lud, 21 Dec 57, p 3

The Institute of Radio Engineering and Electronics of the Czechoslovak Academy of Sciences has worked successfully on analog computers, and was one of the first to publish basic notes on them. Afterward, on the basis of these notes, Engineers J. Havel, R. Hrabanek, F. Jelinek, and L. Kubat constructed a high performance specialized machine on the plan of Dr Z. Koutsky. The machine solves a binomial statistical process which is further processed digitally. Roughly speaking, the machine's process resembles tossing a coin and recording heads and tails. The statistical processes are obtained physically from the fact that the radiation of radioactive materials is detected by a Geiger counter and the subsequently emanated pulses are further processed in electronic circuits. Other components of the machine extract memory numbers from these pulses, calculate them, and subtract, and the totals are remembered and compared with given limits. The machine, operating on a double circuit, has about 50 electron tubes and 150 relays for this purpose. The machine has two memory systems: a relay memory in combination with a telephone type selector serves for the retention of input values, and a relay memory retaining partial results. The results are obtained with a telephonic computer. The machine solves problems connected with the so-called transit probability.

64. Photoelectric Torsion Meter

"A Photoelectric Torsion Meter," by V. I. Zelenskiy; Moscow, Izmeritel'naya Tekhnika, No 1, Jan-Feb 58, pp 37-38

The article describes the design and operation of a photoelectric torsion meter having an axial clearance of 200 mm, developed for measuring torque on a shaft rotating at 600-10,000 rpm.

To the clutch plates between the driving and driven shafts are attached two disks with narrow radial slots; there are 90 slots per disk. Torque is transmitted through a steel axle with squared ends which is connected to the two plates by a key-slot arrangement. On one side of a stationary aluminum frame are arranged eight automobile-type bulbs, and on the other side, eight phototubes. Twisting of the torsion axle causes a displacement of one disk in relation to the other which, in turn, varies the amount of light falling on the phototubes.

The torsionmeter circuit includes a voltage regulator, variable resistor and load resistance, and a galvanometer for measuring photocurrent. A loop oscilloscope is used for recording the magnitude of photocurrent.

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"The sensitivity of the instrument is changed within broad limits -- from 0.1 kgm and higher -- by the selection of an axle of appropriate diameter and length, the change in size of the slots, illumination of the phototubes, and the relative position of the disks."

Experiments with the photoelectric torsion meter have shown certain advantages over other types of torsion meters: a high degree of sensitivity, visual observation and recording on an oscilloscope without amplification, the absence of slip-ring devices, and a narrow axial clearance.

Due to the sensitivity of the phototubes the accuracy of the torsionmeter is easily affected by changes in temperature. A rise in temperature as a result of the proximity of the instrument to the hot bearings of the tested machine and air friction with the disk slots was observed after a short period of operation (5-7 minutes).

65. Principle of German World War II Bombsight Gyroscope Recommended

"A Special Type of Gyroscope Horizon," by H. Kortum, Jena; Berlin, Feingeraetetechnik, No 2, Feb 58, pp 63-71

The article discusses the theory, development, and performance of a special type of gyroscope instrument developed in 1939-40 by the author and associates for use in stabilizing the sight reticule of the Lotfe 7 bombsight.

The peculiar feature of this gyroscope is the fact that its bearing seat rests on a sphere, the center of which coincides with the center of the gyro. The sphere itself is the upper end of an axis around which it can be rotated by means of a motor. The friction produced when the sphere is rotated when in contact with the bearing seat produces a turning moment which accelerates the gyro until the point is reached where the external braking moment produced by the resistance of the air on the surface of the gyro is equal to the driving moment. The directions of the driving axis and the axis of spin remain the same as long as the direction of the driving axis is not changed. If it is changed, a torque, a so-called "thrust moment," perpendicular to the driving moment is produced at the point of contact between the bearing seat and the sphere. This torque produces a precession whereby the gyro axis lags behind the changing driving axis. On the other hand, if the driving axis is rigidly oriented, the thrust moments hold the gyro in a fixed position.

A pilot series of 30 gyros was produced at the end of 1940, and several hundred per month were produced, according to the author, in subsequent series production.

The speed with which the gyro was developed during wartime is used as an example of the author's suggestion for streamlining the organization of development work in East Germany.

66. Ball Bearings Spin for Strength Tests

"Obtaining High-Magnitude Centrifugal Fields," by V. M. Ponzovskiy, Molotov State University imeni A. M. Gorkiy; Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul/Aug 57, pp 69-72

The author notes briefly the work of L. E. MacHattie (Rev Sci Instr., 9, 429, 1941), Beams, Jonng, and Moore (J. Appl. Phys. 17, 886, 1946), Walker, Turner, and Beams (Phys. Rev. 86, 4, 597, 1952), and E. V. Shpol'skiy (UFN, 32, 134, 1947; 41, 241, 1950) in obtaining high centrifugal speeds by rotation of small steel balls. CPYRGHT

"In connection with the possible use of such a method for testing the strength of steel balls and various coatings, the apparatus described by Beams, Jonng, and Moore was reproduced with certain modifications. However, since the work of Beams and others did not give complete data on the circuit elements (which were put together using American tubes anyhow), the author, in fact, had to create new circuits."

Ponzovskiy then describes his apparatus, including circuits and the method used to measure the rate of revolution.

He briefly describes tests for rupture made on balls from the First Moscow Bearing Plant. Bearing diameters were 2.5-4.75 mm. Tables showing results of the tests give a maximum revolution rate for a 2.5-mm bearing of 106,000 rps prior to rupture (120-minute run-up period).

"In comparing these results with the data of Beams and others for American balls of like diameter, it is apparent that those from the First Moscow Bearing Plant rupture at speeds and maximum stresses lower [than those for the American product] by about 15%."

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67. Hunting Regimes in Servo Systems

"Determining the Parameters of Hunting in Certain Servo Systems With a Tripositional Symmetrical Characteristic of the Non-linear Element," by B. A. Ryabov, Moscow Aviation Institute imeni Sergo Ordzhonikidze; Kiev, Avtomatika, No 3, Jul-Sep 57, pp 49-55

This paper presents a method which permits establishing the existence of a hunting regime in servo systems possessing a nonlinear element with certain indicated parameters of hunting, and finding the relationship characterizing the change in any coordinate of the given system in hunting.

The bibliography comprises three original Soviet sources.

"Approximate Methods for Determining the Frequency and Amplitude of Hunting in Improving the Performance of Controllers," by V. M. Kuntsevich, Institute of Electrical Engineering, Academy of Sciences Ukrainian SSR, and P. I. Akinin, Kiev Polytechnic Institute; Kiev, Avtomatika, No 3, Jul-Sep 57, pp 56-69

This article deals with sensitivity signal input improving the performance of controllers.

The phase-plane diagram of the logical element is given, and the condition of existence of hunting in the system is defined.

Two approximate methods for determining the frequency and amplitude of hunting are proposed. The first method, "by sectors," establishes a connection between phase shifts in the elements of the system and the period of hunting. The second, frequency, method is based on the application of the transfer function for elements of the system.

Both methods apply the fundamental harmonic of Fourier series.

68. Interruption Circuits for Servo Systems

"On the Design and Switching Diagrams of Interruption Circuits for Fast Response Off-On Servo Systems," by P. I. Dekhtyarenko, Institute of Electrical Engineering, Academy of Sciences Ukrainian SSR; Kiev, Avtomatika, No 3, Jul-Sep 57, pp 70-83

The application of interruption circuits for fast response off-on servo systems, in particular for systems with an off-on reversing clutch are discussed. A design of the interruption circuits is proposed, and

the effect of constant lag in the servo element is considered. Results are given of experimental investigation of a servo system with an interruption circuit.

69. Equations of Invariance Applied in Control Systems

"Equations of Invariance for Linear Control Systems Under Random Disturbances," by A. G. Ivakhnenko, Institute of Electrical Engineering, Academy of Sciences Ukrainian SSR; Kiev, Avtomatika, No 3, Jul-Sep 57, pp 32-38

Practical ways of eliminating transient and static errors of control systems can be found through equations of invariance. The possibility of applying these equations in the case of random disturbances is considered. Equations of invariance are shown to be valid in this case.

70. Thermal Design Problems of Nuclear Power Plants

"Some Thermal Design Problems of Nuclear Power Plants," by St. Erdelyi, Budapest; Berlin, Energietechnik, No 2, Feb 58, pp 83-86

The first part of the study presents a procedure for the determination of the initial state of the steam. With the aid of this procedure, the initial steam pressure at which expansion ceases (up to condenser pressure at the admissible steam moisture) can be determined for any initial steam temperature. The method was worked out because, in the case of nuclear power plants, this initial steam state is difficult to establish as a result of the often limited initial steam temperature, and has been determined heretofore by means of iteration.

The second part of the study seeks to establish the conditions for efficient use of economizers. By means of an equation containing the temperature and heat transfer values of the boiler and economizer heated with the cooling liquid of reactors and the terms for the investment costs, a limiting case is established, beyond which the installation of the economizer offers economic advantage.

The study also makes possible the calculation of the equivalent of the often very expensive cooling medium, which can be a determinative factor in the choice among various systems.

No numerical values can be introduced into the general equation, because such values vary too greatly in the case of nuclear power plants. The reduction of several cases, however, shows that such values lie on both sides of the limiting case, so that the determination of the limiting case is of importance.



71. Largest Hydroelectric Power Station in the USSR and the World

"Krasnoyarsk Hydroelectric Station (according to information of the project assignment of the Leningrad Branch of the Institute 'Gidroenergoprojekt')," by Engr N. A. Filimonov; Moscow, Gidrotekhnicheskoye Stroitel'stvo, No 11, Nov 57, pp 56-61

CPYRGHT

"The resolution of the 20th Congress of the CPSU to convert the Central Region of Siberia into a large industrial base contemplates the construction of the first hydroelectric station on the Yenisey River, the largest river in the Soviet Union. The total capacity for the large hydroelectric stations planned along the Yenisey River will be about 20 million kw, and they will generate about 120 billion kw·h.

"In 1951-1953 the Moscow Branch of the Institute "Gidroenergoprojekt" worked out a scheme for utilizing the middle part of the Yenisey, i.e., from the town of Minusinsk to the town of Krasnoyarsk. The feasibility of utilizing the water head between these two towns in a single stage was proved.

"The site for the Krasnoyarsk Hydroelectric Station, located 36 km above Krasnoyarsk, was selected on the basis of the geological formations and the economic engineering considerations. The normal rise of the water reservoir level was based on the assumption that it would not flood the towns of Abakan and Chernogorsk with their coal deposits, located at the end of the reservoir (380 km from the dam). The total volumetric capacity of the reservoir will be 77 billion m<sup>3</sup>, and the available capacity 32 billion m<sup>3</sup>; the reservoir area will be 2,130 km<sup>2</sup>.

"The climate in the region of the construction is highly continental. The mean annual temperature of the air is -0.4°C, the minimum -54°C, the mean for January is -20.2° and for July is 18.8°C. The ice cover of the river in the region of the dam reaches a thickness of 1-1.65 m; on some sections spring ice jams cause the water level to rise up to 5.4 m.

"The geological formations are favorable for the erection of a high dam: the foundation for the hydroengineering construction will be granite (long-time test compressive strength is on average 1,3000 kg/cm<sup>2</sup>). The narrow valley with steep banks at the dam site at its bottom part is 750 m wide, and at the crest of the construction is 1,148 m wide.

"Under natural conditions, the Yenisey at the dam site has a mean summer flow of about 2,800 m<sup>3</sup>/sec; the winter flow decreases to 300m<sup>3</sup>/sec; the maximum observed flood flow was about 23,900m<sup>3</sup>/sec.

"For the normal level the head is 101 m, and the effective head for the generators is 86 m."

The installed capacity at the Krasnoyarsk Station will be 4 million kw, as compared with the Bratsk [USSR] 3,600,000 kw, Grand Coulee [US] 2,314,000 kw, and Boulder Dam [US] 1,385,000 kw.

The annual electric power generation of the Krasnoyarsk Station will be 19,140,000,000 kwh. The capacity of each of the 14 generators will be 286,000 kw or 360,000 kw at 100 rpm. Two 400,000-v power lines will connect the station with the Kuzbas and the Bratsk station.

72. East German Welding Technologist Honored

"Awarding of the Gold Honor Pin and of Honorary Membership in the Chamber of Technology to Deserving Colleagues" (unsigned article), Berlin, Schweisstechnik, No 1, Jan 58, p 5

Dr Engr Georg Becker, chief of the Central Institute for Welding Technology of East Germany, Finsterwalde Branch, member of the "Welding Techniques" Technical Committee, first chairman of the "Additive Materials" Technical Committee, and colleague of the "Automatic Welding" and "Training" Technical Committees [Chamber of Technology], was awarded the Gold Honor Medal and honorary membership in the Chamber of Technology. Becker was one of the cofounders of the "Welding Technology" Technical Committee and participated influentially in the work of this committee. He headed the "Additive Materials" Committee, which has done excellent work in standardizing welding electrodes. He personally helped overcome difficulties in producing welding powder for the flux welding process.

73. East German Glass Technologist Honored

"Awarding of the Gold Honor Pin and of Honorary Membership in the Chamber of Technology to Deserving Colleagues" (unsigned article), Berlin, Schweisstechnik, No 1, Jan 58, p 5

Dr Engr Paul Beyersdorfer, chief of the Institute for Glass Technology of the Main Department for the Glass Industry, Ministry of Light Industry, first chairman of the Bezirk Cottbus Committee of the Chamber of Technology, chairman of the "Glass" Specialist Committee and colleague in the "Additive Materials" (Zusatzwerkstoffe) and "Automatic Welding" Technical Committees of the Chamber of Technology, was awarded the Gold Honor Medal and honorary membership in the Chamber of Technology.

Beyersdorfer has been an active member of the Chamber of Technology since October 1947. He is known for his scientific work in the field of colored and special glass and for his work in the physical properties of

glass. He is also known for having done basic research and for furthering the development in producing welding powder for the flux welding process and electric slag welding. In 1952, he was awarded the honorary title of "Meritorious Inventor of the People."

74. East German Industry Personnel Honored

"News From the Society of German Miners and Metallurgists" (unsigned article), Berlin, Neue Huette, No 1, Jan 58, p 54

Engr Kurt Toeppler of Meissen was awarded the honorary title of "Meritorious Technician of the People" by Fritz Selbmann, deputy chairman of the East German Council of Ministers, on 30 November 1957. Toeppler was honored for his services in developing the refractory materials industry in East Germany. He was especially influential in the development of ceramics machine building, in the production of crushing and mixing mills and clay treating machines, and in improving the quality of ceramic materials.

