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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. ASTRONOMY

1. China Holds Conference of Hour System Workers

"Conference of Special Group on the Hour System," by Wang Yang, Peiping, K'o-hsueh T'ung-pao (Scientia), No 1, 1958, pp 31-32

Representatives of ten major institutions concerned with research in geodesy and allied sciences convened in Shanghai 9-11 October 1957 as a Special Group on the Hour System. The 3-day conference was called by Sikawei Observatory on behalf of the Department of Physics, Mathematics, and Chemistry of the Academia Sinica.

The conference discussed the trend of future developments in Chinese work on the hour system as well as the present work at Sikawei Observatory. Having observed some of the important aspects of time work at the observatory, such as astronomical chronometry, time signal broadcasting, receiving, and recording, and astronomical clock work, it made the following recommendations:

1. That a national hour system commission, with subsidiary subcommittees, be established under the leadership of the Department of Mathematics, Physics, and Chemistry, Academia Sinica, to promote the advancement of Chinese work.

2. That time service at Sikawei Observatory, which can meet the immediate astronomical and geodetic needs for time signals, be brought up to the level of work in advanced nations.

3. In order to raise the quality of time work at Sikawei, to promote the use of the hour system and better cooperation between hour system workers, and to investigate local factors in chronometry and longitudinal measurements, that additional chronometric stations be established at the following points and that Sikawei Observatory coordinate and use the data collected by the new stations: Purple Mountain Astronomical Observatory, State Bureau of Surveying and Cartography, Bureau of Geodesy and Cartography of the General Staff of the People's Liberation Army, Laboratory of Geodesy and Cartography of the Academia Sinica, and Wuhan Institute of Geodesy and Cartography.

2. Yugoslav Astronomer Studies in USSR

"Residence Study of Belgrade Astronomers in the Soviet Union"
Sarajevo, Oslobodjenje, 18 Feb 58, p 4

At the beginning of March, Vasilije Oskanjan, science associate of the Belgrade Astronomical Observatory, arrived in the Soviet Union, where he stayed at the invitation of the Soviet astrophysicist Professor Ambartsumyan, director of the observatory in Byurakan (Armenian SSR).

During a 6-month period in the USSR, the Yugoslav astronomer will study the methodology of research on variable stars, which he is also working on in the Belgrade Observatory. He will defend his doctoral dissertation before Soviet scientists.

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II. BIOLOGY

3. Importance of Nucleoproteids to Organisms and Viruses

"The Importance of the Nucleoproteids for the Origin and Subsistence of Organisms and Viruses," by H. Menze; Berlin, Das Deutsche Gesundheitswesen, Vol 12, No 26, 27 Jun 57, pp 815-820

On the basis of the assumptions that nucleoproteids select from heterosyntheses the material for autosynthesis, and that the effect of nucleoproteids is based on two properties of macromolecular nucleic acids, namely, their faculty of identical reproduction and for storing up a protein adequate for their configuration, the article draws the following conclusions:

The chemical behavior of nucleic acids affords two possible effects, the influence of the selection on the heterosyntheses and the production of specific proteins (ferments).

The identical reproduction of genes and the transfer of their specificity to gene products are based on the same mechanisms.

The development of the virus as a dysbiotic process took place at the same time as the development of life as a eubiotic process.

The stepwise action of the genes at the right time and at the right place in the course of evolution indicates mutual phylogenetic adaptation of the extent of autosynthesis to differentiations of heterosynthetic processes.

Life and its evolution have come about through the successive adjustment of heterosynthetic and autosynthetic functional units.

The polyphaenia of the genes and polygenesis of the characteristics do not pose insuperable difficulties to our understanding.

Concepts such as the control, model, and influence of the genes are not necessary for the explanation of the function of the genes.

It is known that the nucleoproteids are capable of identical reproduction, of self-duplication, of autosynthesis; and it is known that the materials necessary for the synthesis can be obtained only by forms which are capable of metabolism, thus by heterosyntheses, and must be selected from these syntheses. This selection process is known from the course of virus infections. Since viruses appear to be the best model for the genes, it is often considered reasonable to assume the same selection process for genes. Complex and successively adjusted biological heterosyntheses,

however, are only conceivable in things which have form and structure, which offer, at least temporarily, a certain separation and guidance for the possibilities of action on the part of chemical and physicochemical processes. Only those things can be ascribed "life" which exhibit form, structure, metabolism, reproduction, and, closely allied to the latter, heredity and mutation. For this reason, the occurrence of individual properties of "life" in nucleoproteids cannot be used as a basis for considering nucleoproteids "living substances," but rather only as an indication of the presence of one component of life, one process which helps to bring the many billions of molecules of a cell into a living entity.

4. Microtome Perfected

"Perfected Microtome," by M. S. Sominskiy, Candidate of Physicomathematical Sciences, Institute of Semiconductors, Academy of Sciences USSR (Leningrad); Moscow, Priroda, Vol 47, No 3, 1958, pp 73-74

After discussing the inconvenience and difficulties encountered in using carbon dioxide to freeze or keep tissue specimens frozen on the stage of the standard microtome produced by the Khar'kov Medical Equipment Plant, the author describes a special microtome stage developed by Ye. A. Kolenko of the Institute of Semiconductors, Academy of Sciences USSR, which employs a "semiconductor thermoelectric battery" (thermocouple device) to freeze the specimen. The thermocouple is positioned so that the cold junction is exposed and the hot junction enclosed in the body of the stage. The specimen is placed in contact with the cold junction and is completely frozen within 4-5 minutes. The actual temperature attained is measured with a spherical semiconductor microthermistor. The device can be operated under laboratory conditions on standard line voltages by employing a BSA 10 selenium rectifier or under field conditions by hooking it up to "any automobile generator." It requires only 2 volts at 10 amperes. Sections down to 2 microns can be made with the stage adapted to the standard Khar'kov microtome (after first removing the carbon dioxide stage). To supply the needs of scientific and teaching institutions, Leningrad Plant No 2 of the Ministry of Local Industry will begin production of this freezing stage and the required selenium rectifier. The microtome itself may also be obtained from this plant. An illustration of the semiconductor freezing stage and the microtome with which it is used accompanies the article.

5. Prof Rudolf Weigl, Polish Biologist, Dies

"Rudolf Weigl" (unsigned article), Warsaw, Medycyna Weterynaryjna, Nov 57, p 701

A Polish veterinary medicine monthly reports the 11 August 1957 death of Prof Rudolf Weigl, eminent biologist. Born in Przerow on 2 September 1883, he entered the Natural Science Department of the Jan Kazimierz University in Lwow in 1903. In 1907, he received his PhD, and in 1913, the degree of docent in zoology, comparative anatomy, and histology. During World War I he worked as a parasitologist in a military laboratory, and later did research on typhus, virus biology, and vaccine production. During the occupation period, Weigl was appointed to the Microbiology Chair of the Jagiellonian University in Krakow.

[For additional information on biology, see Item No 71.]

III. CHEMISTRY

Electrochemistry

6. Current Trends in Work on the Development of Fuel Cells

"The Fuel Cell," by D. Yu. Gamburg, Candidate of Chemical Sciences; Moscow, Nauka i Zhizn', Vol 25, No 1, Jan 58, pp 17-22

The principles of the operation of fuel cells and the advantages to be expected from the development of practically applicable cells of this type are reviewed. It is pointed out that persistent work is being done both in the USSR and abroad on the development of fuel cells with reliable operational characteristics and that a certain measure of success has been attained in this. Work on cells that operate at 700-900°C, burn gaseous fuel, and employ a solid electrolyte is regarded as most promising. It is stated that the solid electrolyte which is used must satisfy the conditions formulated by Schottky. These conditions are discussed in some detail. The design of a water gas fuel element proposed by E. Gorin (USA) is described. The author states that although Gorin's proposal appears to be of interest, fuel cells operating on different principles must also be regarded as promising on the basis of results obtained in the laboratory. Among cells which operate on principles different from that on which Gorin's cell is based, he mentions those proposed by Soviet scientists (O. K. Davtyan, P. M. Spiridonov). As an initial advantage to be expected from the use of fuel cells, a 10-20% increase in the efficiency of the conversion of chemical energy of the fuel into electrical energy is mentioned by the author. At the conclusion of the article it is stated that fuel cells, when they have been developed to the stage of industrial production, will be used principally in transportation (on railroad engines and ships), because they lack moving parts, are noiseless in operation, and furnish a direct current of low voltage. As another potential application of fuel cells, their use as a source of power at communication centers in areas which lack an electric power network is mentioned.

The author says that the use of natural gas in fuel elements and the generation of water gas for such cells on the basis of petroleum gasification and the employment of heavy petroleum residues must be regarded as very promising.

A bibliography consisting of five USSR references follows the article.

A comment by Academician A. N. Frumkin serves as an introduction to the article. Frumkin says in part:

"In evaluating the prospects of fuel cells, one cannot start from the results of thermodynamic calculations and compare these results with actual efficiencies of installations that operate on different principles, e.g., thermal plants for power generation. The reason is that nobody has succeeded as yet in constructing a fuel cell which operates on natural fuel or generator gas steadily enough or for a long enough time to make possible a determination of the actual efficiency of the cell.

"Notwithstanding this conservative estimate, I am of the opinion that in view of the great importance which must be attached to even a partial success in efforts to develop a fuel cell, work on this subject must be continued both as far as designing of highly efficient low-temperature gas cells and experimental research on high-temperature cells (particularly those operating on solid electrolytes) are concerned. Considerable progress in the last-mentioned line of research would become possible if a sufficiently well-conducting solid electrolyte were found through which the transportation of current would take place entirely by means of oxygen anions.

"One must at the same time remember that in the field of chemical sources of electric power other problems of great economic importance must be solved besides that of the fuel cell. Among them are those pertaining to the development of new sources of power with a high specific output and potential or of storage batteries which do not contain non-ferrous metals that are in short supply."

7. USSR Work on Fuel Cells

"The Fuel Will Not Burn," by Engineer L. Yur'yev; Moscow, Znaniye-Sila, Vol 33, No 3, Mar 58, pp 1-4

A fuel cell designed by O. K. Davtyan, which operates on gaseous fuel (e. g., generator gas) and employs a solid electrolyte, is described. It is stated to have an efficiency of 58% and to supply 5 kilowatts per cubic meter of cell volume. Fuel cells developed at Academician A. N. Frumkin's laboratory are also mentioned. These cells, in which hydrogen is oxidized, are said to have an efficiency in excess of 60%.

Industrial Chemistry

8. A Process for the Production of Hydrogen Fluoride by the Hydrolysis of Calcium Fluoride and Fluorite

"Kinetics of the Pyrohydrolysis of Calcium Fluoride and Fluorite Under Dynamic Conditions" by M. A. Mikhaylov, Far Eastern Affiliate, Academy of Sciences USSR, Izvestiya Vostochnykh Filialov Akademii Nauk SSSR, Novosibirsk, No 9, Oct 57, pp 64-68

The kinetics of the hydrolysis of calcium fluoride and fluorite (fluorspar) with steam flowing at a constant velocity were investigated at the temperatures of 1050°, 1150°, and 1250°. It was established that at 1250° the reaction of the hydrolysis of fluorite proceeds according to the Kolmogorov-Yerofeyev kinetic equation with a value of n close to unity. With the lowering of temperature the region to which this equation applies becomes more restricted; toward the end of the process, n has a tendency to increase. This is due to the effect produced by the solid reaction product, which is more pronounced at lower temperatures.

The investigation was carried out because conversion of fluorite by hydrolysis would be of particular interest from the standpoint of industrial application in the Far East, where considerable deposits of this mineral exist, but no sulfuric acid produced locally is available.

9. The Oxythermic Method for the Production of Calcium Carbide

"A Review of the Periodical and Patent Literature for 1954-1956 on the Production and Application of Calcium Carbide," by L. Morcz and B. Novikov; Moscow, Khimiya i Khimicheskaya Tekhnologiya, Vol 8, No 11 (94), Oct 57, pp 3-12

The use of oxygen blowing (the oxythermic method) in the production of calcium carbide is discussed on the basis of British, Danish, and German patents. It is stated that the oxythermic method, to which much attention is now being paid in the Western technical literature, is based on a principle originally developed in the USSR.

10. Separation of Uranium From Vanadium and Other Metals by Electrolysis in the Presence of Ethylenediaminetetracetic Acid

"Separation of Uranium by Inner Electrolysis in the Presence of Vanadium, Aluminum, Chromium, Nickel, and Cobalt," by Yu. V. Morachevskiy and I. A. Tserkovnitskaya, Leningrad, Vestnik Leningradskogo Universiteta, Vol 12, No 6, Seriya Fiziki i Khimii [Physics and Chemistry Series], No 3, May 57, pp 127-130

It has been established that uranium can be separated quantitatively by electrolysis from V, Al, Cr, Ni, and Co when Trilon B [ethylenediaminetetracetic acid] is present.

11. Determination of Uranium in Sea Water by Coprecipitation With Methyl Violet Thiocyanate

"Organic Coprecipitants; Part 8 -- Coprecipitation of Uranium for Its Determination in Sea Water," by V. I. Kuznetsov and A. A. Akimova, Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, Academy of Sciences USSR; Moscow, Zhurnal Analiticheskoy Khimii, Vol 13, No 1, Jan-Feb 58, pp 79-82

A method for the determination of uranium in sea water after this element has been separated by coprecipitation from other elements which are present is described. It was established that addition to acidified sea water of ammonium thiocyanate and methyl violet brings about quantitative coprecipitation of uranium with methyl violet thiocyanate even when uranium is present in a dilution as high as $1:10^{10}$. The precipitate formed in this manner was filtered off and ignited. The uranium present in the residue was determined radiometrically and by the fluorescence method in NaF beads, using an FM-42 fluorometer.

When coprecipitation of uranium with methyl violet thiocyanate is employed, other elements which form complex thiocyanate anions of insoluble thiocyanates (i.e., Hg, Ag, Bi, Zn, Cd, Mo, Fe^3, etc.) are also precipitated. Because these elements are present in very insignificant amounts in sea water, no difficulties arise in that respect. The precipitation of other elements besides uranium can be reduced considerably by adding the sequestering agent Complexon III.

Uranium contained in water from the Sea of Japan and Pacific Ocean water, and salt solutions to which uranium had been added was determined by the method described. This method was used in connection with work done for the Soviet Antarctic Expedition in 1956-1957 by V. M. Kutyurin on the diesel-electric ship Ob'.

[SIR Note: A paper on the determination of uranium by this method was presented by Kuznetsov and Akimova at the Conference on the Application of Radioactive Isotopes held in Moscow on 2-4 December 1957. Cf "Application of Radioactive Isotopes in Analytical Chemistry" by S. S. Rodin, Vestnik Akademii Nauk SSSR, Vol 28, No 2, Feb 58, pp 108-110, Item No 16, below.]

12. A Procedure for the Determination of Uranium, Thorium, and Ionium Present Together

"Determination of Uranium, Thorium, and Ionium in Marine Silts," by L. A. Kuz'mina, Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, Academy of Sciences USSR, Moscow, Zhurnal Analiticheskoy Khimii, Vol 13, No 1, Jan-Feb 58, pp 100-106

A method has been developed for the determination of uranium, thorium, and ionium in a single weighed sample. The completeness of the separation and radiochemical purity of thorium isotopes have been checked by means of tracers. This method was found suitable for the analysis of marine silts as well as of rocks, ores, and minerals. It is applicable at thorium contents from 5×10^{-5} to $x.10^{-4}$% when the uranium content is $x.10^{-4}$% and at uranium contents up to 70% when the ionium content is $x.10^{-4}$% (expressed in uranium equivalents). The absolute error in the determinations did not exceed 10-15%.

13. Similarity Between the Crystal Structure of $BiIn_2$ and That of Some Uranium Intermetallic Compounds

"New Data on the Structure of $BiIn_2$ and the Possible Structure of $TlBi_{1.27 \rightarrow 1.59}$, $NaHg_2$, UHg_2, UZr_2, and TiU_2," by Ye. S. Makarov, Institute of Geochemistry imeni V. I. Vernadskiy; Moscow, Kristallografiya, Vol 3, No 1, Jan-Feb 58, pp 5-9

X-ray investigation of a $BiIn_2$ single crystal showed that this compound has a structure of the Ni_2In type with a ratio of axes c/a = 1.197. It is assumed that $TlBi_{1.27 \rightarrow 1.59}$, $NaHg_2$, UHg_2, UZr_2, and TiU_2 have an analogous structure.

14. Applications of Complex Compounds in the Fields of Nuclear Energy and Semiconductor Technology

"Progress in the Field of the Chemistry of Complex Compounds," by Prof O. Ye. Zvyagintsev; Moscow, Khimicheskaya Nauka i Promyshlennost', Vol 3, No 1, Jan/Feb 58, pp 93-97

This article reviews the theoretical aspects of work on the chemistry of complex (coordination) compounds and current trends in this field as well as practical applications of compounds of this class. Particular attention is paid to work done in the USSR. A bibliography consisting of 16 USSR references and six non-USSR references is appended to the article. As far as practical applications are concerned, the following information is given:

Application of Complex Compounds in Field of Nuclear Energy

"It is known that within the next few years, five large nuclear electric power stations with a capacity of 400-600,000 kw each will be erected in the USSR. These power stations will operate on thermal neutrons, using as fuel uranium dioxide or metallic uranium. The protective coating for these power reactors is being made of a zirconium alloy (cf I. V. Kurchatov, "Some Problems of the Development of Nuclear Power," Pravda, 20 May 1956).

"In connection with this one must first of all mention the problem (that has been partly solved) concerning the development of a basis for the production of pure initial materials for nuclear reactors, namely of uranium, thorium, zirconium, graphite, etc. Very high requirements in regard to purity are put to these materials, especially as far as the content of some impurities is concerned. For instance, uranium must not contain boron in quantities exceeding one 10,000th part of 1% and zirconium must be free of hafnium.

"The refining of thorium, uranium, zirconium, and other materials is completely or almost completely based on the application of the chemistry of complex compounds. For instance, in many cases uranium is obtained by the so-called carbonate method. This method involves conversion of uranium into the complex compound $Na_4 [UO_2 (CO_3)_3]$ which is soluble in water, while iron, aluminum, manganese, and other impurities remain in the insoluble residue under the conditions applied. To purify uranium, a compound investigated by P. G. Melikov and L. V. Pisarzhevskiy is also used, viz., peruranic acid which is obtained by the action of hydrogen peroxide on solutions of uranium salts according to the following formula:

$$U O_2 (NO_3)_2 + 3 H_2 O_2 \rightarrow H_2 U O_6 \cdot 2 H_2O + 2 H NO_3$$

"A high degree of purification of uranium from admixtures is achieved by its precipitation in the form of peruranic acid.

"Metallic thorium is obtained by the electrolysis of a mixture of fused salts of thorium with sodium chloride and potassium chloride. As thorium salts for electrolysis, complex compounds are used which are obtained by fusing ThF_4 with KF, namely $KThF_5$, and K_2ThF_6.

"Another still more complex, but very important, problem is the treatment of products of the reactions taking place in nuclear reactors. These products consist for the most part of unconsumed nuclear fuel and contain fission (splinter) products formed from this fuel as well as newly formed heavy atoms of plutonium or of the uranium isotope U^{233}.

"The separation of complex mixtures of compounds of different elements is based on a number of methods, namely:

a. Precipitation of some elements in the form of insoluble compounds while others remain in solution;

b. Conversion of some elements into volatile compounds and distillation of these elements in the form of such compounds;

c. Conversion of some elements into compounds soluble in organic solvents, so that extraction of these elements can be carried out;

d. Selective adsorption of some elements on adsorbents and separation by washing out these elements from the adsorbents (chromatography).

"Simple compounds of the elements being separated can be employed very rarely; in the majority of cases one must use complex compounds.

"As an example of precipitation in the form of complex compounds one may mention the separation of uranium in the form of ammonium diuranate $(NH_4)_2U_2O_7$, which is insoluble in water, or in the form of the complex compound with sodium acetate which has the formula $NaUO_2(CH_3COO)_3$. As an example of a separation by means of distillation one may mention the distillation of thorium at 150° in the form of a complex compound, i. e., thorium acetylacetonate.

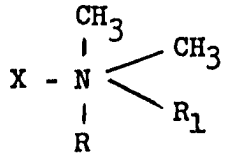
"Data are available on the separation of complex compounds of plutonium and uranium by extraction. Thus, for the separation of uranium and thorium from admixtures and from fission elements extraction with tributyl phosphate is used. Tributyl phosphate (TBP) is immiscible with water and with aqueous solutions. It dissolves readily complex compounds of uranium and thorium nitrates, which form the compounds $UO_2(NO_3)_2 \cdot 2\,TBP$ and $Th(NO_3)_4 \cdot 4\,TBP$ with this solvent.

CPYRGHT

"The compounds described by these formulas are unstable and can exist in solution only at low values of the p_H. When the acidity is lowered [i. e., the p_H raised], they decompose. This is utilized for subsequent re-extraction of uranium and thorium from the organic solvent. It proved possible to select such values of p_H that uranium and thorium can be re-extracted separately. Their separation is achieved by this means.

"This method is also used for the separation of uranium and plutonium from fission products and for the separation of plutonium from solutions in which it is present together with uranium.

"Quaternary ammonium salts react with salts of quadrivalent plutonium in nitric acid solutions, forming complex compounds of the type $Pu(NO_3)_6 \cdot (NR_4)_2$, which can be extracted with organic solvents containing chlorine or with aromatic hydrocarbons. The quaternary ammonium salts which are employed belong to the type



where R and R' are aliphatic radicals with 8, 10, or 12 atoms of carbon. The compounds of plutonium can be easily extracted and separated from uranium, which remains in the aqueous solution.

"The concentration and elimination of radioactive fission elements from solutions after treatment of the nuclear fuel presents considerable difficulties. Many of these splinter elements can be adsorbed on ferric hydroxide and other adsorbents. However, others are persistently retained in solutions, as for instance, ruthenium, which is present in solutions in the form of two radioactive isotopes, i. e., Ru-103 and Ru-106. It was established that a certain part of the ruthenium cannot be precipitated from solutions readily because of the formation of complex compounds of this metal which contain the nitrosyl group NO. These complex compounds are very stable and do not interact with the precipitating reagents. Investigations which have been conducted on the subject establish that these complex compounds have compositions corresponding to the formulas $Ru\ NO\ (NO_3)_2 \cdot 2H_2O$ and $Ru\ NO\ (NO_3)_2 \cdot 3\ H_2O$. With nitric acid these compounds form the complex acid $H[Ru\ NO\ (NO_3)_3]$, from which salts are derived. Some of these salts have been investigated; they proved very stable and resistant to chemical action.

"At present, as is known, we are faced with task of utilizing the energy of thermonuclear reactions. The solution of the problems involved in this necessitates the refining (purification) of a number of substances; undoubtedly, a new series of complex compounds of elements used in this connection will be required (cf. I. V. Kurchatov, "Concerning the Possibility of Developing Controllable Thermonuclear Reactions," Pravda, 10 May 1956).

Application of Complex Compounds in Production of Semiconductor Materials

"The application of very small germanium crystals instead of tubes makes it possible to reduce by many times the dimensions of radio receivers and other electronic devices. This application of germanium became possible because of the development of methods for refining this metal by means of which the content of impurities (arsenic, antimony) could be brought down to very low level, i. e., that of one atom of impurities per 10^{10} atoms of germanium.

"In addition to germanium, silicon of high purity is used in technology. Other semiconductor materials and alloys are also prepared from ultra-pure substances. All of this requires extensive development of methods for the refining of different substances. These methods are based to a considerable extent on the application of complex compounds with the use of which selective precipitation, extraction with organic solvents, distillation, factional crystallization, and purification by other methods is carried out.

"The selenium which is used in semiconductor technology is purified over sodium selenite and sodium selenate. Tellurates are also used for purification in semiconductor technology. Furthermore, complex compounds are employed in the separation and purification of antimony.

Application of Complex Compounds in Metallurgy

"Hydrometallurgical methods for the separation of nonferrous metals and of rare, dispersed, and noble metals from ores, and also procedures for the purification of these metals are based to a considerable extent on the application of complex compounds. The following table lists some complex compounds applied in hydrometallurgy:

Complex Compounds Used in Hydrometallurgy

Metal	Complex Compound	Purpose for Which Complex Compound is Used
Tantalum	$K_2[TaF_7]$	Separation of niobium from tantalum
Niobium	$K_2[NbOF_5] \cdot H_2O$	
Molybdenum	$Me_2[MoO_4]$	
	$(NH_4)_3H_4[P(Mo_2O_7)_6]$	Isolation of metal from solutions
Tungsten	$Me_2[WO_4]$	
Beryllium	Na_2BeF_4	Extracted with water from products of sintering of beryllium concentrate
Rhenium	$K[ReO_4]$	Intermediate compounds in purification and reduction of rhenium
	$(NH_4)_2ReCl_6$	
	$(NH_4)ReCl_4$	
Vanadium	$Ca(VO_3)_2$	Precipitation of vanadium
	$H_7[P(V_2O_6)_6]$	Obtained in leaching out concentrates
	$H_7[P(Me_2O_7)_3(V_2O_6)_3]$	
Titanium	$BaTiO_3$	Has an exceptionally high dielectric constant
Gold	$Ca[Au(CN)_2]_2$	For extraction of gold from ores
	$H[AuCl_4] \cdot 4H_2O$	In electrolytic refining of gold
Silver	$Na[Ag(CN)_2]$	For extraction from ores
	$[Ag(NH_3)_2]OH$	" " " "

Metal	Complex Compound	Purpose for Which Complex Compound Is Used
Mercury	$Na_2[HgS_2]$	For extraction from ores
Antimony	$Na_3[SbS_3]$	" " " "
Copper	$[Cu(NH_3)_5]SO_4$	In oxidative ammonia leaching from ores
Nickel	$[Ni(NH_3)_6]SO_4$	" " " " " " "
Cobalt	$[Co(NH_3)_6]SO_4$	" " " " " " "
Platinum	$(NH_4)_2[PtCl_6]$	For production of pure metal
	$[Pt(NH_3)_2Cl_2]$	" " " " "
Palladium	$[Pd(NH_3)_2Cl_2]$	" " " " "
Rhodium	$[Rh(NH_3)_3(NO_3)]$	" " " " "
Iridium	$(NH_4)_2[IrCl_6]$	" " " " "
Osmium	$[OsO_2(NH_3)_4]Cl_2$	" " " " "
Ruthenium	$[Ru(NH_3)_5NO]Cl_3$	" " " " "

"Complex compounds play an important role in a number of processes employed in the following fields of chemical technology and chemistry: the production of inorganic fertilizers, the production of chemicals used for controlling pests that damage agricultural plants, the manufacture of drugs, the production of dyestuffs, the production of synthetic fibers, the silicate industry, and present-day analytical chemistry."

