

CIA/PB 131891-T8

Approved For Release 2000/08/04 : CIA-RDP80-00410A000000000001-6

~~UNCLASSIFIED~~ SCIENTIFIC INFORMATION
REPORT

17 OCTOBER 1958

1 OF 2

166

T-8
NOV 1958
COPY

PB 131891T-8

CENTRAL INTELLIGENCE AGENCY

SCIENTIFIC INFORMATION REPORT



17 October 1958

Distributed Only By
U.S. DEPARTMENT OF COMMERCE
OFFICE OF TECHNICAL SERVICES
WASHINGTON 25, D.C.

*ARCHIVAL RECORDS
Return to Archives & Records Center
Immediately After Use*

Issued Semi-monthly. Price: Per year \$28.00; Single issue \$2.75.

JOB _____ *BOX* _____

Approved For Release 1999/09/23 : CIA-RDP82-00141R000100170001-5

Use of funds for printing this publication approved
by the Director of the Bureau of the Budget July 31, 1958.

Approved For Release 1999/09/23 : CIA-RDP82-00141R000100170001-5

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

Table of Contents

	<u>Page</u>
I. Chemistry	1
II. Electronics	21
III. Engineering	40
IV. Mathematics	47
V. Medicine	54
VI. Physics	92
VII. Miscellaneous	99

NOTE: Items in this report are numbered consecutively.

I. CHEMISTRY

Chemistry and Technology of Fuels and Propellants

1. Inflammability Characteristics of USSR Reaction Engine (Jet) Fuels

"Inflammability of Reaction Engine [Jet] Fuels," by N. A. Ragozin and A. F. Vorob'yeva, State Research Institute of the Civil Air Fleet; Moscow, Khimiya i Tekhnologiya Topliv i Masel, Vol 3, No 4, Apr 58, pp 39-45

The temperature limits of the formation of explosive mixtures by vapors of T-1, TS-1, and T-2 fuels, a fuel of the kerosene type, and B-70 (an aviation gasoline) depending on the altitude have been determined. The physico-chemical characteristics of these USSR fuels are described.

The altitude (degree of rarefaction) was determined at which the formation of superenriched mixtures begins, with the result that the explosion point of the mixtures becomes unstable. The temperatures of the spontaneous ignition of fuels and the temperatures at which the fuels ignite on contact with a hot surface were determined. The dependence of the flash point on the vapor tension was determined.

The inflammability characteristics of the USSR fuels were compared with those of similar British and US fuels. The US fuels used for comparison were JP-1, JP-3, JP-4, B-73, and B-100/130. The concentrations of carbon dioxide, nitrogen, methyl bromide, and carbon tetrachloride sufficient to extinguish burning gasoline and kerosene vapors and to prevent their explosion were determined. The results were compared with those obtained in work done outside the USSR.

2. Method for Determination of Water Content of Fuels

"A Calcium Hydride Method for the Determination of the Content of Water in Fuels Under Consideration of the Kinetics of Hydrogen Evolution," by M. M. Kusakov, M. A. Landau, N. M. Lubman, and M. I. Shchetsko, Petroleum Institute of the Academy of Sciences USSR; Moscow, Khimiya i Tekhnologiya Topliv i Masel, Vol 3, No 4, Apr 58, pp 55-61

Formulas have been derived for the calculation of the water content of liquid hydrocarbons on the basis of the pressure of hydrogen evolved as a result of the interaction of the water with calcium hydride. In the method described (p-method), the change in the volume of the gas phase, the partial pressure of hydrogen, and the solubility of hydrogen in the fuel are taken

into consideration. It is shown that, when an excess of calcium hydride is present, the reaction of the calcium hydride with water can be described by a kinetic equation of the second order.

Starting from the kinetic equation for a reaction of the second order, a graphic method is proposed for the determination of the limiting values of the volume or pressure of hydrogen evolved as a result of the interaction of calcium hydride with water.

A kinetic variant of the p-method is described which makes it possible to determine the content of water in liquid hydrocarbons with a precision sufficient for practical purposes (a precision of about 6%). This method is suitable for scientific research work. By using it one can determine not only dissolved water but also water dispersed in the form of fine droplets.

Consideration of the kinetics of the evolution of hydrogen in connection with the V-method (volume method) makes it possible to reduce the time necessary for the determination and to improve the precision of measurements from 5% to approximately 3%.

It has been found that saturation of liquid hydrocarbons with water for the determination of the solubility of water in them is best done over the vapor phase rather than by direct contact of the fuel with water and mixing of the two phases, because otherwise values which are too high are obtained.

Determination of the water content of fuels is of importance, even when this content is extremely small, because at low temperatures the water may separate and clog fuel filters and the fuel supply system of planes. The method described has been checked on mixtures of T-1 kerosene and B-70 gasoline with water.

3. New Method for Investigating Stability of Turbojet Fuels

"Evaluation of the Stability of Fuels of the Kerosene Type by Circulating Them Through the Fuel Pumps of a Turbojet Engine," by B. F. Korobov and B. I. Komarov, All-Union Scientific Research Institute of Petroleum Products; Moscow, Khimiya i Tekhnologiya Topliv i Masel, Vol 3, No 4, Apr 58, pp 51-54

A method of repeated pumping of fuel through the fuel system of a turbojet engine has been developed which makes it possible to subject to comparative evaluation the stability of fuels. The results obtained indicate that the method in question can be applied in connection with the solution of practical problems pertaining to the use of fuels in reaction engines. By using this method, suitable antioxidants can be selected and the catalytic effect of copper alloys on the fuel studied. By pumping fuel of the kerosene

type for 50 hrs at an inlet temperature of 800, it was established that machine parts of aluminum bronze remain unchanged; parts of VB-24N antimony-nickel bronze show local darkening; and parts of VB-24I antimony bronze develop considerable darkening over the surface and acquire a resinous coating. These changes indicate the differences in the catalytic effect exerted by the three different types of bronze.

Investigation by the method developed of the effect of antioxidants on fuels of the kerosene type indicated that p-hydroxydiphenylamine is superior to the other additives tested and that it should be subjected to further investigation.

4. Effect of Vanadium and Sulfur on Operational Characteristics of Gas Turbine Fuels

"Fuel for Gas Turbine Power Plants," by B. V. Losikov; Moscow, Khimiya i Tekhnologiya Topliv i Masel, Vol 3, No 4, Apr 58, pp 32-39

Petroleum residue fuels (mazut) from crudes with a low sulfur content and a content of vanadium lower than $1 \times 10^{-3}\%$ can be used on all gas turbines suitable for heavy residue fuels. Mazut from sulfurous crudes containing more than $1 \times 10^{-3}\%$ of vanadium can be used on gas turbines if the temperature of the gas immediately before entering the turbine does not exceed 650°.

The application of fuels with a high vanadium content, which is typical for mazut derived from sulfurous crudes, gives rise to serious difficulties at forced-draft gas-turbine installations, because there is formation of deposits and corrosion of the blade assembly. A promising method of eliminating corrosion caused by vanadium is addition to the fuel of substances which react with vanadium pentoxide and iron oxides, forming low-melting compounds that do not form deposits. Good results were obtained with the use of silicon compounds (e.g., silicones, kieselguhr or diatomaceous earth, kaolin, and bentonite) and of barium, magnesium, and calcium naphthenates soluble in the fuel. However, this method is not yet being applied extensively in practice. Initiation of research in this field on a broad scale is advisable.

The vanadium content of USSR crudes and of residual fuels derived from them is known and must be taken into consideration from the standpoint of possible damage to gas turbines.

The application of distilled fuels of the diesel type with any sulfur content should not give rise to difficulties as far as corrosion of gas turbines due to the presence of vanadium is concerned, because these elements, as well as other ash-forming elements (e.g., sodium), are for all practical purposes absent in fuels of this type. On the other hand, straight-run fuels are preferable to distilled products of thermal and catalytic cracking or gas oils derived from coal distillation, because the latter have a high content of aromatic and unsaturated hydrocarbons, so that deposition of carbon is possible.

5. USSR Conference on New Types of Motor Fuels

"An Intervuz Scientific-Technical Conference" (unsigned article);
Baku, Izvestiya Vysshikh Uchebnykh Zavedeniy-Nefti i Gaz, No. 7,
Jul 58, p 16

CPYRGHT

"Scientist participating in the intervuz scientific-technical conference [a vuz is a higher educational institution] emphasized in communications made by them the exceptional importance of the decision made by the May 1958 Plenary Session of the Central Committee CPSU in regard to accelerated development of the chemical industry.

"Thirty-three reports were presented altogether. The newest methods for the production of petrochemical products and motor fuels and oils were discussed.