Dr Hans-Joachim Mueller of Leipzig was awarded the honorary title of "Meritorious Technician of the People" by Fritz Selbmann, deputy chairman of the East German Council of Ministers, on 30 November 1957. Mueller was honored for taking a leading role in the development of the motor industry in East Germany. He expanded the development of the Alfer process and took a large part in introducing centrifugal casting in heavy metal foundries and in the production of copper alloys low in scarce materials.

Dr Engr Werner Monzer of Berlin-Niederschoneneweide was awarded the honorary title of "Meritorious Technician of the People" by Fritz Selbmann, deputy chairman of the East German Council of Ministers, on 30 November 1957. Monzer was honored for taking a leading role in developing new methods for the production of red brass and aluminum-silicon key alloys with a scrap metal base, in the processing of saline slag, and in the production of lead from lead-containing intermediate products.

Chief Engineer Werner Lott of Rackwitz was awarded the honorary title of "Meritorious Technician of the People" by Fritz Selbmann, deputy chairman of the East German Council of Ministers, on 30 November 1957. Lott won special recognition for his work in improving the quality of light metal semifinished products and in increasing metal output. His annealing process made possible the production of good workable sheets from a scrap metal base during a shortage of blast-furnace metal. His initiative made it possible to produce hypereutectic piston alloys without special devices and to essentially improve the quality so that imports of light metal pistons could be stopped.

Senior Engineer Otto Troeger of Leipzig was awarded the honorary title of "Meritorious Technician of the People" by Fritz Selbmann, deputy chairman of the East German Council of Ministers, on 30 November 1957. Troeger helped increase furnace production through more economical heating. He also deserves special honors for improving the low shaft blast-furnaces in VEB Eisenwerk West (People-Owned West Ironworks), Calbe-Saale, by making changes in the flue (Leitung), in the spraying of the washing units, and in the operational method of the disintegrators, thereby avoiding considerable gas loss and improving the quality of the gas. He also built a gas purification unit with a work group (Kollektiv) in the VEB Eisenwerk West.

VI. MEDICINE

Bacteriology

75. Research on B. pestis

"Utilization of the Carbon From Acetic Acid by B. pestis," by I. V. Domaradskiy and A. F. Semenushkina, State Scientific Research Institute of Microbiology and Epidemiology of the South-eastern USSR; Moscow, Voprosy Meditsinskoy Khimii, Vol 4, No 1, Jan/Feb 58, pp 21-25

The relationship of B. pestis to acetic acid was explored in the research described in this article. Attempts were made to explain the capability of B. pestis to assimilate acetic acid and to clarify the role of this pathogen in cellular biosynthetic processes. Experimental methods are described in detail. Results of the experiments are discussed in the text and presented in three tables and a graph. The tables are entitled: The Inclusion of  $C^{14}$  in Fractions of B. pestis Cultured on Hottinger's Bouillon With Labeled Acetate; The Effect of Glucose and Ammonia on the Distribution of  $C^{14}$  in B. pestis Fractions. A chromatogram obtained by the ionophoresis method is included to demonstrate the distribution of radioactivity following separation of the protein hydrolysate of B. pestis cultured on a medium containing  $C^{14}$  acetate.

The following conclusions derived from the results of these experiments are given:

"1. Live B. pestis cells dried with acetone are capable of fixing radioactive carbon from acetic acid.

"2. The presence of  $C^{14}$  was established in all fractions of B. pestis. The highest radiation intensity was discerned in the lipid fraction.

"3. Glucose increased the radioactivity of the lipid fraction and decreased that of the nucleic acid fraction.

"4. The penetration of  $C^{14}$  into all fractions of B. pestis was intensified by the presence of ammonia salts.

"5. B. pestis utilized labeled acetate for the synthesis of a number of amino acids of which glutaminic and asparaginic acids have been identified.

"6. Forty-five percent of radioactivity was found in the monoaminodicarboxylic acid fraction; 37% of the  $C^{14}$  was bonded to the monoaminomonocarboxylic acids, and only 18% to the basic amino acids."

76. Chinese Study Induced Transformation of Atypical Dysentery Bacilli

"Induced Transformation of Atypical Dysentery Bacilli," by Cheng Wu-fei (鄭武飛), Ch'en Tsu-ch'ing (陳祖璟), and Hsu Wei-chen (徐維晨), Department of Microbiology, Tientsin Medical College; Peiping, Wei-sheng-wu Hsueh-pao, (Acta Microbiological Sinica), Vol 5, No 4, 1957, pp 390-396

This item reports research on the induced transformation of dysentery bacilli. In controlled experiments, each of six strains of atypical dysentery bacilli were subjected to 30 serial passages in a sterile basic medium of 75 percent peptone water in which a "feeder" strain had been cultured and subsequently killed by heating. Simultaneously, one strain of known *Shigella flexner* and three strains of nondysenteric enteric bacilli were given the same treatment for comparative data.

Every third generation of each subject bacillus was transferred to a China blue plate and then to a double sugar medium. The culture was then tested biochemically and serologically for indication of transformation. In the course of the entire experiment, only one strain, the "82 Chung," was fully transformed, as indicated by its acquired ability to agglutinate Flexner antiserum after 30 serial passages in media containing killed *Sh. dysenteriae* and *Sh. flexner*, respectively, as feeders. (The agglutinating titers were 1:640 and 1:320, respectively.) However, under the influence of feeders, all ten strains of the subject bacilli showed varying degrees of change in biochemical activity, indicating some degree of induced transformation had taken place.

The authors pointed out that the atypical strain which was successfully transformed had at one time existed in symbiosis with a typical strain of *Sh. flexner*. Therefore, its acquiring the characteristics of *Sh. flexner* while under the influence of the latter as feeder is understandable. The problem they are confronted with is, "How did this strain, which was originally similar to *Sh. flexner*, acquire the biologic and serologic characteristics of the latter in a medium containing not *Sh. flexner*, but *Sh. dysenteriae* as feeder?"

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They surmised that dysentery bacilli are related to one another to some definite degree and that, in the induced transformation of microorganisms, an atypical strain can acquire characteristics of its closest "kin" by virtue of certain factors which it has in common with a feeder of its own genus, even if it belongs to a different species.

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This hypothesis, in their opinion, does not preclude the possibility that the same subject strain of atypical bacillus eventually would have acquired the characteristics of *Sh. sonnei* and *Sh. schmidtz* feeders. Nor does it mean that those feeders would eventually also induce in the atypical strain the characteristics of *Sh. flexner*. They say that the whole hypothesis merits further study, for it offers dynamic evidence for the origin and evolution of species.

The authors also pointed out that most scholars on variations due to the use of antibiotics have approached the problem from the standpoint of the drug resistance of pathogenic strains. They propose the initiation of studies on atypical strains and their induced transformation in connection with drug resistance.

Soviet theories on the origin of atypical strains, which find support in the results of the authors' experiments, are discussed.

#### Communicable Diseases

##### 77. Pathogenesis of Experimental Tularemia

"Study of the Pathogenesis of Tularemia in Experimental Animals. Report 3: The Dynamics of Proliferation of the Pathogen and Morphological Changes in the Organs of White Rats Following Subcutaneous Introduction of *B. tularensis*," by A. R. Mashkov and A. F. Taranenko, Moscow Institute of Vaccines and Sera imeni Mechinkiv; Moscow Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 28, No 8, Aug 57, pp 122-125

This article reports a study of pathogen proliferation and development of morphological changes in internal organs following infection of rats with 10 million microbial cells of a virulent culture and one billion microbial cells of a Gayskiy culture of *B. tularensis*. One series of rats was treated with a killed culture. The experimental method of administering the vaccine was the same as that employed in experiments reported in Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, No 6, 1950.

Pathological-anatomical investigations are described in detail and are summarized comparatively in tabular form. The following conclusions are presented on the basis of results obtained:

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"1. In experimental tularemia in white rats, the pathogen invaded the internal organs within a short time after subcutaneous introduction and caused the formation of *B. tularensis* granules in them. However, the granule-formation process in white rats was limited, proceeded with weakly expressed dystrophic changes, and underwent reverse development early. Only residual phenomena were in evidence at the end of the second week.

"2. The vaccine process which developed following subcutaneous administration of the Gayskiy culture was accompanied in white rats by the formation of typical *B. tularensis* granules without clearly expressed dystrophic changes in the internal organs. The granule-formation process was terminated toward the 10th-11th day.

"3. Following subcutaneous administration, *B. tularensis* antigen in the form of a boiled bacterial suspension occasioned the formation of typical granules in the internal organs of white rats; reverse development of these granules ended by the 10th-11th day."

78. Czechoslovak Report on Orbit Coordination of Activities in Virology

"On the Possibilities of Coordination of Scientific Activity in Virology Among the Socialist Countries," by Dr Bohumil Styk, Prague, Vestnik Ceskoslovenske Akademie Ved, No 1/2, Jan/Feb 58, pp 43-45

The article reports activities of the first official meeting of the members of the international editorial board of the periodical Acta virologica, held in Prague on 17 and 18 September 1957. Those present included Prof A. A. Smorodintsev and Prof V. M. Zhdanov, Corresponding Members of the Academy of Medical Sciences USSR, Prof Dr C. H. Huang and Prof Dr. Gaw H. Zanyin [sic] from the People's Republic of China; Prof Dr H. Roehrer and Prof Dr H. Urbach from East Germany; Prof Dr F. Przesmycki from Poland; Academician St. S. Nicolau from Rumania; and Academician D. Blaskovic and Dr B. Styk from Czechoslovakia. Also present were the Yugoslav representatives Prof Dr A. L. Terzin; Academician S. Prat, representing the Czechoslovak Academy of Sciences; and Dr Petrik, representing the publishing house of the Czechoslovak Academy of Sciences.

The members of the editorial board pledged to obtain more reports from improved experimental efforts and increase the periodical's periodicity to six times yearly in 1958.



On 18 September, the conference held an unofficial discussion on the possibilities of coordinating scientific research activity in virology and expansion of scientific contacts among the socialist countries.

The assembly discussed the introductory reports of Academician D. Blaskovic and Prof V. M. Zhdanov on the most recent tasks and ways of expanding scientific contacts. After a comprehensive discussion of the various details of implementing the coordination program, first suggested in the June 1956 symposium in Leningrad (article states the broad categories), the board recommended the following provisions for improving the scientific contacts in virology among the socialist countries.

1. To organize lecture courses in virology with the participation of leading specialists from socialist and Western countries, in Moscow and Leningrad in 1958. A commission composed of V. M. Zhdanov as chairman, D. Blaskovic, St. S. Nicolau, and A. A. Smorodintsev will work out the program of courses, the list of participants, and organizational tasks.

2. To organize permanent scientific centers for directing the following important questions in the area of virology:

Influenza -- Institute of Virology imeni D. I. Ivanovskiy of the Academy of Medical Sciences USSR, Moscow; V. M. Zhdanov, head of program

Neuro-virus infection with natural focal area (with the exception of Japanese encephalitis) -- Institute of Virology of the Czechoslovak Academy of Sciences, Bratislava; H. Libikova, head of program.

Japanese encephalitis -- Department of Virology of the Academia Sinica, Peiping; C. H. Huang, head of program.

Poliomyelitis -- Institute for Poliomyelitis Research of the Academy of Medical Sciences USSR, Moscow; M. P. Chumakov, head of program.

Epidemic hepatitis -- Institute of Infraradiobiology of the Academy of Sciences of the Rumanian People's Republic, Bucharest; St. S. Nicolau, head of program.

Other virus infections -- Institute of Virology of the Academy of Medical Sciences USSR, Moscow; R. M. Shen, head of program

General virology -- Institute of Virology of the Czechoslovak Academy of Sciences, Bratislava; D. Blaskovic, head of program

Antivirus immunity -- Division of Virology, Institute of Experimental Medicine of the Academy of Medical Sciences USSR, Leningrad; A. A. Smorodintsev, head of program

3. To organize international symposiums on the following questions in 1958:

Influenza

Poliomyelitis

Pathogenesis and immunology of virus diseases.

The chairman of the problems commission was given the task of preparing a program for these assemblies and related organizational problems, so that the first two symposiums should be held in one place and at one time.

4. To request all participants of the meeting to clarify ways for possible expansion of mutual exchange of virologists among socialist countries in 1958.

5. To organize a future conference of the editorial board of Acta virologica concerning the course of international symposiums or courses in 1958.

[For additional information on communicable diseases see Item 105.]

#### Epidemiology

#### 79. Hemorrhagic Fever in Stavropol'skiy Kray

"Concerning Hemorrhagic Fever in Stavropol'skiy Kray," by Docent L. V. Yarovoy, Chair of Infectious Diseases (director, Docent L. V. Yarovoy), Stavropol Medical Institute; Moscow, Supplement to Vrachebnoye Delo, 1957, p 74

The author describes the history of three cases of hemorrhagic fever in Stavropol'skiy Kray. These cases are interesting from an epidemiological and clinical point of view, the author explains, because up to now there has been no history of natural foci of hemorrhagic fever in this kray.

As a result of the three cases, the problem arose as to whether hemorrhagic fever was endemic to the kray or whether it had been introduced from the Crimea by the annual migration of birds. Since the Hyalomma Plumbeum, a hemorrhagic fever vector, is widely dispersed in this Kray and since the disease did not occur until the first of June when the mass migration of the birds had not yet begun, the author concludes that hemorrhagic fever is endemic in the kray.

80. Sarcosporidiosis in Ul'yanovskaya Oblast

"The Epizootology of Sarcosporidiosis," by S. A. Lubyanskiy, Tr. Ul'yanovskiy S.-x. In-ta (Works of the Ul'yanovskiy Agricultural Institute), No 4, 1956, pp 367-382 (from Referativnyy Zhurnal -- Biologiya, No 18, 25 Sep 57, Abstract No 79014, by A. I. Shchurenkova)

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"From 1944 to 1955 more than 6,000 animals from different rayons of Ul'yanovskaya Oblast were investigated by means of macroscopic examination and macroscopy of muscle tissue. The following organs were examined in all the animals: esophagus, heart, superficial muscles of the neck, spine, and cruppers, diaphragm, and deep shoulder muscles. Results of the investigations are presented in the table. Macrosarco-Sporidia (Balbianids) were observed in 3.4% of the sheep (3,773 were examined), and in 18.4% of the goats (out of 33). Females were more highly infected among agricultural animals. Sarcosporidia were encountered very frequently in malnourished animals and in animals suffering from chronic or postnatal diseases. One-2-Year-old animals slaughtered for meat were found to be most highly infected. Isolated cases of sarcosporidiosis were noted in 5-16-day-old calves, which evidently can be explained by intrauterine infection. Sarcosporidiosis was rare in animals under 2 months or age (2.2%).