In the general part of the article, theoretical work on complex compounds is reviewed with particular attention to stereochemical investigations and to work done in the USSR and abroad on the thermodynamics of reactions by which complex compounds are formed. It is stated that research on equilibria in solutions of complex compounds is conducted in the USSR by a number of investigators, including A. K. Babko at Kiev, P. Komar' at Khar'khov, and K. B. Yatsimirskiy at Ivanovo. It is also stated that important research in the field of complex compounds is being conducted at Kiev, where investigations are being done on the behavior of complex compounds in solutions, mainly nonaqueous solutions.

As far as the literature on the chemistry of complex compounds is concerned, the author states that the best work in this field published hitherto is Vvedeniye v Khimiyu Kompleksnykh Soyedineniy (Introduction Into the Chemistry of Complex Compounds) by A. A. Grinberg, Second Edition, 1951, which has been translated into German, Polish, Chinese, and other languages. Furthermore, he states that among monographs on complex compounds, Termokhimiya Kompleksnykh Soyedineniy (The Thermochemistry of Complex Compounds) by B. K. Yatsimirskiy, Academy of Sciences USSR, Moscow, 1951, is of great value and that the same is true of the book Konstanty Nestoykosty Kompleksnykh Soyedineniy (The Dissociation Constants of Complex Compounds), apparently also by Yatsimirskiy. The author concludes his article with the following statement:

"In accordance with the decisions of the Seventh All-Union Conference on the Chemistry of Complex Compounds held in 1956, the attention of investigators must be concentrated on the following problems:

"1. Investigation of a greater number of complex-forming elements and compounds and groups with different types of structure that add to these elements; expansion of research on the structure and quantitative physicochemical characteristics of complex compounds.

"2. Reinforcement of theoretical work on the chemistry of complex compounds, particularly with the application of quantum mechanics in studies of chemical bonding.

"3. Development of the chemistry of heteropolycompounds and isopolycompounds as well as of compounds of metals with oxyacids and of complex compounds of nonmetallic elements; a considerable expansion of research on nonaqueous solutions.

"4. Expansion of research on the theory of solutions, crystal chemistry, physicochemical analysis, thermodynamics, and chemical kinetics of complex compounds with the application of diverse up-to-date methods of investigation including the use of tracer atoms, application of methods of proton magnetic resonance, etc.

"5. Investigation of the mutual influence of atoms in complex compounds and expansion of research in this field to cover a broad range of compounds of different elements in different valancy states.

"6. Expansion of research on the synthesis and properties of complex compounds that are applied in technology, analytical chemistry, biochemistry, medicine, and other fields."

[For additional information on nuclear chemistry and technology see Item No 23.]

Organic Chemistry

15. Dealkylation of Isomeric Tributenyl Phosphites

"Dealkylation of Isomeric Tributenyl Phosphites With Hydrogen Chloride," by A. N. Pudovik, Kazan State University, Moscow, Zhurnal Obshchey Khimi, Vol 27, No 10, Oct57, pp 2755-2760

The dealkylation of tri-n-butyl phosphite, triallylphosphite, tricrotyl phosphite, and tri-(alpha-methylallyl) phosphite with hydrogen chloride was investigated without a solvent and also in an ether solution. The reactions between phosphorus trichloride and the following alcohols were also investigated: n-butyl, allyl, crotyl, and methylvinyl carbinol. The results proved to be identical. Thus, in the case of the dealkylation of tributylphosphite and the action of phosphorus trichloride on n-butyl alcohol, dibutylphosphorous acid was obtained in good yield. The same held true for analogous experiments with allyl alcohol and triallylphosphite and the resulting diallylphosphorous acid; however, the yield was lower in the case of isomeric butenols and tributenyl phosphites which formed an isomeric mixture similar in composition, and phosphorous acid.

Tributenyl phosphites are intermediate compounds in the reaction of phosphorus trichloride with butenols. Their primary dealkylation takes place in accordance with the Arbuzov rearrangement. The possible mechanism of further dealkylation of acid esters of phosphorous acid under the action of hydrogen chloride is discussed.

M. V. Ivanova participated in the experimental part of the work.

16. New Insecticides

"From the Field of Organic Insectofungicides. XXX. Synthesis of Certain Derivatives of 1-Methylcyclopentanedione-2, 3," by N. N. Mel'nikov and K. D. Shvetsova-Shilovskaya, Scientific Institute for Fertilizers and Insectofungicides; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 2, Feb 58, pp 474-476

With the purpose of finding new active insecticides, a number of complex esters of the enol 1-methylcyclopentanedione-2, 3 that have not been described in the literature have been synthesized. Investigation of their insecticidal properties, indicated that the dione esters of acetic, butyric, carbaminic, acids, and methoxy and ethoxy groups, were not active. Esters of dialkoxythiophosphoric acid are active.

"From the Field of Organic Insectofungicides. XXXI. New Method for Preparing Mixed Esters of Thiophosphoric Acid," by N. N. Mel'nikov, Ya. A. Mandel'baum, and V. I. Lomakina, Scientific Institute for Fertilizers and Insectofungicides; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 2, Feb 58, pp 476-478

The reaction of sodium diethylthiophosphate with aromatic diazo compounds was investigated. It was found that sodium diethylthiophosphate reacts with aryldiazonium in two tautomeric forms with the formation of mixed esters of thiophosphoric acid.

18. Synthesis of Thiophosphoric Acid Esters

"From the Field of Organic Insectofungicides. XXXII. Synthesis of Certain Mixed Esters of Thiophosphoric Acid," by Ya. A. Mandel'baum, N. N. Mel'nikov, and N. I. Petrova, Scientific Institute for Fertilizers and Insectofungicides; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 2, Feb 58, pp 479-480

A new, simple method was developed for the preparation of mixed esters of thiophosphoric acid with yields ranging from 70 to 94%. The method is based on the reaction of dialkylchlorothiophosphates with alcohols in the presence of sodium hydroxide. The majority of the compounds thus synthesized have not been described in the literature.

19. New Insecticides Synthesized

"From the Field of Organic Insectofungicides. XXXIII. Synthesis of Certain Derivatives of 4, 7-Endomethylenetetrahydroindane," by S. S. Kukalenko, N. N. Mel'nikov, T. I. Naryshkina, and N. I. Shuykin, Scientific Institute for Fertilizers and Insectofungicides and the Institute of Organic Chemistry Academy of Sciences USSR; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 2, Feb 58, pp 480-481

In the reaction of hexachlorocyclopentadiene with 3-methylcyclopentadiene-2, 4, an adduct of the composition $C_{11}H_8Cl_6$ is formed. Chlorination of this adduct leads to the formation of mono and dichloro derivatives. Bromination leads to the formation of the monobromo derivative. None of the synthesized compounds appear in the literature. In regard to insecticidal activity, they are weaker than chlordane.

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20. New Therapeutic -- Armin

"Armin," by T. Soldatova, Moscow, Nauka i Zhizn', No 2, Feb 58, pp 79

"The Kazan Chemico-Technological Institute developed a new therapeutic agent called Armin. The preparation belongs to a group of complex esters of alkylphosphonic acids. When pure, armin is a yellow-orange liquid that is soluble in water and other organic solvents.

"Armin is used in the treatment of various forms of glaucoma in cases where it is necessary to bring about a drastic contraction of the pupil (perforation of the cornea, prolapsis of the crystalline lens, etc.)

"Clinical observations at the State Scientific-Research Institute of Eye Diseases imeni Helmholz indicated that Armin lowers the internal eye pressure in patients afflicted with glaucoma without causing any serious side effects.

"By a decision of the Pharmacological Committee of the Scientific Medical Council of the Ministry of Health USSR, the new preparation has been assigned for use in medical practice. At present, it is in production and is entering the network of apothecaries."

21. Parasympathicolytic Furan Derivatives Synthesized

"Research in the Field of Furan Derivatives. Communication XI. Synthesis of Certain Esters of 5-Dialkylaminomethylfuran-2-Carboxylic Acids and Their Salts," by A. L. Midzhoyan, Academician of the Academy of Sciences Armenian SSR, V. G. Afrikyan, and M. T. Grigoryan, Laboratory of Pharmaceutical Chemistry Academy of Sciences Armenian SSR; Yerevan, Doklady Akademiya Nauk Armyanskoy SSR, Vol XXIV, No 2, 1957 pp 73-84

Furfuryltrimethylammonium iodide is being used as a substitute for pilocarpin. This compound, also known as furmethide and furamon, is capable of causing miotic action, contracting the pupil, and decreasing the internal eye pressure. Chemically, the only similarity between furamon and pilocarpin is the five-membered ring with the oxygen bridge. The parasympatheticomimetic properties of furamon induced the authors to investigate other furan compounds for the purpose of synthesizing parasympatheticolytic compounds. A number of these compounds were synthesized by chlorination or bromination of alkyl esters of 5-halogeno-methylfuran-2-carboxylic acids. Comparison of the pharmacological properties of the synthesized compounds with those of furamon, indicates that the inclusion of an alkoxycarbonyl group in the structure of the latter changes its cholinomimetic properties to those of cholinolytic.

Radiochemistry

22. Additional Discussion of USSR Papers Presented at the UNESCO Conference on the Application of Radioactive Isotopes

"An International Conference on the Application of Radioactive Isotopes in Scientific Research," by Academician A. V. Topchiyev; Moscow, Khimicheskaya Nauka i Promyshlennost, Vol 3, No 1, Jan/Feb 58, pp 116-117

[SIR Note: This report supplements the information on USSR papers given in another report concerning the UNESCO International Conference on the Application of Radioactive Isotopes held 9-20 September 1957 at Paris, i.e., "Application of Radioactive Isotopes in Scientific Research," by P. Savitskiy, E. Finkel', V. Serenko, and N. Bulatova, Atomnaya Energiya, Vol 4, No 1, Jan 1958, pp 92-96; see Scientific Information Report No 6. Papers not mentioned in the Atomnaya Energiya article are discussed in and the significance of papers mentioned there is evaluated from a different point of view.]

Great interest was elicited by a report of V. L. Karpov on the unique K-20,000 installation [a gamma installation with a Co^{60} source that has an activity equal to 21,000 gram equivalents of radium] which was erected at the Physico-Chemical Institute imeni L. Ya. Karpov and is superior to all others in existence as far as its activity and the magnitude of the dose that can be achieved with its aid are concerned.

The British investigator Sadington described a method for the preparation of cesium-134 sources with an activity of 1,000-200,000 curies and a specific activity up to 20 curies per gram.

In a paper not scheduled in the program of the conference, V. I. Spitsyn, Corresponding Member Academy of Sciences USSR, made a communication in regard to the ferrocyanide method for the extraction and concentration of cesium-137 on an industrial scale which was developed in the USSR. The discussion that followed indicated that the USSR method is superior as far as its technical characteristics are concerned to analogous methods developed in England and France.

A report by K. K. Aglintsev and others described the results of an investigation of electron spectra which are of importance in the dosimetry of beta- and gamma-radiation. Research on this subject is necessary for the determination of the efficiency of dosimetric and other measuring devices under different conditions.

The meetings in the subdivision of metal physics and metallurgy consisted chiefly of the discussion of reports presented by Soviet scientists. Work on the industrial application of radioisotopes was weakly represented: there were only six reports in this field of which three were USSR.

Reports made by USSR scientists on the application of radioactive isotopes in the investigation of the structure of chemical compounds and the mechanism and kinetics of chemical reactions were on the whole of a general type and contained in addition to extensive experimental data a discussion of fundamentally new methods and results.

A paper by A. B. Nalbandyan, M. B. Neyman, and N. M. Emanuel' discussed the so-called kinetic isotope method for the investigation of the mechanism of complex reactions. This method is based on changes in the specific radioactivity of individual components of a reaction system and has been successfully applied by the authors of the paper for the clarification of the mechanism by which methane, propene, butane, and other compounds undergo oxidation.

The kinetic isotope method was applied in the work of Academician A. A. Balandin and collaborators for the investigation of the mechanism of the catalytic dehydrogenation of butane to butadiene.

In work done by A. I. Brodskiy, Corresponding Member Academy of Sciences USSR, and G. P. Miklukhin, the mechanism of the reactions of the formation and transformations of polythionates was investigated with the aid of S-35. By using the radioactive isotope of sulfur, the authors of this paper investigated reactions of the isotopic exchange of this element in various organic compounds. The data which have been obtained in the work in question are of importance for technological processes such as the vulcanization of rubber, the desulfurization of various products, etc.

New data which clarify certain characteristics of the mechanism of catalytic processes were reported in a paper by S. Z. Roginskiy, Corresponding Member Academy of Sciences USSR. The nature of the intermediate products which form on the surface of the catalyst during a number of catalytic processes was investigated. Results of the application of isotopes in investigations of the structure of the surface of solid catalysts were also reported. By using the so-called differential isotope method, quantitative data were obtained on the non-uniformity of the distribution of energy over the surface of many catalysts.

V. I. Spitsyn, Corresponding Member Academy of Sciences USSR, reported results obtained by the application of isotope methods in the investigation of the structure and properties of high-molecular inorganic substances, the so-called heteropoly compounds. Compounds of this class are being used at present in the production of antibiotics, the production of dyestuffs, and the separation and purification of radioactive isotopes.

A report by S. S. Medvedev on the radiation polymerization of a number of monomers was received with great interest. Principal attention in the report was paid to the radiation polymerization of ethylene. The results obtained in the work described confirm the great practical importance of the employment of polymerization reactions initiated by nuclear radiation.

A session which dealt with the investigation of fission products in the soil, plants, and animal organisms was of great interest from the standpoint of the danger to human health arising in connection with continued testing of nuclear weapons. An extensive report on the subject was presented by Academician V. N. Klechkovskiy, Member of the All-Union Academy of Agricultural Sciences imeni Lenin.

Animated discussions were held at the sessions on the physiology and biochemistry of plants. At the conclusion of a general discussion, the scientists of all nationalities agreed with the fundamental ideas in regard to the circulation of substances in plants which had already been developed several years ago by the Institute of Plant Physiology, Academy of Sciences USSR.

23. A USSR Conference on the Application of Radioactive Isotopes in Analytical Chemistry

"Application of Radioactive Isotopes in Analytical Chemistry (A Conference at Moscow)" by S. S. Rodin, Vestnik Akademii Nauk SSSR, Vol 28, No 2, Feb 58, pp 108-110

A conference on the application of radioactive isotopes in analytical chemistry was held in Moscow on 2-4 December 1957. This conference had been organized by the Commission on Analytical Chemistry at the Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, Academy of Sciences USSR. Approximately 450 scientific workers from 40 cities of the Soviet Union participated in the conference. A number of foreign scientists also participated, among them Shu Ch'uang-liang, Eng [Wu ?] Jeng-ying, and Liu Ch'ing-i (China); I. M. Kolthoff (USA); G. Irving (Great Britian); R. Pribyl, I. Kerbl, J. Maly, I. Vodehnal, and V. Bezdek (Czechoslovakia); J. G. Minczewski (Poland); L. Erdei, and A. Schner (Hungary); L. S. Iutundzic, N. V. Susic (Yugoslavia); N. I. Petrov (Bulgaria); and C. Dragulescu (Rumania).

A number of reports was on the subject of the development of analytical methods in which radioactive isotopes are employed.

I. P. Alimarin read a report on the application of the method of isotope dilution (with the use of the radioisotopes Nb^{95}, Zr^{95}, and Ta^{182}) for the quantitative determination of some rare elements without separating them completely. The last circumstance makes this method particularly valuable in the investigation of elements for which satisfactory methods of determination are not available. The method that has been developed was tried out in the analysis of rocks and alloys.

The method of isotope dilution (with the application of C^{14}) was used for the determination of lower alcohols in products of the oxidation of propylene and butane. A report on this subject was presented by N. V. Neyman, B. Ya. Yefremov, and V. N. Panfilov.

A method of multiple radioactive [isotope] dilution for the determination of small quantities of impurities (of the order of 10^{-7} -10^{-4}%) was proposed by G. S. Rozhavskiy and I. Ye. Zimakov.

A report on the quantitative determination by a radioactivation method of microquantities of impurities (6×10^{-6} -5×10^{-5} %) consisting of nickel, cobalt, copper, tellurium, arsenic, and antimony in iron oxide was reported by A. I. Kulak. A report by V. B. Gaydaymova and L. I. Il'ina attracted attention in which a procedure was discussed for the analysis by the method of beta-ray reflection of samples of tantalum-niobium alloys exhibiting different physical properties. Twelve samples of specially prepared alloys of niobium with tantalum were analyzed in this manner. The content of either component in these alloys ranged from 2 to 98 %. The absolute error in all cases did not exceed 0.5 %. The time required for the analysis was 3-5 minutes.

I. Ye. Starik reported on a method developed in his laboratory by means of which, with the aid of the isotope U^{233}, microquantities (10^{-8} -10^{-5} grams) of uranium can be separated completely from weighable quantities of iron when the U content corresponds to a ratio of U: Fe = 1:10^{5}. The method that has been proposed makes it possible to increase considerably the precision of the determination of unweighable quantities of uranium present in natural formations.

A method for the coprecipitation of uranium with a methyl violet thiocyanate precipitate was proposed by V. I. Kuznetsov and T. G. Akimova. This method makes it possible to coprecipitate uranium quantitatively even when this element is present in dilutions as high as 1:10^{10}. To check this method water from the Sea of Japan and the Pacific Ocean was tested.

Professor Irving reported on the determination of indium in rocks and minerals by means of a radioactivation method. The method that has been described by him is applicable to samples containing indium in quantities as low as 3×10^{-9} grams. The precision of the method is better than ± 10%. This method has a number of important advantages as compared with the spectrometric method of determination.

K. V. Yatsimirskiy reported on the determination of phosphate, sulfate, and molybdate by radiometric titration procedures with the use of a complex compound of Co^{60}. The titration was carried out with luteochloride containing Co^{60} [luteol cobalt chloride?].

Two new methods for the determination of metals present in trace quantities were described by K. V. Troitskiy. One of these methods is based on the different velocities of the evaporation of ultra-small quantities of elements depending on the concentration, while the other is based on ion exchange between the suspension of a radioisotope plus carrier and ions of the element being analyzed.

Some specific characteristics of radiochemical analysis were described in a report by A. K. Lavrukhina. She discussed the specific behavior of ultra-small quantities of radioisotopes and the experimental difficulties which arise in work with ultra-small quantities of substances. She also made suggestions on the expedient employment of different procedures for the isolation of elements in a radiochemically pure state.

I. M. Kolthoff reported on the application of the radioactive isotope Th B (Pb^{212}) in the investigation of crystalline precipitates. He used the dyestuff wool violet for the determination of the adsorbing surface and also to prevent the aging of precipitates.

Kolthoff considered theoretical problems pertaining to the aging of precipitates, using for the interpretation of his results the Frenckel effect and the Schottky effect. The work in question is of importance from the analytical standpoint, because the recrystallization methods used in this work make it possible to achieve a high degree of purification of the precipitate.

A paper by M. M. Senyavin dealt with the problem of the use of radioactive isotopes in chromatography. The author of this paper arrived at some general conclusions concerning the optimum conditions for the chromatographic separation of mixtures consisting of small quantities of substances or of mixtures consisting of microcomponents and macrocomponents. He pointed out a number of problems in chromatography which on the basis of theoretical considerations cannot be solved without the use of radioisotopes.

On the example of complex compounds formed by zirconium and hafnium with oxalic acid, A. N. Yermakov, V. K. Belyaeva, and I. N. Marov demonstrated that it is possible to apply anionites for the determination of association constants of multiply -- charged ions which form stable complexes in strongly acidic solutions.

In some reports, problems pertaining to coprecipitation and the determination of solubility were discussed.

The determination of the solubilities of salts in nonaqueous solvents by methods involving the use of radioactive tracers was described by N. A. Izmaylova and V. S. Chornyy.

The coprecipitation of francium with different precipitates was investigated with the aid of the shortlived radioactive isotope Fr^{212} by A. T. Lavrukhina and S. S. Rodin. This isotope was isolated from uranium and thorium targets which had been bombarded with protons of an energy of 680 Mev on the synchrocyclotron of the Laboratory of Nuclear Problems, Joint Institute of Nuclear Research. After noting that one can separate francium from rubidium with the aid of ferrocyanides, I. V. Tananayev pointed out that it is possible to use ferrocyanides for the separation of francium from cesium. He proposed that a number of mixed ferrocyanides be used for the coprecipitation of francium.

Other reports dealt with the application of radioactive tracers for the checking of methods used to separate niobium (U. I. Bykovskaya) and a method employing radioactive tracers for the control of the production of rare metals (A. A. Grizik and N. I. Marunina). Furthermore, methods involving the application of Ca^{45} for the determination of nonmetallic occlusions in steel (M. I. Tsekhanskiy, N. I. Shishkina, K. V. Khusnoyarov, and G. D. Susloparov), the application of Cl^{36} for the quantitative determination of the content of hexacyclohexane isomers in technical hexachlorane (P. V. Zimakov and L. A. Krasnousov), and the application of tracer atoms for the determination of the efficiency of the fractionation of gaseous hydrocarbons (K. I. Karasev) were described.

Miscellaneous

24. Chinese Establish New Ideograms for Elements 99-102

"The Law of Periodicity," by Pin Sheng; Peiping, K'o-hsueh Ta-chung (Popular Science), No 3, 1958, pp 126-127

This article presents an academic explanation of the periodic system of elements. Mendeleyev's Periodic Table is reproduced with new Chinese ideograms for Elements 99-102 as follows:

Eisteinium (鍽)

Fermium (鐨)

Mendelevium (鍆)

Nobelium (鍩)

[SIR Note: Another report gives the pronounciation of these Chinese ideograms, which, when romanized by the Wade-Giles system would be ai, fei, men, and no, respectively.]

IV. EARTH SCIENCES

25. Electrical Anemometers in Macedonia

"First Electrical Anemometer Constructed in Skoplje," by D. Jordanovski, Skoplje, Nova Makedonija, 27 Feb 58, p 6

Dusko Trpkovski, a white-collar worker in the Hydrometeorological Establishment (Hidrometeoroloskiot zavod) in Skoplje, has constructed the first electrical anemometer. The meteorological station in Bitolj up to now has been the only station in Macedonia equipped with such an instrument, which, however, had been built abroad. A commission of experts has been set up at the Hydrometeorological Establishment to test the instrument for accuracy in indicating wind direction and speed and to decide whether it is suitable and should be installed in the synoptic station in Ohrid.

The Hydrometeorological Establishment is planning to construct many more such instruments and to supply a network of meteorological stations in Macedonia in 1958. The commission has proposed that Dusko Trpkovski be publicly honored and monetarily rewarded for his initiative and labor in the design and construction of the electrical anemometer.

26. Yugoslav Meteorologists on Trial

"Meteorologists on the Accused Bench" (unsigned article), Novi Sad, Dnevnik, 1 Apr 58, p 10

The trial of two noted meteorologists was to begin on 1 April 1958 before a council of the District Court in Belgrade. Prof Ante Obuljen and Aleksandar Koljcicki have been accused of violation of Paragraph 212 of the Criminal Code, which refers to the perpetration of fraud in one's occupation. The investigating judge has assembled the statements of the private complainants, in order that the case will give an exact picture of the damage committed by the meteorologists with their forecasting.

The counsels for the defense of the accused meteorologists are Prvoslav Vasiljevic, president of the Association of Chambers of Lawyers (Savez advokatskih komora), and Nenad Jovanovic, from Novi Sad.

This case has evoked considerable public interest, and the presiding council which will try Obuljen and Koljcicki has permitted "Film News" (Filmske novosti) to photograph individual scenes from the trial.

27. New Seismological Station in Yugoslavia

"Ljubljana Will Obtain New Seismological Station" (unsigned article), Belgrade, Politika, 28 Mar 58, p 4

A new seismological station, construction of which will begin in April, is to be part of the future astronomical and geophysical observatory on Golovec Hill near Ljubljana.

Construction of a modern seismological station in Ljubljana is of great significance to Slovenia, where earthquakes are quite frequent. The first seismological station in the Balkans was built in Ljubljana directly after the great earthquake of 1895, and a technical seismological journal was published 60 years ago in Ljubljana.

28. Yugoslav Seismological Station Buys Seismograph

"Ljubljana Will Obtain New Seismological Station" (unsigned article), Sarajevo, Oslobodjenje, 29 Mar 58, p 4

A new seismological station, part of the future astronomical and geophysical observatory in Ljubljana, has purchased a modern Hiller seismograph for photographic recording of vertical impulses. A regular seismograph will record horizontal impulses until means are assured for two more Hiller seismographs. The investment program has also provided for the purchase of a radio receiver for determining accurate time.

29. New Yugoslav Geographic Journal Published

"Geographic Review," by I. B., Sarajevo, Oslobodjenje, 15 Mar 58, p 4

The Geographic Society of Bosnia-Hercegovina (Geografsko drustvo bosne i Hercegovine) has marked its tenth anniversary with the first issue of the technical journal Geografski Pregled ('Geographic Review'). The publication is divided into four sections.

In the introduction, Prof Husein Brkic, president of the society, reviews the 10 years' development of the organization.

The section "Articles and Discussions" ("Clanci i rasprave") contains ten works on nearly all geographic fields.

In the section "Shorter Contributions" ("Manji prilozi"), Milenko 3. Filipovic localizes the name "Gornja Bosna," using his own experience and literature as a basis.