"In a report by Prof A. Z. Dorogochinskiy (Groznyy Petroleum Institute and Groznyy Scientific Research Institute); B. K. Amerik, Candidate of Technical Sciences; and A. P. Litvin, engineer of the Groznyy Chemical Plant, problems connected with the preparation of raw materials for petrochemical syntheses were discussed.

"Papers by Prof N. I. Chernozhukov and V. I. Isagulyants (Moscow Petroleum Institute imeni Academician I. N. Gubkin) discussed problems pertaining to the synthesis of lubricating oils and of efficient additives to such oils.

"Reports by Prof M. G. Mamedli (Azerbaijdzhan Instrument Institute imeni M. Azizbekov) and B. F. Korobov, senior scientific associate of the All-Union Scientific Research Institute of the Petroleum Industry, dealt with problems pertaining to the production of synthetic reaction-engine and gas turbine fuels.

"A. D. Petrov, Corresponding Member of the Academy of Sciences USSR, discussed the synthesis of individual hydrocarbons from petroleum raw materials.

CPYRGHT

"Oxidation of paraffin in the foam phase formed the subject of a paper by Docent I. G. Triandifilidi (Leningrad Polytechnic Institute).

"In reports by Docent A. K. Seleznev and I. S. Maksimova (Groznyy Petroleum Institute), problems pertaining to the synthesis of betachloroethers and the application of such ethers for chemical synthesis were considered.

"A number of reports dealt with the improvement of catalysts and research on catalysts applied in the petroleum conversion industry. Reports in this field originated at the Chemical Institute of the Academy of Sciences Azerbaydzhan SSR, the Groznyy Petroleum Institute, the Moscow Petroleum Institute imeni Academician I. N. Gubkin, and the Groznyy Scientific Research Institute.

"A very favorable factor in connection with the work of the conference was the participation of a great number of production workers from enterprises located in the city of Groznyy.

"A resolution passed by the conference recommended that the composition of individual hydrocarbons contained in the gasoline and ligroin fractions of all principal USSR petroleum crudes be investigated, the structural group composition of these fractions determined, and a card file of petroleum crudes compiled.

"The necessity of expanding research on the separation of individual hydrocarbons from hydrocarbon mixtures was pointed out. In view of the exceptional importance of work in this field, it has been decided to request the Ministry of Higher Education USSR and the Presidium of the Academy of Sciences USSR to hold an all-union conference on the subject.

"The conference furthermore recommended that higher educational institutions, research institutes, and industrial laboratories expand work on the investigation of possibilities of applying large-scale processes such as thermal and catalytic cracking, coking, etc., with the view of considerably increasing the production of raw materials for petrochemical synthesis.

"The decision was made to develop the technology of dehydrogenation and pyrolysis processes with the application of different catalysts and inactive heat transfer agents, as well as to take measures for the acceleration of the development of processes by which normal paraffinic hydrocarbons are transformed into aromatic hydrocarbons by dehydrogenating cyclization. It was furthermore recommended to expedite the practical application of results obtained in work on the dehydrogenation of six-membered naphthenes contained in the gasoline fractions of crude petroleum.

"Measures have been suggested for the improvement of the quality of reaction motor fuels, including increases in their density and heat-energy output, improvement of the thermal stability of fuels at high temperatures, and application of procedures by which fuels for gas turbine engines can be produced in the most efficient manner.

"The conference advocated the expansion of scientific research on the production of synthetic fibers, plastics, and oxygen-containing compounds derived from petroleum hydrocarbons. The advisability of more profound studies in the field of the preparation and investigation of the properties of catalysts for diverse reactions was pointed out."

6. Book on Gas-Turbine Fuels

Tyazheloye Zhidkoye Toplivo Dlya Gazovykh Turbin (Heavy Liquid Fuel for Gas Turbines), by A. V. Kozhevnikov, Gostoptekhizdat, Leningrad, 1958, 10 printed sheets, price 5 rubles 25 kopecks, reviewed in Novyye Knigi po Nefti i Gazu Vypuskayemye Vo Vtorom Polugodii 1958 Goda (New Books on Petroleum and Gas To Be Published in the Second Half of 1958, Gostoptekhizdat, Moscow, Apr 58, 24 pp (pp 17-18)

CPYRGHT

"This book discusses the physicochemical aspects of the production and application of heavy liquid fuels for gas-turbine installations. The subject is reviewed for the first time in the USSR literature.

"The book will serve the needs of engineers, technical workers, and scientists engaged in the design and operation of gas turbines. It will be of use to designers of gas turbines in the determination of initial data to be applied in the design of combustion chambers and in selecting construction materials the operational characteristics of which depend on the properties of the fuel being employed."

7. Production and Transportation of Liquid and Solid Acetylene

"The Properties of Liquid and Solid Acetylene," by I. I. Strizhevskiy, Candidate of Chemical Sciences; Moscow, Khimicheskaya Promyshlennost', No 4, Jun 58, pp 221-227

Work on the properties of liquid acetylene, the saturated vapor pressures of acetylene, binary acetylene mixtures (acetylene-carbon dioxide, acetylene-ethane, acetylene-ethylene, and acetylene-acetone), the explosive properties of liquid and solid acetylene, and the transportation of solid and liquid acetylene is reviewed, mainly on the basis of non-USSR publications. In the section on the transportation of liquid and solid acetylene, addition of small quantities of carbon dioxide, propane-butane, benzene, acetone, or other admixtures to stabilize acetylene in the liquid state is recommended.

As far as prevention of explosions in transportation and storage of liquid acetylene is concerned, emphasis is placed on good heat insulation and use of refrigerants (e.g., solid carbon dioxide) as a packing between the acetylene cylinder and the outer wall furnishing thermal insulation. Pressing of solid acetylene into blocks to reduce the surface is recommended.

An industrial procedure developed in the USSR by Yu. V. Dalago and G. F. Cheplyugin is described whereby acetylene is filled into cylinders cooled to minus 75°. Low temperatures are produced by evaporating liquid oxygen. As the temperature drops, the solubility of acetylene in acetone rises: it amounts to 20 liters per liter of acetone at 20° and to 1,250 liters per liter of acetone at minus 75°. Filling of the cylinders with acetylene takes place at a pressure of 0.4 atmosphere gauge from a generator of medium pressure.

Industrial Chemistry

8. Role of Development of Thermally Stable Plastics and of Production of Acetylene From Methane in Current Seven-Year Plan

"Development of the Chemical Industry at an Accelerated Rate," by G. V. Uvarov, State Committee on Chemistry, Council of Ministers USSR; Moscow, Khimicheskaya Promyshlennost', No 4, Jun 58, pp 197-200

As far as development of the chemical industry is concerned, the May 1958 Plenary Session of the Central Committee CPSU put particular emphasis on the production of plastics, synthetic fibers, and other synthetic materials [elastomers] and products made of them.

A great amount of attention must be paid to research aimed at the creation of fundamentally new materials and processes and to the development of particularly strong and heat-resistant polymers for plastics and synthetic fibers. An important part of the work in this field must be done by scientists active at the corresponding institutes of the Academy of Sciences USSR, the Physicochemical Institute imeni L. Ya. Karpov, and educational institutions.

To expand further scientific research, particularly in the fields of the theory of the structure of polymers, the study of their properties, and the development of methods for the production of new synthetic materials and their applications in different branches of the national economy, an expansion of the network of scientific research institutes and their affiliates and laboratories is proposed. Organization of the following institutes is envisaged: Scientific Research Institute of Petrochemical Industries at Ufa,

Scientific Research Institute of Chemicals for Polymer Materials at Tambov, Scientific Research and Designing Institute of the Development of Machines and Equipment for the Treatment of Plastics and Rubber (Kiev), and Scientific Research Institute of Lacquer, Varnish, and Paint Coatings at Khot'kovo near Moscow. An affiliate of the Scientific Research Institute of Soil Science (NIIPP) will be organized at Novosibirsk, one of the All-Union Scientific Research Institute of Synthetic Rubber (VNIISK) at Voronezh, one of the Scientific Research Institute of Organic Intermediates and Dyestuffs imeni K. Voroshilov (NIOPiK) at Berezniki, and one of the All-Union Institute of Synthetic Fibers (VNIIV) at Krasnoyarsk. Several other affiliates of institutes will also be opened.

As early as in 1958-1959, experimental plant departments are to be started at which acetylene will be produced from methane by partial oxidation or electric cracking and polypropylene, polyformaldehyde, and other products will be produced.