"Two seasonal peaks in the incidence curve were noted in herbivores -- in July and November-December. In the author's opinion, the first peak is connected with the beginning of the outpasturing period in April when the infection begins; and the second, with the transfer of cattle to stall maintenance and with a decrease in the resistance of the organism. The author rejects the possibility of insect participation in the dissemination of sarcosporidiosis and is of the opinion that infection occurs per os from the environment, which contains invasion stage Sarcosporidiae; the incubation period is approximately 3 months. The frequency of sarcosporidiosis in animals was found to differ even in localities with identical topography; but if it was high in a certain place in one species of animals, it was the same in other species. Sarcosporidia increase indications for isolation and enforced slaughter of cattle. Data concerning dissemination of this invasion among domestic animals should be made more precise, and carcasses should be subjected to more careful sarcosporidiosis."

The table below gives the number of animals examined and the percent infected with Sarcosporidia:

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	<u>No of Animals Examined</u>	<u>% Infected With Sarcosporidia</u>
Cattle	1,465	54.2
Sheep	2,452	36.2
Goats	81	61.7

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	<u>No of Animals Examined</u>	<u>% Infected With Sarcosporidia</u>
Swine	2,204	17.4
Horses	118	49.2
White mice	115	6.9
Rats	95	12.6
Dogs	41	0.0
Chickens	60	1.9

81. Chinese Report Experimental Infection of Mosquitoes With Japanese B Encephalitis

"Studies on the Insect Vectors of B Encephalitis in Canton," by Ts'ai Shang-ta (蔡尚達), Ko Hsia-lin (柯小麟) Jung Kuan (容瑾), and Li Tzu-i (季子儀), Department of Parasitology, Chung-Shan Medical College, Canton; Peiping, Wei-sheng-wu Hsueh-pao (Acta Microbiologica Sinica), Vol 5, No 4, Nov 57, pp 369-378

This paper summarizes the authors' studies which were undertaken during 1953-1955 on certain mosquitoes found in Canton, and their relationship to the epidemiology of Japanese B encephalitis. The summary, which includes tabulated experimental data, is developed in four sections:

1. A survey of the important species found in Canton and their seasonal distribution as influenced by climatic conditions -- Four are mentioned: *Culex fatigans*, *Aedes albopictus*, *Anopheles hyrcanus sinensis*, and *Culex tritaeniorhynchus*. All except *Culex fatigans* have been found elsewhere in China to be vectors of B type encephalitis.

2. Experimental infection of mosquitoes by artificial feeding with the virus and by sucking infected mice -- The adult mosquitoes used in the experiments were grown from larvae found in Canton. It was found that experimentally infected *Aedes albopictus* could harbor the virus for as long as 19 days and could transmit the disease successfully up to 14 days. Experimentally infected *Culex fatigans* could transmit the disease successfully up to 27 days.

3. Isolation of the virus naturally occurring in *Culex fatigans*, "the mosquito found in greatest abundance in Canton" -- From 7,741 mosquitoes of this species collected during the period January 1955-January 1956,

three strains with characteristics identical to the Ching-wei-yen<sub>2</sub> [possibly an abbreviation for Pei-ching Wei-sheng Yen-chiu-yuan (National Institutes of Health, Peiping)] Strains were isolated. Each was passed through mice for several generations by intracerebral inoculation. The infectivity of the virus after each passage was tested. The authors state that their successful isolation of the virus in nature during January and November seems to support the Soviet theory that infected mosquitoes harbor the virus through the winter and are ready to infect man and animals in the spring. They also note that their report constitutes the first known record of *C. fatigans* having been found as a vector of B encephalitis in China.

4. A study of *Culex fatigans*' preference for human blood or that of domestic animals -- Results indicated that this species liked both almost equally well. It was found by the serum precipitation technique that 87 percent of the *C. fatigans* mosquitoes caught in human dwellings had taken blood from man, 40 percent of those from cowsheds were engorged with bovine blood, and 89 percent from hogpens were engorged with blood from hogs. Further study on this subject to elucidate the relationship between man and domestic animals in the epidemiology of B encephalitis is indicated.

According to footnotes, this paper is a condensation of a longer report presented at the July 1956 scientific conference of Hua-nan Medical College, "which has been renamed Chung-shan Medical College," and at the Third Conference of the Korean Medical Association in October 1956. The research was performed by the persons listed above, but this paper and its published English abstract were written by Ch'en Hsin-t'ao (陈心陶), their supervisor.

[SIR Note: "*Culex fatigans*" is used in this item for the Chinese 侍虱席蚊 (shou-lieh k'u-wen). This literally means "gaming *Culex* mosquito" or "*Culex venaticus*" in Latin, but does not appear in any other current Chinese literature or English-Chinese lexicons on hand. These consistently use either a transliteration or a direct translation for the Latin term "fatigans."]

#### Immunology and Therapeutics

##### 82. Specificity of Anticholera Serum Tested

"The Problem of the Specificity of Cholera O-Serum," by I. V. Shantarenko and I. A. Siroko; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 29, No 1, Jan 58, pp 40-43

The following discovery formed the basis for the research described in this article: on investigating feces and liquid washings from the stomachs of patients suffering from acute gastroenteritis with repeated

vomiting and convulsions, an extremely motile, gramnegative Bacillus was isolated; this organism formed a fragile film on the surface of peptone water and was agglutinated by cholera O-serum. The biochemical properties of the microorganism isolated were determined (decomposition of sugars with formation of acid and gas of the B. coli communior type), which completely ruled out the suspicion of cholera which had arisen earlier in the investigations.

Results of this preliminary research warranted testing the specificity of the cholera O-serum available in the laboratory. It was first established that the B. coli culture isolated earlier (culture No 254) was completely agglutinated by the dry cholera O-serum from the Saratov Institute "Mikrob" (series No 3/2, titer 1:1,600, prepared 8 July 1953) and by liquid O-serum series No 2, Irkutsk Antiplague Institute (titer 1:3,200, prepared 13 August 1955).

Two series of experiments were performed: a study of the spectrum of nonspecific properties of cholera O-serum, and use of the Castellani reaction for the study of cultures which appear to be antigenically related. Standard cultures of Flexner Bacillus (types l and f), typhoid Bacillus, and Proteus X 19, freshly isolated culture of Flexner Bacillus type c, and strain No 254 were selected for the agglutination reaction with cholera O-serum. Two tables are included to show results.

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

"1. Antibodies against microorganisms of the intestinal group appeared in dry cholera sera series No 3/2 and No 2 from the Saratov Institute 'Mikrob'; and in liquid cholera O-serum series No 2, Irkutsk Antiplague Institute. Several of them (Flexner Bacillus type c and intestinal Bacillus strain No 254) were completely agglutinated by these sera.

"2. It was established by the use of the exhaustion and Kravchenko-Sokolov reactions that the strains of B. coli and dysentery Bacilli studied did not have common antigens with the cholera diagnosticum. The capability of cholera O-serum to agglutinate the aforementioned microorganisms depends on antibodies, either contained in the normal serum of the producer or appearing as a result of previous immunization with other antigens.

"3. The results obtained demonstrate the possibility of purifying cholera O-serum by adsorption of heterogenous antibodies by Flexner type c dysentery bacillus antigen.

"4. The presence of agglutinins against foreign microorganisms in cholera O-serum can lead to hyperdiagnosis of cholera when accelerated investigation methods are employed. Practicing laboratories must be provided with adsorbed cholera sera."

83. Tularemia Vaccine Strains Characterized

"Characteristics of Tularemia Vaccine Strains According to Laboratory Indexes," by O. S. Yemel'yanova, Institute of Epidemiology and Microbiology Imeni Gamaleya; Moscow Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 28, No 8, Aug 57, pp 125-129

The characteristics of vaccine strains employed for prophylaxis of tularemia which were described by Gayskiy, El'bert and Frybich are amplified and supplemented by laboratory indexes presented in this article. It is stated that development of these indexes was accomplished under the general direction of Prof N. G. Olsur'yev and provided the basis for [official] instructions concerning the production, control, and administration of cutaneous live dry tularemia vaccine. The characteristics of vaccine strains and virulent strains are analyzed with regard to straining, dissociation in culture, suitability of various culture media, and preservation of virulence; effects of varying the number of mice in the experiments were also determined. The author corroborates the opinions of former investigations who consider vaccine strains harmless for guinea pigs. It was further established that the survival rate of guinea pigs following cutaneous administration of a vaccine can serve as an index of the quality of the vaccine strain. Inoculation reactions were carefully observed.

The observation that viability of vaccine prepared from Gayskiy strain No 15 is increased to almost 100% after passage through animal organisms highly susceptible to tularemia is discussed; the resultant variant is known as "restored" Gayskiy strain No 15. It is mentioned that other indexes simultaneously became higher. Two tables are included to show, respectively, the characteristics of Gayskiy strain No 15 and its restored variant, and the number of immunogenic microorganisms in series of vaccines prepared from Gayskiy strain No 15 and its restored variant.

CPYRGHT Conclusions drawn as a result of these experiments are as follows:

"1. Vaccine strains administered for the prophylaxis of tularemia possess morphological, tinctorial, and culture characteristics which are typical for *B. tularensis*, and are agglutinated by specific S-serum of the VI-agglutination type.

"2. The quality of vaccine strains depends on a high content of immunogenic, microbial cells having lasting virulence, which are characterized by growth on blood agar in the form of white (cloudy) colonies. Dissociated strains which contain a higher quantity of avirulent non-immunogenic cells growing in the form of gray (transparent) colonies and strains which decompose easily during the vaccine production process are not suitable for use as vaccines.

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"3. Vaccine strains are harmless to guinea pigs and have lasting virulence for white mice -- 30-50% of the mice died from tularemia vaccine following the subcutaneous introduction of 100 to one million microbial cells.

"4. The vaccine strains protected mice and guinea pigs from 1,000 lethal doses of a virulent culture of B. tularensis and brought about a skin inoculation reaction in guinea pigs."

[For additional information on immunology and therapeutics, see Item No 87.]

Oncology

84. Chinese Investigate Influence of Disturbance of Higher Nervous Activity on Experimental Tumors

"Studies on the Effect of Disturbances of Higher Nervous Activity on the Incidence and Development of Experimental Tumors in Mice," by Wang Heng-wen (王 衡 文), Ch'en Miao-lan (陈 妙 兰), Department of Pathology, Chinese Academy of Medical Sciences, Peiping; and Yang Chien (杨 简), Laboratory of Pathology, Institute of Epidemiology; Peiping, Chung-Hua Ping-li-hsueh Tsa-chih (Chinese Journal of Pathology), Vol 3, No 4, Oct 57, pp 159-162

This article presents the details of experiments undertaken during the past 2 years to determine the influence of disturbance of higher nervous activity on experimental tumors in mice and to supplement previous experiments of certain Soviet medical scientists.

From the results of their experiments, the authors conclude the following:

1. Disturbances in higher nervous activity will accelerate the growth of sarcomas transplanted in mice and promote sarcomagenesis induced by methylcholanthrene.
2. Appropriate conditioned reflexes appear to inhibit the growth of transplanted sarcomas. This view merits further investigation.
3. The experimental method used to investigate the effect of higher nervous activity on the process of tumors has certain definite limitations. All data must be analyzed, in the light of the characteristics of the materials and methods.



Pharmacology and Toxicology

85. The Effect of Small Doses of Vipera lebetina Venom on Blood Morphology

"Experimental Data Concerning the Effect of Small Doses of Vipera lebetina Venom on Blood Morphology," by A. A. Pisonova, Trudy Stalinabadskogo Medsitsinskogo Instituta (Works of the Stalinabadsk Medical Institute), 1956, No 18, pp 25-34 (from Referativny Zhurnal -- Biologiya, No 22, 25 Nov 57, Abstract No 96064, by T. P. Veselova)

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"Experiments were conducted on healthy rabbits as well as on rabbits in which allergy processes (Artyus-Sakharov phenomenon) were experimentally induced. A 1:2,000 solution of Vipera lebetina venom was introduced subcutaneously in gradually increasing doses, from 0.4 to 3 ml, over a period of 1-2 weeks. The introduction of the venom into healthy rabbits did not change their hemoglobin or erythrocyte content. Also, the venom did not effect the leukocyte or eosinophil count produced at the height of the Artyus phenom. The subcutaneous administration of the venom did not produce local inflammation."

86. The Stability of Preserved Vipera lebetina Venom

"The Stability of the Coagulation Property of Preserved Vipera lebetina Venom," by Z. S. Barkagan, Trudy Stalinabadskogo Medsitsinskogo Instituta (Works of the Stalinabadsk Medical Institute), 1956, No 18, pp 19-24 (from Referativny Zhurnal -- Biologiya, No 22, 25 Nov 57, Abstract No 96063, by T. P. Veselova)

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"Vipera lebetina venom which has been preserved in liquid form loses 20-25% of its coagulation capacity every month regardless of its concentration. Dried Vipera lebatina venom in hydropscopic and decomposes rather quickly."

87. Vaccines and Sera for Snake Bite

"A Method for Obtaining Anti Snake Bite Vaccines and Sera,"  
by Ye. Nauryzbayev, Trudy Alma-Atinskogo Zoovet. Instituta  
(Works of the Alma-Ata Zooveterinary Institute), 1955, No 8,  
p 150-157 (from Referativny Zhurnal Biologiya, No 22, 25 Nov  
57 Abstract No 96065, by T. P. Veselova)

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"To obtain the most active and economical antislake bite vaccine, the author established an antigen depot in an organism, utilizing aluminum hydroxide, lanolin, and gypsophila to which the anatoxin of the anis-trodon had been added. It was determined, in rabbits, that the saponin vaccine possesses high immunogenic properties. After a one ml dose or two 0.5 ml doses, immunity begins in one month and last for 6-8 months. The saponin vaccine can be used to hyperimmunize horses and to obtain antitoxin serum."