The fourth section gives more reviews and commentaries of various professional activities, members, and books.

At the end of the journal, Prof Tvrtko Kanaet has written an obituary for Academician Petar S. Jovanovic, a well-known Yugoslav geographer.

Geografski Pregled has a diversified content, attractive format, good-quality paper, and many illustrations.

V. ELECTRONICS

Communications

30. Noise Elimination by Means of Computers

"On the Transmission of Electrical Signals," by D. A. Novik, Tr. Televiz. fil.-labor. M-vo radiotekhn. prom-sti SSSR, 1956, No 1, pp 75-79 (from Referativnyy Zhurnal--Elektrotekhnika, No 8, Jun 57, Abstract No 17729)

The possibility of eliminating noise interference in the reception of electrical signals with the aid of computer circuits is discussed. Block diagrams of computer systems are given.

31. Determination of Noise Levels for Radio Broadcast Receivers

"Determination of the Levels of a Harmonic Signal Producing Interference at the Input of Various Classes of Receivers," by A. Ya. Breytbart and I. L. Lyudmirskiy, Tr. Televiz. fil-labor. M-vo radiotekhn. prom-sti SSSR, 1956, No 1, pp 64-68 (from Referativnyy Zhurnal--Elektrotekhnika, No 8, Jun 57, Abstract No 17744)

"Nominal interference levels are determined for various types of receivers on the basis of the GOST (State All-Union Standard) for radio broadcast receivers. A description is given of the experimental determination of interference levels at the input of receivers operating at frequencies of 170 and 200 kc."

32. Observations of Long-Distance Reception at Moscow Television Center

"Reception at the MTTs (Moscow Television Center) Beyond the Limits of Direct Visibility," by P. K. Kirillov, Tr. Televiz. fil.-labor. M-vo radiotekhn. prom-sti SSSR, 1956, No 1, pp 48-63 (from Referativnyy Zhurnal--Elektrotekhnika, No 8, Jun 57, Abstract No 17755)

A number of conditions affecting long-distance reception of television signals is discussed. Antennas -- wave ducts and rhombic -- with high gain are tested. For decreasing noise, a separate synchronization channel and an intermediate frequency automatic gain control with a 0.4-Mc band is used. The apparatus contains a feeder antenna system, antenna amplifier, and monitoring unit consisting of receiver, synchronization and scanning unit,

picture control unit, and power supply. A resolution of 350 lines is used. The article includes charts of field strength at the television center and an evaluation of picture quality and sound.

33. Conference on Television Development Held at Kiev

"Scientific and Technical Conference on the Problems of the Development of Television" (unsigned article), Moscow, Tekhnika Kino i Televideniya, No 1, Jan 58, pp 93-94

In November 1957 the Ukrainian republic and the Leningradskaya Oblast boards of the Scientific and Technical Society of Radio Technology and Electrical Communications imeni A. S. Popov together with the All-Union Scientific Research Radio Engineering Institute held a conference at Kiev on the problems of the development of television. More than 200 workers from various television centers and research organizations took part in the conference, at which over 30 reports were given.

A number of articles were presented on relay television stations and mobile stations. Among these was a report by N. Yu. Baymakov concerning methods of increasing the range of mobile stations by the use of mobile relay stations.

The results of experiments on television coverage by means of aircraft relay systems performed in the Kiev-Odessa area were given in a report by I. I. Litvak.

Kinescope projection with flying-spot systems and the application of optical sampling to these systems were discussed in reports by I. Ya. Butlitskiy and L. G. Semenov.

A report was presented by I. F. Grachev on the results of organized observations of the transmission of television signals over long distances and the use of these data for expanding receiving networks in the European USSR. Observations were also made of signals emanating from television centers in England, Italy, Sweden, France, and other European countries.

Electromagnetic Wave Propagation

34. New Cutoff Attenuator for Very Short Waves

"A Two-Channel Cutoff Attenuator for Meter Waves," by L. M. Kapchinskiy, Tr. Televiz, fil.-labor. M-vo radiotekhn. prom-sti SSSR, 1956, No 1, pp 45-47, (from Referativnyy Zhurnal--Elektrotekhnika, No 8, Jun 57, Abstract No 17760)

"The two-channel attenuator described is a circular cutoff waveguide, excited at identical or different frequencies by two coupling loops with separate oscillators. A pickup loop serves as the receiving element and is situated in the diametric plane of the waveguide. The loop may be moved along the axis of the waveguide. Linear attenuation is one db/mm. The relative calibration of the attenuator in the linear portion is practically independent of the frequency within a wide range of frequencies. The attenuator is used for operating in a frequency band of 50-70 Mc. It is possible to mix lineally the signals from two separate sources with this arrangement. Photographs of the attenuator and a construction diagram are provided."

35. Study of Electron Discontinuities in Ionosphere

"Investigation of Ionospheric Discontinuities by Radioastronomical Methods," by V. V. Vitkevich, Physics Institute imeni P. N. Lebedev; Moscow, Radiotekhnika i Elektronika, No 4, Apr 58, pp 478-486

By the use of radio emission from radio stars, a study is made of electron discontinuities in the ionosphere, and the size and electron concentration of large-scale discontinuities are computed. Data are presented on irregularities of horizontal radio refraction and on the disturbances of interference pattern by electron discontinuities.

The basic positions of this work were presented in February 1951 at the Colloquium of the Oscillations Laboratory of the Institute of Physics of the Academy of Sciences USSR, and in March 1951 at the Conference on the Study of Problems of the Sun and Earth.

Methods for measuring radio refraction and obtaining results on meter and decimeter waves are examined, and refraction curves are given for 0.5- to 1.5-meter waves.

Two types of curves were obtained in recording the irregularities of vertical refraction using solar radio emission. The first type had a normal shape with few variations, while the second type showed noticeable irregularities having a repetitious, almost periodic character. These irregularities were greater for wave lengths of 2 and 4 meters than for the shorter wave lengths of 1.5 and 0.5 meters.

Tests were also conducted at Cape Ay-Todor and on Kastel' Mountain near Alushty on radio emission from radio stars. The irregularities of radio refraction in these cases were analogous to those of local sources of solar emission.

A method is described whereby the gradients of optical length of wave paths are determined. Assuming that these irregularities are electronic, the author finds qualitative characteristics for electronic discontinuities causing irregularities of refraction.

Tests were performed on horizontal refraction in 1952 in Ashkhabad and Crimea, using radio emission from radio stars in the constellations Cygnus and Cassiopeia. Curves obtained in these tests had a broken nature which characterized the irregularities of refraction in changing from one lobe of the interference pattern to the neighboring lobe.

Representative curves are given showing a gradual transition from a distinct interference pattern to a distorted pattern which was observed for radio stars on a 6-meter and 3.5-meter wave length. This distortion is explained by rapid oscillations of the wave front.

It is emphasized that the author's conclusions, which are based on data obtained on irregularities of refraction, are somewhat conditional and require verification.

36. Transit Klystron for Frequency Division

"Frequency Division in a Triple-Transit Klystron," by S. A. Kornilov, Moscow, Radiotekhnika i Elektronika, No 4, Apr 58, pp 522-529

A description is given of the operation of a transit klystron as a frequency divider, using the first gap [cavity] as a beam current modulator and the second and third gaps [cavities] as the regenerating portion. The analysis is made on the basis of slowly charging amplitudes. Expressions are obtained for resonance characteristics, excitation threshold, and attenuation band in a self-oscillating and potential-oscillating system.

The equivalent circuit of a regenerative output resonator, pertaining to the third or output gap of the klystron and equations for determining induced current are given.

In conclusion, the author finds that a transit klystron such as the one described may be used as a frequency divider having properties resembling those of a divider using electron tubes and a grid control. In halving the frequency, a band may be obtained which is half as wide as the pass band of the output resonator.

Laboratory Instruments and Equipment

37. Direct-Current Amplifier for Use With Photomultiplier Tubes

"A Direct Current Amplifier With High Mutual Conductance," by V. I. Moroz, Pribory i tekhn. eksperimenta, 1956, No 1, pp 63-66 (from Referativnyy Zhurnal--Elektrotekhnika, No 8, Jun 57, Abstract No 16873)

"A description is given of the differential circuit of a two-stage direct-current measuring amplifier designed for operation with photomultipliers for recording weak luminous flux. The tubes of the first stage are pentode type 6Zh7 which operate with a grid current of 10^{-11} amp. The input stage acts as a paraphase amplifier with large negative feedback current for stabilization of the amplification factor. The signal, reaching the first tube of this stage, is in inverse phase at the input of the second tube of this stage. This partially compensates for the decrease in amplification factor caused by the negative feedback. The second negative feedback circuit is established as a result of the power supply to the screen grids of the first stage by the capacitive elements, forming the cathode loads of the output stage. The output stage, a differential cathode follower with a large current amplification factor, is used with an oscillograph or recording milliammeter with a small time constant. A circuit of the amplifier with all data and its amplitude characteristics for different cathode loads is given. For an internal impedance of 10 ohms, the total mutual conductance of the amplifier is 250 ma/v. The linearity of amplitude characteristics is maintained within limits of 0-5 ma, with an accuracy of 1%. At an amplifier input impedance of 10^8 ohms, the current amplification factor is 2.5×10^7. Zero drift is approximately 0.5 mv/hour."

38. Instrument for Measuring Transconductance of Electron Tubes

"A Device for Measuring the Static Transconductance of Receiving Tubes With Low Power Amplifiers," by M. A. Shepsenvol and M. A. Orekhov, Obmen opytom. M-vo radiotekhn. prom-sti. SSSR, 1955, No 8-9, pp 68-69 (from Referativnyy Zhurnal--Elektrotekhnika, No 8, Jun 57, Abstract No 17300)

"Instruments used for measuring static transconductance of electron tubes have a number of disadvantages: sensitivity to power-line instability, the dependence of measurements on the shape of the curve of the line voltage, and others. The circuit of a device is given which is practically free of these drawbacks. The principle of operation of the circuit is based on stabilization of the voltage directly at the plate of the tube being tested, which makes it possible to measure the transconductance in a strictly static system. Oscillations on the grid of the test tube come from a stabilized generator at 1,000 cps. The measuring portion of the instrument consists of an amplifier, a detector, and a paraphase linear amplifier. The device also contains a stabilized power supply for the plate circuit of the test tube."

39. Use of Staggered Circuits in FM Discriminators

"On the Theory of Discriminators With Staggered Circuits," by V. A. Volgov, Tr. Ryazansk. radiotekhn. in-ta., 1956, No 1, pp 28-41 (from Referativnyy Zhurnal--Elektrotekhnika, No 8, Jun 57, Abstract No 17640)

"An examination is made of the question of choice of parameters for FM discriminator circuits from the viewpoint of obtaining frequency characteristics with maximum transconductance and the best linearity. As a result of experiments performed on discriminators with two and three staggered circuits, formulas were derived for the circuit Q-factor and the necessary mistuning for operation without distortion, and also formulas for determining the capacitance of the circuits for a given amount of nonlinear distortions caused by asymmetry of characteristics in mistuning. Comparison shows that an FM discriminator with staggered circuits may provide higher values of transconductance of frequency characteristics than with intercoupled circuits. The relationship makes it possible to choose circuit parameters according to necessary demands."

40. Computation of Parallel-Balanced Direct-Current Amplifiers

"On the Computation of Parallel-Balanced Direct-Current Amplifiers," by V. P. Aksenov, Tr. Mosk. energ, in-ta., 1956, No 18, pp 344-358 (from Referativnyy Zhurnal--Elektrotekhnika, No 8, Jun 57, Abstract No 17662)

"Computed formulas are given for determining the plate currents of symmetrical parallel-balanced stages of direct-current amplifiers considering differences in tube parameters and load impedance of both halves of the stage. Equations are given for the differential amplification factor and amplification level, and an example of numerical computation of a three-stage amplifier with parallel-balanced stages is provided."

41. Formation of Short Pulses With Relay and Thyratron Circuits

"Examination of Some Circuits for the Formation of Short Pulses," by G. V. Glebovich, M. I. Gryaznov, and K. N. Ptitsyn, Moscow, Radiotekhnika i Elektronika, No 4, Apr 58, pp 562-566

"The method by which pulses of 10^{-8} to 10^{-9} second duration are obtained is based on the principle of line discharge through a resistance equal to its characteristic impedance. The periodic sequence of pulses is determined by the frequency of operation of the commutator which connects the charged line with the load. Since the commutator determines the duration of the pulse rise and the clipped portion of the pulse and, in part, the pulse hump, it must instantaneously commutate the applied voltage, providing the necessary discharge current, and at the moment of commutation the voltage must decrease to zero."

A system of polarized relays, modified to decrease parasitic parameters, a special mercury contact relay, and thyratrons serve as the commutators in tests conducted on pulse formation.

A family of curves showing characteristics of ionization in thyratrons at different voltages is given.

"As a result of these experiments the following conclusions are made:

"1. In a circuit using a thyratron for line discharge, the duration of pulse rise is determined by (and is considerably less than) the ionization time.

"2. A circuit with a thyratron is easily subjected to external synchronization which, in most cases, is not possible in relay circuits.

"3. The instability of firing of a thyratron may be made relatively small, and for a type TGI 1-3/1 thyratron may be less than one millimicrosecond."

42. Greater Application for Heterodyne Wavemeters

"Widening the Limits of Application of a Heterodyne Wavemeter," by Ye. N. Garmash, Moscow, Izmeritel'naya Tekhnika, No 2, Mar/Apr 58, pp 88-89

A method for determining unknown frequencies with a heterodyne wavemeter is discussed which permits widening the measurement range due to the use of higher order harmonics.

A procedure is described whereby the number of harmonics of the wavemeter is first determined for two points of zero beat. According to the number of harmonics and the fundamental frequency of the wavemeter, the unknown frequency is found by the formula $f_x = f_1 n$, where f_x is the unknown frequency, f_1 is the fundamental frequency (first harmonic) of the wavemeter for the first tuning at zero beat, and n is the number of harmonics of the fundamental frequency of the wavemeter for the first tuning at zero beat.

It was found that this method was also suitable for measuring frequencies beyond the limits of the higher frequency of the second band (2,000-4,000 kc) as a result of the use of harmonics of a higher order.

A table is provided showing frequencies for input voltages of 4-4,200 mv in a Type 526 heterodyne wavemeter.

43. Ultrasonic Microscope

"Utilization of TV Methods in Instrument Building," by L. Grushkovich, Moscow, Priborostroyeniye, No 3, Mar 58, pp 30-31

The article contains the following passage:

"In applications of acoustics for the detection of defects in various materials, the Sokolov device is used. The waves falling on a piezoelectric plate cause the charge to distribute over the plate in a pattern similar to that of an ultrasonic field. The piezoelectric plate is placed at the face of a cathode-ray tube. The electron beam falling on the plate produces secondary emission which is attracted to the anode. The resulting electric pulses are used to modulate the cathode-ray-tube beam.

"An ultrasonic microscope is build on a similar principle."

44. Industrial Control TV Installation

"PTU-3 Type TV Installation" (unsigned article), Moscow, Energetik, No 3, Mar 58, cover page 3

A plant of the Radio Engineering Industry is manufacturing the PTU-3 industrial closed-circuit TV installation. This installation has TV receiving and transmitting units intended for the control of industrial processes where the manufactured articles are either moving or stationary.

The installation comprises the following units: transmitting TV camera KT-16; control desk with video-control device VK-24, amplifying unit, control unit, coupling unit, and sync-signal generator; one or two VK-24 type remote video control devices; power supply unit; and an assortment of connecting cables. The TV camera is equipped with two (Yu-8 and Yu-9) lenses which can be interchanged from the control desk. The installation can transmit, with the aid of a coaxial cable, a video signal to a distance of about 500 m. The angle of sight of the camera is 32° and 22°, respectively, for the Yu-8 and Yu-9 lenses.

The over-all dimensions of the TV camera are 270 X 314 X 675 mm and it weighs 40 kg. The cost of the unit is about 140,000 rubles.

Components

45. Atomic Batteries

"Atomic Batteries," by V. S. Merkulov, Moscow, Izmeritel'naya Tekhnika, No 2, Mar-Apr 58, pp 94-97

The advantages, disadvantages, and applications of atomic batteries are described with reference to three general classes of batteries -- those using a method of direct charging (with and without dielectrics), those using contact potentials, and those using semiconductor contacts, phosphors, and thermocouples.

A description is given of the general construction and principle of operation of each type of battery, with particular emphasis on those using semiconductor contacts. As an example of the latter, the author mentions an experimental battery having extremely small dimensions. On the surface of a miniature (0.32-cm^2) semiconductor plate thin layer of Sr^{90} with a radioactivity of 50 microcuries was placed. The battery provided an output voltage of 0.2 volt, a current of 5 microamperes, and an efficiency equal to one percent.

Another miniature battery is described which is based on the use of powdered phosphorus and an oxide of the radioactive isotope Pm^{147} as the source of energy.

Materials

46. Comparison of Input Impedance of Crystal Detectors With Current and Frequency

"Input Impedances of Germanium and Silicon Detectors in the Centimeter Wave Band," by N. A. Penin, F. S. Rusin, and N. Ye. Skvortsova, Moscow, Radiotekhnika i Elektronika, No 4, Apr 58, pp 543-546

Computations are made of the relationship between the input impedance of germanium and silicon detectors and the amount of positive current bias and frequency for a frequency band of 5 to 3 cm. These results agree favorably with those obtained experimentally.

The equivalent circuit used contains elements which represent the capacitance of the detector, the inductance of the contact leads, the impedance of the semiconductor body, and the capacitance and impedance of the barrier layers.

Curves are given showing the relationship of real and virtual components of input impedance to wavelength.

47. Synthetic Quartz Crystals

"Synthesis of Crystals," by N. N. Sheftal', Moscow, Nauka i Zhizn', No 3, Mar 58, pp 59-64

The article contains the following passage:

"A method developed in the USSR permits the growing of piezoelectric quartz crystals heavier than 2 kg in about 6 weeks' time. Thus crystals of quartz, which presumably would require millions of years to grow under natural conditions, are now grown synthetically. The scarcity and high cost of piezoelectric quartz are now things of the past. The synthesis of quartz crystals produces larger crystals than those found in nature, as well as crystals having admixtures that will give them new valuable properties.

"This method paves a new way for the synthesis of many other important natural and synthetic crystals."

48. Viscosity of Molten Germanium

"Investigation of Germanium Viscosity Dependence on Temperature," by V. M. Glazov and D. A. Petrov, Moscow, Izvestiya Akademii Nauk, Otdeleniye Tekhnicheskikh Nauk, No 2, Feb 58, pp 15-19

The aim of this work was to investigate the changes in viscosity of pure molten germanium which occur with a change in temperature. Such an investigation would be helpful in conducting the process of germanium refining. The author believes that no systematic studies of the viscosity of molten germanium have been undertaken up to the present.

The investigation was conducted with a special viscosimeter in a vacuum of 10^{-3} to 10^{-4} mm. A high-purity germanium was used having a resistance of about 55 ohms/cm. A quartz container was used to hold the molten germanium. The viscosity determinations were made in the temperature range of 940-1,250°C, for both heating and cooling cycles.

The construction of the viscosimeter suspension system was such that the computation of the kinematic viscosity could be made with the aid of a formula applicable to low-viscosity fluids. In the temperature range of 950°C-1,200°C the kinematic viscosity of the molten germanium varied from 0.130 to 0.098 centistoke; and the dynamic viscosity for the same temperature range varied from 0.750 to 0.500 centistoke.

49. Principles of Operation and Theory of Magnetic Transformers With Permanent Magnets

"Magnetic Transformer With Permanent Magnet," by V. N. Mil'shteyn and N. A. Palibina, Moscow, Izmeritel'naya Tekhnika, No 2, Mar-Apr 58, pp 47-52

"The principles of operation, design, and several questions on the theory of magnetic transformers with permanent magnets used for measuring direct current by the compensation method are discussed."

A method for the approximate computation of output voltage and the choice of optimum ratios of parameters and cross-sectional areas of windings are given. In an experiment on the measurement of AC voltage of several laboratory models having different ratios of areas of windings at constant current density, results were obtained which favorably corresponded with computations.

The authors conclude that at present the development of magnetic transformers of the type described is in the initial stage; however, the prescribed method for computing magnetic transformers may prove useful in future research.

Reference is made to the following publications: V. N. Mil'shteyn, Elektrichestvo, 1950, No 5; and V. N. Mil'shteyn and N. A. Palibina, Informatsionnyy nauchno-tekhnicheskiy byulleten' NIIEplopribora, 1956, No 3.

50. Scintillators for Radiation Detectors and Counters

"Scintillators in Physical Research," by L. T.; Moscow, Atomnaya Energiya, Vol 4, No 3, Mar 58, p 312

From 27 to 30 November 1957, the Second Scientific Coordination Conference on the Synthesis, Production, and Application of Scintillators was held at Khar'kov. The conference was organized by the Institute of Crystallography, Academy of Sciences USSR, the Khar'kov Affiliate of the All-Union Scientific Research Institute of Chemical Reagents, and the All-Union Scientific Research Institute of Mineral Raw Materials.

The conference was opened by L. M. Belyayev, chairman of the Organizational Committee deputy director of the Institute of Crystallography, Academy of Sciences USSR. Two hundred and thirty persons representing 62 scientific and production laboratories participated in the conference; 59 reports were heard.

Work conducted at different laboratories specializing in the field of scintillators was discussed at the conference, including the investigation of the properties of scintillators, their application in a number of scientific and technical fields, and some problems of the design of photoelectronic multipliers.

On behalf of a group of investigators, V. I. Startsev presented a report entitled "Progress of Scientific Research on Scintillator Materials and Production of These Materials in the USSR." N. S. Khlebnikov told about the latest achievements in the design of photoelectronic multipliers.

The conference was subdivided into two sections: the section of the synthesis and investigation of scintillator materials and the section of the production, investigation, and application of scintillators.

The first section discussed work on the synthesis of different luminescent substances (p-terphenyl, tetraphenylbutadiene, diphenylbutadiene, derivatives of oxadiazole, derivatives of BBO or 2,5-di(4-biphenyl) oxazole, etc.), the preparation of various materials of exceptionally high purity, the preparation of plastic and liquid scintillators, and the investigation of the luminescence and scintillation characteristics of these substances.

In the second section reports were given on the production of a number of scintillators (e. g., of lithium iodide crystals activated with europium and thallium), of detectors of slow neutrons, etc. Furthermore, problems were discussed pertaining to the effect of the temperature gradient on the distribution of impurities during the growth of crystals, problems connected with the transfer of energy in plastic scintillators, investigations of the dependence of luminescence on the temperature, etc. A special meeting of this section dealt with the application of scintillators in industrial geophysical investigations, in geophysical equipment, in the petroleum industry, and in other fields of the national economy.

At an exposition held in connection with the conference, the following exhibits were shown; scintillators for the recording of alpha-, beta-, and gamma-radiation and of slow and fast neutrons, crystals of Na I (Tl) that are 40-120 millimeters in diameter and up to 80 millimeters high, anthracene crystals, plastic scintillators of different dimensions produced on the basis of polystyrene containing different additives, films, etc. Several types of photoelectronic multipliers were also exhibited, including spectrometric photoelectronic multipliers with photocathodes 15-190 millimeters in diameter.

Publication of the transactions of the conference in the form of a special book is planned.

51. Alloys of Germanium and Silicon With Gallium and Thallium

"Constitutional Diagrams and Properties of the Alloys of Gallium and Thallium," by Ye. M. Savitskiy, V. V. Baron, and M. A. Tylkina, Institute of Metallurgy imeni A. A. Baykov, Academy of Sciences USSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 3, Mar 58, pp 763-775

Since gallium and thallium had become available for investigation only recently, an adequate study of the structure of their alloys and the physicochemical properties of these alloys could not have been made hitherto. For this reason, the present investigation was conducted. The structure and physicomechanical properties of the alloys of gallium with silicon, of gallium with germanium, of thallium with germanium (comprising the full range of concentrations), of gallium with antimony, of gallium with magnesium, of gallium with copper, and of thallium with lanthanum were investigated.

The work was done to investigate the effect of thallium and gallium on the structure and properties of the semiconductor materials silicon and germanium and to acquire a better knowledge of the properties of intermetallic compounds formed by gallium and thallium in some systems. The mechanical and physical characteristics of these compounds and of the alloys were also investigated. These characteristics are important from the standpoint of the application of the alloys for practical purposes.

As a result of the work that has been done, the constitutional diagrams of the alloys were determined with greater precision and data were obtained on the microstructure, hardness, mechanical strength, ductility when exposed to compression, and electrical resistance at different temperatures of the alloys of gallium and thallium with the other elements mentioned. In the investigation of the lanthanum-thallium alloys it was found that the compound La_2Tl has a higher electrical resistance, higher hardness, and lower ductility than the other alloys of the same system. It was established that the hardness and electrical resistance of alloys within the region of the La_2Tl and La Tl compounds are considerably higher than those of the components forming these alloys.

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

Miscellaneous

52. New Publications in Radio Engineering and Electronics for 1958

"Books on Radio Engineering and Electronics for 1958," by P. O. Chechik, Radiotekhnika i Elektronika, Moscow, No 3, Mar 58, pp 445-455

A list of books planned for publication in 1958 is given. The quantity of material on radio engineering, electronics, and related fields is considerably greater than that published in 1957 and will comprise approximately 22,800 pages. The books are listed according to publisher.

State Publishing House for Technical and Theoretical Literature

Elektronika, fizicheskiye osnovy deystviya elektrovakuumnykh i poluprovodnikovykh priborov (Electronics, Physical Principles of Operation of Electrovacuum and Semiconductor Devices), by V. I. Gaponov, 880 pp, 25,000 copies, 3d quarter.

Teoriya kolebaniy (Theory of Oscillation), by A. A. Andronov and S. E. Khaykin, 2d edition, 768 pp, 20,000 copies, 3d quarter.

Kvantovaya elektrodinamika (Quantum Electrodynamics), by A. I. Akhiezer and V. B. Berestetskiy, 2d edition, 480 pp, 8,000 copies, 3d quarter.