9. Advantages of Polyethylene as Electrical Insulating Material

"News of Science and Technology" (unsigned news items); Moscow, Fizika v Shkole, Vol 18, No 5, Sep-Oct 58, p 17

In accordance with the decision of the May 1958 Plenary Session of the Central Committee CPSU, the production of plastics in the USSR will increase toward 1965 by factors ranging from 4.5 to 8, depending on the type of plastic. The production of polyethylene will expand at a particularly fast rate.

The characteristics of polyethylene as an electrical insulating material are of especial advantage: they resulted in its use in diverse electrical equipment, particularly radio equipment. Without the use of polyethylene, development of efficiently and reliably working radar appliances would not have been possible.

10. Progress in Work on Heat-Resistant Organosilicon Compounds

"USSR Work on Heat-Resistant Organosilicon Polymers" (unsigned article); Moscow, Khimicheskaya Promyshlennost', No 4, Jun 58

CPYRGHT²⁵⁸

"On 19 May 1958 a collegium of the Ministry of Chemical Industry considered the status of scientific research and experimental investigations on organosilicon compounds.

CPYRGHT

"During recent years, a number of new chlorosilanes have been developed and tested experimentally. This includes methylphenyldichlorosilane, methyldichlorosilane, and chloromethyl dichlorosilane. As a result of the work that has been done, new organosilicon varnishes, liquids, lubricants, and oils have been developed the thermal stability of which was raised up to a temperature limit of 250-300°.

"Work has also been conducted on the further improvement of procedures for the production by the fluidized solids method of basic intermediate products for the production of organosilicon compounds. This type of production was developed up to the stage of industrial application. As a result of work done at the Dankovsk Chemical Plant, production of organosilicon compounds that are of importance from the economic standpoint was launched.

"The production of the heat-resistant butadiene-styrene rubber SKT was organized. Products made of this rubber can be used at temperatures from minus 55° to plus 200-250°. Technical products made of SKT organosilicon rubber are being produced at the Sverdlovsk and Leningrad Rubber Technical Products Plants.

"The Moscow Institute of Plastics has developed and tried out at experimental installations procedures for the production of new organosilicon resins, powders for pressure molding, and adhesives capable of withstanding temperatures of 300-400° for long periods of time.

"The collegium noted that, notwithstanding the progress achieved, the chemical industry does not yet satisfy to the fullest possible extent the demand of the national economy for organosilicon products and articles made of these products.

"At the Dankovsk Chemical Plant, there is a serious lag as far as introduction into production of newly installed capacity for the manufacture of organosilicon products is concerned. Workers of the plastics industry have not yet solved the problem concerning the development of a heat-resistant foam plastic with the physical and mechanical characteristics that have been specified.

"The collegium outlined the principal problems which must be solved by scientific research institutes with the view of eliminating within the shortest possible time the lag existing in the development of new heat-resistant and mechanically strong organosilicon materials and products. To coordinate all scientific research and experimental work pertaining to the development of the production of organosilicon compounds and articles produced from them, the collegium recommended the organization of a special scientific-technical council and unified planning of all measures to be taken in this field."

11. Trends in USSR Petrochemical Synthesis

"Some Problems of Petroleum Chemistry and of the Petrochemical Industry," by Academician A. V. Topchiyev, chief scientific secretary of the Presidium, Academy of Sciences USSR; Moscow, Neftyanoye Khozyaystvo, Vol 36, No 5, May 58, pp 1-13

The chemical conversion of petroleum gases and liquid hydrocarbons derived from petroleum has become an independent, rapidly developing field of scientific research and industrial organic synthesis during recent years. This type of conversion is referred to as petrochemical synthesis. Its rapid development is due to the fact that petroleum and products derived from petroleum are a readily available crude material from which a great number of products of importance for the national economy can be produced.

The development of the petrochemical industry will require more extensive work on the composition and properties of petroleum and products derived from it. Investigations in this field will involve new types of research based on the application of the most modern physical methods. One must utilize extensively for this purpose the methods of mass-spectrometric analysis, infrared spectrometry, absorption spectroscopy, and ultraviolet spectrometry and possibly also procedures based on the determination of paramagnetic resonance as well as a number of other methods.

One must particularly emphasize the importance of investigations on the composition, properties, and methods of conversion of petroleum crudes for the further development of methods leading to the production of reaction-engine fuels, lubricating oils, and additives to fuels and oils. USSR achievements in the field of reaction-engine technology are due to a considerable extent to work done by petroleum specialists. Further development of reaction-engine technology will require the synthesis of new types of lubricating oils and of different additives to them.

Production of aromatics from petroleum raw materials will expand, because these hydrocarbons, in addition to unsaturated hydrocarbon gases, have become a very important raw material for the synthesis of petrochemical products, primarily high polymers. Polymerization of olefins in the petroleum industry has ceased to be a method for the production of liquid fuels and lubricating oils and has become a method for the petrochemical synthesis of high polymers. Hitherto, polyethylene was produced mainly in the gas phase at high pressures (1,200-2,000 atmospheres) and at a temperature of about 200°. At present, the high-pressure synthesis of ethylene is being replaced by a low-pressure synthesis of this polymer according to Ziegler's method. However, not all possibilities of utilizing and perfecting the radical-propagated high-pressure process of the polymerization of

ethylene in the gas phase have yet been exhausted. One may expect that the application of new, highly effective initiators generating free radicals will make it possible to increase considerably the efficiency of the high-pressure process. Principal attention must be paid to the development of a method for the production of polyethylene at relatively low pressures (35-50 atmospheres) with the application of heterogeneous catalysts, which resemble the aromatization catalysts applied in the petroleum industry. Catalytic polymerization leading to isotactic polymers (stereospecific catalysis) is acquiring increased importance. The mechanism of the action of stereospecific catalysts is not yet too well known, and more research must be done on the subject. The high degree of crystallinity of the new poly-alpha-olefins produced by stereospecific catalysis lends to them a number of important characteristics, i.e., mechanical and thermal stability, properties which facilitate treatment resulting in the formation of fibers, etc. Much attention is being paid at present to the synthesis of fibers consisting of isotactic polypropylene, because this material is suitable for the production of fibers of a quality which makes the product competitive with nylon.

The application of complex organometallic catalysts is also of great importance in connection with the polymerization of isobutylene. The polymerization of isobutylene in this manner is of considerable theoretical interest in view of the fact that the problem in question has not been treated in the literature until now. At present, conditions have been found of conducting the reaction in such a manner that the molecular weight of polyisobutylene can be controlled within a range from a few hundred to tens of thousands. The possibility of controlling the molecular weight of polyisobutylene is apparently of considerable importance in connection with the production of components of lubricating oils used in the new technology. The polyisobutylene produced by the new method differs from polyisobutylene formed in the presence of aluminum chloride or boron fluoride.

Of considerable interest also is work on the production of copolymers of propylene and ethylene with isobutylene and the production of polymers of acetylene and of copolymers of this hydrocarbon with ethylene and propylene.

Much can yet be done as far as the synthesis of useful organosilicon compounds from petroleum raw materials is concerned.

Practical applications of methods for the synthesis of organosilicon compounds was initially realized in the USSR. Investigations which have already been carried out in this field made it possible to synthesize a number of new products of this type which can be used as components of lubricating oils and as initial monomers for the synthesis of organosilicon compounds, including products of the elastomer type. The application of organosilicon resins in aviation electromotors that operate under a heavy

work load increases the length of service of these motors by a factor of 5-6. The replacement of metal with plastics in the construction of boats and small ships will eliminate losses due to corrosion, reduce the amount of labor required for the production of the vessels, and, what is most important, make it possible to build nonmagnetic vessels.

The solution of problems pertaining to the synthesis of highly polymerized materials is impossible without improvement of the current methods for the production of monomers. The very large volume of the production of high polymers that has been foreseen can be realized only when the monomers are available in large quantities at low cost. The only possible crude material for the production of such monomers is petrochemical raw material. For this reason processes of the conversion of petroleum hydrocarbons leading to nitrocompounds, chlorinated derivatives, compounds containing oxygen, and other products will be of primary importance.

Oxidation processes will play a very important role in petrochemical synthesis. One of the principal tasks in the field of oxidation processes, particularly as far as liquid-phase oxidation is concerned, will be the development of a controllable process that makes it possible to produce selectively the desired oxygen-containing compounds. Progress has already been achieved in this respect. For instance, methods for the selective oxidation of higher paraffinic hydrocarbons into the corresponding alcohols have been developed. Oxidation of petroleum paraffins into fatty acids is also being carried out on an industrial scale. Important problems must be solved as far as development of effective methods for the production of dicarboxylic acids is concerned, including sebacic acid, azelaic acid, and other acids needed for the production of high-quality plasticizers and synthetic lubricants.