88. Utilization of Ditilin for Facilitating Electroshock Therapy and the Prevention of Complications

"The Utilization of a Domestic Preparation, Ditilin, for Facilitating Electroshock Therapy and the Prevention of Complications," by B. A. Lebedev, Third Psychiatric Clinic (director, Prof Ye. S. Averbukh) Leningrad Psychoneurological Institute imeni V. M. Bekhterev; Moscow, Zhurnal Nevropatologii i Psikhatrii imeni S. S. Korsakov, Dec 57, No 12, pp 1487-1493)

The author describes two cases in which ditilin was utilized for facilitating electroshock therapy and the prevention of complications. Ditilin is the diiodmethylate of the dimethyl aminoethyl ester of succinic acid, i.e., a complex ester formed by succinic acid and two molecules of choline. Its action is similar to that of choline, accumulating in the neuromuscular synapse. Disrupting the transmission of neuromuscular excitation, ditilin weakens the skeletal muscles. The preparation hydrolyzes slightly and is destroyed by the cholinesterase of the blood, thereby making its action temporary. Prozerin, a cholinesterase inhibitor, increases the action of ditilin; however, it is antagonistic to other curare-like substances.

The author concludes that ditilin prevents complications during electroshock therapy and is quite safe since it is quickly destroyed by cholinesterase and has minimum action on the diaphragm muscles.

Public Health, Hygiene, and Sanitation

89. New Dust Meters

"New Instruments for Measuring Dust in Air," by M. I. Volokhov, L. K. Misyunas and O. P. Leont'yef; Moscow, Priborstroyeniye, No 4, Apr 57, pp 18-20

With the aid of three diagrams, the authors describe in detail the components and operating principles used in three dust measuring instruments.

The instruments described include the TVK-3 dust meter, the EK-4 electronic konimeter, and an instrument developed by O. P. Leont'yef which operates on a principle utilizing the electrical properties of the dust, i. e., by measuring the electrical charge of the dust particles.

90. Study of the Microflora in Air With the Aid of an Aerocentrifuge

"Study of the Microflora in the Air of a Lying-In Home With the Aid of an Aerocentrifuge," by L. P. Perlina, Chair of Microbiology (scientific director, Prof S. S. Rechmenskiy), Kishinev Medical Institute; Moscow, Supplement to Vrachebnoye Delo, 1957, p 105

The purpose of the investigation, the author explains, was to comparatively evaluate the petri dish method of collecting microbes from the air and the Rechmenskiy aerocentrifuge method. Samples of air were collected in lying-in homes and the data evaluated. As a result of data collected, the author concludes that the aerocentrifuge method was very effective and permitted the collection of samples in 3-5 minutes, as compared with the petri dish method which would require 50-60 minutes. The number of microbes collected with the aerocentrifuge method was greater than with the petri dish method. In addition, the aerocentrifuge is of simple construction and can be constructed by any laboratory.

Radiology

91. East German Book On Radiation Protection

Arzt und Atomschutz (The Physician and Atomic Defense), by R. Mitzscherling, M. D.; Berlin, Publishing House of the Ministry of National Defense, 1957, 177 pp

This volume was compiled by the author on the basis of the work of Soviet scientists (not mentioned) and the work of T. Sears (The Physician In Atomic Defense) to inform East German physicians of the nature of atomic energy and methods of treating and protecting against radiation injury. Most of the first half of the book deals with the fundamental concepts of nuclear energy; only five pages are devoted to measures against radioactivity, touching only superficially on such subjects as the admissible dosages, protection of the individual, medical examination, laboratory equipment, the disposal of radioactive wastes, and artificial means of increasing the resistance of the organism to radiation.

The second half of the book deals with the clinical aspects of atomic defense and discusses ionization and biological effect, clinical treatment of radiation injury, pathological-morphological changes, the treatment of acute radiation sickness, the aftereffects of radiation, the effect of the detonation wave, the effect of the light rays, the treatment of burns, and the protection of the population against atomic weapons.

92. Toxicology of Various Radioactive Substances Discussed, Prophylaxis Recommended

"Problems of Toxicology of Radioactive Substances," by D. I. Zakutinskiy; Moscow, Meditsinskaya Radiologiya, Vol 3, No 1, Jan/Feb 58, pp 3-8

The extensive use of atomic energy has created a new branch of toxicology, i. e., toxicology of radioactive substances. The author classifies these substances into three categories:

1. Radioactive substances that are equally distributed in tissues and are well hydrolyzed.

2. Radioactive substances that accumulate chiefly in the skeletal system and remain there for long periods.

3. Radioactive substances that are poorly hydrolyzable, and are retained as radioactive colloids in tissues that are rich with cells of the reticuloendothelial system.

Furthermore, radioactive substances exist in organisms in either weighable or "unweighable" amount (i.e., traces), thus dictating different procedures and methods to study their effects.

The author suggests the following problems that have to be subjected to further tests: Dangers from long chronic exposure to doses close to safe minimum doses, increase of the natural level of radiation of certain radioactive elements, effects of small doses of radiation that result only in functional stresses, radiation effects on visual apparatus, and early aging and death.

Prophylaxis against radiation effects include (a) speedy elimination of radioactive substances from the individual, and (b) treatment of radiation sickness. Recommendations for speedy elimination of radioactive substances include the so-called "replacement" therapy, use of substances that form complex compounds with radioactive substances and speed elimination, use of drugs that speed metabolism and especially calcium metabolism, and the use of mechanical means to rid the organism of radioactive elements.

Recent recommendations include studies directed toward the extinction of ultraviolet light caused by the effects of radioactive substances. Further research is needed in solving the best prophylaxis and treatment of remote sequelae of radiation sickness such as tumors due to disturbed sex function, changed reactivity and immunity, etc.

93. Novocaine Proves Therapeutic Against Irradiation if Head Is Protected

"On the Influence of Novocaine on Certain Changes in the Nervous System of Animals Under Ionizing Radiation Effects," by M. N. Livanov, and L. I. Kaburneyeva; Moscow, Meditinskaya Radiologiya, Vol 3, No 1, Jan/Feb 58, pp 9-16

Experiments performed on rabbits subjected to single total, and single partial irradiation by 500-1,000 r and 1,300 r of X rays, indicate the following.

1. After a single total irradiation, the increased impulses arriving to the highest branches of the central nervous system are probably one of the factors causing the development of radiation sickness.

2. Novocaine administered in low concentrations (0.01-0.04 g/kg) is one means of decreasing these pathological impulses and blocking them.

3. Novocaine administered in the above-mentioned low doses has a definite effect both on the condition of the cortex and on the survival of the animal.

4. Novocaine exerts a positive effect when the animal's body is irradiated and its head is protected by a screen, but not if the head is irradiated while the body is protected.

94. Single General X-Ray Irradiation Depresses Hypothalamic Function and Inhibits Afferent Links to Spinal Centers

"Dependence of Changes of Physical Thermoregulation, Caused by Single General Irradiation of Rabbits by X Rays, on the Condition of the Hypothalamic Area," by I. N. Kondrat'yeva; Moscow, Meditinskaya Radiologiya, Vol 3, No 1, Jan/Feb 58, pp 16-22

The aim of this research was to study the interrelationships between the condition of the centers of the hypothalamic area and physical thermoregulation after experimental radiation sickness caused by a single total X-ray irradiation by 1,000 r.

Tests were conducted on 11 rabbits, in whom electrodes were implanted into the hypothalamic area. Results indicate the following:

1. In response to stimulation of hypothalamus in healthy unirradiated rabbits, there was vasoconstriction, and respiratory frequency was altered.

2. After single total X-ray irradiation by 1,000 r, in cases where there was no reaction toward warming, stimulation of hypothalamus produced no vascular reaction.

3. After irradiation, the threshold of motor reactions to the stimulation of hypothalamus was decreased.

The author suggests that the hypothalamic area is in a parabiologic condition after irradiation and that the depression of respiratory reaction to warming is due to inhibition at the afferent part of the reflex arc connecting with the spinal centers.

95. New Method for Remote Study of Peripheral Blood Constituents During Irradiation

"Method for Studying the Composition of Peripheral Blood During Irradiation," by V. Ye. Busygin and Yu. G. Grigor'yev; Moscow, Meditsinskaya Radiologiya, Vol 3, No 1, Jan/Feb 58, pp 22-26

The aim of this research was to develop a method for remote sampling of blood during irradiation, not requiring the presence of the experimenter near the animal, and to study the very early reactions occurring in the blood system during live experimental conditions of irradiation.

Such an apparatus is described and photographed. It consists of a blood sampler attached at one end of two rubber tubes through which blood samples from the experimental animal are conveyed to a revolving disk containing 16 small test tubes each with a capacity of 0.35 ml. This disk revolves at 30 seconds per 1/16 revolution, although this rate may be altered. The instrument has also an electromagnet and a key to wind and start it, electric cord, etc. Blood is heparinized and removed through paraffined tubes far from the animal being irradiated to be tested immediately. Blood is automatically measured by the special revolving valveless piston-type pump

A table of results on leukocyte count before and up to 40 minutes after irradiation proves the gradual decrease of leukocytes from 8,950 to 4,600, and the gradual development of leukopenia.

96. Original Immunity Regained by Revaccination Within Ten Days After Irradiation

"Effectiveness of Revaccination Against Typhoid Fever in Irradiated Animals," by M. A. Tumanyan and A. V. Izvekova, Division of Medical Microbiology (head, V. L. Troitskiy, Corresponding Member, Academy of Medical Sciences USSR) of the Institute of Epidemiology and Microbiology imeni N. F. Gamaley of the Academy of Medical Sciences USSR; Moscow, Meditsinskaya Radiologiya, Vol 3, No 1, Jan/Feb 58, pp 26-29

The aim of this research was to study the effects of ionizing radiation on animal immunity toward typhoid fever, and experiments were conducted on mice subjected to 250 r.

Results indicate the following:

1. X-ray irradiation after immunization significantly decreases animal immunity to typhoid fever, but revaccination within 10 days after irradiation restores immunity in irradiated animals to the level of the immunity of revaccinated animals not subjected to irradiation effects.
2. Production of immunity in revaccinated animals is due to the changed immunological reactivity which is preserved in irradiated animals and appears because of the primary immunization before irradiation.

97. Antireticular Cytotoxic Serum Protects Against Penetrating Radiation

"Protein Fractions of Blood Serum of Irradiated Dogs To Whom ACS Was Administered," by A. S. Boyko, in the collection Tsitotoksiny v Sovrem. Meditsine, Kiev, 1956, 167-173 (from Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 18, 25 Sep 57, Abstract No 20113, p 56)

Fifteen dogs were subjected to the effects of large doses of X rays (upper limits of LD<sub>50</sub>). Injections of antireticular cytotoxic serum (ACS) were administered to ten of the experimental animals (0.0015 dose) subcutaneously, at 4-day intervals. Altogether, there were two courses, with three injections in each, and a 7-10 day interruption.

Of the five control animals, four died; and of the ten experimental ones who received ACS, only three died. Periodic tests proved shifts in total protein, albumin, globulins, and albumin/globulin ratio during radiation sickness.

Stimulating antireticular cytotoxic serum therapy aids in activating the vital processes of the elements of active mesenchyme.

98. X-Ray Therapy Successfully Used in Removing Keloids

"Method of Keloid Irradiation and Results After X-Ray Treatment," by T. Roxin, Radiologia, 1, 1956, 10-14 (Rumanian) (from Meditsinskiy Referativnyy Zhurnal, No 5, Section 2, May 57, Moscow, p 4)

X-ray treatment is best for both fresh and old keloids. The method varies to suit location, size, and age of keloids. Keloids of recent origin are treated with small doses (150-200 r) with 10-day intervals, and a total of three treatments. Older keloids require 250 r doses with



2-3 week intervals, and a total of 1200-1500 r. Postoperative keloids may be treated with 300-450 r depending on their thickness. Satisfactory results are obtained in 80% of all cases.

Irradiation must have a definite rhythm, with definite intervals regulated to suit the dose. Surgical intervention to remove keloids must be followed with X-ray treatments to prevent the formation of new keloids.

99. Irradiation Intensifies Pathogenicity of Influenza Virus

"Morphological Study of Changes in the Respiratory Tract of Albino Mice Infected With Influenza Virus After Subjection to the Effects of X-Ray Irradiation," by Aleksandr Smorodintsev, Central Scientific Research Roentgeno-Radiological Institute, and Institute of Experimental Medicine of Academy of Medical Sciences USSR, Leningrad; Moscow, Voprosy Virusologii, No 5, Sep/Oct 57, pp 290-296

The aim of this research was to explain the causes for the intensified multiplication of the virus and to study the changes in the cellular epithelium of the respiratory tract of irradiated animals infected with influenza virus.

Tests were conducted on 177 albino mice irradiated with 400 r, and inoculated with virus influenza of low pathogenicity (A-prime-3711).

Results indicate protective oxyphilic inclusion bodies in the cytoplasm of the respiratory epithelium of albino mice irradiated with X rays and inoculated with influenza virus. Also, large quantities of basophilic inclusions appear in various areas of the protoplasm, confirming intensified multiplication of virus influenza. The protective oxyphilic substance around the protoplasm occurs later and to a lesser extent in irradiated mice than in control animals. Specific lesions of the epithelium of the respiratory tract are evident up to the 16th day in irradiated mice, but completely disappear by the 8th day in control animals.

The course of virus infection in animals subjected to irradiation by 400 r doses and inoculated with a strain of virus influenza of low pathogenicity is accompanied by great changes in the parenchyma of lungs and morphologically resembles infection induced by highly pathogenic strains of the virus.

100. Increase of the Protective Effect of Hypoxia Against Irradiation Effected by Cysteine and Benzedrine

CPYRGHT "Increase of the Protective Effect of Hypoxia Against Irradiation by Means of Cysteine and Benzedrine." by M. Praslichka, Institute of Biophysics of Czechoslovak Academy of Sciences, Brno; Prague, Folia Biologica, Vol 3, No 5, 1957, pp 271-281

"Mice and rats which have been exposed to the action of coal-gas and have about 50% carboxyhaemoglobin in their blood are more resistant to the effects of irradiation; in these animals the minimum ALD/30 days is increased by about 100 r. With lower values of carboxyhaemoglobin, no protective effect is obtained. The protective effect for mice irradiated in an environment with different concentrations of coal-gas increases in proportion to these concentrations until limits compatible with life are reached. The ALD of radiation was increased in these experiments from 700 to 1,500 r. In conformity with data in the literature, cysteine, administered to mice 20 minutes prior to irradiation, gave protection against radiation. Neutralized cysteine chloride (Cysmona) proved most satisfactory for this purpose. The administration of cysteine prior to irradiation also enhanced the effect of coal-gas. In this way, some mice even survived following a dose of 1,600 r.