Asimptoticheskiye metody v teorii nelineynykh kolebaniy (Asymptotic Methods in the Theory of Nonlinear Oscillations), by N. N. Bogolyubov and Yu. A. Mitropol'skiy, 2d edition, 448 pp, 10,000 copies, 2d quarter.

Avtoelektronnaya emissiya (Autoelectronic Emission), by M. I. Yelinson and G. F. Vasil'yev, 160 pp, 6,000 copies, 2d quarter.

Sluchaynyye protsessy v elektricheskikh i mekhanicheskikh sistemakh (Random Processes in Electrical and Mechanical Systems), by V. L. Lebedev, 240 pp, 10,000 copies, 2d quarter.

Infrakrasnoye izlucheniye (Infrared Radiation), by Zh. Lekont, translated from French, 544 pp, 10,000 copies, 2d quarter.

Fizika dielektrikov, oblast' sil'nykh poley (Physics of Dielectrics, in Region of Strong Fields), by G. I. Skanavi, 800 pp, 8,000 copies, 4th quarter.

Molekulyarnyye puchki (Molecular Beams), by K. Smith, translated from English, 96 pp, 8,000 copies, 4th quarter.

Elektronnaya optika poley, ne obladayushchikh osevoy simmetriyey (Electron Optics of Fields Axially Asymmetric), by A. M. Strashkevich, 160 pp, 6,000 copies, 4th quarter.

Teoriya informatsii (Theory of Information), symposium, translated from English, edited by A. A. Kharkevich, 240 pp, 10,000 copies, 3d quarter.

Metody elektricheskovo modelirovaniya (Methods of Electrical Simulation), by I. M. Tetel'baum, 400 pp, 10,000 copies, 2d quarter.

Teoriya impul'snykh sistem (Theory of Pulse Systems), by Ya. Z. Tsypkin, 640 pp, 10,000 copies, 2d quarter.

Ionizovannyye gazy (Ionized Gases), by A. Engel, translated from English, edited by M. S. Ioffe, 256 pp, 10,000 copies, 4th quarter.

Ul'trazvuk i yevo primeneniye v promyshlennosti (Ultrasound and Its Use in Industry), by O. I. Babikov, 176 pp, 10,000 copies, 2d quarter

Termosoprotivleniye (The Thermoresistor), by I. T. Sheftel', 96 pp, 20,000 copies, 2d quarter.

Osnovnyye zakony fiziki (Basic Laws of Physics), by A. Kendel, reference manual, translated from 3d German Edition, edited by N. N. Malov, 256 pp, 50,000 copies, 2d quarter.

Mezhdunarodnyy elektrotekhnicheskiy slovar' (International Electrical Engineering Dictionary), group 0.7, Electronics, nine languages, 400 pp, 20,000 copies, 1st quarter.

Nemetsko-russkiy elektrotekhnicheskiy slovar' (German-Russian Electrical Engineering Dictionary), compiled by M. L. Ginzburg, 1,040 pp, 50,000 copies, 4th quarter.

Russko-nemetskiy radiotekhnicheskiy slovar' (Russian-German Radio Engineering Dictionary), compiled by P. K. Gorokhov, 400 pp, 30,000 copies, 4th quarter.

Publishing House of Academy of Sciences USSR

Poluprovodniki v nauke i tekhnike (Semiconductors in Science and Technology), by a group of authors, 560 pp, 10,000 copies.

Sbornik rekomenduyemykh terminov po dielektrikam (A Collection of Recommended Terms in Dielectrics), by a group of authors, 32 pp.

Podvodnoye televideniye (Underwater Television), by N. V. Vershinskiy, 112 pp, 7,000 copies.

Shirokopolosnaya dal'naya svyaz' po volnovodam (Wide-Band Long-Distance Communication by Waveguides), by Yu. I. Kaznacheyev, 48 pp, 10,000 copies.

Radio nashikh dney (Radio of Our Day), by M. Ye., Zhabotinskiy and I. L. Radunskaya, 160 pp

State Publishing House for Power Engineering Literature

Radiopriyemnyye ustroystva (Radio Receiving Devices), by Yu. A. Bulanov and S. N. Usov, 400 pp, 10,000 copies, 3d quarter.

Elektroradioavtomatika (Radio Automation), by E. I. Gitts, 320 pp, 15,000 copies, 3d quarter.

Promyshlennaya elektronika (Industrial Electronics), by A. L. Gorelik, revised edition, 400 pp, 15,000 copies, 3d quarter.

Elektronnyye, ionnyye i poluprovodnikovyye pribory (Electronic, Ionic, and Semiconductor Devices), by A. V. Dykin and L. A. Kotomina, 272 pp, 10,000 copies, 4th quarter.

Nastroyka, regulirovka i kontrol' radioapparatury (The Tuning, Adjustment, and Control of Radio Apparatus), by P. P Mesyatsev, 160 pp, 15,000 copies, 2d quarter.

Proyektirovaniye radioperedatchikov na novykh lampakh (Design of Radio Transmitters With New Tubes), by B. S. Agafonov, 128 pp, 10,000 copies, 2d quarter.

Priyem ChM-signalov so sledyashchey nastroykoy (Reception of FM Signals With Follow-Up Tuning), by D. B. Ageyev and Ye. G. Rodionov, 128 pp, 100,000 copies, 2d quarter.

Radiotekhnicheskiye izmereniya (Radio Engineering Measurements), by Ye. S. Antseliovich, 320 pp, 10,000 copies, 3d quarter.

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53. Yugoslav Academic Council Cooperates With Polish Academy of Sciences

"Cooperation With the Polish Academy of Sciences" (unsigned article), Sarajevo, Oslobodjenje, 22 Mar 58, p 4

The Polish Academy of Sciences has invited the Yugoslav Academic Council (Jugoslovenski Akademiski savjet) to appoint a delegate to a meeting which will be held in Warsaw for consideration of problems in the field of electro-acoustics.

The Academic Council has appointed Engr Stevan Milosavljevic, scientific associate of the Institute for Materials Testing of Serbia (Institut za ispitivanje materijala Serbije), as its delegate. Milosavljevic will read a paper on designs of modern electroacoustical equipment, with special reference to their adaptation to phonograph equipment.

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VI. ENGINEERING

54. Radioactive Isotopes Used for Measuring Wear of Aircraft Engine Parts

"Radioactive Isotopes Measure the Wear of Aircraft Engine Parts," by A. Pokrovskiy, Moscow, Sovetskaya Aviatsiya, 21 Apr 57, p 3

A new method, which is finding wide application, has been developed for measuring the wear of aircraft engine parts. This method, which is based on the introduction of radioactive substances on the friction surfaces of aircraft engine parts, permits wear measurement without taking the engine apart.

Wear was previously determined by micromeasurements of the engine parts, which required dismantling the engine. The new method is based on the following principles. If a radioactive substance is introduced into the surface layer of an engine part, particles of this substance will be destroyed and carried away by the lubricant, together with the base metal, during friction of the parts while the engine is in operation. By measuring the radiation intensity of the wear products at different intervals, it is possible to determine rather accurately their total weight content and thus to estimate the wear of the parts without dismantling the engine. It is necessary, however, to activate first the friction surfaces of the engine parts. Several activation methods are known at present, but the most convenient one is the method recently developed by the Civil Air Fleet.

In this method, radioactive metal insets are pressed into the part to be tested. These radioactive insets also perform the function of indicators warning of the wear in engine parts. The appearance in the lubricant of particles of the radioactive substance, which is imbedded a certain distance from the friction surfaces, acts as a warning signal pointing to the necessity of dismantling and overhauling the engine.

The radioactivity of the "worn-off" material is determined by two methods: by analysis of separate batches of the lubricating oil or by direct immersion of a pulse counter into the circulating lubricant. The second method is more convenient because it simplifies the measuring technique and allows observations at 5- to 10-minute intervals.

The use of radioactive isotopes in measuring the wear of engine parts has the additional advantage of making it possible to observe the wear of several parts at the same time. To achieve this, the engine parts are activated with different isotopes which emit radiations having different penetration ranges. The problem of determining the wear of several parts at the same time in this case is a matter of determining the amount of each individual isotope in the total mixture.

55. New Soviet Ultrasonic Equipment and Technical Applications of Ultrasonics

"Inaudible Sound," by I. Tolmacheva; Moscow, Sovetskaya Aviatsiya, 27 Apr 57, p 4

The article reviews the properties and applications of ultrasonic waves with frequencies in excess of 16,000-20,000 cycles per second. Soviet scientists are claimed to have been the first to use ultrasonic waves for detecting defects in metal products, concrete constructions, plastic and rubber articles, and many other materials. This method permits checking the quality of individual parts during their manufacture, even when they are components of an assembled machine or equipment.

New instruments reflecting Soviet achievements in ultrasonic technology are shown at the exhibition opened in the Polytechnic Museum in Moscow in connection with the current All-Union Conference for Industrial Applications of Ultrasonic Technology.

A photograph is given showing a new ultrasonic defectoscope called the "UZD-7N," made by the Gorkiy Plant of the Ministry of Radio Engineering Industry. This instrument is widely used in aircraft repair plants for locating cracks in motor and aircraft parts. It can detect horizontal and oblique cracks up to 1.5 mm in size as well as other defects. With the help of this instrument it is also possible to control the quality of welding of various parts. The "UZD-7N" ultrasonic defectoscope is also used for measuring thicknesses ranging from 10 mm to 2 meters.

Ultrasonic control is used for the determination of physical and chemical properties of articles made of plastic, rubber, leather, and high-molecular materials. Another photograph shows an apparatus used for this purpose.

The field of applications of ultrasonic waves is expanding daily. Ultrasonic waves have proved very effective in the cleaning of miniature-size metal articles, for example, thin channels of fuel pumps. Ultrasonic devices used for this purpose are shown at the above-mentioned exhibition. Of great potential importance is the application of ultrasonic waves in the processing of such technically important and hard-to-process semiconductor materials as germanium. Ultrasonic waves help to determine the quality of fuel and lubricants used, for example, in aviation. A third photograph illustrates an ultrasonic soldering instrument "UP-21," shown at the exhibition, which is used for soldering aluminum with soft solders without the use of a flux. This soldering instrument was developed and built by the Leningrad Scientific Research Institute and will undoubtedly find wide application in industry as well as in aircraft maintenance work.

Ultrasonic waves are used in metallurgy for ore enrichment and in the construction and road industries. They speed up dyeing processes in the textile industry and leather tanning processes and help doctors in the detection of malignant tumors.

56. Stability of Cylindrical Shell

"Stability of a Cylindrical Shell Under the Simultaneous Influence of Torsion Moments and Normal Pressure," by V. M. Darevskiy, Moscow; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, No 11, Nov 57, pp 137-147

This article presents a theoretical and experimental investigation of the stability of a thin cylindrical shell of "average" length with the nondeforming edges under the simultaneous influence of torsion moments and normal pressure. Some of the results are based on an experimental investigation made by P. G. Burdin for his dissertation at the Air Force Engineering Academy imeni N. Ye. Zhukovskiy in 1956.

57. Irreversible and Nonequilibrium Processes in Gas Compression and Expansion

"Irreversible and Nonequilibrium Processes in Compression and Expansion in Gas Machines," by M. D. Khaskind; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Sep 57, pp 76-81

A study is made of the nonsteady one-dimensional motion of a viscous heat-conducting gas in piston engines. An appraisal is made of the irreversible and nonequilibrium processes in the compression and expansion of the gas in relation to its physical constants and relative speed of flow.

It is shown that irreversible effects of heat-conductivity and internal friction result in insignificantly small deviations from the equilibrium values characteristic for the compression and expansion of the gas. However, the nonequilibrium character of the nonsteady motion of a nonviscous and non-heat-conducting gas results in more significant deviations.

58. Device for Oscillographic Study of Hydraulic Compressor Performance

"The Indicator Diagram of a Hydraulic Compressor of Superhigh Pressure," by L. F. Vereshchagin, A. A. Semerchan, and V. A. Galaktionov, Laboratory of Physics of High Pressures, Academy of Sciences USSR; Moscow, Pribory i Tekhnika Eksperimenta, No 5, 1957, pp 79-85

A study is made of indicator diagrams of two superhigh-pressure hydraulic compressors with the aid of a specially built device employing tenso-transmitters, which afforded, for the first time, the possibility of following the operation of hydraulic compressors from the viewpoint of the influence of clearance space on performance.

One of the compressors tested, the K-6, is a laboratory device with a maximum pressure of 6,000 atmospheres and an output of 15 liters per hour, and is intended for the compression of fluids in relatively small volumes. This compressor has two successive pressure valves and thus differs from the GK-7/6000 hydraulic compressor, which has an L. F. Vereshchagin system, and is series-produced by the Experimental Plant of Chemical Machine Building of Gosplan USSR. The second hydrocompressor (model K-38) is produced for pressurizing water to 3,000-3,500 atmospheres and has a delivery of 4 tons per hour.

In the recording of the pressure, the cylinder of the hydraulic compressor is connected to the inside of an obturator by means of a channel. During a change of pressure in the cylinder, the pressure is varied also in the internal cavity of the obturator, which leads to a deformation of the outside surface of the obturator in the direction of the internal channel. The transmitting element is a transformer made of constantan wire 0.03 mm in diameter, with an 8-mm base and an initial resistance of 120 ohms, and is glued to the outside of the hollow obturator. A second transformer, attached to an area which is not deformed by the internal pressure, serves for temperature compensation.

The resistances of the two wire transformers are inserted into the arms of an AC measurement bridge with a carrier frequency of 10 kc. Relatively slow variations of pressure in the cylinder of the compressor, converted into voltage variations in one arm of the bridge, modulate the carrier frequency.

After amplification in a double-cascade amplifier, the signal is detected by a synchronous detector. As far as design is concerned, the two fixed arms of the measurement bridge, the carrier-frequency oscillator, the amplifier, and the detector comprise a separate instrument, the ETS-23-7, which was developed by the All-Union Scientific Research Institute of the Ministry of Defense Industry for the purpose of tensometry. This instrument, with one carrier-frequency oscillator, has three measurement channels for simultaneous measurement of three processes. The amplified electric signal was recorded by means of the MPO-2 magnetoelectric oscillograph.

In regard to the accuracy of the indicator diagrams, a distinction is made between the absolute accuracy in the construction of individual diagrams and the relative accuracy of an observation of a group of diagrams for various nominal pressures. The error in the production of a single diagram is compounded in the recording of the pressure and the motion of the piston and during the recording of the calibration curves. Errors in the measurement of pressures of 3,000 atmospheres by means of a first-class manometer with a scale up to 5,000 atmospheres are estimated at 1.7 percent, whereas errors connected with the quality of the wire of the transformer and its coupling with the electronic amplifier, demodulator, and other electrical circuits, and with the deciphering of satisfactorily recorded oscillograms, with a small number of repeated observations, amount to 5-7 percent. Since the errors resulting from the change-over of the pressure-time coordinates into pressure-volume coordinates must also be included, the total error in the pressure value amounts to as much as 10 percent in the construction of a diagram with a nominal pressure of 3,000 atmospheres.

Through an examination of errors by an analogous method for the determination of the variation of the volume of the cylinder, it was established that, with satisfactory recording of the diagram of motion (without superimposed torsional vibrations of the crankshaft), the total error amounts to 6-8 percent. The use of the criterion of upper dead center and an analytical calculation of the motion of the piston sharply decrease the authenticity of the diagram in reference to volume.

In the examination of the variation of form of indicator diagrams in comparison with diagrams obtained at other pressures, the accuracy of the recording method increases considerably, since, in this case, errors are eliminated which are connected with graduation, change-over, and the like. At the same time, the variation of parameters of the electric circuit is insignificant for short periods of time.

59. Institute for the Electrical Economy in Yugoslavia

"'Thunder' in the Laboratory," by V. Ticina, Belgrade, Politika, 26 Mar 58, p 5

A control apparatus which was recently put into operation in the Institute for the Electrical Economy (Institut za elektropivredu) in Zagreb enables high-voltage technicians to test electrical equipment and insulating material with up to 800,000 volts. In practical application, this means that all materials which are built into transformer stations and transmission lines, and which have been tested by the apparatus, can withstand high voltage such as that created by a generator in the laboratory of the institute.

When a duty-load dispatcher wants to find out the load distribution in a certain power station, instead of spending long hours at calculation, he relies on an invention of the institute, the so-called "dispatcher's" analyzer." All the dispatcher needs to do is to press a button on the analyzer to ascertain the load of a certain power station. If a transmission line is damaged, the analyzer presents the data necessary to determine whether some other transmission line can take over the load of the damaged line.

Low-voltage technicians of the institute have designed the prototype of a miniature high-frequency telephone apparatus. This small apparatus will serve to maintain communications among power substations by using transmission lines and will make it possible for personnel of a power plant and a transformer station to be in constant contact. This apparatus will also be used for communications between isolated building sites and remote divisions of a factory.

This type of equipment is somewhat larger than the usual telephone apparatus, is much cheaper than the high-frequency telephone equipment of customary design, and is made, for the most part, from domestic materials.

Soon the Institute for the Electrical Economy will begin to test the quality of a wide variety of electric materials produced by Yugoslav factories. For the most part, products intended for mass consumption, such as switches, elecric ranges, heaters, pots, and wires, will be inspected. Products which meet the requirements of laboratory tests will then be submitted to a commission of the Society of Engineers and Technicians of Croatia (Drustvo inzenjera i tehnicara Hrvatske), which will assign a quality mark to them.

60. Docent Stefan Zukowski, Master of Engineering, Dies

"Stefan Zukowski" (unsigned article), Warsaw, Mechanik, Oct 57, p 452

A Polish technical monthly reports the 24 August 1957 death of Stefan Zukowski, Master of Engineering. He was born 29 July 1902 in Astrakhan, and arrived, after the Russian Revolution, in Poland, where he completed his middle and higher education. In 1929, the completed the H. Wawelberg and S. Rotwand State Higher School of Machine Building and Electrotechnology and then the Mechanics Branch of Warsaw Polytechnic.

In 1929, he began scientific-teaching work as assistant in the Endurance Laboratory in the Higher School of Machine Building and Electrotechnology in Warsaw; in 1933, he became its director. In 1933-34, he was assistant in the Chair of Metalworking Machine Tools, and in 1934, deputy assistant in the Chair of Ballistics. He also worked in defense industry as director of a reporting section in Rembertow.

During the occupation, he was in England and Turkey and did work as an expert and counselor in defense industry.

Returning to Poland in 1946, Zukowski became a contract professor in the Engineering School in Warsaw, and was very active in organizing new departments there.

He was a long-time active member of the Society of Polish Engineers and Mechanics and one of the originators of the Evening School of the Engineering School in Warsaw. In 1946, he took on the job of director of investments in the Central Administration of Metal Industry; there he contributed to the quick rebuilding of Polish industrial plants. Zukowski also published several works on [mechanical] springs in 1954.

VII. MATHEMATICS

61. Chair of Computer Mathematics of Moscow State University

"On the Chair of Computer Mathematics of the Moscow State University," by I. S. Berezin; Moscow, Uspekhi Matematicheskikh Nauk, Vol 12, No 3, (75) May/Jun 57, pp 256-261

The full text of the article follows.

The Chair of Computer Mathematics was established in 1949, within the Mechanics-Mathematics Faculty at Moscow State University to train specialists in computer and machine mathematics and develop scientific work in that field. The chair has been headed since 1952 by Academician S. L. Sobolev.

The following are working in the chair at present: Professors L. A. Lyusternik, A. A. Lyapunov, and M. R. Shura-Bura; Docents I. A. Berezin, N. P. Zhidkov, O. N. Golovin, A. D. Gorbunov, and K. A. Semendyayev; and Assistants V. G. Karmanov, M. A. Kartsev, and S. V. Yablonskiy. Those serving on other chairs and at the computing center, as well as aspirants and specialists from other institutions, are attracted to the study of special courses and the guidance of seminars, theses, and course works.

To provide training and scientific functions for the chair on transfer of the university to the Lenin Hills, a series of laboratories was created on the basis of which a computing center was organized in 1956, equipped with contemporary calculating machines, including the high-speed "Strela" digital computer.

During the chair's existence 148 specialists have been trained, as follows: 1950, 10; 1951, 28; 1952, 12; 1953, 9; 1954, 38; 1955, 23; and in 1956, 28.

Fifty-seven specialists will be graduated in 1957, and in the future there will be at least 55-60 graduates per year.

Training Organization

The plan for the first years is the same for all mathematics students. Specialization of the students for computer mathematics begins with the third year, when, in addition to general mathematical courses, study of special and basic concentration courses as well as special practical experience and seminars begin.

Basic Concentration Courses

The following concentration courses are specified by the training plan now in effect.

"Computing Methods" -- This course, extending through the third and fourth years for a total of 120 hours, provides the following: operations with approximating quantities, theory of interpolation and its applications, uniform and mean square function approximation, numerical differentiation and intergration, numerical methods for solving transcendental and algebraic equations, computational methods of linear algebra, and numerical methods for the solution of differential and integral equations. A lecture course accompanied by computer practice is given 2 hours per week throughout the full 2 years.

"Mathematical Machines and Devices" -- This course is presented 2 hours per week during the third year. In the course the operating principles of mathematical machines and devices and the possibilities of various calculating machines for the solution of mathematical problems are presented.

"Electronics and Radio Engineering" -- This course is presented 2 hours per week in the third year. It aims at acquainting the students with problems of radio engineering necessary for understanding the circuits and operating principles of contemporary electronic calculating machines. The course is accompanied by laboratory work amounting to 32 hours.

Special Courses

During the training, in addition to the basic courses, the students are required to attend and meet the requirements of two elective, year-long special courses. The list of special courses studied varies. As an example the special courses studied in the 1955/1956 and 1956/57 academic years are listed here.

1955/56 Academic Year	
Automatic digital computers and programing	M. R. Shura-Bura
Programing	A. A. Lyapunov
Elements of Cybernetics	A. A. Lyapunov
The Logical Foundations of Electric Current	S. V. Yablonskiy

Electronic Mathematical Machines of Continuous Operation	V. B. Ushakov
Several Questions Concerning the Approximation of Differentiable Functions of Many Variables	S. M. Nikol'skiy
Direct Methods of Mathematical Physics	I. S. Berezin
Operator Calculus	A. D. Gorbunov
Mathematical Methods for Predicting the Weather	I. A. Kibel'
1956/57 Academic Year	
Solution of Mathematical Problems on Electronic Digital Computers	M. R. Shura-Bura
Programing	R. I. Podlovchenko
Electronic Mathematical Machines of Continuous Operation	V. B. Ushakov
Direct Methods of Mathematical Physics	A. D. Gorbunov
The Calculation Methods of Linear Algebra	V. G. Karmanov
Multivalued Logics	S. V. Yablonskiy
Introduction to the Theory of Algorithms	V. A. Uspenskiy

Students are also permitted to attend the related special courses under other chairs.

Special Seminars

Students of the third, fourth, and fifth years specializing in computer mathematics must regularly participate in the work of one of the special seminars of the chair. A list of the special seminars which functioned under the chair in recent years follows.

1955/56 Academic Year

Numerical Methods for the Solution of Ordinary Differential Equations

Numerical Methods for the Solution of Partial Differential Equations

Calculation Methods of Linear Algebra

The Approximation of Functions

Practical Methods for Approximating Functions

The Theory of Electric Circuits

The Algebra of Logic

Programing

1956/57 Academic Year

Methods for the Approximate Solution of Differential Equations

Numerical Methods for the Solution of Ordinary Differential Equations

Numerical Methods for the Solution of Partial Differential Equations

The Approximation of Functions of Many Variables

Iteration Methods for the Solution of Mathematical Problems

Problems of Mathematical Logic; Theory of Electric Circuits and Programing

Discrete Analysis

Theory of Control Systems

Problems in Cybernetics

Automatic Programing

The seminars indicated above are designed fundamentally for the students. In addition to these seminars three scientific research seminars function under the chair. Members of the chair, aspirants, those serving in the computation center, and others participate in these seminars.

A scientific research seminar on computer mathematics is held at which, as a rule, new results obtained by the participants of the seminar are reported.

A scientific research seminar is held on machine mathematics at which new results in machine mathematics and programing are discussed.

A scientific research seminar is held on computer techniques at which the results of the work at the computation center in this field and the results contained in Soviet and foreign literature are reported.

The subjects of several reports discussed at these three seminars in 1955-1956 follow.

"Different Methods for the Solution of Problems of Gas Dynamics," S. K. Godunov

"Concerning a Different Method for Solving the Problem of Trichomi," A. F. Filippov

"Several Evaluations of the Theory of Tabulation," Vitushkin

"Method of Orthogonal Projections for a Finite Difference Analog of One System of Partial Differential Equations," V. I. Lebedev

"Comparative Investigations of Various Grid Algorithms for the Solution of Elliptical Equations in Partial Derivatives," N. S. Bakhvalov

"Application of Three-Valued Logic to the Investigation of Elecrical Systems," G. K. Moisil (Rumania)

"Programing Program," V. M. Kurochkin, N. P. Trifonov, A. P. Yershov, and E. V. Lyubimskiy

"Utilization of Computers for Calculation and Interpretation of Spectral Oscillations of Molecules," R. I. Podlovchenko

"Programing by the Method of Floating Scales for a Machine With a Fixed-Point System," Ye. A. Zhogolev

"Systems of Operation for a Machine With a Fixed-Point Suitable for Programing by the Method of Floating Scales," Ye. A. Zhogolev

"Logical Systems on Ferrite Cores," N. P. Brusentsov (review)

"Application of Semiconductor Devices in Computers," N. P. Sentsov (review)

"The Establishing of Addition-Substraction on Push-Pull Ferrite Cells," B. Ya. Fel'dman

"The Establishing of Addition-Substraction on Ferrite Cores in Binary and Ternary Number Systems," N. P. Brusentsov and Yu. N. Kolotov

"System Schematic for a Small Digital Computer on Ferrite Cores," N. P. Brusentsov

Special Laboratory Practicum and Industrial Practice

According to the plan each student attends a special laboratory practicum during the fourth year and the first half of the fifth year for 4 hours per week. After creation of the computation center, the student's practicum was transferred there. In the beginning the students are occupied with the solution of problems on calculating machines and on an electronic computer (20-24 hours) and with solution of problems on electroanalogs (20-24 hours). After this, they are occupied with the programing and solution of problems on electronic digital computers. The assignments for the special laboratory practicum take the form of solving industrial problems which come into the center. After completion of the fourth year the students begin a month's industrial practice. Before creation of a computation center the practice bases were the institutes of the Academy of Sciences and the design bureaus engaged in the design of computers or their utilization for the solution of mathematical problems. On creation of the center, it became the fundamental base for student industrial practice.