A promising field of organic synthesis is the chlorination of hydrocarbons derived from petroleum, particularly hydrocarbons contained in petroleum gases. Chlorinated hydrocarbons are of great economic importance. Specifically, one may point out that carbon tetrachloride is required for the production of the new synthetic fiber enant.

In addition to chlorination, processes of the nitration of paraffinic hydrocarbons are of great interest. Nitroparaffins are of importance as solvents while nitroolefins can be used as monomers for the production of highly polymerized products of a new type. In the field of research on the nitration of paraffins, one must differentiate between nitration reactions and oxidations with nitric acid, investigating the two types of reaction separately. Oxidation with nitric acid is much more selective than oxidation with oxygen and will be of practical importance for this reason.

Investigation of the theoretical relationship underlying high-velocity heat transfer has already formed to a considerable extent a scientific basis for a new and very effective method of cracking gaseous paraffinic hydrocarbons. The process in question must now be applied industrially and the

principles that have been established employed in the production of butadiene, isoprene, and other products. This method for the production of unsaturated gaseous hydrocarbons is becoming of great importance in connection with the utilization of petroleum by-product gases.

No less important is research leading to the development of efficient industrial methods for the separation of gaseous hydrocarbons. In addition to improvement of the methods already available, attention must be paid to theoretical problems pertaining to the separation of gases and the development of gas separation procedures based on adsorption, diffusion, and thermal diffusion.

The production of acetylene from natural gas with the application of oxidative cracking and electric cracking will be applied industrially in the near future. At present the lack of efficient industrial processes for the production of acetylene restricts the production of a number of synthetic organic products including acetaldehyde, acetic acid, acrylic acid nitrile, and other intermediates for the production of high polymers.

Problems of petrochemical synthesis should not be tackled on the technological level only. If this is done, only old processes will be used and in the best possible case processes already known abroad will be applied. To eliminate the existing lag of USSR science and technology in the field of petrochemical synthesis, theoretical research must be done: otherwise, technological progress will be impossible. There are many examples which demonstrate that theoretical research done by USSR scientists is capable of leading to new industrial processes that are of importance from the economic standpoint. Some of these examples are Lebedev's work on the production of butadiene and of synthetic rubber from it; work by Zelinskiy and his school on catalytic conversions of hydrocarbons; and the investigation of the formation of hydroperoxides of alkyl-aromatic hydrocarbons, on the basis of which a unique industrial method for the production of acetone and phenol was developed which has been applied for the first time in the world in the USSR.

If the trends in the field of petrochemical synthesis are analyzed, one arrives at the conclusion that the following two principal directions and main classifications are pre-eminent:

1. Work in the field of chain reactions and free-radical reactions, the theoretical aspects of which are built on a solid basis created by the efforts of USSR scientists -- Here the principal problem is utilization of the theoretical results which have already been achieved in the solution of actual chemical problems. This, of course, does not in any measure exclude, but on the contrary makes necessary further advancement of the theory. The USSR industry has not yet utilized to the fullest possible extent the possibilities inherent in the theory of reactions propagated by radicals, particularly as far as oxidations, nitrations, chlorinations, and some other types of reactions are concerned.

2. Work on catalytic processes, primarily those involving heterogeneous catalysis -- In this field theoretical work has not progressed to an equally great extent. While in the field of radical-propagated reactions advanced theoretical results have been achieved, the theory of heterogeneous catalysis has not progressed to a sufficient extent. There is still no adequate scientific basis for the selection of catalysts which have a specific action required for the realization of definite chemical processes, and theoretical work required for the industrial application of results of laboratory research has often not yet been done. For these reasons, research must be concentrated on the development of a theoretical basis for practical applications of heterogeneous catalysis. Work on homogeneous catalysis must also be expanded: insufficient attention has been paid to this type of catalytic conversion hitherto. Extensive possibilities exist as far as the application of nuclear radiation in petrochemical synthesis and in the conversion of petroleum in general is concerned. The application of nuclear radiation is particularly promising as far as reactions proceeding by a free-radical mechanism are concerned. Equally important is the application of nuclear radiation in modifying polymerization processes with the view of improving the properties of polymers. This applies to the radiation-chemical polymerization of ethylene, propylene, and isobutylene.

Of considerable importance also is cracking of hydrocarbons by irradiation and their radiolysis as a result of the action of nuclear radiation applied under different thermodynamic conditions, particularly at temperatures lower than those necessary for cracking.

Research on the radiolysis of alkanes has demonstrated that the products which are formed differ essentially from those obtained by thermal cracking and that furthermore the specific relationships which underlie radiolysis and the study of products obtained by radiolysis make it possible to clarify a number of fundamental problems pertaining to the role played by ions and their interactions, effects due to the properties and behavior of radicals, and the action of excited molecules in transformations involving hydrocarbons. The stabilization by cooling of radicals obtained by the action of nuclear radiation makes it possible to gain a deeper insight into complex processes of radiation chemistry and represents one of the most important problems as far as both production of new types of fuel and the practical application of many processes of petrochemical synthesis are concerned.

12. Work in Far East on Crude Materials Containing Fluorine and Boron

"A Conference in the Far East on the Raw Material Basis for the Development of a Chemical Industry There and the Prospects of Such a Development," by Ye. P. Ozhigov; Novosibirsk, Izvestiya Sibirskogo Otdeleniya Akademii Nauk SSSR, No 5, May 58, pp 138-140

A conference on the raw materials available in the Far East and the prospects of the development of a chemical industry there was held at Vladivostok, 25-27 November 1957. This conference was organized on the initiative of the Chemical Division (Otdel) of the Far Eastern Affiliate, Academy of Sciences USSR, and the Maritime Division (Otdeleniye) of the All-Union Chemical Society imeni V. I. Mendeleev.

Representatives of the sovnarkhozes (councils of national economy) of the territorial economic regions of the Far East and workers at the Maritime, Far East, and Kamchatka geologic administrations, at the Ural Scientific Research Institute of Chemistry of the Ministry of Chemical Industry USSR (UNIKhIM), at the Far Eastern Affiliate of the Academy of Sciences USSR, and at local higher educational institutions and industrial enterprises participated in the meeting.

Twelve reports were given at plenary and sectional meetings. The contents of some of these reports are reviewed briefly below:

In a paper entitled "Problems of the Development of the Chemical Industry in the Far East" V. T. Bykov, Doctor of Chemical Sciences, and Ye. P. Ozhigov (Far Eastern Affiliate, Academy of Sciences USSR), Candidate of Chemical Sciences, stated that the following prerequisites exist for the development of a chemical industry in the Far East: availability of chemical raw materials (deposits of fluorite of world importance and occurrences of sulfur, coal, etc., as well as availability of wood), the possibility of producing cheap electric power (by increasing the output of the thermal electric power stations and building hydroelectric stations at the Ulakhe River), and the advisability from the economic standpoint of developing new enterprises in order to eliminate the necessity of shipping ores and concentrates. Within the general scope of the development of chemical industry, the construction of plants for the production of sulfuric acid, hydrofluoric acid, and other acids and production of salts of these acids and trace-element fertilizers in the maritime region are foreseen. Furthermore, the building of a nitrogen fertilizer combine in Amurskay Oblast and expansion of the sulfuric acid and forest products chemical industries in Khabarovskiy Kray are proposed.

There is also the intention of constructing a calcium carbide plant and a synthetic rubber plant in the Far East.

A number of reports dealt with the possibilities of expansion of the sulfuric acid industry in the Far East. Prof G. M. Vlasov (All-Union Geological Scientific Research Institute) discussed the history, geology, and mineralogy of sulfur deposits in the Far East. He pointed out that 33 sulfur deposits have already been surveyed there. He furthermore subjected to consideration the ways for the further investigation and development of sulfur occurrences on Kamchatka and the Kurile Islands. V. Ye. Savateyev (Far Eastern University), in a paper entitled "Volcanic Sulfur Deposits of the Kurile Islands," stated that 21 sulfur deposits have been discovered on these islands. The most promising deposits from the standpoint of industrial exploitation are on Paramushir Island.

In a report entitled "Volcanic Sulfur Deposits of Kamchatka," V. M. Nikol'skiy (Kamchatka Expedition) noted that the volcanic sulfur deposits of Kamchatka have not yet been investigated thoroughly. However, the existence of 12 such deposits has been established. Although no deposits which would warrant industrial exploitation have been found hitherto, the geological characteristics of Kamchatka indicate that prospecting for sulfur there will presumably be worthwhile.