"Large doses of benzedrine increased respiratory metabolism in mice and sensitized them to hypoxia; this was more marked in male animals. The protective effect of altitude hypoxia against irradiation began to be displayed on reducing the atmospheric pressure to 400-380 mm Hg, after which it increased rapidly to a degree of hypoxia incompatible with life. When administered in doses close to the lethal minimum for mice irradiated in an environment with full access of air, benzedrine had a slightly protective effect in males, but little or none in females. Lower doses had no protective effect even in males. When administered after irradiation, benzedrine had no protective or sensitizing effect. In proportion to the size of the dose administered, benzedrine enhanced the protective effect of low oxygen tension hypoxia, and shifted its limit from 400 mm Hg to normal atmospheric pressure. The same doses of benzedrine with irradiation under the same condition had a more marked protective effect in males than in females. Its effect was displayed for up to 2 hours after injection and was greatest at 20-40 minutes after administration, i.e.,

at the time of maximum values of respiratory metabolism" -- English abstract

CPYRGHT

Surgery

101. Necrectomy After Third Degree Burns

"Basis for Early Necrectomy Following Experimentally Produced Third Degree Burns," by M. A. Tsukerman, Candidate of Medical Sciences; Ya. I. Veksler, Candidate of Medical Sciences; P. S. Sizyakin; N. I. Terent'yev; D. P. Korzan; D. N. Runovskiy; A. R. Sheyngerts, Candidate of Medical Sciences; and S. A. Brun (Rostovna-Donu); Moscow, Ortopediya, Travmatologiya, i Protezirovaniye, No 5, Sep/Oct 57, pp 44-49

Rabbits were subjected to third degree burns to determine the best time for surgical intervention. Various tests on 42 animals included the following: blood studies, electrocardiograms, gas-exchange studies, vascular permeability, and capillary resistance tests.

Results prove that necrectomy, under these experimental conditions, was most effective on the 5th-7th day after the infliction of third degree burns.

102. Ninth Congress of Ukrainian Surgeons To Be Held in June 1958

"Announcement" (unsigned article); Kiev, Vrachebnoye Delo, No 1, Jan 58, p 111

The Ninth Congress of Ukrainian Surgeons will be held in Dnepropetrovsk from 26 June to 1 July 1958.

The program will consist of the following:

1. The status and measures of improving traumatological assistance in the coal, metallurgical, and mining industries.
2. Remote results of surgical treatment of stomach and duodenal ulcers.
3. Surgical treatment of diseases of the pancreas.
4. Original research and new developments in surgery.

Copies of reports will be accepted until 15 March 1958 and should be sent to Prof I. N. Ishchenko, Faculty Surgery Clinic, Bul'var Shevchenko, 17, Kiev.

103. Czechoslovakia Site of International Conference on Tissue Trans-  
plantation

"Biological Bases of Tissue Transplantation" (unsigned article);  
Prague, Vestnik Caskoslovenske Akademie Ved, No 1/2, Jan/Feb 58,  
pp 53-55

An international conference on the theme "Biological Bases of Tissue Transplantation," held under the auspices of the Biological Sciences Section of the Czechoslovak Academy of Sciences and the Department of Experimental Biology and Genetics, Institute of Biology of the Czechoslovak Academy of Sciences, took place in Liblice from 14 to 16 October 1957.

A total of 69 Czechoslovak delegates and 40 delegates from ten other countries, including 27 from the Soviet Union attended.

The conference dealt with two main problems: (a) transplantation of normal tissues and possibilities of overcoming tissue incompatibility, and (b) transplantation of tumorous tissues.

A total of 35 addresses were presented, two thirds of which were given by foreign delegates.

Veterinary Medicine

104. Culturing Foot-and-Mouth-Disease Virus in the Brain of the Mouse

"Culturing Type-C Foot-and-Mouth-Disease Virus of Cattle in the Brain of the White Mouse," by W. Winkler, Friedrich Loeffler Institute, Island of Riems; Leipzig, Archiv fuer Experimentelle Veterinaermedizin, Vol 11, No 5, 1957, pp 813-815

In a first series of experiments; deep frozen epithelium of a cow's tongue (-400C) containing type-C virus produced by the institute was first subjected to five direct 24-hour cattle passages; then an alternating (cattle tongue — mouse brain — cattle tongue) passage was carried out. According to careful spot tests of the 9th, 13th, 16th, 22d, and 24th alternating passages, it was found that, after a few direct mouse passages, the critical point was reached and no further multiplication of the virus in the mouse brain took place.

A second series of experiments, conducted parallel to the 24-hour direct mouse passage, followed the course of a 36-hour direct mouse passage, starting from the 60th alternating passage. This passage reached the critical point at the 106th mouse passage, after which the cattle controls did not become infected after 48 hours, whereas the guinea pig controls were definitely infected. A return was made to the preserved mouse brains of the 101st mouse passage, and the passage was carried through up to the 125th mouse passage, predominantly with cattle controls. Within 24 hours after infection, the cattle showed disease symptoms ranging from good to very good. Only insignificant delays were evident. This passage was stopped in favor of the 24-hour mouse passage for technical reasons.

In keeping with experiments carried out with the A<sub>5</sub>-type by Roehrer ("The Gradual Adaptation of the Type-B Cattle Virus of the Foot-and-Mouth Disease to the Brain of the Mouse Through Alternating Passages," Zbl. Bakt. I Orig., 158, 312-13 [1952]) and with the O<sub>2</sub>-type by Koetsche ("The Breeding of Type-O Virus of the Foot-and-Mouth Disease in the Brain of the White Mouse," Arch.exp.Veterinaarmed. 2, 168-74, [1956]), a third series of experiments involved direct cattle passages up to the 52d passage from 24-hour mouse passages of the 60th alternating passage (100th and 175th mouse passage). Utilizing material from the 10th, 30th, and 50th cattle passages of the 100th and 175th mouse passages, it was found that the cattle controls for the mouse passage starting with the tenth cattle passage developed symptoms of the disease up until the 23d mouse passage (passage cut off), while those starting with the 30th cattle passage showed symptoms up until the 13th mouse passage. No cattle were available for the mouse passage of the 50th.

It was thus demonstrated that the new property, that of multiplying in the mouse brain, is not lost through direct cattle passages. Thus type-C behaves in the same manner as type A<sub>5</sub> of Roehrer and type O<sub>2</sub> of Koetsche.

105. Newcastle Disease Infectivity Studied

"On the Infection Spectrum of the Newcastle Disease Virus," by H. Bindrich, Friedrich Loeffler Institute; Leipzig, Archiv fuer Experimentelle Veterinaarmed.zin, Vol 11, No 5, Sep/Oct 57, pp 717-740

In the case of suckling pigs, the virus of the "Italy" and "Dessau" strains of Newcastle disease held only after intracerebral infection and caused affections of the central nervous system, which, on the other hand, did not occur after similar infection with the virus of the "Dedelow" strain.

In the case of young dogs, reactions of the organism, but no nervous symptoms, occurred only after intracerebral, suboccipital, and intraperitoneal administration of virus of the "Dedelow" strain.

The proof of an inoculation virus from the same types of animals could be shown only in five cases through a return passage to incubated chicken eggs, even though embryos frequently died with a simultaneous loss of hemagglutinative properties.

In the case of pigs and dogs, specific antibodies resulted from infection.

The suckling mouse proved to be receptive to the virus of the above-mentioned strains, but the "Dedelow" strain could be continued only through the 25th passage.

In the case of suckling guinea pigs symptoms of the disease could be produced after intracerebral transmission of the virus, but only a few passages could be carried out with the "Dedelow" strain virus.

From an immunization viewpoint, there were no connections between the Newcastle disease virus and the distemper and Poliomyelitis suum pathogens.

In regard to their pathogenic properties, the three investigated strains of Newcastle disease showed qualitative differences for various types of animals. This is important as a diagnostic fact in connection with the infection spectrum in cases where there is a question of the plurality of the Newcastle disease virus.

From an epizootological viewpoint, the danger of transmission of the Newcastle disease virus through swine, dogs, and mice is estimated to be very slight.

106. Institute of Veterinary Medicine, Kazakh Branch of the All-Union Academy of Agricultural Sciences imeni V. I. Lenin

"Institute of Veterinary Medicine of the Kazakh Branch of the All-Union Academy of Agricultural Sciences imeni V. I. Lenin," (unsigned article), Moscow, Veterinariya, No 11, Nov 57, pp 66-67

The Institute of Veterinary Medicine of this branch of academy was the first scientific research institution in Kazakhstan. The institute was established in May 1925 and was reorganized in 1940 into its present

form. The institute today consists of ten laboratories (Helminthology, Protozoology, Biochemistry, Laboratory for the Study of Especially Dangerous Diseases, Laboratory for the Study of Brucellosis, Laboratory for the Study of Foot-and-Mouth Disease, Laboratories for the Study of the Diseases of Sheep, Cattle, Hogs, and Fowl). In addition, there are two Scientific Research Veterinary Experimental Stations, i.e., the West Kazakhstan in Ural'sk and the South Kazakhstan in Chimkent.

At the institute considerable research is being conducted on brucellosis, especially on pathogens of the melitensis and bovvis types of brucella, and on the development of an artibrucellosis vaccine.

The staff of the institute and its two experimental stations total 55 scientists and six aspirants who have published seven volumes of scientific "trudy" and scores of brochures and pamphlets.

107. Alma-Ata Zooveterinary Institute

"The Alma-Ata Zooveterinary Institute" (unsigned article); Moscow, Veterinariya, No 11, Nov 57, p 63

The Alma-Ata Zooveterinary Institute was founded in October 1929, and is one of the oldest higher educational institutions in Kazakhstan. The institute is organized primarily for training veterinarians and zootechnologists. It has two faculties: the Veterinary Medicine Faculty and the Zootechnical Faculty where, at present, some 2,000 students study. The Alma-Ata Zooveterinary Institute is one of the largest institutes of its kind in the Soviet Union; it graduates more than 350 veterinarians and zootechnologists yearly. Since its founding, the institute has graduated 3,495 highly qualified specialists in the field of animal husbandry.

The scientific staff of the institute totals more than 170 persons of whom 15 are professors with a doctor's degree and 69 are Candidates of Sciences. There are 35 chairs in the institute. Among the leading instructors, the following are mentioned: Prof M. I. Ivanov, Doctor of Veterinary Sciences, Honored Worker of Sciences; Prof N. P. Orlov, Doctor of Veterinary Sciences, Honored Worker of Sciences; Prof D. A. Zykov, Active Member of Academy Sciences Kazakh SSR; Prof M. I. Goryayev, Active Member of Academy Sciences Kazakh SSR; Prof V. A. Bal'mont, Active Member of All-Union Academy of Agricultural Sciences; Prof V. I. Lenin; Prof B. P. Vsevolodov, Doctor of Veterinary Sciences; Prof P. A. Bulanov, Corresponding Member of Academy of Sciences Kazakh SSR; Prof T. F. Tavildarova, Doctor of Agricultural Sciences; Prof N. U. Bazanova, Doctor of Biological Sciences; Prof F. M. Mukhamedgaliyev, Corresponding Member of Academy of Sciences;

Doctor of Biological Sciences; Prof Ya. I. Kleynbok, Doctor of Veterinary Sciences; Prof A. M. Roslyakov, Doctor of Agricultural Sciences; Prof P. A. Karasev, Doctor of Veterinary Sciences; Prof Ya. M. Skorniyakov, Doctor of Veterinary Sciences; and Prof V. I. Ryakhovskiy, Doctor of Veterinary Sciences.

108. Visit of Soviet Veterinarians to Yugoslavia

"Delegation of Soviet Veterinarians Visited Pozarevac," by D. B.; Zagreb, Borba, 10 Feb 58, p 4

A Soviet veterinary delegation which is staying in Yugoslavia today visited Pozarevac, where they inspected the Veterinary-Diagnostic Center.

Miscellaneous

109. New Soviet Publications in the Fields of Epidemiology, Immunobiology, and Microbiology

"In the Administration of the All-Union Society of Epidemiologists, Microbiologists, and Infectionists imeni I. I. Mechnikov," by F. G. Barinskiy; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, No 12, Dec 57, pp 141-143

The State Publishing House of Medical Literature (Medgiz) announces the necessity of publishing in 1958 new monographs on infectious diseases, textbooks on the problems of general microbiology and epidemiology, and laboratory diagnosis, and the works of Mechnikov and Gamaleya.

The Editorial-Publishing Commission of the Administration of the All-Union Society of Epidemiologists, Microbiologists, and Infectionists imeni I. I. Mechnikov has been requested to investigate the possibility of the publication of a new periodical on the problems of immunology in 1958, and to investigate the possibility for the branches of the All-Union Society to publish locally periodicals on the problems of epidemiology and microbiology.

110. Czechoslovak Neurologist Has Birthday

"Local News in Brief" (unsigned article); Prague, Rude Pravo, 14 Feb 58, p 2

Miroslav Sercl, MD, distinguished Czechoslovak neurologist, is 50 years old today. Miroslav Sercl is the head of the Neurological Clinic of the "J. E. Purkyne" Military Medical Academy (Vojenska lekarska akademie J. E. Purkyne) and has been decorated with the Order of the Republic.



111. Hungary Honors Physicians

"Iron, Diamond, and Gold Diplomas for Physicians," (unsigned article); Budapest, Esti Hirlap, 1 Dec 57, p 1

Special awards for long and outstanding service are to be awarded to physicians on 4 December 1957.

Dr Imre Zoltan, professor and head of the Gynecological Clinic No II, Budapest, will receive a diploma for 25 years of service; Dr Jozsef Baló, professor of the Institute of Pathological Anatomy (Korbonctani Intezet), and Dr Jozsef Melli, professor and head of the Institute of Public Health (Kozegeszsegtani Intezet) will receive diplomas for 40 years of service; Dr Samuel Strehlinger, head of the Department of Obstetrics and Gynecology, Rokus Hospital, Budapest, will receive a "diamond" diploma in recognition of 60 years of service.

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## VII. METALLURGY

### 112. USSR Making Purest Cadmium for Atomic Research

"Honorable Contract" (unsigned article); Alma-Ata, Kazakhstanskaya Pravda, 15 Jan 58

Last year, the All-Union Scientific Research Institute for Nonferrous Metals made the purest cadmium in the USSR. This pure cadmium was prepared by the zone melting method. In this method, the metal ingot passes up to ten times through a miniature electric annular furnace. The cadmium obtained in this manner contains but a few ten thousandths of parts of impurities and has a number of valuable properties. It is used as a moderator of the chain reaction in atomic reactors.

This year, scientists at Ust'-Kamenogorsk have started to fulfill an honorable contract, namely, the melting of high-purity cadmium for the Joint Institute of Nuclear Research at Dubna.