Course and Diploma Work

For development of the independence of the students, the course work done by the students during the third and fourth years and the diploma work in the fifth year are assigned great significance.

The subjects of the course and diploma work are very diverse but the majority of the subject matter is related to analysis of various methods of numerical solution of mathematical problems and their application to the

solution of problems of mechanics, physics, and technology; to application of electronic digital computers and modeling devices for solution of definite problems; to questions of automatizing programing; with non-mathematical utilization of electronic digital computers.

A list of diploma works completed in the 1955/56 and 1956/57 academic years follows. This list is far from the total number of works completed in these years.

Application of direct methods for the solution of certain boundary problems of the theory of elasticity

Grid methods for the solution of equations in functional derivatives

Application of the grid method to the solution of problems concerning transverse oscillations of plates

Methods for accelerating the convergence of iteration processes

Numerical methods for the solution of differential equations with a retarded argument

Unstable one-dimensional flow of an ideal gas with varying entropy

Some problems of the theory of algorithms

Programing of a method for finding the polynomical having the best approximation of a continuous function

Finding the inverse of high order matrices on high-speed electronic machines

Programing for the solution of a system of ordinary differential equations by the Runge Kutta method on a machine having a fixed point method or floating scales

Solution of certain problems of gas dynamics on electronic digital computers

Utilization of electronic digital computers for the solution of problems of crystallography

Utilization of electronic digital computers for the solution of several problems of weather prediction

Automatizing the control of programs

Some problems in the automation of programing

Investigation of the characteristics of a turbojet engine electro-analog

Investigation of the aerodynamic characteristics of an airplane on electromodels

Utilization of electronic digital computers for translation

As this list shows, many thesis subjects have a definite applied character.

Training of Aspirants

The education of aspirants in computer mathematics began in the fall of 1950. Statistics are presented below regarding the entrance and graduation figures of aspirants for 1950-1956.

Entrance Year	No Admitted to Aspirant Training: In Attendance	By Correspondence
1950	3	--
1951	4	--
1952	2	--
1953	4	2
1954	5	3
1955	5	7
1956	4	1
Total	27	13

The following dissertations were presented during this time.

V. G. Karmanov, "On the Solution of Certain Boundary Problems for Equations of a Mixed Type" (1954)

N. P. Trifonov, "Application of High-Speed Electronic Digital Computers to the Solution of Problems Concerning the Structural Analysis of Crystals" (1954)

A. I. Ivanova, "Several Problems Concerning the Convergence of Gaussian Quadrature Formulas on Infinite Intervals" (1955)

K. F. Shirinov, "Approximating Methods for the Solution of Certain Spacial Problems of the Theory of Filtration" (1955)

I. D. Sofronov, "An Approximate Solution for Singualr Integral Equations (1956)

Three persons have completed their aspirantura without defending their dissertation. At present 15 persons in various academic years are pursuing their aspirantura in attendance and 13 persons are pursuing their aspirantura by correspondence.

Scientific Work at Chair and in Computing Center

Scientific research is conducted along three lines, as follows.

1. The basis and analysis of different numerical methods for the solution of mathematical problems, and their application to the solution of applied problems and to the solution of theoretical questions in computer mathematics.

Participating in this work are Academician S. L. Sobolev, Prof L. A. Lyusternik, young workers, and aspirants.

2. Development of the method and theory of programing, and program automation and the application of digital computers for the solution of applied problems (problems of gas dynamics, weather prediction, crystal structural analysis, and others).

Working on this aspect are Prof M. R. Shura-Bura, Prof A. A. Lyapunov, workers of the chair and the computing center, and aspirants.

3. Research work on the creation of new equipment for digital computing techniques and the improvement of existing machines.

This last aspect appeared only recently with the construction of the computation center, but interesting results in this direction have already been obtained.

The scientific research seminars indicated above have great significance in developing scientific work. It is around these seminars that the young personnel get together, participating in the evolution of one or another aspect and collectively discussing research results.

In addition, computation work for different chairs of the university and for other scientific and industrial organizations is done in the computation center.

62. Cohomologic Theory of Stratified Spaces Studied

"On Cohomologic Spaces of Paths," by A. L. Onishchik, Moscow, Matematicheskiy Sbornik, Novaya Seriya, Vol 44 (86), No 1, Jan 58, pp 3-52

This work is a study of cohomologic spaces of closed paths on various topological spaces. Algebraic methods of the topology of stratified spaces are used. The work also contains some applications of the notion of a space of paths to problems in the cohomologic theory of stratified spaces.

"Let X be a linearly connected topological space, P(X) be a space of paths on X terminating at a certain fixed point $x_0 \in X$, and $\Omega(X)$ be a subspace of P(X) consisting of closed paths. J. P. Serre (Applications, Ann of Math, 54, No 3, 1951, pp 425-505) first applied the methods of the topology of stratified spaces to the study of the topology of the space $\Omega(X)$. In his treatment he introduced the stratified space (P(X), X, q) with stratum $\Omega(X)$, where q is the reflection of the space P(X) on X relating each path to its origin. This remarkable stratified space is, in fact, the foundation of all later work in this area, and, in particular, is the basis for the present work.

"If Y is a certain topological space, we will denote by H(Y) its algebra of singular cohomologies with coefficients in a certain ring. Let $\xi = (E, B, p)$ be a linearly connected stratified space in the Serre sense with stratum F.

In the theory of stratified spaces, an important role is played by the homomorphisms i^*: $H(E) \longrightarrow H(F)$ and p^*: $H(B) \longrightarrow H(E)$, which are induced by the superimposition i: $F \longrightarrow E$ and the projection p: $E \longrightarrow B$. Let B be simply connected. In Section 1 of this paper, a homomorphism c^*: $H(F) \longrightarrow H(\Omega(B))$ is defined which by analogy with homotopy theory is called the characteristic homomorphism of the stratification $\mathcal{E}$.

"The homomorphisms i^*, p^*, and c^* will play equal roles in the following development.

"In the same section, an infinite sequence of stratified spaces $\mathcal{E}_n$ are constructed in the stratified space $\mathcal{E}$. These are connected by a chain of homomorphisms. If the space $\mathcal{E}_n$ is linearly connected and has linearly connected strata, then the local system of coefficients on its basis and formed by the algebras of the homologic strata is simple. The study of spectral sequences of the stratifications $\mathcal{E}_n$ is thereby simplified.

"In Sections 2 and 3 we assume that the ring of coefficients is a field of characteristic 0. Let X be a simply connected topological space. It follows from the existence in the space $\Omega(X)$ of a factor satisfying the given conditions that $H(\Omega(X))$ is a free anticommutative algebra. In section 2, using a spectral sequence of the stratification $(P(X), X, q)$, the relation between $H(X)$ and $H(\Omega(X))$ is studied for the case when $H(X)$ is a free algebra of the finite type. It is shown that $H(\Omega(X))$ in this case has a free system of elements which are transgressive in the space $P(X)$ whereupon their images under the transgression comprise a free system of elements of the algebra of $H(X)$. Consequently, the free elements of the algebra of $H(\Omega(X))$ are of a degree which is one less that the degree of the free elements of the algebra of $H(X)$...."

The work was done under the direction of Ye. B. Dynkin.

63. Finite Difference Analog for Green's Function, Three-Dimensional Case

"Finite Difference Analog for Green's Function in the Three-Dimensional Case," by L. A. Lyusternik; Moscow; Vychislitel'naya Matematika, No 1, 1957, pp 3-22

A cubic grid embedded in a three-dimensional Euclidean space is considered and a finite difference analog for Green's Function is derived. Two theorems were proved in the development and it was stated that analogous theorems hold for the n-dimensional case where n is greater than 3. Four literature references were cited, namely, two of L. A. Lyusternik, one of M. R. Shura-Bura, and one of A. Stoehr.

64. Finite Difference Solution for a Poisson Equation

"Investigation of a Means of Increasing the Accuracy of the Grid Method for Solving a Poisson Equation," by Ye. A. Volkov; Moscow, Vychislitel'naya Matematika, No 1, 1957, pp 62-80

In this work a method of successive corrections for a finite difference solution of a Poisson equation is investigated. The method investigated was presented in the paper of L. Fox entitled "Some Improvements in the Use of Relaxation Methods for the Solution of Ordinary and Partial Differential Equations," Proc. Roy. Soc. Lond., 190, A. 1947.

65. Solving of a Dirichlet Problem

"Concerning the Question of Solving the Intrinsic Dirichlet Problem for the Equation of Laplace by the Method of Grids," by Ye. A. Volkov; Moscow, Vychislitel'naya Matematika, No 1, 1957, pp 34-61

In the work a series of new estimations is presented for the error introduced when solving the Dirichlet problem for the equation of Laplace by the method of grids. A number of these estimations were presented in abbreviated form in the work of the author presented in Doklady Akademii Nauk SSSR, 96, No 5, 1954.

Information from the author's summary follows.

"While deriving the estimates in sections 4-6 we made assumption concerning the boundedness of M_p, or $\bar{M}_p \leq M_p$ $(p \leq 3)$, or we assumed that the derivative $U_x^{(p)}$, $U_y^{(p)}$ $(p \leq 3)$ of the exact solution of the Dirichlet problem for the equation of Laplace is continuous to the right. In the book of N. M. Gyunter a special theorem is proved which gives the sufficient conditions for fulfilling our assumptions in the case of a curvilinear boundary Γ. Its formulation follows:

"Theory 1. If $\Gamma \in L_{k+1}(B, \lambda)$, $(k \geq 0)$ and $f \in H(p, A, \lambda)$ $(0 \leq p \leq k+1)$, then the solution of the intrinsic Dirichlet problem for the equation of Laplace $U \in H(p, CA, \lambda')$ is in G.

"We note that theorem 1 indicates the conditions on which our assumptions are fulfilled, but does not give the method of calculating the quantities $\bar{M}_p \leq M_p$, M_p, $A_p(CA)$, $\lambda(\lambda')$, entering in our estimate of the error.

"In 1941 I. G. Petrovski was presented with the problem of estimating the quantity M_4, entering in S. A. Gerschgorin"s estimate of the error by means of Γ the equation of the boundary of the region, and the function f given on the boundary, not solving the same equation of Laplace. The dissertation of Sh. Sh. Sutyusheva was dedicated to the solution of this problem. The estimates $M_p (p \leq 4)$ of Sutyusheva were made under somewhat greater assumptions than the assumptions of theorem 1 (here the existence of a bounded third derivative K''' of the curve bounding the region is assumed) and have complicated expressions where the greater p the more complicated the expression for these estimates.

"In practice the possibility of estimating M_p by some indirect method presents itself in several cases.

"As was noted above, the estimates derived for polygons serving as the boundaries for the region with sides parallel to the coordinate axes or parallel to the bisectors of the coordinate angles have a simpler form than the estimates for regions with curvilinear boundaries. The estimates for polygons consist of two summands while the estimates for regions with curvilinear boundaries consist of three summands. This lies in the fact that on derivation of the estimates for regions with a curvilear boundary, we used lemma 2 of the work; namely, that the inequality $n_k \leq 4 \mathcal{L}/h$ holds where $\mathcal{L}$ is the length of the curve $\Gamma \in L$, in L. This yields as estimate the inequality of the lemma concerning the number of nodes lying at a distance $(k + 1) h \leq r_{ij} < (k + 2)h \leq \tau$ from the boundary. For this reason for an estimate of the error as a consequence of the discrepancies of $h^4/6\, M^{(4)}_{ij}$ at the nodes at which $r_{ij} > \tau$ we were required to apply the lemma of Gershgorin separately: namely, the following lemma: The maximum of the modulus of the solution for the difference equation

$$\Delta_h V_{ij} = \alpha_{ij}, \quad r_{ij} \geq 2h$$

$$V_{ij} = 0, \quad 0 < r_{ij} < 2h$$

$V/\Gamma = 0$ can be estimated by $M_V < M\alpha \ell^2 / 4h^2$

where M_α is the max $|\alpha_{ij}|$, where ℓ is the radius of the circle completely containing the region G. Apparently, the estimate obtained from the lemma concerning the number of nodes lying at a distance $(k + 1) h \leq r_{ij} < (k + 2) h \leq \tau$ from the boundary is satisfied for any k satisfying the condition $3h \leq (k + 2)_h \leq r$, where r is the radius of the maximum circumference contained in G, and also for regions bounded by closed continuous curves consisting of a finite number of sections satisfying the conditions of Lyapunov. Nevertheless, in practice it is possible to replace the coefficient 4 by 2 in the above estimation."

VIII. MEDICINE

Communicable Diseases

67. Eradication of Brucellosis Foci

"Experimental Work on Eradication of Brucellosis Foci Among Sheep and Goats," by M. G. Lokhov and R. M. Gurevich, Saratov Institute "Mikrob" and Saratov Veterinary-Experimental Station; Moscow, Zhurnal Mikrobiologii, Epidemiologii, i Immunobiologii, Vol 28, No 9, Sep 57, pp 16-21

A 1950 outbreak of brucellosis in a populated area of Saratovskaya Oblast involving sheep and goats and humans and subsequent eradication of the focus are described in this article. Sheep and goats in the collectivized sector and privately owned cattle were found to be the source of infection for humans. All sheep (kolkhoz and privately owned) were assumed to be diseased and were isolated as to pastures and reservoirs; in the autumn these animals were consigned to the meat delivery quota. Sheep farms and kolkhozniks' pens in which diseased sheep were found were mechanically purified and disinfected and manure was burned. No new animals were brought in for one year. At the end of this time, new animals were examined for brucellosis by serological and allergic methods. Negative results were obtained. The appearance of brucellosis among humans also ceased from 1950.

A comprehensive plan of antibrucellosis measures to be employed in eradicating brucellosis on farms in other regions included the following:

1. Timely detection of brucellar animals by watching for the clinical picture of brucellosis.

2. Obligatoryobabteriological investigation of aborted fetuses.

3. Detection of brucellar animals by use of complement fixation, agglutination, and allergic reactions.

4. Careful mechanical purification and disinfection of animal quarters and adjacent territory (it is mentioned that a solution of formalin and caustic soda in a DUK apparatus was used).

5. Keeping a precise record of all animals in kolkhozes and individual farms and checking them for brucellosis.

6. Conscientious isolation of brucellar animals.

Two tables are included to show, respectively, the results of examining sheep by the complex method and the results of serological investigation of sheep in the village of Nechayevka.

The author presents the following conclusions based on the results of this work:

"1. Mass infection of sheep and goats occurred in foci of acute brucellosis following the appearance of abortions. Isolation of sick animals and continuous disinfection did not arrest further infection of animals.

"2. The most complete detection of brucellar animals was achieved by the use of a comprehensive method of investigation with allergic and serological reactions.

"3. In foci of brucellosis of small livestock with an acute course of infection, 48.9% of the brucellar animals on one farm were isolated after a single examination by the comprehensive method, and up to 71.4% of the positively reacting animals in the same foci were isolated after 5-7 investigations.

"4. On farms where there are no provisions for separate raising of young animals or for carrying out the remaining comprehensive antibrucellosis measures after isolated sick animals, it is expedient to consign all livestock from these farms to the meat quota. This affords the possibility of completely eradicating a focus of brucellosis over the course of one year without inflicting great economic hardship on the farm. If these measures are not carried out, eradication of brucellosis is prolonged for many years, thereby involving considerable loss.

"5. During the performance of the whole complex of antibrucellosis measures, prophylactic inoculation with dry live brucellosis vaccine of all persons who have had contact with animals is very important for preventing infection of humans.

"6. Organizational measures play an important role in eradicating brucellosis foci, particularly precise recording of animals; the cooperation of Soviet organizations, farm directors, and sanitary coordinators of each ten-house unit; and sanitary education of the population concerning measures for controlling and preventing brucellosis."

68. Virulence of Brucella Strains Studied in Tissue Culture Experiments

"A Study of the Virulence of Br. abortus bovis Strains 19, BA, and 24 in Chick Embryos," by D. Blitek, Yu. Parnas, and S. Tsuber, Chair of Microbiology, Lublin Medical Academy, and State Scientific Research Institute of Agricultural Labor and Hygiene; Moscow, Zhurnal Mikrobiologii, Epidemiologii, i Immunobiologii, Vol 28, No 9, Sep 57, pp 33-35

The research described in this article was performed to determine the sensitivity of chick embryos to the standard strains Brucella abortus bovis, 19, BA, and 24. The article is introduced with several remarks concerning the properties of these strains and their suitability for preparing live vaccines. The strains were seeded on a Braun medium; the extent of their dissociation, excluding S-form colonies, was then determined by a modified Henry method and the Braun method. Live 3-9-day chick embryos were infected via the yolk sac with these seedings in doses of 0.1 ml of a suspension containing 10, 100, 1,000, 10,000 Brucella per ml. The eggs were kept in a thermostat at 36° and examined daily; those embryos in which no signs of life could be detected were dissected and pathological-anatomical changes, listed in the article, were noted. These changes were most pronounced in embryos infected with strain 24, which confirmed the supposition that this strain is more virulent than the others. All strains were virulent for chick embryos in doses of 10-1,000 cells. A table presents data which characterize the virulence of Brucella determined according to the viability of chick embryos following infection.

A correlation between the infecting dose, age of the embryo, intensity of pathological-anatomical changes, and rapid death of the infected embryo was also noted. A tendency toward atypical growth of Brucella cultured on chick embryos was observed; forms which appeared are discussed.

In conclusion, the author states that chick embryos were found to be sensitive to the minimum dose of bacteria (about ten cells), and that this sensitivity was not encountered in any other experimental subject. In the author's opinion, chick embryos are the best medium for seedings from blood.

69. Bacteriological and Biological Evaluation of the Brucellar Ring Reaction

"Bacteriological and Biological Evaluation of the Milk Ring Reaction After Brucellosis in Cattle," by P. P. Samoylov, Tr. Dagest. s.-kh. in-ta. (Works of the Dagestan Agricultural Institute), No 6, 1955, p 47-48; (from Referativnyy Zhurnal -- Biologiya, No 23, 10 Dec 57, Abstract No 99690, by I. Ya. Panchenko)

"Research on the evaluation of the diagnostic value of the milk ring reaction with a chromatic antigen was conducted with a long-established brucellosis infection. When compared with the serological reaction of the blood, the ring reaction was inconsistent in many cases. All the constant positive ring tests were consistent with one of the types of serological blood reactions, i.e., agglutination (plate or test tube) or complement fixation. In bacteriological investigations of milk samples conducted parallel with the ring reaction, brucellosis cultures were not isolated from cows whose milk had given a positive ring reaction or from healthy control animals [possibly infected at some earlier date] whose milk had

given a negative reaction. In postslaughter bacteriological and biological investigations of the lymph nodes and parenchumatous organs of ten animals whose milk had given a positive ring reaction, no brucellosis cultures were isolated. Therefore, one cannot ascertain the presence of the infection on the basis of the milk ring reaction with a chromatic antigen since the reaction can be positive for both infected and recuperated cattle."

70. Chinese Study Factors in Inapparent B-Encephalitis Infection

"A Study of Certain Factors in Subclinical Epidemic B-Type Encephalitis," by Huang Chen-hsiang (黃 祯 祥), Department of Virology, Chinese Academy of Medical Sciences; Peiping, Chung-hua I-hsueh Tsa-chih (National Medical Journal of China), Vol 44, No 2, 1958, pp 109-116

This article gives the details of experiments on white mice which were undertaken to study some factors in subclinical infection with B-type encephalitis virus. Factors related to the characteristics of the virus and others related to the defense mechanism and state of the experimental animal were considered. The experimental data are tabulated and discussed in the light of their significance.

71. Human Contact With Ectoparasites

"Humans and Their Contact With the Ectoparasites of Rodents," by S. P. Piontkovskaya, Ye. N. Simonovich and D. S. Ayzenstadt, Vopr. krayevoy. obshey i eksperim. parasitologii i med. zoologii. (Collection of Works Concerning Regional, General, and Experimental Medical Zoology), Vol 9, 1955, pp 50-64; (from Referativnyy Zhurnal -- Biologiya, No 23, 10 Dec 57, Abstract No 98206, by N. G. Bregetova)

"During 1951 and 1952 in the southwestern regions of the USSR, the ectoparasites found on susliks and rodents, as well as the ectoparasites found in their lairs, were investigated; domestic animals were also inspected. The predominent ticks usually found in suslik burrows were Ixodes laguri laguri, Liponyssus criceti and the Eulaelaps stabularis, the latter two being gamasidal; Neopsylla setosa, Ctenophtalmus orientalis, and Ceratophyllus simplex were the prevalent fleas. The possible means of contact, especially with I. laguri, a carrier of tularemia and certain rickettsial pathogens, was determined; such contact is possible when working the earth. The possible means of contact with other rodent ectoparasites was also outlined. The action of insecticides on burrow entomofauna was observed."

[For additional information on communicable diseases see Item No 97.]

Epidemiology

72. Transmission of Tularemia by Dermacentor marginatus

"Transovarian Transmission of the Tularemia Pathogen by Dermacentor marginatus," by V. P. Romanova and V. P. Vozhenko, Tr. Rostovsk. n. -D. gos. n.-i. protivochumn. in-ta. (Works of the Rostov-on-Don State Scientific Research Antiplague Institute), 1956, No 10, pp 221-228; (from Referativnyy Zhurnal -- Biologiya, No 23, 10 Dec 57, Abstract No 98203, by T. N. Dunayeva)

"The infection of larva and nymphs of D. marginatus was conducted on tularemia infected white mice. Infection of the adult ticks was accomplished on quinea pigs and rabbits. A virulent strain of Bact. tularense -- an inoculation of one microbial cell of which is fatal to white mice in 4-5 days -- was utilized for the tests. Only 33 of the 53 female ticks investigated became infected. The offspring of these females as well as the offspring of seven females found to be infected in nature were utilized in the experiment on transovarian transmission. Some 18,800 larva were fed on 94 white mice; none of them was infected as a result. In experiments with 840 larva of female ticks infected in the laboratory two instances of infection were observed; analogous results were obtained in four instances in experiments with 1,260 larva of female ticks infected in nature.

As a result of experiments in which 1,000 nymphs were fed on 30 white mice, two mice died of tularemia. Some 700 nymphs of females infected in nature were fed on 35 white mice, three of which died of tularemia; 4 out of 48 mice died as a result of biotests in which suspensions from the nymphs were being investigated. A total of 330 young ticks (180 from the laboratory and 150 from spontaneously infected females) were fed on ten guinea pigs; not one of the pigs developed tularemia. Investigation of 135 ticks by inoculating 45 mice twice gave positive results. An investigation of all phases of the second generation (5,190 larva, 570 nymphs and imagoes) yielded negative results. The determination of transovarian transmission of the tularemia bacteria in D. marginatus explains its capacity for serving as a reservoir of the infection over a long period of time, thus maintaining the enzcotic in the natural focus where it can be transmitted to animals."

73. Epizootic Tularemia in Aginskiy Rayon

"Epizootic Tularemia in Aginskiy Rayon," by T. N. Dunayeva, Izv. AN Arm SSR. Biol. i s.-kh. n. No 12, 1956, pp 23-31 (from Referativnyy Zhurnal -- Biologiya, No 23, 10 Dec 57, Abstract No 98205, by T. N. Dunayeva)

"During 1952-1954, a tularemia epidemic, which mainly involved water rats, was investigated on the shores of the Akhuryan River in Aginskiy Rayon (Armenian SSR). Tularemia bacteria cultures were also isolated from Meriones persicus. One tularemia bacteria culture was isolated from Citellus citellus and from Neopsylla setosa fleas found on a suslik which was caught on the shores of the river. In addition, tularemia bacteria cultures were isolated from Haemaphysalis numidiana ticks and fleas which were found on a marten. In autumn 1953, cases of tularemia involving lambs and humans who had come in contact with the bodies of dead lambs, were observed on the farms in this area. The sheep were strongly infested with Ornithodorus lahorensis ticks (more than 500 ticks per lamb). Tularemia bacteria cultures were isolated from ticks taken from sick lambs, and three cultures were isolated from dead lambs. After the serological examination of 320 lambs and sheep, a positive agglutination reaction was obtained from 58 animals. In autumn 1954, cases of tularemia, which were confirmed by serological and allergy tests along with the isolation of five tularemia bacteria cultures (from lymph nodes, blood and eyes), occurred among slaughterhouse workers. The sheep brought to the slaughterhouse were strongly infested with H. otophila ticks. A total of 34 tularemia bacteria cultures were isolated from 3,051 ticks investigated."

74. B. tularense in American Mink

"An Occurrence of B. tularense Isolated from the American Mink," by M. F. Shmuter and S. G. Abramova, Tr. Rostovsk.-n-D. gos. n.-i. protivochumn. in-ta. (Works of the Rostov-on-Don State Scientific Research Antiplague Institute), No 10, 1956, pp 229-230; (from Referativnyy Zhurnal -- Biologiya, No 23, 10 Dec 57, Abstract No 98204, by T. N. Dunayeva)

"During an intensive tularemia epidemic (between December 1948 and February 1949 in an unidentified area) involving gray field voles, house mice, and rabbits, the infection was also observed in nurseries raising American mink. A biotest mouse, infected with an emulsion from the internal organs of mink which had died in March, died of tularemia within 7 days."