A. G. Bayula and N. V. Zakasovskaya (Far Eastern Affiliate, Academy of Sciences USSR), in a report entitled "The Production of Sulfur Concentrates From the Sulfur Quartzites of Paramushir Island," brought out that the sulfur ores of this island can be enriched by a flotation process using pine oil in a quantity of 450 grams per ton. The experiments that have been carried out indicated that concentrates containing 70-80% of sulfur can be produced by this method with a yield no lower than 80%.

Ye. A. Boom (Far Eastern Affiliate, Academy of Sciences USSR), Candidate of Technical Sciences, told about experiments in which the possibility of obtaining by the filtration method elemental sulfur with a yield of 70-75% and a purity amounting to 99.99% had been established. The principal advantage of this method is the direct production with its use of refined sulfur from the concentrate without having to produce lump (kom) sulfur first.

O. A. Shumkov, chief concentrator of the Mining Division of the Maritime Sovnarkhoz, recommended that, instead of producing elementary sulfur from quartzites, the quartzites be oxidized to obtain sulfur dioxide directly.

A report entitled "The Present-Day Status and Prospects of the Development of a Production of Inorganic Fluorine Compounds" was given by G. N. Bogachev (UNIKhIM), Candidate of Technical Sciences. He briefly outlined the history of the fluorine industry in the USSR; characterized the development of the production of elemental fluorine, sodium fluoride, and sodium fluorosilicate, as well as of other fluorides; and discussed in detail the technology of the production of cryolite and aluminum fluoride, describing

methods that have been developed by UNIKhIM and the Scientific All-Union Research Institute of Fertilizers and Insectofungicides. The author of the report subjected to consideration the organization in the USSR of new industries that will produce elemental fluorine, anhydrous hydrogen fluoride, fluorosulfonic acid, cobalt trifluoride, and acidic potassium and sodium fluorides. The raw material for the production of these compounds will be fluorite of high quality.

In a paper given under the title "Concerning the Problem of New Technological Methods for the Production of Fluorine Compounds," M. A. Mikhaylov (Far Eastern Affiliate, Academy of Sciences USSR), Candidate of Chemical Sciences, brought out that it is possible to apply pyrohydrolysis with superheated steam for the conversion of fluorite into cryolite or into salts of hydrofluoric acid. It is best to apply the fluidized solids methods for the treatment of either fluorite or a charge consisting of fluorite and silicon dioxide. By using a mixed charge, one can produce fluorine derivatives and cementing materials for construction purposes.

Ye. P. Ozhigov, Candidate of Chemical Sciences; M. A. Mikhaylov, Candidate of Chemical Sciences; and M. M. Golubev (Far Eastern Affiliate, Academy of Sciences USSR), proposed, in a report given under the title "New Methods for the Decomposition of Datolite Raw Material," two methods for the decomposition of material of this type, viz., by treatment with superheated steam or by treatment with a soda solution in an autoclave under pressure. In a report under the title "A Carbon Dioxide Method for the Conversion of Datolite Ores into Boric Acid," Yu. S. Plyshevskiy (UNIKhIM), on the basis of results obtained by investigation of the constitutional diagram of the system $\text{CaO} - \text{B}_2\text{O}_3 - \text{SiO}_2$, expressed the opinion that datolite decomposes at $920 \pm 20^\circ$ with the formation of the calcium borate $\text{CaO} \cdot \text{B}_2\text{O}_3$, which is readily soluble even in weak acid. A method for the treatment of datolite has been proposed which involves calcining at 960° after addition of calcium oxide and subsequent decomposition of the calcined material in an autoclave with carbon dioxide at a pressure of 5 atmospheres and a temperature of $95-100^\circ$. The degree of conversion into boric anhydride is 90.4%.

13. Czechoslovak Scientists Develop New Method of Producing Sulfuric Acid

"Local and Foreign News" (unsigned article); Prague, Obrana Lidu
28 Aug 58, p 2

Workers in the research department of a chemical establishment in Usti nad Labem [Inorganic Chemical Research Institute?] have discovered a method of producing sulfuric acid from "low-percentage" ores. Their discovery adds to the world's technical knowledge and makes it possible to utilize Czechoslovakia's pyrite deposits which have a low percentage of sulfur.

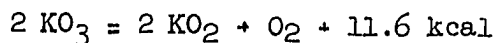
Inorganic Chemistry

14. Investigation by Magnetic Method of Spontaneous Decomposition of Potassium Ozonide

"General Meeting of the Department of Chemical Sciences, Academy of Sciences USSR, on 24-25 April 1958" (unsigned article); Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 8, Aug 58, pp 1017-1018

I. A. Kazarnovskiy, Corresponding Member of the Academy of Sciences USSR, reported on an investigation by the magnetic method of the kinetics and mechanism of the spontaneous decomposition of potassium ozonide. This investigation was carried out together with S. I. Reykhshteyn, Candidate of Chemical Sciences, and L. N. Bykova.

Potassium iodide slowly evolves oxygen at room temperature according to the equation



Investigation of the kinetics of this reaction disclosed its auto-catalytic character and the existence of an induction period. Measurements of the magnetic susceptibility in the range of 0-20°, which had been conducted together with kinetic measurements, indicate that there is intermediate formation of atomic oxygen; this is confirmed by the fact that traces of ozone are formed. It was found that during the initial period of the decomposition the content of atomic oxygen in the solid reaction mass first grows and then, after passing through a maximum at a point corresponding to a 50% decomposition of the potassium ozonide, decreases to zero. At the point of the maximum the solid phase contains about 20% of the total quantity of the oxygen that has developed in the form of atoms. At the 50% decomposition point there are pronounced topochemical maxima on the curves of the rate of formation of atomic oxygen plotted against time and the rate of formation of molecular oxygen plotted against time. The data obtained support a hypothesis according to which the induction period is characterized by an accumulation of defects in the potassium ozonide lattice, i.e., accumulation of O_2^- ions and oxygen atoms. After a certain critical quantity of these defects has formed, the initial phase separates into a phase saturated with lattice defects and nuclei of a new phase consisting of KO_2 . This point corresponds to the beginning of an active period of the reaction, which from this point on proceeds mainly on the boundary between the two phases.

Organic Chemistry

15. New Organosilicon Monomers

"Synthesis of New Types of Organosilicon Monomers," by A. D. Petrov, V. F. Mironov, V. A. Ponomarenko, S. I. Sadykh-Zade, and Ye. A. Chernyshev, Institute of Organic Chemistry imeni N. D. Zelinskiy, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 8, Aug 58, pp 954-963

Work on the synthesis of organosilicon compounds conducted during the past 10 years dealt to a considerable extent with the solution of the following new problems: (1) development of methods for the introduction into alkylchlorosilane radicals of diverse functional groups (double bonds and halogeno, nitrile, butadienyl, carboxyl, and other groups), (2) development of silicohydrocarbons and their derivatives capable of polymerization, and (3) development of methods for the inclusion of different elements, particularly metallic elements (Al, Ti, B, etc.), into siloxane chains. The results obtained by the application of these methods are reviewed in the following articles: A. D. Petrov and V. F. Mironov, Uspekhi Khimii, Vol 22, 1953, p 377; A. D. Petrov, V. F. Mironov, and Ye. A. Chernyshev, Uspekhi Khimii, Vol 26, 1957, p 292; P. George, M. Prober, and G. Elliot, Chemical Reviews, Vol 56, 1956; and K. A. Andrianov, Uspekhi Khimii, Vol 26, 1957, p 895.

This article reports hitherto unpublished work done by the authors of the article on the following subjects: (1) catalytic addition of silicon hydrides to unsaturated and aromatic compounds, (2) high-temperature condensation of silicon hydrides with alkyl-aryl halides and alkenyl halides, and (3) the synthesis of silicohydrocarbons and derivatives of silicohydrocarbons capable of polymerization.

The following results were obtained in the work described:

1. In the presence of H_2PtCl_6 , alkyl-dichlorosilanes were found to add acetylene, ethylene, and propylene in the temperature range of 20-60° with an almost quantitative yield.

2. In the presence of platinum catalysts, alkyl-dichlorosilanes give higher yields of addition products, while silicochloroform gives higher yields of addition products in the presence of peroxides.

3. Hitherto unknown dichlorosilanes and trichlorosilanes were obtained by condensing alkyl-dichlorosilanes and silicochloroform with aryl halides and alkenyl halides at 600°.

4. Silicon-containing derivatives of butadiene, acrylic acids, vinyl ethers, and acetals were synthesized for the first time. These compounds form solid polymers of the linear type under atmospheric pressure.