### 113. Polymorphous $\beta \rightarrow \alpha$ Transformation of Titanium Iodide

"Certain Characteristics of the Polymorphous  $\beta \rightarrow \alpha$  Transformation of Pure Titanium Iodide," by Ye. I. Antipova, M. V. Guterman, and M. G. Lozinskiy; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, No 9, Sep 57, pp 45-49

High-temperature metallography methods were used to show the various kinetics of the growth of  $\alpha$ -titanium in the process of polymorphous transformation of titanium iodide. Specimens of titanium iodide containing small amounts of iron, silicon, aluminum, and carbon were used in the experiments by the authors at the Institute of Machine Science, Academy of Sciences USSR.

Results indicated that the formation and growth of  $\alpha$ -titanium crystals up to their final dimensions may require more than 1/16 sec time, at a rate of 0.8-1.2 mm/sec. In special cases the average growth rate was 0.06-0.08 mm/sec. From dilatometric curves for the specimens it is evident that the  $\alpha \rightarrow \beta$  transformations in the specimens began at temperatures of about 860-880°C and the  $\beta \rightarrow \alpha$  transformations occurred at about 900-880°C.

114. East German High-Purity Copper for Transmitter Tubes

"Industrial Experiments and Their Results on the Production of Oxygen-Free Copper," by H. Eckstein, Eisleben; Berlin, Neue Huette, No 1, Jan 58, pp 32-36

In 1953, an industrial research project was assigned to the Hettstedt Copper Melting Shop of the VEB Mansfeld Huetten-Kombinat "Wilhelm Pieck" for the production of copper with a maximum of 0.0003% oxygen, 8.9 specific weight (cast), and a conductance (soft annealed) of at least  $58 \text{ m}/\Omega \cdot \text{mm}^2$ , as required by transmitter tube manufacturers. By melting down selected, well-washed copper cathodes in a hard-coal-fired crucible furnace with a graphite crucible under glowing charcoal, and pouring under a protective nitrogen atmosphere, copper with an oxygen content not over 0.0002%, a specific weight of 8.92 (cast material), and a conductance, measured on the cast ingot, of not less than  $57.5 \text{ m}/\Omega \cdot \text{mm}^2$  was obtained.

115. Sintering and Recrystallization Processes

"Studies of the Sintering and Recrystallization Processes," by W. Rutkowski, Gliwice; Berlin, Neue Huette, No 1, Jan 58, pp 37-43

The article describes a study of the sintering process at the boundary surface between layers of copper and iron, and copper and tungsten, powder in pressed samples. The influence of the length of the sintering period and of the oxide content of the powder are given special attention. Investigations of the recrystallization of pure silver with small, intentionally added impurities (tungsten powder) are described, and the influence of varying amounts of tungsten is studied in the case of various stages of recrystallization.

116. Soviet Powder Metallurgy

"Certain Problems From the Theory and Practice of Soviet Powder Metallurgy," by W. S. Rakowski; Berlin, Neue Huette, No 12, Dec 57, pp 764-767

Soviet study of the sintering process with the aid of tagged atoms has shown that the sintering process takes place primarily in accordance with the principle of "hole migration," and that the activity of the sintering process is greater, the higher the diffusivity of the components. The sintering process was also found to be strongly activated by the effect of sound waves, which also improve the properties of the sintered material.

The Soviet Union has developed metal-ceramic friction-brake materials on an iron-powder rather than a copper base. These materials contain three different types of components: (a) the base component (iron), (b) lubricating components (lead, graphite, baryt, copper sulfide, etc), and (c) components which impart a high coefficient of friction (chromium, silicon, silica, and asbestos).

The USSR has also developed large self-lubricating sleeve bearings of iron powder for use in railroad cars. These bearings (pure iron with an addition of 3-5 percent molybdenum sulfide) are superior to the Babbit-metal bearings and other bearings now in use.

117. East German Institute Tests Welding Method With Vibrating Electrode

"On the Possible Influence of a Mechanically Vibrating Electrode on the Electric-Arc Welding Process," by G. Tybus, Central Institute for Welding Techniques, Halle (Saale); Berlin, Schweisstechnik, No 3, Mar 58, pp 101-105

A T1 VIIIm electrode with a diameter of 4 millimeters was vibrated in the longitudinal direction with a 50-cycle mains frequency and a vibration stroke of about 0.4 millimeter. A slight lateral vibration, which varied with the length of the electrode, could not be avoided. With normal current load, the fusion rate was increased 20-25 percent. In most cases, the sputter losses were normal, and the penetration was equal to that of a deeply penetrating electrode. The arc could be kept short; the electrode burned well and did not stick. The results are to be considered individual trials, since the device was not suitable for an extended continuous operation. The welding of austenitic steels was improved, and the scatter losses were reduced. The tests indicated that the vibrating-electrode method might be used to good advantage for stabilizing the arc and improving the fusion in the case of automatic welding under a protective-gas and CO<sub>2</sub> atmosphere.

VIII. PHYSICS

Nuclear Physics

118. Method for Preparing Very Fine-Grained Nuclear Emulsions Developed

"Especially Fine-Grained Emulsions for Nuclear Research," by N. A. Perfilov, N. R. Novikova, and Ye. I. Prokof'yeva; Moscow, Atomnaya Energiya, Vol 4, No 1, Jan 58, pp 45-51

The article describes a method developed in 1949 for preparing a very-fine-grained photographic emulsion. The silver-bromide crystals of the emulsion have a most probable diameter of 0.04-0.08  $\mu$ . Since 1949, techniques for preparing the emulsion have been improved and its sensitivity has been raised.

A potentiometric method of controlling the emulsification process is described. It is claimed that with this method very-fine-grained emulsions can be prepared for recording charged particles with any degree of sensitivity, depending on the purposes of the experiment. Particles ranging from fragmentary to relativistic can be recorded with a track density of 60 grains per 100  $\mu$  of path length.

119. Formulas for Electron Temperature in Powerful Gas Discharges Given

"Electron Temperature and Degree of Ionization in Initial Stages of a Powerful Gas Discharge," by V. I. Kogan; Moscow, Atomnaya Energiya, Vol 4, No 2, Feb 58, pp 178-180

Formulas for electron temperature and degree of ionization in the initial stages of a powerful impulse discharge are given. Discharges in hydrogen are considered. A preponderance of an electron ionization mechanism is assumed. Equations for the balance of ionized and excited atoms are taken as a point of departure. The work was done in 1954 under the direction of L. A. Artsimovich and M. A. Leontovich. The assistance of D. V. Orlinkiy in the numerical calculations is acknowledged.

120. Choice of Radio-Frequency Ratio in Large Synchrotrons Discussed

"On an Allowable Frequency Ratio in Synchrotrons," by Ye. M. Moroz and M. S. Rabinovich; Moscow, Atomnaya Energiya, Vol 4, No 2, Feb 58, pp 128-131

The problem of choosing a radio-frequency ratio in electron accelerators is considered in connection with the building up of synchrotron oscillations under the influence of electron radiation fluctuations at high energies. The energy dependence of the amplitude of synchrotron oscillations caused by radiation fluctuations is studied. A steady-state solution of the phase equation is obtained. "This equation may be applied with sufficient accuracy for practical use to all large synchrotrons."

It is shown that in the acceleration of electrons to energies of several Bev, the maximum allowable frequency ratio is sharply restricted and is determined by the limiting amplitude of the accelerating voltage.

121. Survey of Cyclotron Development Presented

"History of Cyclotron Development," by L. M. Nemenov; Moscow, Atomnaya Energiya, Vol 4, No 2, Feb 58, pp 117-127

A 10-page account is given of the development of the cyclotron from 1930 to present. The account is based on information from published sources, most of which are Western, and includes photographs from these sources.

122. Stability of Bunches of a Quasineutral Plasma Studied

"Axial Stability and Localization of Quasineutral Plasma Bunches Accelerated by Electromagnetic Fields," by G. A. Askar'yan, Moscow, Atomnaya Energiya, Vol 4, No 1, Jan 58, pp 71-74

The author introduces the work as follows:

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"In connection with Veksler's recently proposed coherent method of plasma-bunch acceleration, it is of interest to consider the stability of bunches of a quasineutral plasma relative to the axis of the wave train in which radiation flux is channeled. The work of M. L. Levin (1957, unpublished) was concerned with this problem, but the model of a bunch used in this work, namely, the model of absolutely screening bunches, does not permit the behavior of bunches to be studied at frequencies approaching plasma resonance and under other frequency and plasma conditions. A

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more concrete consideration of the problem has therefore been proposed by the author. An oscillator model of a bunch is used which more completely describes its behavior in electric fields, and expressions for the forces are used which allow one to consider such specific properties of plasma formations as anisotropy of plasma parameters on application of external magnetic fields, etc...."

The oscillator model of a plasma bunch is explained. The forces acting on a bunch on displacement from the axis of the wave train are computed.

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The author comments that "despite the simplified model given for the behavior of such an ephemeral structure as a plasma bunch, the results obtained are applicable not only in studying the influences on a quasi-neutral plasma bunch by electromagnetic waves and fields, but also for developing methods of weakening the Coulomb spreading of electron bunches used for coherent generation of electromagnetic radiation. The results also have interesting possibilities in studies on the astronomical scale of the passage of cosmic plasma formations through cosmic magnetic fields."

The assistance of M. S. Rabinovich and M. L. Levin is acknowledged.

123. Method of Applying "Solid Hydrogen" to Photographic Emulsion Described

"Solid Hydrogen Targets on the Surface of a Photoemulsion," by V. A. Otroshchenko, V. A. Sviridov, K. D. Tolstov, and A. I. Shal'nikov, Chair of Low-Temperature Physics of Moscow State University and Joint Institute of Nuclear Research; Moscow, Pribery i Tekhnika Eksperimenta, No 6, Nov-Dec 57, pp 110-111

A method of obtaining "solid hydrogen" on the surface of a photographic emulsion is discussed. The technique is used in studies on the interaction of elementary particles with protons and deuterons. It is noted that, if hydrogen is merely mixed with the emulsion material, it becomes impossible to distinguish between interactions with free and bound nucleons.

CPYRGHT The method is described as follows:

"The use of a condensate of gaseous hydrogen on the surface of a photographic film was first proposed for obtaining hydrogen ice. The film was cooled with liquid helium. In the initial construction the instrument was placed in a vacuum and the photographic film was cooled by direct contact with a vessel containing liquid helium. The condensed hydrogen was supplied to the cold surface of the emulsion through a special diffusion attachment. The thickness of the ice obtained in these



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experiments, as measured by recoil protons, did not exceed 10-20  $\mu$ . Measurement of the surface temperature of the emulsion at the time of hydrogen condensation showed that the factor preventing our obtaining a thicker layer of hydrogen ice was the low heat conductivity of the photographic film.

"To avoid this difficulty and obtain a greater thickness, the instrument shown in the figure was used. The photographic film is at the bottom of a container immersed in liquid hydrogen. Liquefied deuterium is fed to the container, and the emulsion is covered to the desired thickness. The Dewar vessel of hydrogen is then evacuated until the deuterium solidifies. The container in which the deuterium ice is forming is then rotated mechanically into the desired position with respect to the accelerator beam.

"Five liters of liquid hydrogen are used to prepare the target and maintain it through several hours of exposure. As a control experiment, the target was irradiated with neutrons from a polonium-beryllium source. By comparing the number of recoil deuterons from the target with the number of recoil protons inside the emulsion, the thickness of the target was shown to be not less than 300  $\mu$ .

"To produce a hydrogen target, the Dewar vessel must be filled with liquid helium and the container must be suspended above the surface of the helium at the desired temperature...."

The assistance of V. I. Veksler, I. B. Danilov, and the workers at the Kriogennaya Laboratory of Moscow State University is acknowledged.

124. Gamma-Ray Spectrum From Inelastic Scattering of Fast Neutrons

"Gamma-Ray Spectrum Produced in the Inelastic Scattering of Fast Neutrons by Nuclei of Magnesium, Aluminum, Iron, Copper, Tin, and Antimony," by I. F. Barchuk, M. V. Pasechnik, and Yu. A. Tsybul'ko; Moscow, Atomnaya Energiya, Vol 4, No 2, Feb 58, pp 132-137

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"The study of the inelastic scattering of fast neutrons is of both theoretical and practical importance. Through such investigations it is possible to obtain information on the levels of stable nuclei. Inelastic scattering processes play an important role in reactors on fast neutrons and data on the spectrum of inelastically scattered neutrons is necessary to complete the development of the theory of fast-neutron reactors. In this connection, then, the necessity of developing a neutron spectrometry for fast neutrons and a gamma-spectrometry for inelastically scattered neutrons becomes obvious. For the past 5-7 years, therefore, many papers connected with this problem have appeared.

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"In this work we have measured the gamma-ray spectrum produced by inelastically scattered neutrons on magnesium, aluminum, iron, copper, tin, and antimony. Neutron energy was 2.8 Mev. The measurements were made with a scintillation spectrometer with NaJ(Tl) crystal, and FEU-1 B photoelectron multiplier, and a 50-channel pulse analyzer with magnetic-drum memory. The spectrometer had a resolution of 6.5-7% for gamma-rays from Co<sup>60</sup>.

Gamma-rays with the following energies were observed (in Mev): from magnesium, 0.97, 1.41, 1.92, and 2.3; from aluminum, 0.84, 1.00, 1.80, and 2.16; from iron, 0.84, 1.25, 1.46, and 1.70; from copper, 0.63, 0.78, 0.96, 1.12, 1.38, 1.46, 1.72, and 2.03; from tin, 0.84, 1.16, 1.50, 1.80, and 2.16; and from antimony, 1.04, 1.50, 1.84, and 2.16. -- Authors' abstract

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125. Attenuation of Gamma-Rays in Water Studied

"Passage of Scattered Gamma-Radiation in Water," by V. I. Kukhtevich, Yu. A. Kazanskiy, Sh. S. Nikolayshvili, and S. G. Tsypin; Moscow, Atomnaya Energiya, Vol 4, No 2, Feb 58, pp 138-143

The attenuation of a dose of scattered gamma-quanta from Au<sup>198</sup>, Co<sup>60</sup>, and Na<sup>24</sup> sources was measured as a function of the distance between the source and the detector. Measurements were made at various collimation angles to avoid the possibility of the incidence of primary gamma-radiation on the detector. Measurements were made at distances from 3-4 to 8-12 times the free-path length of the gamma-quanta. The collimation angles ranged from 30 to 80 degrees.