75. Chinese Research On Epidemic Hemorrhagic Fever

"Brief Introduction to Epidemic Hemorrhagic Fever," by Chang En-to ( ). Heilungkiang Epidemic Control Station; Peiping, Chung-chi i-k'an (Intermediate Medical Journal), No 1, 1958, pp 32-33

This article treats of epidemic hemorrhagic fever, which the author says is prevalent in Inner Mongolia, Heilungkiang Province, Kurin Province, and Korea. A presentation of the clinical picture of five stages of the disease follows a brief discussion of various types of hemorrhagic fevers and nomenclature. Differential diagnosis, treatment, and epidemiology are also discussed.

The following information is included:

Chinese research on epidemic hemorrhagic fever was initiated in 1955. Although the Soviet scientist Smorodintsev claims to have proved by the method of animal inoculation that the pathogen is a virus, his findings have not been confirmed by Americans who attempted to repeat his experiments. The latter believe that the responsible agent may be a rickettsia. Chinese scientists Yang Fu-hai (杨 扶 海) and Huang Chen-hsiang (黄 祯 祥) both believe the viral origin of epidemic hemorrhagic fever is more likely. It has been reported that Japanese scientists Kitano and Kasahara successfully isolated the epidemic hemorrhagic fever virus from a monkey inoculated with infectious material from Laeleps jettmami Vitsthurn, a mite found on the rat Apodemus agrarius. They believe that rats carry an inapparent infection.

The Chinese have conducted a survey of mites and rats in a "certain area" of Heilungkiang Province with respect to the epidemiology of this disease. They observed that in that area there was only one peak of incidence, October-January; whereas there are two in Manchuria and Korea, namely, May-June and October-December; and two also along the Soviet coast, June-July and September-October.

A schedule of treatment consisting chiefly of maintenance of fluid and electrolyte balance and shock prevention is suggested.

76. Chinese Writes On Infectious Hepatitis

"Epidemiology of Infectious Hepatitis and Prevention," by Chang Kuei-ning (张 桂 宁), Tsingtao Medical College; Peiping, Chung-chi I-k'an (Intermediate Medical Journal), No 1, Jan 58, pp 6-7

This article gives a brief history of the recognition of infectious hepatitis as a viral disease and reviews its epidemiological characteristics and prevention. Noting that the artifical infection of experimental animals has been unsuccessful but that volunteers in the US have been artifically infected, the author maintains that man is the sole source of infection. However, an editorial note following this statement points out that Japanese scientists have experimentally infected white mice with infectious hepatitis virus.

Hematology

77. Book Published Containing Essays on Vascular Permeability

Moscow, Voyenno-Meditsinskiy Zhurnal, No 9, Sep 57, p 96

The following book is listed as a new book: Ocherki po Sosudistoy Pronitsayemosti (Essays on Vascular Permeability) (author not given), Moscow, Medgiz, 1956, 380 pages.

This book consists of works of various authors devoted to the problems of physiological processes of vascular permeability; methods of research; and changes of vascular permeability during hypertonic diseases and also during hypertensive syndrome, sepsis, diphtheria, intoxication by carbon monoxide, chlorine gas, electrotrauma, and burns, as well as during other diseases such as cardiac infarcts, Basedow's disease, etc. The book contains a long list of Soviet and non-Soviet literature on the subject of vascular permeability.

78. Chinese Produce Plasma Substitute

"Dextrorotary Sugar Anhydride -- a Blood Plasma Substitute," by Sun Chia-lin (孫 嘉 麟) and Shih Chieh-sheng (施 介 生); Peiping, Yao-hsueh T'ung-pao (Pharmaceutical Bulletin), No 2, 1958, pp 89-90

This article reports the successful preparation in China of a blood plasma substitute similar to those known in Sweden as Macrodex and in the US as Pravolex, Expandex, Gentran, etc. The method of preparation is presented along with the graphic formula. The pharmacology of the product, its medical application, and dosages are discussed. The authors state that the blood expander is in commercial production in China.

Sources cited include the following: Ind. Eng. Chem. 46(1954)2605, Ind. Eng. Chem. 45(1953)692, J. Biol. Chem. 176(1948)603, and J. A. C. S. 76(1954)5041.

Immunology and Therapeutics

79. Development of New Associated Vaccines Recommended

"The Problem of Associated Vaccines" (unsigned article); Moscow, Meditsinskiy Rabotnik, 18 Apr 58, p 3

"The development of the theory of vaccine prophylaxis of infectious diseases and the introduction into practice of an ever greater number of preparations containing both killed microorganisms and attenuated toxins has made the question of associated vaccination the order of the day. Such a vaccination procedure has been used for a long time against typhus, paratyphoid, and tetanus. Success in the immunization of humans with mixtures of various antigens has been the stimulus to the creation of vaccines against a number of bacterial rickettsial, and virus diseases. Associated vaccination is being acknowledged more and more.

"The All-Union Scientific Conference on the Problems of Associated Vaccination which was held recently in Moscow demonstrated that the number of institutes that have been working on this important problem has increased in recent times. The conference participants discussed theoretical and practical results achieved in this field.

"Reports by V. A. Krestovnikova, V. D. Gekker, G. V. Vygodchikov (Moscow), G. P. Cherkas (Khar'kov), and N. P. Yefimova (Perm') concerning the production of chemical associated enteric vaccines, anaerobic anatoxins, and polyvalent sera were listened to attentively.

"A number of reports were devoted to the problem of further improving the associated corpuscular vaccine against enteric infections. As research which has been conducted has shown, it is entirely possible that this preparation could be prepared in the dry form.

"The problem of the investigation of live associated vaccines against the most important infections, primarily those which exhibit natural foci infectivity, was discussed extensively. Ye. A. Gubina (Institute imeni N. F. Gamaleya) V. S. Antadze (Tbilisi), V. G. Pelipenko (Stavropol'), S. A. Ananyan (Institute of Virology imeni Ivanovskiy), and others gave reports on this subject.

"In all, more than 30 reports were heard."

80. Chinese Report Cases of Septicemia Due to Bacillus Pyocyaneus

"Report of a Case of Pyocyanic Pyotoxinemia," by P'eng Hsing (彭 興), People's Liberation Army Sanitarium; Peiping, Chung-hua Erh-k'o Tsa-chih (Chinese Journal of Pediatrics), Vol 9, No 2, 1958, pp 185-186

This article presents a case report of pyocyanic pyotoxinemia in an infant who responded favorably to immediate treatment with various antibiotics. Pseudonomas aeruginosa infection was confirmed culturally. The case occurred in February 1956, was treated at Mukden Medical College Hospital, and ran a course of about 12 days.

"Septicemia Due to Bacillus Pyocyaneus (Report of a Case)," by Sung Hsiao-shun (宋 孝 純), Pang-fou First Municipal People's Hospital; Peiping, Chung-hua Erh-k'o Tsa-chih (Chinese Journal of Pediatrics), Vol 9, No 2, 1958, pp 183-184

This article reports a case of septicemia due to Bacillus pyocyaneus which occurred in a 3-year-old in August 1956. Clinical manifestations at first indicated acute gastroenteritis, but Salmonella cultures were negative. The causative agent was found to be Bacillus pyocyaneus in both blood and urine cultures. Disturbances of central nervous activity were manifested in aphasia, convulsions, and paralysis of the limbs.

The disease did not respond readily to treatment with streptomycin, chloramphenicol, and penicillin, but the patient had made basic recovery when she was discharged from the hospital after 33 days.

The author notes that the new antibiotic, polymixin B, is active against Bacillus pyocyaneus but that there is no record of its use in the Chinese literature.

Internal Medicine

81. Analysis of Functional Changes in Internal Organs During Burns

"Functional Changes in Internal Organs During Burns," by N. A. Belov, Maj Med Serv, and V. Ye. Belyayev, Lt Col Med Serv, Moscow, Voyenno-Meditsinskiy Zhurnal, No 8, Aug 57, pp 11-15

Functional changes and disturbances occurring in internal organs are correlated with regard to the severity of burns which are classified into the following four groups: burns covering up to 10% of the body, burns covering 11-20% of the body, burns covering 21-30% of the body, and burns covering more than 30% of the body.

Pathological changes in internal organs and systems studied in burns of various degrees include the following: (a) changes in the nervous system, for example, the onset of shock, insomnia, coma, and delirium; (b) changes in the cardiovascular system, for example, tachycardia, cyanosis (especially of the lips), fall in blood pressure (both systolic and diastolic), and myocardial dystrophy; (c) changes in peripheral blood, such as hemorrhage, edema, increased number of metamyelocytes, and erythropoiesis inhibition; and (d) changes in other systems, such as fall of total and free gastric HCl, hemoglobinuria, hemorrhage in the gastrointestinal tract, etc.

The authors coordinate the seriousness of burns with the above mentioned symptoms, analyze the development of pathological changes, and make a prognosis of the final outcome.

82. Aminopeptide -- An Enzyme Hydrolysate of Proteins Containing all Essential Amino Acids Recommended as Protein Source

"Aminopeptide" (unsigned article), Moscow, Voyenno-Meditsinskiy Zhurnal, No 8, Aug 57, p 95

Aminopeptide, which is an enzyme hydrolysate of proteins, is a clear yellow solution, devoid of anaphylactic and toxic properties. It contains all the essential amino acids and can be used as a source of proteins for parenteral feeding. Aminopeptide in solution contains 4-5% protein in the form of amino acids and peptides.

Aminopeptide may be kept at room temperature (14-20°) for about a year. Ampules containing 250 ml of aminopeptide solution should be kept in water at 80-90° for about 30-40 minutes before usage to make certain that the protein solution is completely dissolved, for some precipitation does occur on cooling.

Aminopeptide is used for determining the state of protein equilibrium. It is administered to weakened patients before their operation, to improve hypoproteinemia, and in cases of disturbed nutrition; also, it is administered to patients with extensive burns. It may be administered subcutaneously, intramuscularly, intravenously, rectally, and by drip infusion. Minimal protein requirement is achieved by administering 1-2 liters of aminopeptide solution per day.

83. Disturbances of Gastric Secretory and Motor Functions Due to Burns Commensurate With Severity of Burn Patient's Condition

"On the Secretory-Motor Function of the Stomach During Thermal Burns," by P. V. Pilyushin, Maj Med Serv; Moscow, Voyenno-Meditsinskiy Zhurnal. No 8, Aug 57, pp 16-20

The purpose of the present research was to study gastric functional condition in patients with thermic burns of varying degrees of severity, and after varying periods. Observations were made on 114 patients suffering from burns caused by boiling water, flames, molten metals, etc. Patients ranged in age from 18 to 52 years.

Two tables represent variations of gastric secretion with respect to the severity of burn trauma and the period of burn sickness. Results prove the following:

1. There is a pronounced inhibition of the secretory, acid-formation, and motor functions of the stomach of patients suffering from thermic burns. These disturbances are especially noticeable during the first day, during which they are in direct proportion to the severity of the burns. These disturbances continue through the peak of infection and septic complications but to a lesser degree. The more severe the burns, the greater is the inhibition of gastric secretion and the greater is the fall in gastric acidity. In the majority of cases, restoration of health is accompanied with the normalization of gastric function.

2. Due to the above-mentioned disturbances, which lead to inefficient digestion and absorption, special attention must be paid to the diets of burn patients, especially during the first 5 to 10 days after the accident.

Pharmacology and Toxicology

84. Cortisone Acetate Preparation Proven Antiexudative and Connective Tissue Stimulant

"Cortisone Acetate (Korton-Atsetat)" (unsigned article), Moscow, Voyenno-Meditsinskiy Zhurnal, No 9, Sep 57, p 95

Cortisone Acetate (Korton-Atsetat) is a white powder, insoluble in water. It is a crystalline hormonal substance (steroid hormone); it accelerates protein and later on carbohydrate metabolism; it acts as an antiexudate in inflammatory processes and then stimulates the development of connective tissue, and exerts antihistamine and antihyaluronidase effects. It is used internally in the form of tablets or intramuscularly in the form of microsuspensions. It is used in treating certain diseases, allergies, hay fever, dermatitis, serum diseases, some eye inflammatory diseases, and in certain types of leukosis. Among contraindications for its use are a tendency towards thrombosis, and active tuberculosis.

The use and dosage of this cortisone-acetate preparation must be individually determined. It is used in 10 ml ampules containing 25 mg per ml, or tablets containing 25 mg per tablet. Dosage varies from 25 mg to 400 mg per day.

Physiology

85. Psychophysiological Basis of Sensations

"Contribution of Soviet Psychology to the Theory of Sensations," by B. G. Anan'yev, Leningrad Scientific-Research Institute of Pedagogy, Academy of Pedagogical Sciences RSFSR: Moscow, Voprosy Psikhologii, No. 1, Jan/Feb 58, pp 3-15

The scientific study of the relations between mental and physical processes (psychophysics) began about 100 years ago at the point of juncture of psychology, physics, and physiology of the organs of sensation. Although psychophysics played an important role in identifying the mechanisms of sensations, the prevailing idea concerning the peripheral mechanisms of sensations led the physiological theory on sensations into a theoretical impasse, limiting its scientific value and rendering its practical application to people insignificant.

A great many studies were conducted in the Soviet Union during the past 40 years on various types of sensations. The modern theory on sensations owes its escape from doldrums and this predicament to considerable experimental data accumulated during that period. The experimental data collected were evaluated critically and clarified in the light of dialectical materialism. The warning that was sounded by Ivan Petrovich Pavlov, however, must always be borne in mind. He said, "We must never forget the elementary rule of science which requires association of old with constantly accumulating new facts. Scientific theorization makes that necessary."

A study of evolution of sensations was made by A. N. Leont'yev during the late 1930s. In connection with that study he came to the conclusion that a new form of adjustment which arises establishes a signal which is related to metabolism, gradually bringing about the orientation of an organism with regard to its immediate environment. He claimed that sensation was constantly associated with the entire process of vital activity of the organism and represented the initial form of signalization and orientation. Sensation must, therefore, be viewed as a necessary element of behavior, movement, and action which acquire a special meaning in the subsequent development of a living being.

Leont'yev's entire concept of psychogenesis not only does not contradict the reflex theory of Sechenov and Pavlov, but, in understanding the significance of signaling, it closely resembles that theory. It is not an accident, therefore, that the subsequent series of experiments on orientation, including the orienting activity of reflexes from various analysors, are based on that particular work of A. N. Leont'yev.

Pavlov's theory concerning analysors and temporary associations made it possible for physiologists and psychologists to penetrate deeply into the real mechanism of sensations. The present day views are that receptors are transformers of outside energy into nervous processes. The newest discoveries in electrophysiology of afferent routes, which connect those transformers with the cerebral terminals of analysors, are also of great significance. Manifestation of nuclear and diffused cells of the cerebral terminals of analysors introduced radical changes in the concept of cerebral projection of the receptor impulses.

This made it possible to approach more closely the cardinal fact of the theory of sensation: the projection of an image. The image itself became treated as a reflex effect of the work of analysors.

S. V. Kravkov and his coworkers contributed greatly to the study of interaction between vision and sensations of other modalities. K. Kh. Kekcheyev and his coworkers made a wider study of those interactions between vision and other types of sensitivity. His investigations of factors and conditions that determine the dynamics of sensations (visual, proprioceptoral, interoceptoral, and others) expanded the sphere of our knowledge concerning the nature of sensations considerably.

Studies conducted by physiologists and psychologists on sensitization and conditioned reflex changes in the activity of various analysors may be successfully utilized in developing the physical and mental capabilities of man. Practical application of the theory of sensation is necessary not only for work with people in various fields of activity, but also for developing further the theory of sensation itself.

Achievements in exact sciences, in technology, and in modern socialist methods of production make it realistic for man to master cosmic space. Biophysics, biochemistry, and physiology are directly connected with aviation medicine. Together they are ready to work on the new problems that have arisen because it is possible that man may make an attempt to go beyond the limits of the earth's atmosphere.

There is much in common between animals and humans as far as weightlessness is concerned. But the essential differences in the nature of animals and humans would inevitably tell in the methods of their orientation in outer space. It must be always remembered, therefore, that even though scientists have always conducted experiments with animals to prepare the ground work for the solution of various anthropological problems, the results of experiments on animals must be carried over to humans with extreme care.

Vision is the only organ of sensation that can lead man beyond the limits of the earth's surface. Visual sensations and perceptions have become the mainstay of theoretical thought and exploration of the universe. Equipped with optic technology an eye can become man's guide to the entire celestial cosmos.

A certain hypothetical picture was drawn about the loss of weight by man while in flight through space in the theoretical and scientific-fiction writings of Tsiolkovskiy. This picture becomes less fictional if we compare its idea and forms with the over-all scientific data known concerning system of sensations in man. There is no doubt that the analysor activity of the human brain, in all its details, is defined by the conditions of existence and position of man on earth. This must be the primary consideration when preparing a man for cosmic flights. In the course of many investigations man will be studied not only as a complex organism, but also as a single unit of consciousness.

Subsequent developments in Soviet physiological science will revolve around the problem of interrelation between sensation and thought, the solution of which will depend on results of experimental research not only in the field of the theory of thinking, but also in the field of the theory of sensations.

36. Psychophysiological Control of Motor Activity

"Origin and Development of Conscious Control Over Movements of Man," by A. V. Zaporozhets, Institute of Psychology, Academy of Pedagogical Sciences RSFSR; Moscow, Voprosy Psikhologii, No 1, Jan/Feb 58, pp 24-36

The author of this article describes the results of experiments conducted by him and his coworkers at the Institute of Psychology of the Academy of Pedagogical Sciences RSFSR and at the Department of Psychology of the Moscow State University, to determine the role consciousness plays in the formation of motor habits. The dependence of motor functions and perception of those functions on the conditions and character of activity of an individual was also investigated. This work was begun in the 1930s.

I. P. Pavlov stated, "Voluntary movements are performed by man consciously." On the basis of this, the Soviet psychologists went on to say that control over voluntary movements takes place by means of an image which reflects the conditions and character of the motor act to be performed. By utilizing the most recent achievements in the physiology of higher nervous activity and the theory of living organisms, they became convinced that it was possible to advance somewhat further toward understanding the genesis and nature of conscious forms of control over movements of man. They concluded that the formation of control over the voluntary movements of man is brought about by requirements of life and is dependent on the complexity of and continuous variations in external and internal conditions.

Mental control over behavior can be found in the animal world, although only in the simplest form: behavior does not reach substantial development in animals. A human being must increasingly expand his horizon and from early childhood is forced to acquire complicated, social methods of motor behavior which are completely new to him. His orientation becomes focused on images as objects with a definite purpose and requiring special adaptation. Due to the presence of the second signal system, the images that form in man acquire a generalized and perceptual character, and movements executed, on the basis of those images, become genuinely conscious and voluntary.

87. Book Published on Pathological Anatomy of Radiation Sickness Is Reviewed and Second Edition Recommended

"Pathological Anatomy of Radiation Sickness," by Prof A. V. Smol'yannikov, Col Medical Serv, Moscow, Voyenno-Meditsinskiy Zhurnal, No 9, Sep 57, pp 87-90

This article is a review of a book by N. A. Krayevskiy, entitled Ocherki Patologicheskoy Anatomii Luchevoy Bolezni (Essays on Pathological Anatomy of Radiation Sickness), Moscow, Medgiz, 1957, 229 pages.

The book reviews original research carried out in the USSR on various aspects of acute, subacute, and chronic radiation sickness caused by external radiation and also by the entrance of certain radioactive substances into the body. The book consists of an introduction, ten chapters, and conclusions. It has many photomicrographs and photographs.

In the introduction the author stresses the importance of using the morphological method for research in studying radiation sickness. The author strives to systematically present the pathological anatomy of radiation sickness from the viewpoint of its pathogenesis, thanatogenesis, and differential diagnosis of radiation sickness.

In each of the next ten chapters, the author describes the initial changes characterizing the latent period and the period of the peak of radiation sickness in each of the acute, subacute, and chronic forms, and also radiation sickness due to internal irradiation. Several very complex problems are discussed, for example, the problem of compensation for disturbed functions; the mechanism for the development of hemorrhagic syndrome; changes of general resistance; the reactivity of an injured organism; the nature, characteristics, and pathogenesis of infectious complications; and the problem of tissue and cell sensitivity toward radiation and the relationship of this sensitivity to structures and functional condition of tissue and cell complexes.

The ten chapters individually discuss the following topics:

1. Changes in the hemopoietic system, and these are presented in detail.

2. Changes in the cardiovascular system, and the hemorrhagic syndrome which accompanies radiation sickness.

3. Changes in the respiratory organs.

4. Changes in the gastrointestinal tract.

5. Changes in the kidneys.

6. Changes in glands of internal secretions.

7. Changes in the central nervous system and in its peripheral branches.

8. Changes in the skeleton and the development of a typical bone regeneration in chronic radiation sickness.

9. Effects of internal sources of irradiation due to polonium, radiothorium, and radioactive strontium.

10. Infectious complications from radiation sickness.

Important information summarized is the evidence for parallelism between the degree of injury to the nervous system and the functional disturbances of various organs; and the evidence that during increasing destruction of bone marrow, the compensation syndrome of disturbed hemopoiesis is increased by increased hemopoiesis in the intact part of bone marrow.

The author stresses the importance of distinguishing between infectious complications arising from radiation sickness and the over-all complex processes characterizing radiation sickness. Complications arising in the lungs, the oral cavity, the gastrointestinal tract, sepsis, etc. are reviewed.

In the last chapter, called "Conclusions," the author discusses certain basic problems of the pathogenesis and the dynamic development of radiation sickness, the general principles of the biological effects of radiation sickness, direct and indirect injurious effects of radiation sickness, and the interrelationships between some of these factors.

The reviewer concludes that this book by Krayevskiy is timely and significant and can be a guide in directing some future research in the field of radiation sickness. Finally, the reviewer recommends, in view of the above-mentioned facts, that the author prepare a second edition of this book, besides, the first edition is already out of print.

88. Radioactive Isotopes Laboratory Formed in Szczecin

"Radioactive Isotopes Laboratory in Szczecin" (unsigned article), Warsaw, Trybuna Ludu, 5 Dec 57, p 5

A Polish daily newspaper reports the recent activation of a Laboratory for the Study of Radioactive Isotopes of the Radiology Laboratory, Pomorze Medical Academy, in Szczecin. The apparatus installed in the laboratory, which occupies a whole floor of the new academy building, came from East Germany and the Soviet Union. Some of the precision instruments were manufactured domestically.

The new center is designed primarily for clinical purposes, where diagnostic and medicinal uses of isotopes will be tested.

The lectures in a new radiology course at the academy are given by the well-known radiologist Prof Dr Czeslaw Murczynski.

Surgery

89. Hospitals Especially Equipped for Early Treatment of Napalm Burns Recommended

"Napalm Burns and Their Treatment," by Prof I. S. Kolesnikov, Maj Gen Med Serv, and B. S. Vikhriyev, Candidate of Medical Sciences and Capt Med Serv; Moscow, Voyenno-Meditsinskiy Zhurnal, No 8, Aug 57, pp 3-7

The author briefly reviews the composition and the profoundly injurious effects of napalm burns. Evidently, burns by napalm cause pain stimuli to last longer than similar injuries caused by the usual thermal burns; therefore, napalm burns covering 2-3% of the body must be considered with caution for they often lead to shock and acute toxemia.

In areas where napalm can be used, knowledge to counteract its effects is advised; for example, putting out the flame, covering the body, wearing gas masks, and dipping the injured part into cool water. Under conditions of mass evacuation, napalm victims are transported to "BMP" (batal'onnyy meditsinskiy punkt, battalion aid station). Here the victims are classified into various groups with respect to the severity of their injuries and are treated accordingly: patients with burns covering up to 5% of their bodies; patients with injuries covering 5-10% of their bodies (and including facial injuries); and patients with injuries over more than 10% of their bodies, plus shock symptoms, etc. All patients are treated with antitetanus serum and receive narcotics and cardiac stimulants. Serious cases are treated with antishock solution, receive blood transfusion, plasma substitutes, intravenous infusion of blood substitutes, penicillin, etc. as each case requires. After getting a patient out of shock, napalm burns are treated with gasoline and alcohol, and the flaky epidermis is removed. The wounds are dressed with antibiotic-containing emulsions (best is 10% sintomycin).

Slightly injured patients are evacuated to a "GLR" (gospital' dlya legko ranenykh, hospital for slightly wounded). Some of these patients will have slight areas injured with napalm, but due to the depth of these injuries, and because some of these injuries will be on the face, neck, and/or extremities, they will have to be sent to special burn hospitals of the army or to front rayons for plastic surgery.

Patients of the third group suffering from severe shock are treated at a "PMP" (Regimental Medical Aid Station) by various means, such as with "lidol", i.e., dolantin, dimedrol, atropine, and aminozine. Special attention should be given to the patients' nutrition: vitamin rich food, about 3,000 calories per day, high-protein diet plus additional subcutaneous and intravenous feeding with proteins and protein hydrolysates. Blood and erythrocyte mass transfusions also are recommended.

The authors conclude that since napalm burns are deep injuries that are apt to produce necrosis and local serious complications, it is essential to perform surgical operations as soon as possible at specially equipped hospitals before disfigurement and amputation become inevitable.

90. Early Use of Antibiotics Permits Delayed Surgical Treatment of Burns

"On the Possibility of the Surgical Treatment of Wounds at Delayed Periods," by A. N. Orlov, Lt Col Med Serv; Moscow, Voyenno-Meditsinskiy Zhurnal, No 8, Aug 57, pp 8-10

Since it is now considered that the sooner surgical treatment is administered, the lighter is the course and the better the results of wound treatment (and yet under the present conditions of war, casualties will be numerous and surgical aid will be delayed), the author decided to study the possibility of delayed surgical treatment of burns through the early use of antibiotics.

Observations were made on 203 patients treated for various thermic burns, such as burns from flames of burning fluids, burns from melting and red hot metals, and burns from boiling water and foods. Some patients were treated within 6 hours of their accidents, others within 24 hours, and still others were treated on the 2d to the 6th day, and even later. Various antibiotics, including penicillin, bicillin (intravenously), penicillin ointment, and sintomycin emulsions, were used. Patients were classified into four groups depending on the seriousness of their injury.