"General Meeting of the Department of Chemical Sciences, Academy of Sciences USSR, on 24-25 April 1958" (unsigned article); Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 8, Aug 58, pp 1017-1018

On behalf of a group of workers active at the Institute of Organic Chemistry (V. F. Mironov, V. A. Ponomarenko, S. I. Sadykh-Zade, and Ye. A. Chernyshev), A. D. Petrov presented a paper entitled "Synthesis of New Types of Organosilicon Monomers." This paper described hitherto unpublished work on the catalytic addition of silicon hydrides to unsaturated and aromatic compounds; the high-temperature condensation of silicon hydrides with alkyl-, aryl-, and alkenyl halides; and the synthesis of butadienylsilanes, trialkylsilylacrylic acids, trialkylsilylstyrenes, and silicon-containing ethers and acetals. It was demonstrated in the work described that in a number of reactions chloroplatinic acid is preferable as a catalyst to platinum deposited on a carrier. Among the numerous organosilicon monomers synthesized by A. D. Petrov's group there are many unsaturated compounds. These compounds are of particular importance because of their tendency to polymerize.

In the discussion which followed the presentation of Petrov's paper, V. V. Korshak, Corresponding Member of the Academy of Sciences USSR, noted that in the work described a large amount of data has been obtained on the basis of which one may draw conclusions in regard to the effect of silicon in various groups on the reactivity of compounds containing these groups, particularly as far as polymerization reactions are concerned.

Biochemistry

16. Czechoslovak Research on Protein Molecules

"Good Eating," by Lt Col Antonin Halek; Prague, Zapisnik 58, 11 Jul 58, p 2

At the Czechoslovak Academy of Sciences (Ceskoslovenska Akademie Ved), A. Linek and C. Novak, scientific workers, are calculating the number of atoms in protein molecules and the structure of these molecules. They need four computers for their work, but they will not be able to reach definitive results until they have better computers.

Another group of scientific workers, under the direction of Academician F. Sorm, Laureate of the State Prize, and Dr B. Keil, is studying the molecular structure of proteins at the Chemical Institute of the Czechoslovak Academy of Sciences. Their work in this field is known throughout the world. International acclaim for their work is so great that they were asked to assume the chairmanship of two sections at a biochemical congress in Vienna.

II. ELECTRONICS

Communications

17. New Facsimile Equipment

"New Facsimile Communication Equipment," by V. N. Amerantov and G. B. Davydov; Moscow, Elektrosvyaz', No 9, Sep 58, pp 36-43

During the past few years FTAM and FTAM-2 models of fast transmitting facsimile equipment were developed in the USSR. The present speed of operation of the FTAM equipment is 360 lines per min.

The FTAM-2 model is intended primarily for transmission of photographs through truck communication lines at a speed of 250 lines per min. The resolving power of this unit is 5 lines to one mm when operating at the maximum speed of 250 lines per min. The basic parameters of the FTAM-2 unit are: transmission speed, 60, 120, and 250 lines per min; diameter of drum, 70 mm; length, 300 mm; feed, 0.2 and 0.265 mm; and carrier frequency, 1,900 cps at 60 and 120 lines per min and 2,800 cps at 250 lines per min. Synchronization is controlled by a tuning-fork oscillator.

The recently developed Soviet electrochemical paper EKChB-3 permits obtaining a satisfactory image with 5-6 gradations of darkness.

The FTAP equipment using flat sheets of electrochemical paper (unrolled from a roll) has the following characteristics: the width of the picture up to 220 mm; speed, 120 lines per min; feed, 0.2 mm, carrier frequency, 1,900 cps; and power supply from 127 or 220 v, 50-cps ac line.

The new "Rekord" facsimile utilizes an electromechanical recorder which applies ink or colored paste to a common writing paper. The parameters of this device are as follows: drum diameter, 70 mm; length 150 mm; speed, 120 mm per min; feed, 0.2 mm; and carrier frequency, 1,900 cps.

18. Scatter Propagation in Northern USSR

"Experience in Establishing Regular Radio Communication on Meter Waves Utilizing Ionosphere Scattering," by A. Ya. Stukman; Moscow, Elektrosvyaz', No 9, Sep 58, pp 74-75

In the course of many years of exploitation of the Leningrad-Murmansk radio-communication line, it was established that frequent communication failures from one day to 2 weeks' duration occurred mostly in the fall.

Experimental scatter propagation was conducted in December 1957 with VHF transmitter installed in Leningrad. In this experiment the frequency range of 32-42 Mc was tested out using single rhombic antennas with sides of 10-15 wavelengths. The power of the transmitter was about 8 kw.

This equipment permitted establishing scatter propagation contact and helped in forming a definite conclusion as to the nature of equipment required for this type of communication. An adapter was designed for reception of VHF signals with the existing equipment. The sensitivity of the receiver was 0.25 microvolt for the band-pass of 3 kc and at signal-to-noise ratio of 3. The variation in field intensity at the receiver was small throughout the whole 32-42 Mc range.

As a result of the investigation, the following requirements were set up for satisfactory scatter propagation on this particular line: a need for a more powerful transmitter and more efficient antennas at both receiving and transmitting ends. The most advantageous frequency range was found to be 36-37 Mc.

The Leningrad Directorate of Radio Communication and Radiobroadcasting has taken steps to organize regular two-way radio communication with Murmansk on meter waves utilizing scatter propagation.

19. Recent Soviet Patents in Field of Communications

"Authorship Certificates" (unsigned article); Moscow, Elektrosvyaz', No 9, Sep 58, p 78

Class 21a¹, 32₀₄. No 110440 -- S. I. Katayev and A. M. Polykovskiy; Method for Improving Utilization of Frequency Band of Communication Channel Transmitting Video Signals

Class 21a¹, 33₂₀. No 110609 -- R. A. Kudryavtsev; Method of Amplitude Modulation of Video Signals and Device for Applying This Method

Class 21a³, 51. No 109415 -- A. G. Muradyan, M. N. Stoyanov, and A. A. Trifanov-Yakovlev; Method of Multiplexing Subscribers Lines on a City Telephone Network

Class 21a⁴, 22₀₂. No 111238 -- E. V. Zelyakh and Ya. I. Velikin; Electric Band-Eliminating Filter

Class 21a⁴, 29. No 110604 -- D. V. Ageyev, V. V. Malanov, and K. P. Polov; Audio-Frequency Pulse-Power Amplifier

Class 21a⁴, 35₁₄. No 110427 -- L. N. Koroblev; Electronic Voltage Regulator

Class 21a⁴, 38. No 110480 -- B. M. Vul and A. P. Shotov; Method of Leads Manufacturing for the Middle Part of Germanium Transistors

Class 21a⁴, 46₀₄. No 110198 -- A. I. Ardab'yevskiy, L. D. Bakhrakh, and L. N. Deryugin; Method of Beam Swinging in a Linear Antenna

Class 21a⁴, 46₀₄. No 110610 -- A. I. Ardab'yevskiy, L. D. Bakhrakh, and L. N. Deryugin; Method of Electric Beam Swinging Using Dispersal Elements

Class 21a⁴, 46₀₆. No 110733 -- B. B. Lagor'yev; Waveguide Transformer.

Electromagnetic Wave Propagation

20. Wave Propagation in Slotted Waveguides

"The Propagation of Electromagnetic Waves in Circular Waveguides With Periodic Slots," by N. N. Smirnov; Moscow-Leningrad, Zhurnal Tekhnicheskoy Fiziki, No 7, Jul 58, pp 1494-1504

The author examines the problem of wave propagation in circular waveguides with spiral slots and with periodic ring slots. Equations for determining phase velocity and damping in waveguides with ring slots and dispersion equations for symmetrical waves in waveguides with spiral slots are computed.

Certain conclusions are reached in regard to wave propagation in waveguides with spiral slots. Among these are the following:

1. As the angle of inclination of the spiral slot increases, the phase velocity of the wave decreases and damping increases.
2. An increase in the relative width of the slot results in a decrease in phase velocity.

Dispersion equations are also developed for nonsymmetrical waves.

It is suggested that waveguides with spiral slots may be useful as transmission lines for H₀₁-mode waves and as flexible joints in transmission lines.

The assistance of L. A. Vaynshteyn and Ya. N. Fel'd is acknowledged.

Instruments and Equipment

21. High-Precision Measurement of Magnetostriction

"High-Sensitivity Method for Measurement of Magnetostriction," by S. I. Voskoboynikov; Moscow, Izmeritel'naya Tekhnika, No 4, Jul-Aug 58, pp 59-61

An optomechanical magnetostriction measuring device developed by the author and built at the Central Scientific Research Institute of Ferrous Metallurgy is described in this article.