The experimental results are compared with results of theoretical calculations, using certain assumptions through which the problem was reduced to the calculation of a triple integral instead of the indeterminate solution of a kinetic equation. Agreement between the theoretical and experimental results is termed satisfactory.

The problem was proposed by A. K. Krasin; G. I. Marchuk collaborated in the solution.

126. Intensity of Gas-Discharge Radiation Analyzed

"Estimation of Electron Temperature and Degree of Ionization in the Initial Stage of a Powerful Impulse Discharge," by N. A. Brozunov, V. I. Kogan, and D. V. Orlinskiy; Moscow, Atomnaya Energiya, Vol 4, No 2, Feb 58, pp 180-183

Measurements of the radiation intensity of a powerful gas discharge over the visible portion of the spectrum are given. The results are interpreted on the basis of an assumed predominance of an electron ionization mechanism.

The discharge tube was of glass with a diameter of 18.5 cm and with a separation of 97 cm between electrodes. Current reached a maximum of approximately 250 kiloamperes. Kogan's equation for electron temperature was used in an analysis of the data (Atomnaya Energiya, 4, No 2, 1958, p 178). The analysis showed that for a given initial pressure electron temperature changes slightly over a fairly wide time interval in the neighborhood of the break in the current curve; and with an increase in the initial pressure electron temperature drops off slowly from 4 ev at  $p_0 = 0.1$  mm Hg to 2.5 ev at  $p_0 = 2.0$  mm Hg. The degree of gas ionization averaged over the discharge at the time of the current break was found to be several percent.

The assistance of L. A. Artsimovich, S. Yu. Luk'yanov, and S. M. Osovets is acknowledged. The study was completed in 1954.

127. Hungarians Review Research on Elementary Particles

"New Problems of Elementary Particle Research," by Ervin Fenyves, Department of Cosmic Radiation, Central Physics Research Institute, Budapest, Energia es Atomtechnika, No 11-12, Nov-Dec 57, pp 612-618

According to the author, this article summarizes the most important research results and their phenomenological interpretation in the field of heavy, unstable particles and antinucleons.

128. Hungarians Explore Possibility of "Starlike" Fusion Reactor

"Problem of the Starlike Fusion Reactor," by Dr Karoly Simonyi and Miklos Uzsoy, Department of Atomic Physics, Central Physics Research Institute; Budapest, Energia es Atomtechnika, No 11-12, Nov-Dec 57, pp 597-603

The authors explore the possibility of stationary conditions in a deuterium-tritium plasma under constant pressure in a spherical container. The temperature selected for the center of the plasma sphere is approximately the temperature required to produce maximum thermonuclear energy; the temperature of the exterior wall is set at a few thousand degrees.

Although these hypothetical conditions would produce measurable temperatures, the authors conclude that these temperatures are beyond the heat-resistant properties of all foreseeable materials, so that the technology of a fusion reactor of this type is impossible to achieve.

In their otherwise Western bibliography, the authors include an English-language article entitled "On the Possibility of Controlled Power Production Using Thermonuclear Fusion," by G. Kalman, L. Pocs, G. Schmidt, and K. Simonyi, Budapest, Periodica Polytechnica, No 1, 1957, p 53; a condensation of this same article appeared in Energia es Atomtechnika, No 4, Aug 57, pp 220-224

129. East German Atomic Reactor at Rossendorf

"Pankow in the Atomic Race," Bonn, Das Parlament, 26 Feb 58

The atomic reactor at Rossendorf, near Dresden, operates according to the principle of the greatest possible flow of neutrons (Neutronenfluss), in order to achieve only a small loss of uranium. The critical mass is 3.5 kilograms. The reactor is a water-water reactor, distilled water being used as a moderator and as a coolant. With an output of 2,000 kilowatts, the reactor has a maximum neutron flux of  $10^{13}$  per square centimeter per second. The distilled water circulates at a maximum temperature of 35 degrees centigrade through the active zone and delivers the heat in a heat exchanger to a second heating circuit.

The 8-meter-high reactor is equipped with all possible safety devices. Fuel consists of bars of uranium 235, and control rods are used for quick regulation.

130. Slovak Atomic Power Plant

"Before Construction Begins," by Juraj Bober, Bratislava, Pravda, 15 Feb 58, p 7

During the second half of 1958 construction will begin on the Slovak atomic power plant in the village of Bohunice, a little over 10 kilometers from Trnava. Czechoslovakia plans to build ten atomic power plants by 1970 to cover the increased consumption of electricity, which is expected to reach 45 billion kilowatt-hours in 1965 and 100 billion kilowatt-hours by 1975.

It was difficult to find a suitable location for the power plant because the level of underground water had to be at least 15 meters below the surface and wind must blow almost constantly in the area chosen for an atomic power plant. For this reason 21 different localities were checked out, including the area around Kosice, along the Hornad River, along the Laborec River, along the Poprad River, and in Western Slovakia.

It was discovered that the most advantageous conditions are near Trnava. Underground water level is about 22-25 meters below the surface and the wind blows naturally. The site is a few kilometers from the Vah River, which will supply water to the power plant. Up to 2,500 liters of water per second flow past here.

Soviet planners still have some important problems to solve, such as the external shape of the nuclear reactor. The electric power plant will be double-circuit, the reactor will be heterogeneous, as it will work with uranium 235 and with natural uranium. The thermal output is presupposed to be 700 megawatts and the electrical output 150 megawatts, which is only a little less than for the hydroelectric power plant on the Danube near Bratislava.

Expenses for the atomic power plant are estimated at one billion crowns. This amount includes the cost of several developmental works which will not be included in other atomic power plants. The cost of one kilowatt-hour from the atomic power plant will be 16-18 hellers. The power plant will consume 25 percent of the energy it produces for its own operation.

One of the most pressing tasks today is the education of enough qualified technicians. Students are studying in Czechoslovakia at the Faculty of Technical and Nuclear Physics (Fakulta technicke a jadrove fysiky) at Charles University in Prague; others are taking the 4 year nuclear industrial course or the "nadstavbovy" [extension?] course of nuclear physics and technology at the Advanced Electrotechnical School (Vyssi prumyslna skola elektrotechnicka) in Prague. Still other Czechoslovak students are studying at advanced schools in the Soviet Union as students and as aspirants.

### 131. East German Research Reactor

"Research Reactor, Atomic Energy, Welding Research, and Quality Control in the German Democratic Republic," by F. Erdmann-Jesnitzer, Berlin, Schweisstechnik, No 3, Mar 58, pp 93-95

On 16 December 1957 at the research station in Rossendorf near Dresden, the Reactor Institute was officially turned over to the Central Institute of Nuclear Physics in a ceremony during which the keys to the institute were handed to the director, Professor Barwich. This first East German research reactor, which was built in a record time of approximately 18 months, was officially put into operation on this day, after a successful 2-day trial run. In a short speech, Barwich praised the USSR for its assistance in the building of the reactor.

The institute building is in the shape of a large T, with the reactor occupying a large hall. In another area of the large research station, construction is in progress on a cyclotron, which is expected to be finished in the second quarter of 1958.

The reactor, the individual parts of which were delivered by the USSR, has certain features of a series-produced article, and represents the basic design for reactors to be delivered to other countries later.

The article concludes with a discussion of the aid which the reactor and its use can bring to welding problems and the study of metals.

132. Dubna, the "Atom City" of the USSR

"In the City of the Peaceful Atom," by P. Sergeev, chairman of the Executive Committee, Dubna City Soviet, Moscow, Leninskoye Znamya, 16 Mar 58

The article discusses the rapid growth of the city of Dubna, where the Joint Institute for Nuclear Research is located. The institute's director is Prof D. I. Blokhintsev; among other members of the institute are V. I. Veksler, Corresponding Member of the Academy of Sciences USSR; V. P. Dzhelapov, Doctor of Physicomathematical Sciences; and Prof M. A. Markov, Prof V. A. Petukov, Prof M. G. Marshcheryakov, and Prof V. M. Pontekorvo. The institute contains, among others, the following laboratories: Laboratory of Nuclear Problems, Laboratory of High Energies, Laboratory of Theoretical Physics, Laboratory of Radiochemistry (proposed), Laboratory of Neutron Physics, and a plant for production of experimental physics instruments.

The city of Dubna was founded in the summer of 1954. Today the city encompasses 55 square kilometers and has a population of 14,000. The city has 5 secondary schools, 3 hospitals, 4 dining halls, 6 kindergartens, 8 nurseries, and 12 shops. The city is to have gas service sometime in 1958.

Atomic and Molecular Physics

133. Fluorescence of Cd-Vapor and a Cd-Cs Vapor Mixture

"Fluorescence Studies on Cd Vapor and a Cd-Cs Vapor Mixture," by H. Friedrich and R. Seiwert, Second Physics Institute, Humboldt University; Berlin, Experimentelle Technik der Physik, Vol 5, No 5, 1957, pp 193-205

In measurements of the dependence of the intensity of Cd resonance fluorescence ( $\lambda = 3216 \text{ \AA}$ ) on temperature, made with a secondary electron multiplier, it was shown that resonance fluorescence begins at 75 deg C ( $N \approx 3 \cdot 10^{18}$  atoms per  $\text{cm}^3$ ). The transition from the "beam" to the "volume fluorescence" takes place in the vicinity of 230 deg C; at 259 deg C a maximum occurs, the position of which depends on the geometric conditions of the experimental arrangement.

The study of the sensitized fluorescence of a Cd-Cs vapor mixture is facilitated by the fact that it can be observed for a long period of time at temperatures below the point where the quartz becomes discolored by the Cs vapor. The quartz quickly becomes opaque, if the temperature of the Cs vapor is increased above about 250 deg C. The fluorescence spectrum in the range 3,200-6,700 angstroms, photographed with the quartz spectrograph Q 24 and the three-prism spectrograph FD-S, contains several Cs lines, which can be divided into the primary series, the secondary series, and the Bergmann series. The Cs resonance lines ( $\lambda = 8,521$  and  $8,943$  angstroms) can be demonstrated in the fluorescent light by means of a special spectral photograph (glass spectrograph of Wittge, Agfa infrared plate 850).

#### Solid State Physics

##### 134. Magnetic Domain Patterns in Silicon-Iron Crystals

"Magnetic Domain Patterns in Silicon-Iron Crystals With Internal Stresses," by W. Stephan, Experimentelle Technik der Physik, No 4, 1957, pp 145-162

This article, a condensation of a 1956 Jena University dissertation, describes and interprets, on the basis of work done at the Institute of Magnetic Materials in Jena, the magnetic domain patterns in silicon-iron crystals with internal stresses resulting from a quenching or polishing process. The domain patterns are made visible by the powder method, and the magnitude of the internal stresses and their change with depth are determined for crystals which have been subjected to a mechanical surface polishing.

The stress patterns on the (100)-face are formed by zigzag Bloch walls which represent the boundaries of prismatic closure domains. The energy of this orientation of highly indicated 90-degree walls is computed and compared with the energy of prism walls which are not zigzag in shape. When the internal stresses are increased, the simple prism structure splits up, which decreases the unfavorable prism volumes.

Mechanics

135. Motion of Gyrostabilized Platform With Large Deviation Angles

"Motion of a Gyrostabilized Platform With Large Deviation Angles," by N. T. Kuzovkov, Moscow; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, No 1, Jan 58, pp 44-51

The motion of a platform in relation to a system of coordinates  $\xi, \eta, \zeta$  connected with the base on which the platform is mounted is studied. The position of the platform and the gyro motors is characterized by four variables (coordinates  $\alpha, \beta, \gamma, \delta$ ) for which four equations, based on the well-known Euler equations of motion of a solid body with a fixed point, are constructed. Euler's equations are constructed separately for each element entering into the design of a gyrostabilized platform. The influence of other elements on a single element is considered for the time being by the unknown moments from normal reactions at points of contact and, later on, all these moments are easily determined. Such an approach to the study of the dynamics of gyroscope systems was applied for the first time by Prof A. Yu. Ishlinskiy.

According to a method previously presented by the author (Kuzovkov, N. T., "Construction and Transformation of Structural Diagrams for Automatic Regulation Systems," Uchenyye Zapiski MGU, No 172, Mekhanika, No V, 1954) a structural schematic of the system based on the previously worked out differential equations is drawn up.

The bibliography to the article consists of three original Soviet works.

136. Equation for Bending of Plate Studied

"Bending of a Sharp-Edged Plate of Variable Thickness," by Ye. V. Makhover, Uch. zap. Leningr. gos. ped. in-ta, No 17, 1957, pp 28-39 (from Referativnyy Zhurnal -- Mekhanika, No 11, Nov 57, Abstract No 13062, by P. M. Varvak)

An equation for the bending of a sharp-edged plate of varying thickness under fixed boundary conditions is studied. The fourth-order differential equation obtained is degenerate at part of the contour, and for its study the author proceeds from a theory of degenerate elliptical second order equations which were developed in the works of S. G. Mikhlin and others. Conditions of discrete and nondiscrete operators of the equation are explained.



137. Stability of Cylindrical Rib-Reinforced Shells

"Stability of a Rib-Reinforced Cylindrical Shell Under Uniform External Pressure," by N. A. Alfutov, Inzhenernyy sb., No 23, 1956, pp 36-46 (from Referativnyy Zhurnal -- Mekhanika, No 11, Nov 57, Abstract No 13048, by A. V. Sachenkov)

P. A. Sokolov's solution (Prikl. matem, i mekhanika, No 1, 1933) for freely supported cylindrical shells, reinforced with identically stiff ribs, under the action of transverse and longitudinal loads is expanded in the case of a cylindrical shell of finite length, reinforced by ribs of various stiffness. The problem is solved by a dynamic method. It is assumed that with the loss of stability the circumference of the cylinder does not expand and the movements of U and W are chosen in accordance with these assumptions. The loss of stability in the shell is studied in relation to the number of reinforcing ribs whose stiffness was regulated by conditions of uniform strength of construction. The simultaneous loss of stability of a shell as a whole and of the covering between intermediate ribs is calculated by this criterion of uniform strength.

138. Stability of Shells Under Large Deflections

"Symmetrical Bending of Orthotropic Shells of Rotation Taking Into Account Large Deflections," by Ye F. Burmistrov, Inzhenernyy sb., No 24, 1956, pp 139-150 (from Referativnyy Zhurnal -- Mekhanika, No 11, Nov 57, Abstract No 13034, by D. V. Peshtmaldzhyan)

The symmetrical bending of orthotropic shells of rotation during large flexures is considered. An equation for the equilibrium of shells of rotation made of anisotropic materials is derived.