The following are the major results:

"1. Early use of antibiotics in sufficient doses makes it possible to perform successful surgery on patients with thermic burns at periods even later than the 3d to the 5th day."

"2. Delayed surgical treatment must be done with caution on patients who have deep and extensive burns, i.e., over more than 15% of their bodies.

"3. The use of bicillin for prophylactic purposes in thermic burns is most advantageous."

91. Surgeon Reviews Methods of Therapy of Burn Patients

"On the Therapy of Patients With Burn Trauma," by V. V. Pirozhenko, Capt Med Serv; Moscow, Voyenno-Meditsinskiy Zhurnal, No 8, Aug 57, pp 74-76

The medical history of 152 patients suffering from burns of up to 10%, 11-20%, 21-30%, 31-40%, and 41-75% of their bodies is analyzed. These patients were admitted at various periods ranging from within 6 hours to 48 hours and more after the accident. Their burns were caused by flames, molten metal, boiling water, etc.

Immediate therapeutic treatment of patients suffering burn shock consisted of administering 1-2 ml morphine, 50 ml of a 3% solution of chloride hydrate in plasma, etc. To prevent dehydration and hemoconcentration, blood transfusion (250-500 ml) and therapeutic serum of Belen'kiy, as well as physiological salt solution, and 5% glucose (500 ml) were used.

Patients arriving with first- and second-degree burns and suffering no shock, after receiving either morphine or chloride hydrate, underwent surgical treatment according to the method of Vil'bushevich. After removal of the blisters and necrotized epidermis, 3 to 4 layers of gauze moistened with S. S. Avedisov's emulsion were placed over the burned surface. Occasionally a one-percent sintomycin emulsion and other agents were used. Patients with infectious burn wounds first received hypertonic solution, and then their wounds were dressed with gauze covered with Avedisov's and Vishnevskiy's emulsions. Facial burns were treated by the open method. Later, a 5% solution of potassium permanganate was used, and to remove scabs, vaseline or vaseline ointment was used.

At present, treatment of extensive second- and third-degree burns is unthinkable without surgical treatment, which results favorably and shortens the period of treatment. In treating limited third-degree burn wounds, the necrotized part is removed and the defective surface is sutured or is covered by plastic means. Skin transplants can be used; often the method of free skin transplants used is that according to Reverden-Yanovich-Chainskiy.

The author reviews 28 cases of his own observation in which he used skin transplants according to methods of various surgeons; his remarks follow.

For burn patients in a serious state of toxemia, anemia, loss of plasma, intoxication, low erythrocyte count (2-3 million), low hemoglobin (24-50%) and sepsis, the use of large amounts of fluid by mouth and intravenous infusion of 5% glucose, etc., for long periods is recommended. The method used for some other patients, consisted of transfusions of blood from 200 to 400 ml which were administered at first daily, and then every other day until homoglobin rose to 70-80% and erythrocyte count mounted to 4.0-4.5 million cc.

Patients in whom sepsis had developed were treated with transfusions of blood and plasma and with penicillin and sulfanilamide preparations. There were numerous complications during the course of burn healing, but the average healing period was 43 days; and of the 152 patients treated, 143 were completely cured, five remained invalid, and four died for various reasons.

92. Fibrin Films Highly Recommended for Treating Fresh Burn Traumas

"Burn Therapy by Fibrin Films," by A. G. Lyashko, Col Med Serv, Moscow, Voyenno-Meditsinskiy Zhurnal, No 8, Aug 57, pp 76-78

Fibrin films which have been used exclusively in treating fresh burns since 1951 are presently used in the following manner: Perforated fibrin films which are preserved in special banks are removed from their paper rolls aseptically and are placed in a solution of rivanol or norsulfazole (sulfathiazole). Then the skin is freed of blisters and the fibrin films are removed from their solution and placed over the affected skin surface. The fibrin films are well secured by bandages with pads which are moistened with a solution of rivanol or norsulfazole. The bandages are not changed for several days. After repeated dressings, if the films are dissolved they are replaced. Fibrin film treatment excels other methods by the fact that they decrease loss of plasma and the sensation of pain.

The author reviews his personal observations on 61 cases of first-, second-, and third-degree burns on the face, upper extremities, lower extremities, and on the trunk of the body of patients he treated with fibrin films. Average duration of burn trauma when treated with fibrin films was 16 days; with ANT-17, 15 days; and with other methods, 20 days. Whenever necessary, penicillin, morphine, plasma, whole blood, detoxicants, 40% glucose solution, nutritions and vitamin-enriched food, vitamin C in solution or as powder, etc. were used.

The author concludes that the use of fibrin films is of great advantage in treating burn traumas because it diminishes shock syndrome, prevents secondary infections and intoxications, and decreases loss of plasma -- all of which have favorable effects toward recovery from burn sickness.

93. Cold Water Therapy of Patients With Thermic Burns Recommended

"Cold Therapy of Patients With Burns," by V. A. Markelov, Maj Med Serv; Moscow, Voyenno-Meditsinskiy Zhurnal, No 8, Aug 57, pp 78-79

The author recommends treating burns with cold water at 10-12°C. This method cures first- and second-degree burns, shortens the healing period, and prevents ulceration. Clean, pure water which is used either for immersing the burned surface or to moisten bandages or holding the burned surface under cool running water may be successfully used.

The author briefly summarizes the case history of one patient suffering from second degree burns caused by boiling water. He reviews his experience while working at a PMP (regimental aid station) with regard to the use of cold water in treating thermic burns.

It is concluded that cold water may be successfully used as the first means of aiding burn victims on arrival at mobile dispensaries and at stationary hospitals.

94. Fifth Military-Scientific Conference of Military-Medical Academy imeni Ya. Ye. Purkin'ye in Czechoslovakia Stresses Burn Therapy

"On the Fifth Military-Scientific Conference of the Military-Medical Academy imeni Ya. Ye. Purkin'ye in Czechoslovakia," by Prof A. S. Georgiyevskiy, Maj Gen Med Serv, and Prof N. S. Molchanov, Maj Gen Med Serv and Corresponding Member, Academy of Medical Sciences USSR; Moscow, Voyenno-Meditsinskiy Zhurnal, No 9, Sep 57, pp 91-94

The Fifth Military-Scientific Conference of the Military-Medical Academy imeni Yan Yevangelist Purkin'ye was held during the latter part of April 1957, at Hradec Kralove, Czechoslovakia. More than 80 reports were heard on medical and military problems by representatives of various medical services from a number of the Peoples' Democracies.

Highlights of this conference included the following:

On the first day, two full-length color films with sound track were shown on the theme of diagnosis and surgical therapy of aneurism of cerebral blood vessels, and the problem of complete and partial pulmonary resection.

During the second day, the conference considered two problems: the use of angiography for the diagnosis of various diseases and nonmalignant tumors of lungs and bronchi, and the clinical and surgical therapy of benign tumors of lungs and of bronchi, and their differential diagnosis. Prof N. S. Molchanov, Major General of the Medical Service, reported on his experience in treating burn victims from various clinics and therapeutic institutions of the Soviet Union. He revealed changes occurring in the internal organs due to burn disease and pointed out rational methods of complex therapy of severe forms of this type of injury.

During the third day, the Military-Scientific Conference considered the subjects of surgery, therapeutics, and hygiene. The majority of reports on surgery were on the problem of wounds and their therapy. The effect of hyaluronidase on muscular tissue regeneration was discussed. It was shown that hyaluronidase stimulates connective tissue growth and profoundly changes metabolism in the acids of the nuclei. The effect of diathermy on the regenerative capacity of skeletal muscles by V. Puzh also was proved beneficial, especially when used immediately after wound infliction. F. Bartosh reported on a method of using cytograms of the surface of the wounds to determine their stage of healing. V. Goub and others reported on gas gangrene therapy, and the best therapeutic methods proved to be using antibiotics in combination with therapeutic serum, or serum in combination with blockade of the lymphatic passages. Prof Ya. Gibashek reported on skin transplants for surgical therapy of chronic suppurative inflammation of the middle ear.

The reports of the therapeutic section included various subjects; for example, the effect of procaine blockade on the stellate ganglion and on cardiac rhythm, the subject of glaucoma, and the use of ion-measurers ["ionoizmeriteley," possibly intended to be iono-obmeniteley or ion-exchange method] for the treatment of uremia.

The majority of the hygiene section reports concerned the problem of nutrition of the armed forces and the medical control over stress of personnel. Ya. Gorak reported on use of the method of measuring optical rheobase and chronaxie for determining the degree of combat preparedness. It was noted that changes of chronaxie did not always parallel changes of rheobase. The method of general rheoplethysmography was also used in evaluating physical preparedness of combat trained and untrained people.

Prof Ya. Melk and Dr Ya. Peregrin reported on complete normalization of the processes of stimulation of the cerebral cortex during oxygen deficiency under decreased barometric pressure. The authors obtained positive results by using "psikhoton" or caffeine.

Prof V. Dvorzhak and others reported on the effect of ionizing radiation on certain disinfecting substances. Results were determined by chemical and bacteriological means.

A careful examination of the reports presented at the Fifth Military-Scientific Conference of the Academy imeni Ya. Ye. Purkin'ye indicates that great scientific work is proceeding along both military and pure scientific research lines, and that both pure science and therapeutic scientists are making extensive use of all modern methods of clinical use and laboratory research.

Finally, this conference has made it evident that closer exchange of experience is necessary between the military medical scholars and scholars of various institutions in the Soviet Union and in Czechoslovakia.

95. Artificial Heart Tested in Czechoslovakia

"A Step Into the Human Heart," by Josef Krivanek, Prague, Obrana Lidu, 16 Jan 58, p 1

In the near future surgeons will perform operations using artificial circulation of blood. The heart will be disconnected and blood circulation will be maintained by artificial heart and lungs.

It is certain that Czechoslovak surgeons will also contribute to these scientific developments. The first successful experiments with artificial blood circulation were made in the surgical clinic of Prof Navratil in Brno. On 15 January 1958 another important step was taken at the surgical clinic of "Palacky" University in Olomouc, where extracorporeal blood circulation was tested with the first Czechoslovak artificial heart, made by Czechoslovak designers and workers. (A photograph of the heart is given on page 1 of the source.)

The artificial heart was made from a design by an assistant of the surgical clinic of "Palacky" University, Fiser, MD. The heart was constructed at the "Sigma" National Enterprise in Lutin under the leadership of Engr Richard Eschler. Final, important preparation of the instrument for use in heart surgery was made by the "Fatra" National Enterprise in Napajedla and the TOS (Tovarny na obrabeci Stroje, Machine Tool Factory) National Enterprise in Kurim. With the exemplary cooperation of these enterprises it was possible for the surgical clinic in Olomouc, working under the leadership of Prof Vladislav Rapanek, MD, to create an artificial heart which can substitute for the human heart for as long as one hour and thus permit the most complex operations within the heart. Surgeons will operate on the so-called "dry" or "poor" heart with the flow of blood directly into the heart and the aorta closed, thereby excluding the circulation of blood through the heart. Surgeons will be able to repair the most complex heart defects, suture closed apertures in the case of an congenital defects, relocate veins, and put in new valves.

The artificial heart made in Lutin is completely original and now, after the first successful tests, will be put into experimental operation.

96. Czechoslovak Hospital Tests Artificial Heart

"New Artificial Heart" (unsigned article), Prague, Obrana Lidu, 6 Apr 58, p 2

There is a scientific workshop for research on artificial hearts at the military hospital in Ruzomberk. The foundations for this work were laid by Colonel Simko, MD and the work is being continued by Major Rozhold, MD. Up to now four different types of artificial hearts have been used.

One danger constantly arises in using artificial hearts. The mechanism of the artificial heart often destroys red blood corpuscles. Although this fault is gradually being eliminated, technicians are not able to reduce the destruction of red blood corpuscles to a minimum.

Major Rozhold and his colleagues, however, made a brilliant discovery: an artificial heart that has almost completely eliminated destruction of red blood corpuscles. This artificial heart (oxygen pressure pump, as it is known officially) has been put through initial tests and has proved itself outstanding. Although a few technical adjustments must still be made, this invention of world importance will soon be presented to the Czechoslovak and foreign public.

Veterinary Medicine

97. Pathology of Anthrax in Lions

"Anthrax in Lions," by H. Kronberger, Veterinary-Pathological Institute of Karl Marx University, Leipzig; Leipzig, Archiv fuer Veterinaermedizin, Vol 13, No 8, 15 Apr 58, pp 235-237

The article gives a description of the pathological and histological findings of a post mortum dissection of six young lions infected with anthrax.

It is assumed that the pathogens were introduced via the alimentary canal and led to septicemia. The most pronounced pathological-anatomical changes were found in a 16-month-old, powerful male lion which succumbed with apoplexy very quickly after the introduction of the infectious agent. This animal died on a fast day; thus the introduction of the pathogens with the food (meat) could have taken place, at the latest, at noon on the preceding day. The same conditions existed for two lionesses which were killed, whereas three younger animals had received meat on the day which was a fast day for the adult lions. One of the animals died on the third day, and two on the fourth day after the last possibility of infection through the food.

A striking discovery was the fact that in the rather large pride of lions only the younger animals were mortally afflicted. It could not be ascertained whether only the younger animals received infected meat. It could likewise not be ascertained whether the grown animals had also eaten the infected meat and were not infected, or whether they did not come in contact with the infected meat at all.

The three youngest of the six animals were extensively infested with Ascaris lumbricoides, two of them were infected with a subacute enteritis, which had existed before the infection. These younger animals had not yet grown their permanent teeth.

The histological picture shows that, without doubt, all six lions excreted anthrax bacilli with feces and urine.

98. Docent Edward Wilkus, Polish Veterinarian Dies

"Edward Wilkus" (unsigned article), Warsaw, Medycyna Weterynaryjna, Dec 57, p 748

A Polish monthly on veterinary medicine reports the 23 June 1957 death in Lublin of Docent Edward Wilkus, Doctor of Veterinary Medicine, director of the Chair of General Zoology in the Maria Curie Sklodowska University in Lublin. He was born on 7 November 1912 in Kojdanow.

Wilkus received his graduation certificate from the St Zolkiewski State Gymnasium in Siedlce in 1930; he then studied in the Mathematics and Natural Sciences Branch of Warsaw University from 1930 to 1936 and received a degree of Master of Biology. Later, he taught in several higher schools and was a member of the Home Army.

In 1944, Wilkus was active in organizing a gymnasium in Siedlce; but after the opening of the Maria Curie Sklodowska University in Lublin, he went there as a senior assistant at the Animal Anatomy Laboratory of the Veterinary Department. After 1948-1949, he worked at Jagiellonian University and the Warsaw University; in 1950, he received his doctor's degree.

From 1952 until his death, Dr Wilkus was associated with the chair of General Zoology of the Maria Curie Sklodowska University in Lublin. He also wrote several important works in the field of animal husbandry.

Miscellaneous

99. Uzbek Medical Progress

"Some of the Problems of Soviet Medical Science in Uzbekistan," by Prof E. I. Atakhanov, Chairman, Scientific Medical Council of Ministry of Health Uzbek SSR; Tashkent, Meditsinskiy Zhurnal Uzbekistana, No 11, Nov 57, pp 28-33

"Considerable progress has been made in medical science and in organization of medical scientific research and health service in the Uzbek SSR during the past 40 years. Using the directive of the 20th Congress of the Communist Party of the Soviet Union as a basis, the Scientific Medical Council of the Ministry of Health Uzbek SSR has been instrumental in formulating plans for medical scientific research in support of the general economic development program for this Central Asian republic.

"Medical workers of the Uzbek SSR have been instrumental in calling several scientific conferences and congresses at which the growth of medical knowledge was discussed and evaluated. Valuable achievements in medicine were ably presented at the joint session of the Academy of Medical Sciences USSR and the Ministry of Health Uzbek SSR, held in Tashkent in September 1954.

"Very few investigations were conducted in the field of regional pathology and regional hygiene prior to the revolution. It can be said that development of medical science in Uzbekistan began when the study of regional pathology was inaugurated and after a foundation was laid for clinical investigation of various tropical diseases of Central Asia.

"Achievements in various other branches of medicine during the past 40 years have also been great. The following organizations have been instrumental in laying the foundation for the basic trends in medical research and practice: Institute of Vaccines and Serums, established in 1918. Tashkent Medical Institute, established in 1919; Institute of Health Resorts and Physiotherapy imeni Semashko, established in 1919; Institute of Malariology and Medical Parasitology, established in 1924; Samarkand Medical Institute imeni I. P. Pavlov, established in 1930; Tashkent Institute of Advanced Study for Physicians, established in 1932; Uzbek Tuberculosis Institute, established in 1935; Institute of Blood Transfusion, established in 1939; and Tashkent Pharmaceutical Institute. There is no doubt that the Andizhansk Medical Institute, organized in 1955, and the Institute of Regional Medicine of the Academy of Sciences Uzbek SSR, organized in 1957, will soon increase the achievements of medical science and improve medical practice in the Uzbek SSR."

100. Prof Zygmunt Adolf Moczarski Polish Geneticist Dies

"Zygmunt Moczarski" (unsigned article), Warsaw, Medycyna Weterynaryjna, Nov 57, p 701

A Polish monthly on veterinary medicine reports the 16 August 1957 death in Poznan of Prof Zygmunt Adolf Moczarski, honorary member of PAN (Polska Akademia Nauk, Polish Academy of Sciences), full professor of the University of Poznan Agricultural Department, and holder of the Commander's Cross of the Order of Polonia Restituta.

Born in Warsaw on 8 March 1876, he completed studies at the Warsaw University Medical Department in 1904 and received the degree of Doctor of Medicine. In 1906, he completed agricultural studies in Wroclaw. He did a great deal of work concerned with the Main School of Rural Economy. Moczarski taught at the Scientific Institute in Pulawy and the University of Poznan; he retired in 1948.

He was the author of several valuable works on genetics, evolution, and zootechnology.

101. Alloys of Rhenium With High-Melting Metals

"Alloys of Rhenium With the High-Melting Metals Mo, Ti, Zr, Ta, Ni, Co, Cr, W, and Mn," by Ye. M. Savitskiy and M. A. Tylkina, Institute of Metallurgy imeni A. A. Baykov, Academy of Sciences USSR, Moscow, Zhurnal Neorganicheskiy Khimii, Vol 3, No 3, Mar 58, pp 820-837

Rhenium is a dispersed element; there are no rhenium minerals: this element accompanies copper and molybdenum. Its content in the earth crust is very low. Rhenium was discovered in 1925, but has not been investigated too extensively up to now. However, the data which have been published and the work of the authors of this paper indicate that this metal is very promising for industrial applications in a number of fields of technology. Research on rhenium in the US, which began during World War II, has expanded at a particularly fast rate beginning in 1950.

An experimental investigation of the systems formed by rhenium with Ti, Mo, Ta, Cr, Ni, Co, Zr, W, and Mn has been conducted by the authors of this paper. The investigation in question was carried out on cast alloys. Different methods of physicochemical analysis were used with the application of a special method of casting in an arc furnace provided with a tap-hole at the bottom. The melting points were determined and high-temperature hardening was carried out. As a result of the investigation, the type of interaction of rhenium with the high-melting metals mentioned was established and the changes of hardness, melting temperature, and electrical conductivity in the systems in question were investigated. It was established that metals with a cubic body-centered crystal lattice (Mo, Ta, Cr, beta-Ti, beta-Zr, and W) and also nickel (which has a face-centered crystal lattice) form with rhenium, which exhibits a hexagonal crystal structure, extensive regions of mutual solubility in the solid state, notwithstanding the differences in the crystalline structure. In all cases the regions of solid solutions containing rhenium are rather small. In a number of systems, sigma-phases or phases of the alpha-Mn type are formed with rhenium. These phases are distinguished by a high degree of hardness and brittleness. They occur within the systems Re-Ti, Re-Mo, Re-Ta, Re-Cr, Re-Zr, and Re-W.

In alloys of rhenium with chromium, titanium, zirconium, molybdenum, tungsten, and tantalum there is a general tendency toward increased hardness of the alloys and formation of a maximum on the composition-hardness curve at a content of rhenium which corresponds to the formation of a chemical compound. In the systems rhenium-nickel and rhenium-cobalt, the hardness curves are smooth and have a shape typical for systems forming solid solutions. In the systems investigated, no alloys with higher melting points than that of rhenium were found.

102. Prospects of the Use of Rhenium as a Component of Heat-Resistant Alloys

Discussion of Reports Presented at the Conference on the Investigation of Constitutional Diagrams of Metal Systems 17-21 May 1957, Institute of Metallurgy imeni A. A. Baykov, Moscow, Academy of Sciences USSR, comments by V. N. Yeremenko, Institute of Cermets and Special Alloys, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Neorganicheskiy Khimii, Vol 3, No 3, Mar 58, pp 837-839

In commenting on the paper "Alloys of Rhenium With the High-Melting Metals Mo, Ti, Zr, Ta, Ni, Co, Cr, W, and Mn" by Ye. M. Savitskiy and M. A. Tylkina [see Item 101, above], V. N. Yeremenko gave the following information:

"The paper presented by M. A. Tylkina contains many interesting data on the structure of alloys based on rhenium. At the Institute on Cermets and Special Alloys, Academy of Sciences Ukrainian SSR, work is also being conducted on rhenium alloys, but not with the purpose of developing heat-resistant materials. One can hardly expect that rhenium will be applied as the principal component or alloying component of alloys used as construction materials. For instance, blades [for gas turbines] presumably will not be made of rhenium or of alloys containing a considerable proportion of rhenium, because this metal does not occur very extensively in nature and is very expensive. Nevertheless, there are fields of application for which rhenium alloys are very well suited and for which these alloys are already being used. This refers particularly to materials that are to be used for electrical contacts in cases where very severe conditions of service are encountered both as far as the current and the potential are concerned. Furthermore, rhenium alloys are suitable for applications in electronics.

"At the Institute of Cermets and Special Alloys, Academy of Sciences Ukrainian SSR, the structure of alloys formed in the system rhenium-beryllium has been investigated by I. N. Frantsevich and the Aspirant V. N. Bulanov. A constitutional diagram has been constructed which shows that the compound ReBe is formed in this system. This compound interacts with the melt, forming solid solution on the basis of beryllium. The boundaries of the existence of phases have been determined in this system. Published information is available on some systems of alloys based on rhenium which have been discussed at this conference by workers from the Laboratory of Rare Metals, Institute of Metallurgy of the Academy of Sciences USSR. It is regrettable that the authors reported the results obtained by them without considering published data. A comparison of their results with published data would have been useful and would have contributed to forming a more rounded picture with regard to the structure of these alloys."

103. USSR Conference on Alloys of Rare Metals

"Investigation of the Alloys of Rare Metals (An All-Union Conference)," by Ye. M. Savitskiy, Doctor of Chemical Sciences, and V. F. Terekhova, Candidate of Technical Sciences, Moscow, Vestnik Akademii Nauk SSSR, Vol 28, No 2, Feb 58, pp 111-112

"Rare metals and alloys containing rare metals are acquiring increased importance from the standpoint of applications in new fields of technology and as materials which exhibit special physical properties (e.g., heat-resistant, semiconductor, nonmagnetic and magnetic, corrosion-resistant, and thermoemissive alloys, including alloys used as construction materials).

"To give an opportunity for the exchange of data obtained in scientific research and to facilitate coordination of work on the investigation of alloys of this type, the Institute of Metallurgy imeni A. A. Baykov, Academy of Sciences USSR, and the Commission on Rare Metals of the Scientific-Technical Committee at the Council of Ministers USSR called an all-union conference that was held 18-20 November 1957. Representatives of scientific research institutions, higher educational institutions, and the industry participated in the conference.

"At this conference reports were given and discussed which dealt with raw material resources available for the production of rare metals, the production of these metals in a pure state, problems to be solved by scientific research dealing with alloys of rare metals, results of the investigation of alloys of different systems including data on the physicochemical properties of these alloys, and problems pertaining to the industrial application of rare metals and their alloys.

"The discussions at the conference demonstrated that work on rare metals which is conducted at a number of scientific research institutions and in the industry proceeds successfully. At the same time shortcomings have become apparent which hamper the progress of research in this field. It was emphasized in connection with this that the number of rare metals produced industrially in a pure state must be increased.

"The most backward field of research is that pertaining to the determination of constants which characterize the physicochemical properties of rare metals in a pure state and of alloys derived from them. The lack of these data delays expedient application of rare metals in the national economy. The same applies to the absence of information on a number of constitutional diagrams of rare-element systems.

"The conference stated [in its resolution] that many specialized branch scientific research institutes have not taken appropriate organizational measures and do not conduct to an adequate extent research pertaining

to the effects exerted by rare metals on the physicochemical properties of new materials. Plant laboratories at enterprises that are concerned with rare metals for all practical purposes do not participate in this work. The coordination of work on rare metals and alloys of rare metals is inadequate. The information available on the work being conducted is inadequate and there is no special periodical dealing with investigations in this field. The absence of uniform methods for the determination of the physicochemical properties of rare metals and alloys of rare metals hinders the application of data that have been obtained.

"Recognizing the exceptional importance of research aimed at the development of new rare-metal materials for applications in the new technology, the conference regarded as necessary a considerable expansion of work on constitutional diagrams and physicochemical constants of rare metals and alloys containing these metals. Institutes of the Academy of Sciences USSR and its affiliates, academies of sciences of the union republics, specialized branch institutes, higher educational institutions, and plant laboratories must participate in this work.

"The Institute of Metallurgy has been charged with the coordination of work on the determination of constitutional diagrams of systems containing rare metals.

"The resolution passed by the conference emphasizes the particular urgency of developing methods which would reduce the time necessary for and the cost of the investigations on rare metals and alloys containing these metals, particularly by introducing increased mechanization and automatization into the preparation of samples and the determination of the properties of these samples.

"The conference furthermore recommended that the exchange of information and data in this field be improved and that the publication of a special periodical be organized. It also urged scientists and workers in the fields of engineering and technology to raise in the near future the level of research on rare metals and their alloys as well as on their industrial applications to an extent commensurate with the increasing demands of the national economy in this respect."