The distinguishing feature of the device is a double-link lever of the second order which actuates the pointer with a mirror. The sample is clamped at one end in a fixed support and the other end is in contact with the double-link lever. A beam of light incident on the mirror is reflected to a measuring scale.

The maximum error of the device is 4% for measurement of longitudinal magnetostriction and 5% for transverse magnetostriction. The described optomechanical magnetostriction meter has the following advantages over other existing models: constancy of increment independently of the position of light indicator, a much higher sensitivity, and capability of measuring both longitudinal and transverse magnetostrictive effect.

22. Multichannel Electronic Timer

"Multichannel Timer," by A. A. Vasil'yev and I. D. Grigor'yev Moscow, Pribory i Tekhnika Eksperimenta, No 3, May-Jun 58, pp 65-68

A new device is described which can generate up to 25 separate pulses each shifted with respect to the trigger pulse by a preassigned interval from 0 to 10 sec with stability of $\pm 10^{-5}$ to ± 0.5 microsec. The time-position of each pulse may be controlled independently of each other in the above indicated ranges in steps of 100 microsec, one millisecc, 10 millisecc, 100 millisecc, and one sec.

The operation of the device is such that at the moment of arrival of the trigger pulse an electronic switch admits the 1.6 Mc oscillation from a stabilized quartz generator to a frequency divider. The division factor is 160, so that the frequency at the output of the divider is 10 kc. The 10 kc frequency is fed to a counting circuit composed of five ring-of-ten counters, which correspond to five decimal places. The desired pulses are selected by connecting coincidence circuits to proper cells of corresponding counting circuits.

This timer has provisions for obtaining of a series of pulses at 100 kc, 10 kc, one kc, 100 cps, 10 cps, and one cps, which are properly timed with respect to the trigger pulse. Each ring-of-ten counter has Type TG-1-0.1/0.3 thyratrons, of which only one is conducting at any particular instant. These ring-of-ten counters are reliable in operation and do not require special selection of thyratrons.

23. Precision Frequency Meter

"Device for Precision Frequency Measurement," by R. I. Utyamyshhev; Moscow, Pribery i Tekhnika Eksperimenta, No 3, May/Jun 58, pp 62-65

The article describes a high-speed electronic counting device which utilizes a quartz oscillator to obtain high precision measurements. The device can measure ac frequency in the range from 100 to 100,000 cps, angular velocity in the range from 100 to 100,000 rpm, and time intervals from 100 microsec to 1,000 sec. The accuracy of the instrument is about 0.01%.

This frequency meter incorporates the following components: quartz oscillator, frequency dividers, control amplifier, control trigger, pre-amplifier, blocking amplifier, pulse shaping device, decimal counters, signal level indicator, induction-type signal transducer, frequency doubler, and amplifier of extraneous trigger pulses. The device incorporates 21 tubes of various designation.

24. Classification of Soviet Mass Spectrometers

"Industrial Mass Spectrometers," by A. Pavlenko, A. E. Rafal'son, and A. M. Shereshevskiy, State All-Union Design Bureau for Analytical Instrument Building; Moscow, Pribery i Tekhnika Eksperimenta, No 3, May-Jun 58, pp 3-15

Application of mass spectrometers in industry is very promising due to the great flexibility of this method for fast gas analysis. In the near future mass spectrometers in combination with computer technique will find a wide application in automation of many technological processes.

The present efforts in development of mass spectrometers are directed toward the building of units in which the separation of ions according to their mass will take place in magnetic field, and of units in which the ion separation will be carried out according to the transit time and the change of energy. Mass spectrometers of high-resolving power utilize a nonuniform magnetic field. Instruments of this type which were first built in the USSR possess a resolving power of 5,000-7,000.

The designation of the Soviet mass spectrometers is as follows: MKh, for chemical analysis; MI, for analysis of isotope composition; and MV, of high resolving power. With respect to the principle of ion separation, the spectrometers are designated as follows: 1, in homogeneous magnetic field; 2, in nonuniform magnetic field; 3, reserve; 4, magneto-dynamic; 5, on the basis of transit time; and 6, at radio frequency. With respect to the field of application, the mass spectrometers are designated as follows: 1, indicators; 2, instruments for industrial control; 3, instruments for laboratory investigation; and 4, special instruments.

Thus in a mass spectrometer the designation MI 1305 would stand for mass spectrometer for isotope analysis (MI) with separation in homogeneous magnetic field (1) for laboratory research (3), fifth model (05).

The article describes the following models of mass spectrometers: MI 1301, MI 1303, MI 1305, MKh 1302, Mkh 1303, MV 2301, MI 1101, MI 1306, MKh 5201, and MKh 6401.

25. DC Amplifier

"DC Amplifiers With Contact Converter," by G. I. Levitan;
Moscow, Izmeritel'naya Tekhnika, No 4, Jul/Aug 58, pp 54-59

Amplifiers with contact converters for inversion of dc voltage into ac voltage are widely used in measuring technique.

At the Electric Prospecting Laboratory of the All-Union Scientific Research Institute of Methods and Technique of Prospecting in Leningrad, a portable dc amplifier was developed by the author and L. M. Ioffe. The device has a sensitivity of 50 millivolts and an input impedance of 2.5 megohms. Type RP-4 polarized relay is used as a contact converter operating at a frequency of 80 cps and a power consumption of about 2 milliwatts. The RP-4 relay was tested for 150 hours of continuous operation at a pulse spacing factor fluctuation of 6%. The range of measurement of the device is 5 millivolts to 5 v.

The over-all amplification factor is defined as the ratio of pulse peak at the primary winding of the output transformer to that of the input dc voltage; it was found to be 7,200. A negative feedback is utilized to assure amplification stability for the condition of plate voltage variation up to 80 v. In recording the square dc pulses the rise time was of the order of 0.05 sec. The device incorporated five pentodes in its circuit.

Components

26. Band-Elimination Quartz Filter for Multi-Channel Systems

"Band-Elimination Quartz Filter for A-12-Channel High-Frequency Telephone System," by E. V. Zelyakh; Moscow, Elektrosvyaz', No 9, Sep 58, pp 44-50

The purpose of this quartz band-elimination filter is to suppress residual currents at frequencies of 60,64 108 kc, which might leak through the modulators of individual channels.

The author states that despite the importance of such filters the existing literature does not contain the analysis or methods for their calculation. Thus, the purpose of this work is to fill such a gap in the technical literature.

A series of formulas are developed which permit determining the physical dimensions and cuts of the quartz resonator plate. On the basis of the suggested method of calculation, at the Leningrad Branch of the scientific Research Institute of Communications, Ministry of Communications, a quartz band-elimination filter for the A-12-channel high-frequency telephone system was developed and tested for several years on a trunk long-distance communication line. This filter was developed by A. D. Fedorov under the direction of Ya. I. Velikin.

27. Wire Tensometers

"Instruments for Deformation Measurement With Aid of Wire Tensometers," by V. V. Kedrov, M. B. Karvatskiy, and N. I. Morozov; Moscow, Trudy Tsentral'nogo Aero-Gidrodinamicheskogo Instituta imeni Prof N. Ye. Zhukovskiy, No 698, 1957, 43 pp

This work is intended to provide information to persons engaged in the experimental investigation of the strength of machine components with the aid of wire tensometers. The article describes the principle of operation and construction of certain types of tensometers which have found wide application in practice. Methods for selection of appropriate equipment and circuits to fit the specific requirements are given.

Tensometers operating in a circuit with ac measuring bridges permit simultaneous measurement of static and dynamic deformation. Circuits for measuring deformation employing carrier frequency are built with three units: the measuring bridge, amplifying device, and recording unit. The

measuring bridge transforms the tensometer resistance into a proportional electric voltage. The measuring bridge is supplied with ac voltage from a special carrier frequency oscillator. As a result of deformation, a modulation process occurs between the fixed points of the tensometer (transducer). The modulated signal from the output diagonal is fed to the input of an amplifier. The amplified signal is demodulated by a phase-sensitive detector and through a filter is fed to the loop of an oscillograph.