The problem for orthotropic plates and spherical shells is solved in the first approximation. In both cases it is assumed that the angle of deflection has the same form as is also present in small flexures of a flat plate

$$\gamma = C (P^3 - \alpha P^k)$$

where C and  $\alpha$  are the arbitrary constants, and  $k^2$ , is the relation of the modules of elasticity along the meridian and the parallel.

The relationship between the flexure in the center and the working pressure with which the problem of the stability of shells made of different materials is studied is obtained.

139. Deformations in Thin-Walled Shells

"Basic Energy Relationship During Deformation of Thin-walled Elastic Shells," by N. A. Alomyae, Issledovaniya po vopr. ustoychivosti i prochnosti. Kiev, AN USSR, 1956, pp 70-74 (from Referativnyy Zhurnal -- Mekhanika, No 11, Nov 57, Abstract No 13033, by A. L. Gol'denveyzer)

A formula of the virtual work of deformation of thin elastic shells which analyzes the final displacement is derived. The deformations are not assumed to be small. A hypothesis concerning the nature of the distribution of the deformations according to the thickness of the shell is not introduced, but it is apparently used in a hidden form in the calculation of the virtual work.

Assuming that the work of deformation depends only on the final state, the author derives the relationship which must satisfy the law of elasticity in the theory of shells (analogous to Green's theories in the general theory of elasticity).

140. Bend Tests on Reinforced Circular Plates

"The Effect of a Stiffening Rib on the Bending of a Circular Plate the Outer Edge of Which Is Fastened," by N. P. Fleyshman, Nauchn. zap. In-ta mashinoved. i avtomatiki, AN USSR, No 6, 1957, pp 92-99 (from Referativnyy Zhurnal -- Mekhanika, No 11, Nov 57, Abstract No 13016, by M. P. Sheremet'yev)

The problem of bending a circular plate, the outer edge of which is fastened, with an arbitrary load is solved by a method of functions of complex variables. In the solution, the flexing of the plate is resolved into two components: the first characterizes the flexing of a nonreinforced plate under a given load; the second component takes into consideration the effect of a reinforcing ring. In solving the problem the author uses results he previously obtained (Uch. zap. L'vovskogo gos. un-ta, ser.fiz.-mat., Vol 22, No 5, p 84 [Referativnyy Zhurnal -- Mekhanika, No 9, 1954, 4898]).

141. Dynamics of Incompressible Fluid of Variable Viscosity

"On the Uniqueness of the Solution of Approximate Boundary Problems in the Dynamics of an Incompressible Fluid of Variable Viscosity," by S. A. Regirer, Institute of Permafrost, Studies, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 117, No 3, 21 Nov 57, pp 384-386

On the basis of the equations of dynamics for an incompressible fluid with a variable viscosity,

$$\frac{\partial v}{\partial t} + (v \nabla) v = - \frac{1}{\rho} \nabla p + F + \eta \nabla^2 v + 2$$

$$\vec{\alpha} \nabla v + \vec{\omega} \times \vec{\Omega}; \quad \text{div } v = 0;$$

$$\frac{\partial T}{\partial t} + v \nabla T = a \nabla^2 T + \frac{\gamma}{\rho c} E,$$

where  $E = [\Omega^2 + 2 \text{div} (v \nabla)v]$ ,  $\vec{\alpha} = \nabla \eta$ ,  $\vec{\Omega} = \text{rot } v$  (remaining definitions as universally accepted), the author employs the method of D. Ye. Dolidze (Doklady Akademii Nauk SSSR, 96, No 3, 437 (1954) and Tr. Tbilissk. matem. inst., 21, 261, 1955) to demonstrate the uniqueness of the solution of a series of monotypical boundary problems obtained by successive approximations employing, alternately, two methods: (a) solving for  $v$  and  $p$  with a given temperature distribution, and (b) solving for  $T$  with a given velocity distribution, assuming in both cases that  $\gamma = \gamma(T)$  in the solution of the problem of flow and heat exchange within the flow.

142. Nonstationary Flow Between Porous Walls

"On a Nonstationary Flow of a Viscous Fluid Between Parallel Porous Walls," by D. Ye. Dolidze, Tbilisi Mathematics Institute imeni A. M. Razmadze, Academy of Sciences Georgian SSR; Moscow, Doklady Akademii Nauk SSSR, Vol 117, No 3, 21 Nov 57, pp 380-383

The study is based on work by Berman (A. S., J. Appl. Phys., 24, No 9, 1953), who treated the case of a two-dimensional stationary laminar flow of a viscous incompressible fluid between parallel porous walls when the porosity

of the walls was constant. Berman found that, if the axis  $x$  is parallel to the flow, the flow function can be written

$$\Psi^* (x,y) = (1 - \lambda^0 x) \Psi^0(y), \quad \lambda^0 = 2v^0/h\bar{u}(0),$$

where  $h$  = the distance between the walls,  $v^0$  the permeability rate, and  $\bar{u}(0)$  the averaged value of the linear velocity in the flow  $x = 0$ .

This article considers the case of a nonstationary flow when the porosity is a function of time alone; the flow characterized by the function  $\Psi^*$  is taken as the initial state.

#### Miscellaneous

#### 143. High-Pressure Laboratory Gas Compressor

"Gas Compressor for Investigations at Superhigh Pressures,"  
by L. F. Vereshchagin and V. Ye. Ivanov, Laboratory of the  
Physics of Superhigh Pressures, Academy of Sciences USSR;  
Moscow, Pribory i Tekhnika Eksperimenta, No 4, Jul/Aug 57,  
pp 73-77

The authors briefly discuss achievements in gas compressor design, citing the (Swiss) Amsler and Co. 4,000-atm machine as the maximum achievement.

Their objectives in the design of a gas compressor, the authors say, were maximum design simplicity, operational reliability, and minimum oil content in the compressed gas. It was decided on the basis of these considerations that a high degree of compression was needed.

The authors' experience in creating a hydraulic compressor for a pressure range of up to 12,000 atm facilitated an approach to the problem, somewhat unusual in that they decided to build a compressor operating with a compression rating of 100 or higher, while compressor building theory and practice stopped at ratings of 3-5.

A description of the compressor design is given and two drawings are included. Over-all dimensions are 1,650 x 580 x 1,750 mm. Test results are described and graphed, and lubricants are briefly discussed.

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"The compressor described [in the article] compresses gases to a pressure of 5,000-6,000 kg/sq cm. Its output is 120 cc/hr (compressed gas) with an input pressure of 100 kg/sq cm (from an ordinary gas bottle). Piston rate is 240 strokes/min. The compressor is belt-driven off a 5- to 7-kw electric motor. Nitrogen, hydrogen, ammonia, and isobutane gases have been subjected to compression."

144. Max Planck's Library Returned to East Berlin From USSR

Stockholm, Svenska Dagbladet, 21 Mar 58, p 17

The private scientific library of Max Planck, German physicist and Nobel Prize winner, which was shipped to the USSR after World War II, has been brought back to East Berlin, where it will be housed in the building of the East German Physical Society.

145. Radioactivity Measuring Instruments Produced in Czechoslovakia

"A Success of Our Technologists" (unsigned article), Bratislava, Pravda, 13 Feb 58, p 2

The "Metra" plant in Blansko has begun to manufacture instruments for measuring radioactive radiation, which up to now Czechoslovakia has imported. The instrument was constructed at the Research Institute for Electrotechnical Physics (Vyskumny ustav pre elektrotechnicu fyziku) in Premysleni near Prague. Its size is 105 by 165 by 55 millimeters, and with it is possible to measure the intensity of beta and gamma radiation anywhere where work is done with radioisotope or X-ray instruments. By the end of April Czechoslovakia will produce 1,000 units. At the same time it is preparing for production a similar instrument with a double indicator, with which it will be possible to determine the intensity of radiation by means of the deviation of a needle and with a headphone by hearing buzzing.

IX. MISCELLANEOUS

146. Doctoral and Candidates Dissertations Defended in Czechoslovak Academy of Sciences

"Doctoral Dissertations and Candidates Dissertations"  
(unsigned article), Prague, Vestnik Ceskoslovenske Akademie Ved, No 12, Jan/Feb 58, pp 116-119

In the second quarter of 1957, the degree of Doctor of Sciences was granted in the institutes of the Czechoslovak Academy of Sciences to the following persons on the basis of the successful defense of their dissertations.

Chemical Sciences Section

Institute of Chemistry

Dr Engr Josef Pliva -- "Utilization of Infrared Spectroscopy in the Study of the Composition of Terpene Compounds."

The work contains results of a systematic 9-year study of the infrared spectra of terpene compounds and relationships between the spectrum and the structure of these materials. A new method for the spectroscopic determination of carbon structures is described and confirmed by many examples. The characteristic frequencies of double bonds and keto groups in cyclical terpene compounds are observed. An important part of the work is the collection of data on the spectra and physical properties of terpene compounds, including more than 250 pure materials.

Frantsek Santavy, MD -- "Alkaloids of Colchicum Plants and Their Derivatives."

The work presents a survey of 20 years of effort by the author in the study of materials contained in autumn colchicum and related plants. The work includes not only the isolation of new alkaloids and the determination of their composition, but also a study of their quantitative determination and biological effectiveness. A study was made not only of the biological effectiveness of the newly isolated alkaloids and their derivatives, but also of a large series of derivatives, prepared from colchicimes. During this process, a material was accidentally discovered which retained its "stathmokinetic" properties at a reduced toxicity level and could be successfully used in curing myeloides leukemia.

Biological Sciences Section

Institute of Biology

Dr Albert Pilat -- "Czech Types of Champignons."

Institute of Physiology

Docent Jan Brod, MD -- "Chronic Pyelonephritis."

Technical Sciences Section

Institute for Electrical Engineering

Dr Engr Antonin Veverka -- "Electrical Testing (Prukaz) of Solid Insulators."

In the third quarter of 1957, the degree of Candidate of Sciences was awarded to the following persons in various institutes of the Czechoslovak Academy of Sciences on the basis of successful defense of their dissertations.

Mathematical and Physical Sciences Section

Institute of Astronomy

Lubor Kresak, Doctor of Natural Sciences -- "Distribution of Telescopic Meteor Trails."

Jaroslav Ruprecht -- "Dynamics of Galactic Star Clusters and Their Structure."

Chemical Sciences Section

Institute of Chemistry

Alexander Jakubovic, Doctor of Natural Sciences -- "The Influence of Factors From a Neoplastic Tissue Extract Containing Unstable Sulfur Compounds and the Effect of Elemental Sulfur on Tumor Development and the Hepatic Catalysis Activity of the Host."

Pavel Kourim -- "Synthesis of Pyrethrum Analogs."

Biological Sciences Section

Institute of Physiology

Stepan Figar, MD -- "Research on Functions of Human Peripheral Blood Vessels by the Graphic Method."

Jiri Parizek, MD -- "Castration by Cadmium."

Vaclav Vokac, MD -- "Protective Action of Stomach Mucus as a Specific Inhibitor of Pepsin in the Formation of Stomach Ulcers and the Influence on the Origin of These Lesions by Synthetic Pepsin Inhibitors."

Institute of Biophysics

Oldrich Necas, MD -- "Regeneration of Yeast Cells."

147. Czechoslovak Scientists in Hungary

"Foreign Scientists Arrived in Hungary on Study Tour" (unsigned article), Budapest, Magyar Nemzet, 12 Dec 57, p 5

Dionyz Ilkovic, Corresponding Member of the Czechoslovak Academy of Sciences, and Viliam Thurzo, Corresponding Member of the Slovak Academy of Sciences, arrived in Hungary on a study tour.

148. Polish Scientists in Budapest

"Polish Scientists Arrived in Budapest" (unsigned article), Budapest, Nepszabadsag, 17 Nov 57, p 4

On the basis of the Hungarian-Polish cultural agreement, the following Polish scientists arrived in Budapest:

Tadeusz Dziewanowski, chief assistant at the Technical University in Wroclaw, to study the organization and equipment of the Electrical Engineering Laboratory of the Budapest Technical University (Budapesti Muegyetem).

Andrzej Zieba, assistant professor at the Wroclaw Technical University, to acquaint himself with the work of the Hungarian Mathematics Institute (Magyarorszagi Matematikai Intezet).

Maria Wranska, lecturer at the Wroclaw Technical University, to visit the Chemistry Institute of the Budapest University of Sciences (Budapesti Tudomanyegvetem Kemiai Intezete).



149. Long-Term Agreement Between Academies of USSR and East Germany

"Scientists Work Together" (unsigned article), Berlin, Neues Deutschland, 31 Jan 58, p 1

An agreement concerning scientific cooperation during the next 3 years, and a [specific?] plan for scientific cooperation during 1958 were signed in Moscow on 30 January 1958 by a delegation of the German Academy of Sciences in Berlin and representatives of the Academy of Sciences USSR. Prof Dr Hans Falkenhagen, regular member of the German Academy of Sciences in Berlin, and K. V. Ostrovityanov, vice-president of the Academy of Sciences USSR, had held the preliminary negotiations leading to this agreement.

The agreement, the first between the two academies to extend over a 3-year period, calls for mutual support in solving scientific problems. Also, it provides for the annual exchange of major research subjects in order to assimilate them and for establishing projects which lend themselves to collaboration.

During 1958, 55 scientists from each country will travel to the other as guests of the host country's academy.

150. Hungarian Agricultural and Food Industry Scientific Society

"Agricultural and Food Industry Scientific Society Holds Special Session" (unsigned article), Budapest, Nepakarat, 15 Nov 57, p 2

The Hungarian Agricultural and Food Industry Scientific Society held a special session on 14 November 1957 to commemorate the 40th anniversary of the Great October Revolution.

Dr Gabor Torok, director of the Canned Goods, Meat, and Cold-Storage Industry Research Institute (Konzerv, Hus, es Hutoipari Kutato Intezet), presided over the meeting.

151. Yugoslav Forestry Expert Honored by Italian Academy

"Academician Ugrenovic Is Honorary Member of the Academy of Forestry Sciences in Florence" (unsigned article), Zagreb, Borba, 7 Feb 58, p 5

The Academy of Forestry Sciences in Florence has chosen Dr Aleksandar Ugrenovic as an honorary member. Ugrenovic is the best-known Yugoslav forestry expert. For many years he has been a professor at the University of Zagreb. In 1957, Ugrenovic was chosen to be an honorary member of the United Nations "Silva Mediterranea" organization. He is also a corresponding member of scientific institutions in Prague and Helsinki. His numerous scientific works in the field of forestry have made him highly respected throughout the world.

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