104. Diffusion and Heat Resistance of Nickel Alloy Systems

"The Relation Between Diffusion and Heat Resistance of Nickel Alloy Systems," by I. I. Kornilov and A. Ya. Shinyayev, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, No 9, Sep 57, pp 50-55

Measurements of diffusion coefficients in the metal alloy systems of Ni-Ti, Ni-Ti-Cr, and Ni-Ti-Cr-W-Al showed that the binary alloy has the highest value at all temperatures. The five component alloy has the lowest value at 1,100° C, a value equal to that of the ternary alloy at temperatures higher than 1,100° C and a value greater than that of the ternary alloy at temperatures from 1,200 to 1,250° C. Values for the energy of activation of the diffusion process for each alloy, calculated on the basis of data on coefficients of diffusion, were 73.1, 84.0, and 91.3 K cal/gr-atom for the binary, ternary, and five-component alloys, respectively. Comparison of the coefficients of diffusion and heat resistance showed that change of the values of coefficients of diffusion definitely determines the change in heat resistance.

105. Press-Forging of Molten Steel

"Pressing of Molten Steel," by I. Savin; Moscow, Tekhnika-Molodezhi, No 4, Apr 58, pp 17-18

The article proposes a method of press-forging steel parts directly from molten steel, which will reduce the metal waste, for example, in the manufacture of medium-size gears, from 75% to 10%.

The new process is visualized as follows: the molten metal is poured into a die mold heated to about 200° C. A short time after pouring, a thin crystalline crust is formed and a pressure of 500 kg/cm^2 is applied to the metal through a die-plunger. The same pressure is maintained in the mold until the metal is fully crystallized. Shrinkage cavity formation during solidification is completely prevented.

This process also promises to speed up greatly the production of press-forged articles.

106. Death of Polish Foundry Specialist

"Professor Kazimierz Gierdziejewski Dies" (unsigned article), Berlin, Giessereitechnik, No 10, Oct 57, p 240

Kazimierz Gierdziejewski died on 29 July 1957 in Krakow at the age of 69. After World War II he managed a foundry in Wegierska Gorka and worked on plans for many new foundries. In 1946 he laid the organizational framework for the Foundry Research Institute in Krakow, which developed rapidly under his guidance, and participated in the work of the First Congress of Polish Science. In recognition of his services he received the Polonia Restituta Officer's Cross and the Gold Cross of Merit of the NOT [Naczelna Organizacsa Techniczna, Chief Technical Organization] at the beginning of 1957. He published more than 100 technical books. Gierdziejewski was well known abroad and belonged to a number of international foundry committees and unions.

X. PHYSICS

Atomic and Molecular Physics

107. Range and Specific Ionization of Ions in Gases Measured

"Range and Specific Ionization of Multicharged Ions in Gases," by Ya. A. Teplova, V. S. Nikolayev, I. S. Dmitriyev, and L. N. Fateyeva, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 34, No 3, Mar 58, pp 559-568

The range and specific ionization of ions in air, argon, and hydrogen were measured. Ions from Be to Ne were used and velocities ranged from $1.5 \cdot 10^8$ to $12 \cdot 10^8$ cm/sec. It was found that at velocities less than $5 \cdot 10^8$ cm/sec the limiting velocity and range of the ions were approximately proportional to the velocity of the particles. At higher velocities, the range was proportional to the square of the velocity and the limiting ionization curve had a flat maximum similar to that in the Bragg curve for alpha particles. It was also observed that the stopping power of a substance is not the same for the different ions but decreases with the increase in the atomic number of the ion.

It is noted in the introduction that the problem of the passage of charged ions of light elements through a substance has arisen in connection with the study of hypernuclei and nuclear reactions under the influence of multicharged ions.

Nuclear Physics

108. Experiment With Protons to Verify Relativistic Increase in Mass

"Measurement of the Mass of 660-Mev Protons," by V. P. Zrelov, A. A. Tyapkin, and P. S. Farago, Joint Institute of Nuclear Research; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 34, No 3, Mar 58, pp 555-558

The mass of protons computed on the basis of the relativistic equation $m_2 = m_0[1-(v^2/c^2)]^{-1/2}$ by measuring the velocity and on the basis of the equation $m_1 = p/v$ by measuring the momentum and velocity of the

protons was compared. The experiment was performed in the external beam of a synchrocyclotron with protons of energy 660 Mev. The relative deviation Δ m/m was 0.004 (1 ± 0.6). It was found that within the limits of the experimental error the results agree with the relativistic law for the increase in mass.

109. Effect of Impurities on Photoelectric Absorption of Gamma Rays Studied

"Photoelectric Absorption of Scattered Gamma Radiation," by M. M. Sokolov, A. P. Ochkur, A. A. Fedorov, and N. I. Karabanov; Moscow, Atomnaya Energiya, Vol 4, No 3, Mar 58, pp 284-285

The spectrum of scattered gamma radiation in a medium with low atomic weight and containing various admixtures of heavy metals was studied. "It is well known that the coefficient of photoelectric absorption is proportional to the fourth power of the atomic number of an element. One may use this relationship as a basis for determining the concentration of heavy elements in a medium with low Z. Such a determination made on the basis of the total intensity of scattered gamma radiation was made in a paper by G. M. Voskoboynikov (Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya, No 3, 351, 1957). More complete data on the effect of admixtures of heavy elements on photoelectric absorption can be obtained by studying the spectral composition of scattered gamma radiation."

110. Thermal Relaxation Processes in Systems With Equivalent Spins Considered

"Relaxation Processes in a System of Interacting Spins," by I. V. Aleksandrov, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 118, No 4, 1 Feb 58, pp 675-678

The thermal relaxation processes of systems of several equivalent spins 1/2 subjected to an external magnetic field is considered. The relaxation process is taken as "internal," that is, caused by the interaction of spins of nuclei of the same molecule. The dipole-dipole interaction of nuclear magnetic moments relating the spin system to the thermal motion of the molecules is assumed to be small in comparison with the interaction of the spin system with the external field. The dipole-dipole interaction is then handled as a perturbation and the relaxation processes are described in terms of the transition probabilities between levels of the system of interacting spins.

111. First Experiments Using Synchrophasotron of Joint Institute Described

"Interaction of 9-Bev Protons With Nuclei of Photoemulsion," by N. P. Bogachev, Wang Shu-fen, I. M. Gramenitskiy, L. F. Kirillova, R. M. Lebedev, V. B. Lyubimov, P. K. Markov, Yu. P. Merekov, M. I. Podgoretskiy, V. M. Sidorov, K. D. Tolstov, and M. G. Shafranov; Moscow, Atomnaya Energiya, Vol 4, No 3, Mar 58, pp 281-284

Results of the first experiments performed on the synchrophasotron of the High-Energy Laboratory of the Joint Institute of Nuclear Research are given. Photographic emulsions of the NIKFI-R type were subjected to a beam of 9-Bev protons. A total of 258 cases of interaction between protons and emulsion nuclei were recorded, and an analysis of the different types of stars is given.

112. Interactions Between Pions and Protons Investigated

"Nuclear Interactions of Pi-mesons and Protons in Graphite," by N. M. Kocharyan, G. S. Saakyan, M. T. Ayvazyan, A. S. Aleksanyan, and Kh. B. Pachadzhyan, Institute of Physics, Academy of Sciences Armenian SSR; Yerevan, Izvestiya Akademii Nauk Armyanskoy SSR, Vol 10, No 3, 1957, pp 81-88

Experiments to determine the transverse cross sections for the inelastic nuclear interaction of protons and pions in graphite are described. Measurements were made in 1955 at the Aragats High-Mountain Station. An Alikhanyan-Alikhanov magnetic spectrometer was used in the measurements. Tables and a discussion of the data are given.

113. No Atomic Plane Foreseen in Immediate Future

"Toward the Atomic Plane" (unsigned article), Budapest, Muszaki Elet, No 24, 26 Dec 57, p 13

According to this article, the press has been making irresponsible statements concerning nuclear-powered planes and rockets. Some papers, it is stated, have even published stories maintaining that Sputnik II was launched by an atomic rocket, whereas there was no need whatsoever for this.

"If it was stated in 1945 that it would take 30 years to develop an atomic plane or rocket, then today...we can deduct a maximum of 8-12 years from this deadline. Although more is known today about the problems involved in the construction of an atomic plane, it will still surely take years to solve these problems."

The article maintains that the direct use of atomic energy to drive a plane is unfeasible. It can be used only as a source of heat for some type of jet engine. The greatest problem is to render harmless the radioactive exhaust gases. Until this problem has been solved, "the atomic plane will be nothing but an unsolved chapter in the interesting development of flight engineering."

Electricity

114. Method for Calculating Efficiency of Rectifying Photocells in Direct Conversion of Energy of Penetrating Radiation Into Electrical Energy

"On Calculating the Efficiency and Quantum Yield of Rectifying Photocells Being Acted on by Penetrating Radiation," by M. A. Talibi and G. B. Abdullayev, Institute of Physics and Mathematics; Baku, Doklady Akademii Nauk Azerbaydzhanskoy SSR, Vol 14, No 3, Mar 58, pp 201-205

"In connection with the production of semiconductors of a relatively high degree of purity and the development of new types of rectifying photocells, there has been a significant increase in the attention being devoted to the study of the direct conversion of radiant energy into electrical energy."

The authors propose a method for determining the absorption of penetrating radiation by a layer of material included between plane absorbers. On the basis of this method, formulas are presented for computing the efficiency and determining the effective quantum yield of rectifying photocells which convert the energy of penetrating radiations directly into electrical energy.

Mechanics

115. Bending of Plates

"Bending of Oblique-Angled Plates," by V. T. Baykov, B. N. Lopovok, and I. I. Trapezin, Tr Mosk. aviats. in-ta, No 69, 1956, pp 3-10 (from Referativnyy Zhurnal--Mekhanika, No 11, Nov 57, Abstract No 13072, by I. Ye. Sakharov)

The problem of bending parallelogram-shaped plates with pinched edges under a uniformly distributed load is solved by Kantovich's method.

116. Stability of Plates of Variable Thickness

"Investigation of the Stability of Plates of Alternate Thickness Under Tangential Stresses,"by A. A. Korolev, Izv. Vses. n.-i. in-ta gidrotekhn., No 57, 1957, pp 112-128 (from Referativnyy Zhurnal--Mekhanika, No 11, Nov 57, Abstract No 13080, by A. A. Kurdyumov)

The article considers the problem of the stability of plates consisting, according to width, of three parts: the middle part being of constant thickness, and the thickness of the side parts changing according to the hyperbolic cosine law. The problem is solved by the method of energy consideration.

117. Stability of a Plate With Noncontinuous Boundary Conditions

"Free Vibrations and the Stability of a Rectangular Plate With Noncontinuous Boundary Conditions," by V. Novatskiy, Byul. Pol'skoy AN, Series 3, No 4, 1955, pp 163-172 (from Referativnyy Zhurnal--Mekhanika, No 11, Nov 57, Abstract No 13106, by N. N. Babayev)

The problem concerning the determination of the frequency of the free oscillations and the values of the critical load of a rectangular plate, three sides of which are freely supported along the entire edge, and the fourth side rigidly fastened at one part of its length while the other part is either freely supported or not fastened at all, is solved. The load compressing the plate acts in a plane to its middle surface, being applied to two opposed edges, and fastened in the usual manner.

A similar problem is solved in addition to this for the case of a rectangular plate, freely supported along its whole contour and having a slit located along the plate's axis of symmetry so that the end of the slit coincides with the supporting contour. The theory of integral equations is used as the apparatus for the solution of this problem. It is shown that by a similar method more complex problems could be investigated, in particular, the case of a plate with a linear support inside the contour.

118. Bending of Thin Elastic Plates

"Clean Bending of Thin Plates With Two Circular Openings by M. I. Kalinyak, Nauchn. zap. L'vovsk. politekhn. in-ta. No 38, 1956 (1957), pp 141-148 (from Referativnyy Zhurnal--Mekhanika, No 11, Nov 57, Abstract No 13064, by Ya. S. Uflyand)

The solution of a problem on the transverse bending of a thin elastic plate weakened by two circular openings of equal radius, is presented, using systems of polar coordinates. The case is considered when at infinity the plate is in a state of clean bend.

The values of the maximum contour values of bending moments for different relationships of the radius of the openings to the distance between their centers are calculated.

119. Approximate Solution for Problem Concerning Vortex Flow of Ideal Gas

"On One Class of Plane-Parallel, Steady Vortex Flows of a Gas", by Yu. S. Zav'yalov Tomsk State University imeni V. V. Kuybyshev; Moscow, Doklady Akademii Nauk SSSR, Vol 116, No 3, 1957, pp 363-364

In the monograph of L. I. Sedov (reference 1, at end of item) and in the work of Yu. V. Rudnev (reference 2) it is proved that, if the velocity v of a plane-parallel steady vortex flow of an ideal compressible fluid has the form $v(p,\psi) = f(p)\ F(\psi)$, where p is the pressure and ψ is the current function, then the problem concerning the vortex flow of a gas reduces to the problem concerning the potential flow with the same system of linear current and velocity $V(p) = f(p)$. In the above work this problem is considered for a more general case.

The author begins with the following introduction:

"Let the quantity $1/v\ \partial^2 v/\partial p^2$ be independent of ψ. The function $v(p,\psi)$ must then have the form

* $v(p,\psi) = f_1(p)F_1(\psi) + f_2(p)F_2(\psi)$, where the functions $f_1(p)$ and $f_2(p)$ satisfy the relation

** $f_1''(p)/f_1(p) = f_2''(p)/f_2(p)\ldots,$" and then succeeds in showing that if the function $v(p,\psi)$ is expressed by formula * under conditions **, then the problem concerning the vortex flow of a gas leads to the problem concerning potential flow.

In the work of I. Z. Kalishevich (reference 4), it is proved that if under adiabatic flow of a gas the total energy is constant and if the function characterizing the entropy varies slightly, the velocity function may be approximately represented in the form *. Then utilizing the results obtained above, an approximate solution of the rotation problem is derived. One of these solutions for the case of supersonic motion is presented in reference 3.

1. L. I. Sedov, Ploskaya Zadacha Gidrodinamiki i Aerodinamiki (Plane Problem of Hydrodynamics and Aerodynamics), 1950.

2. Yu. V. Rudnev, symposium, edited by L. I. Sedov, Teoreticheskaya Gidromekhanika, No 4, 19 (1949).

3. Yu. S. Zav'yalov, Avtoreferat dissertatsii, (Dissertation), Tomsk, 1956.

4. I. Z. Kalishevich, Doklady Akademii Nauk SSSR, 99, No 1, 37 (1954).

120. Two Additional Cases Pertaining to Streamlining of Bodies With Finite Dimensions

"Concerning the Strong Influence of the 'Second' Form of Hydrodynamic Motion on Flat Bodies (the Dynamics of Plane Discontinuous Flows)," by A. A. Nikol'skiy; Moscow, Doklady Akademii Nauk SSSR, 1957, Vol 116, No 3, 1957, pp 365-368

The fundamental aspects of this work were presented by the author at the Ninth International Congress on Applied Mechanics in Brussels, 12 September 1956.

In his former work which appeared in Doklady Akademii Nauk SSSR, Vol 116, No 2 (1957), the author reported an investigation of the streamlining of bodies in an ideal fluid during development of a second form of motion close to them connected with formation in the current of surfaces γ of a tangential burst of speed. In this work, as in the former, the full field of velocities is considered as the sum of a fundamental field E_1, corresponding to the streamlining of a body without formation of the surfaces γ, and of the complementary field E_2; the general circulation of an element of the surface γ is denoted by Γ;

$w = \varphi + i\psi$, $w_1 = \varphi_1 + i\psi_1$, $w_2 = \varphi_2 + i\psi_2$ are, respectively, the complex potentials of the fields E, E_1, E_2; t is the time; p is the pressure; ρ is the density. Here the formulas and designations of the former work are employed. In the former work two cases of motion

were considered, cases I and II and their corresponding subcases. "Here we will not consider these cases but will consider two additional cases; namely, cases III and IV with their corresponding subcases pertaining to the streamlining of bodies with finite dimensions."

Miscellaneous

121. New Vacuum-Meter Developed in Yugoslavia

"New Vacuum-Meter of Dr Milena Varicak," by R. Popovic, Belgrade, Politika, 19 Mar 58, p 5

One of the speakers at the First International Congress for Vacuum Technology (Internacionalni kongres za vakuumsku tehniku), to be held in June 1958 in Namur, Belgium, will be Dr Milena Varicak, head of the Laboratory for the Physics of Solids, "Rudjer Boskovic" Institute, and scientific consultant of the Natural Sciences and Mathematics Faculty in Zagreb. Varicak will report on her new vacuum-meter, which measures vacuum with the aid of a semiconductor.

With nearly all equipment in nuclear physics and for certain branches of industry (electrical industry, metals industry, the production of electronic tubes, and others), the low pressure of gases, or a vacuum, is required, which is measured by vacuum-meters. Until now, there has been no vacuum-meter constructed to measure all the low pressures in nuclear equipment; the fact that several meters have been used has made the process of measurement unquestionably more expensive.

Five years ago, scientists in Germany successfully used thermistors, (semiconductors of new design) for a vacuum-meter. Although this was the best vacuum-meter at that time, it could not measure the entire range of pressures in nuclear equipment, and another meter still had to be used with it.

When the neutron generator was built in the "Rudjer Boskovic" Institute in Zagreb, it was necessary to make a vacuum-meter to measure gases at low pressure, and the conclusion was reached that it would be possible to make a vacuum-meter with a conductor adequate for measurement in the neutron generator.

After 2 years' work, a vacuum-meter was designed by Dr Varicak, based on the thermistor system. The technical construction of the meter was developed by Branimir Seftic, Varicak's associate. The invention was recently registered in their names in the Patent Office of Yugoslavia (Patentni ured Jugoslavije).

The value of the new vacuum-meter lies in its ability to measure the entire range of gas pressure required for nuclear apparatus, and it significantly simplifies manipulation during the operation of nuclear apparatus. In addition, the measurement time has been shortened, and the meter is less expensive and more durable than previous vacuum-meters, which were very light and frequently broke down.

At present, the "Rudjer Boskovic" Institute is investigating the possibility of using the new vacuum-meter to measure the intensity of X rays, gamma rays, and flux neutrons.

XI. MISCELLANEOUS

122. Scientific Developments in the Georgian SSR

"Devotion to Work by Scholars," by G. Mikeladze, Chairman of State Scientific-Technical Committee of Council of Ministers Georgian SSR; Tbilisi, Zarya Vostoka, No 22, 27 Jan 58, p 5

In the past 2 years, considerable progress has been made in the Georgian SSR in the field of scientific research. At present, there are 180 scientific research establishments and thousands of specialists are employed in productive research.

There has recently been formed a major computer center in Tbilisi. This center will greatly aid scholars in the field of applied sciences, and will aid the planning and design organizations in their work concerning complicated mathematical calculations.

Within the system of the Academy of Sciences Georgian SSR, there have been formed, during this period, three new institutes: the Institute of Electronics, Automatics, and Telemechanics; the Institute of Applied Chemistry and Electrochemistry; and the Institute of Mining.

In addition, there have been formed in the republic a series of new institutes, i.e., the Tbilisi Scientific Research Institute of Instrument Building and Means of Automation (TNIISA); the Scientific Research Institute of the Automation of Production Processes (Avtomatprom) in Gori; the Planning-Design Institute of the Automation of Production Processes (Avtomatprom) in Rustavi, and the Tbilisi and Kutaisi Special Design Bureaus of Instrument Building and Means of Automation.

"The opening of these institutes and design bureaus testifies not only to the tremendous growth of technical sciences in the Georgian SSR, but also to the growth of highly qualified cadres, scientific workers, engineers, technologists, and specialists in all fields of science.

"During the last year, these new institutes and design bureaus have contributed considerably to science. In the Tbilisi Scientific Research Institute of Instrument Building and Means of Automation there has been developed a mathematical machine for calculating the composition of the charge of a cupola, which has considerable significance for the accurate obtention of graded pig iron. It has also developed a model computer for the regulation of the position of electrodes in iron alloy furnaces.

"In problems concerning the automation of technological processes of the food and light industry, success has been achieved by the Scientific Research Institute of the Automation of Production Processes in Gori.

This institute has, in part, developed for the food industry such processes as the automation of the production of green-bagged tea and of champagned wine, and has developed an instrument for the determination of the fat content of milk."

123. Hungarian Academy Research

"Accomplishments of Academicians" (unsigned article), Budapest, Muszaki Elet, 9 Jan 58, p 4

Source summarizes briefly the accomplishments of the academicians and the results of research performed under the direction of the Hungarian Academy of Sciences.

According to the report of the Committee on Geology and Geochemistry, Academician Elemer Vadasz has begun the investigation of pollen spores occurring in bauxite. The Geochemical Research Laboratory, directed by Academician Elemer Szadeczky-Kardoss, has achieved outstanding results in its experiments with the transformation of rock through high pressure, as well as in investigating the reciprocal influences of magma and coal on each other. The Geodetic Research Laboratory has completed the calculation of the Gauss-Kruger coordinates relating to the Krasovskiy ellipsoid. Hungary has begun its participation in the activities of the IGY under the direction of Academician Antal Tarczy-Hornoch.

Under the direction of Gusztav Tarjan, Corresponding Member, the Department of Coal and Ore Dressing Sopron University, has conducted research on the kinematics of hydrocyclone and the sedimentation rate of solid particles in coarse dispersions. The Main Committee on Hydrology has investigated the possible uses of radioactive isotopes in hydrology.

Emil Mosonyi, Corresponding Member, has achieved results from his research on the development of column-supported power plants.

Under the direction of Academician Sandor Geleji, the Main Committee on Metallurgy succeeded in the theoretical computation of the forces generated in the course of making metals malleable. Under the direction of Academician Jozsef Vero, the Department of Metallography [of Budapest Technical University?] investigated the hardenability of standard steels.

Under the direction of Laszlo Gillemot, Corresponding Member, good results were achieved in the investigation of the susceptibility of titanium steels to nitriding and of the prerequisites to the nitriding of these titanium steels.

Imre Razso, Corresponding Member, was engaged in developing further the theory of soil cultivating machines.

In the field of power engineering Otto Benedikt, Corresponding Member, broadened the theory of and developed further the new 50-cycle commutator-type vehicle motor. Laszlo Heller, Corresponding Member, arrived at significant partial results in solving air condensation by means of natural ventilation as utilized for large units.

The Main Committee on Telecommunications drew up a detailed recommendation regarding the long-range research and industrial development program of Hungarian telecommunications. Istvan Barta, Corresponding Member, achieved results in this field in his investigations of the possibility of receiving and improving the quality of the reception of foreign television broadcasts. Under the direction of Geza Bognar, Corresponding Member, the Telecommunications Research Institute (Tavkozlesi Kutato Intezet) constructed a model electric, broad-band microwave radio connection operating at a frequency of 4,000 mc. Tivadar Millner, Corresponding Member, evolved a system for measuring the specific effect of microscopically minute impurities on the recrystallization of wolfram.

Under the direction of Academician Erno Winter, research was conducted relating to the evaporation of oxide cathodes; it was discovered that given a certain combination and physical structure, the evaporation can be reduced to a minimum at normal shop temperatures. Consequently, certain products of vacuum engineering can be made to last several times as long as they do at present. Under the direction of Gyorgy Szigeti, Corresponding Member, research is being conducted in the field of semiconductors and illuminants to increase the effectiveness of phototubes. Nandor Barany, Corresponding Member, has constructed an ophthalmological instrument which makes possible precise determination of the stereoscopic vision of a patient.

The Main Committee on Automation has drawn up long-range plans. The research group of the academy, working at the university department under the direction of Pal K. Kovacs, Corresponding Member, has had success in developing rapid-acting voltage regulators with nonrotary units for large turbogenerators.

Under the direction of Karoly Szechy, Corresponding Member, important model tests have been conducted to determine earth pressures on bridge abutments and the load capacity of pilings.

Under the leadership of Mor Korach, Corresponding Member, several scientific themes have been developed in the field of "silicate" metallurgy.

The Department of Organic Chemical Engineering, under the direction of Academician Zoltan Csuros, has had success in developing the technology for the production of nonwoven textiles.

124. Soviet Acoustics Specialist Visits Hungary

"Soviet Visitor at the Optical and Cinema Technology Association" (unsigned article), Budapest, Muszaki Elet, 20 Feb 58, p 2

O. D. Burkov, acoustics specialist and a department head of the "Scientific Research Institute on Film Technology in Moscow," [probably All-Union Scientific Research Institute of Cinephotography in Moscow], went to Budapest for a 2-week study trip on the basis of a scientific and technical cooperation agreement. He visited the Optical and Cinema Technology Association (Optikai es Kinotechnikai Egyesulet), where he exchanged ideas with Hungarian experts on film technology and acoustics, the Audio and Orion Factory (Audio- es Oriongyar), and film factories in Budapest.

125. Yugoslav Republic Will Organize Scientific Investigative Work in Agriculture

"Scientific Investigative Work Will Be Organized in Agriculture," (unsigned article), Belgrade, Politika, 30 Mar 58, p 12

On 28 March 1958, the problem of scientific investigative work in agriculture was examined at a meeting of the Executive Council of Bosnia-Hercegovina under the chairmanship of Osman Karabegovic. The proposal adopted for the organization of this work will eliminate present deficiencies. The means and personnel will be concentrated in independent faculty establishments (fakultetski zavodi) for the solution of problems in certain branches of agricultural production. The bureaus will be supported in their work by the srez agricultural stations, and through the stations the results achieved will be put into practice.

The Executive Council also decided to found an enterprise for designing and research in industry (preduzece za projektovanje i istrazivanje u industriji). The enterprise will be concerned with working out investment programs and designs for the chemical industry, the chemical processing of wood, and the food-processing industry.

The council also made several decisions based on a proposal for the reorganization of the clinical hospital of the Medical Faculty in Sarajevo. It was decided to separate the Physiological Clinic and the Clinic for Ophthalmic Diseases (Klinika za ocne bolesti) into two special institutions with independent financing.