The magnitude of oscillograph beam deflection is described by an equation $A = K \xi$, where K is a function of the voltage supply (U_p) of the measuring bridge, S_m is sensitivity of the bridge, S_u is the bridge transconductance, and S_{sh} is the loop sensitivity. Thus $K = U_p S_m S_u S_{sh}$

The instrument 4-ANCh-3a is intended for measurement of static and dynamic deformation in machine parts and other structures. The device permits deformation at four points to be measured simultaneously. The carrier frequency is 3,500 cps and the operating frequency band is 0 to 500 cps. The device uses wire elements of 60- to 400-ohm resistance. The bridge power supply voltage is 7 v. The instrument has three ranges of sensitivity, respectively, 10 : 4 : 1. The maximum value of measured deformation is as follows: for the first range, 0.5×10^{-3} ; for the second, 1.25×10^{-3} ; and for the third, 5×10^{-3} expressed in relative units. Frequency range of measured deformation is 0 to 500 cps. The output of the device is fed to a Type K9-21 loop oscillograph and will operate satisfactorily at ambient temperatures of -50° to $+50^\circ$ C and humidity up to 98%. The device can operate continuously for 2.5 hr with voltage fluctuation of $\pm 5\%$. The instrument power supply is drawn from an ac power line of 110-220 v and frequency of 50 or 400 cps; it consumes about 120 w. The device weighs 35 kg and has overall dimensions of 470 x 250 x 280 mm. The error of the instrument under ordinary conditions does not exceed 4%.

The instrument 8-ANCh-7 is intended for simultaneous measurement of static and dynamic deformations at eight points. This instrument is connected to the same type of transducer and loop oscillograph as the 4-ANCh-3a instrument. The technical specifications and characteristics of this instrument are similar to the 4-ANCh-3A.

The instrument 4-ANCh-5 measures and registers static and dynamic deformations at four points simultaneously. The carrier frequency is 7,000 cps and operating band is 1,000 cps. The 4-ANCh-5 model differs from the other two models by the method of connecting the measuring bridges and by a wider frequency range. Recording is done with a magnetic oscillograph. The instrument has four ranges of sensitivity with respective ratio of 100 : 40 : 16 : 5. The maximum value of measured deformations

are as follows: for the first range, 0.5×10^{-3} ; for the second range, 1.25×10^{-3} ; for the third range 3.12×10^{-3} ; and for the fourth range, 10×10^{-3} expressed in relative units. The frequency range of measured deformations is from 0 to 1,000. The instrument is designed for operation with the MPO-2 loop oscillograph. Overloading due to vibration directly acting on the instrument should not exceed one g. The over-all instrument error does not exceed 3 %.

The instrument 4-AB-5 measures dynamic deformations at three points. The static deformation can be measured at only one point. The power to the bridge is drawn from a 24-v dc source. The instrument has four ranges of sensitivity with the following respective ratios: 100 : 36 : 12.5 : 4. The maximum values of measured deformation are as follows: for the first range, 12.5×10^{-3} ; for the second range, 4×10^{-3} ; for the third range, 1.4×10^{-3} ; and for the fourth range, 0.5×10^{-3} expressed in relative units. The frequency range of measured deformation is from 5 to 1,500 cps. The total error of the instrument is 3%.

The tensometers described can, in addition to the measurement of deformation also be used for measurement of other physical magnitudes. A number of data-units with resistance-wire sensing element have been developed to measure acceleration, pressure, force, momentum, and other magnitudes.

28. Czechoslovak Defectoscope Made With Transistors

"Defectoscopes With Transistors" (unsigned article); Prague, Obrana Lidu, 1 Aug 58, p 2

A group of workers led by Engr Frantisek Matous at the Transportation Research Institute (Vyzkumny Ustav Dopravni) has designed a defectoscope in which a part of the tubes were replaced by transistors. The new instrument is considerably smaller than previous models and weighs only 2.1 kilograms.

Computers and Automation

29. New Telemetering System

"New Principles of Construction of Telemetering Systems With Pulse-Time and Pulse-Width Modulation," by V. A. Il'in and A. I. Novikov; Moscow, Avtomatika i Telemekhanika, No 8, Aug 58, pp 757-761

The article discusses the principles of construction of single-channel and multichannel telemetering systems incorporating exponential transducers in which the time division of channels is obtained without the help of commutators.

As a result of this study, the Institute of Automatics and Telemechanics, Academy of Sciences USSR, has developed new and simple high-stability pulse-time and pulse-width transducers which were called exponential. Such exponential pulse-width transducers are in the form of a bridge, one arm of which incorporates two resistors and the other a resistor and capacitor. The diagonal of the bridge has a diode. The pulse-time modulation is attained by introduction of a differentiating circuit at the output of the transducer and pulse-shaping stages in the transmitter. The transmitter of the VST-1 system is built with semiconductor components having no tubes, contact elements, or local power sources.

The dc pulses generated in the receiver are of 1.5-sec duration and of 2-sec period. The characteristic feature of the receiver is the presence of a memory element. The precision of the system is equal to that of a first-class instrument. Error due to the ambient temperature fluctuation in the range from -50°C to $+50^{\circ}\text{C}$ and the power supply voltage variation within $\pm 15\%$ are less than 1%. The distance range of the system having a 4-millimeter bimetallic transmission line is over 500 km.

In conclusion, the author states that the exponential transducers and telemetering systems with exponential transducers should find wide application in various fields of science and engineering.

30. Computer Method for Integral Equation Solution

"Method for Instrument Solution of a Certain Class of Integral Equations," by Yu. S. Val'denberg, Moscow, Avtomatika i Tele-mekhanika, No 8, Aug 58, pp 725-730

The article describes an iterative method for approximate solution of Friedholm's and Volterra's first- and second-type linear equations. This procedure is of great interest because, in synthesis of the automatic control systems for their optimum characteristics, the integral equations are encountered.

The computer used in this study was built with two main units: the computing unit and the storage unit. The computing unit would perform multiplication, integration, and subtraction. The storage unit memorizes the ordinates of the desired function and later reintroduces them into the computer unit. This reiterative process is carried out in a closed system of the two units mentioned. In case of simple iteration the storage device consists of two memory blocks, in one of which is stored the Kth and in the other the (K+1)th approximations of the desired function. At the end of calculation of each approximation, a special commutation device switches these blocks in such a manner that in the one in which the Kth approximation was stored the (K+2) approximation will be recorded.

The afterglow effect of a cathode-ray tube is utilized in the storage unit. The recorded function is fed to the deflection plates of the tube. The "trace" of the beam does not disappear instantaneously and the image of this function is read by the photomultiplier FEU-1 with the aid of a Nipkow scanning disk with holes placed in a spiral. Photomultipliers FEU-2 and FEU-3 are used for obtaining vertical and horizontal synchronizing pulses. The integral conversion calculator (VIP) performs the integration of subintegral function. The control pulse unit (BUI) consists of frequency dividers and single-shot multivibrators which form the pulses of desired shape.

The field of application of this device is not limited to the solution of integral equations with convolution-type kernel or experimental curves.

The author expresses his appreciation for the help offered by V. V. Solodovnikov.

31. Automatic Optimizers

"Automatic Optimizer," by A. A. Fel'dbaum; Moscow, Avtomatika i Telemekhanika, No 8, Aug 58, pp 731-743

Self-regulating systems, which are at present in their infancy, will acquire great importance in the near future. One of the most significant classes of self-regulating systems is the automatically optimizing system whose function consists in automatic scanning for the conditions which would ensure minimum value of a certain magnitude in the presence of additional limitations.

Automatic optimizers may be utilized as automatic devices for solution of variational problems by a direct method, for automatic synthesis on models of optimal control parts of automatic systems, for automatic determination of dynamic characteristics of complex objects, and for optimizing the operating conditions of controlled objects in actual production.

Determination of the method of automatic scanning is the most important problem in the design of an optimizer.

32. Role of Information Theory in Future Automation Discussed

"The Transfer of Information --- the Essential Feature of Control," by A. M. Petrovskiy, Institute of Automatics and Telemekhanics, Academy of Sciences USSR; Moscow, Nauka i Zhizn', No 8, Aug 58, pp 3-4

One is obliged in each control system to deal with the transfer and processing of information, that is, information concerning the situation of the controllable object and the commands entering at that object. In such appliances the function of processing and transfer of information may be effected manually, by automatic regulators, or by computers.

For example, the dispatcher of a power system or the computer controlling its operation obtains information concerning the work of different consumers of electric power, reprocesses this information, and sends signals controlling the function of individual generators to the stations in the given power system.

In the article the author states that the transfer and processing of the information is the fundamental content of any process of control. Thus the complexity of these processes increases and the role of the theory of information becomes greater during the projecting of automatic systems.

Several questions are discussed concerning the rational construction of transfer systems and the conversion of information for the example of remote control of a generator in a power system during varying load.

According to the author, two methods are possible for obtaining control commands at the point where the generator is located. According to one method, these commands are generated in full at the point of control and are transferred over the line to the generator, where they are received by a comparatively simple receiver of the apparatus.

In the second method it is taken into account that the character of the load's change is repeated to a significant degree from day to day and consequently the control commands are repeated at one and the same time for different days.

Examples are given, and from the material presented the value which information theory will have for future automation is made clear.

33. New Components Needed for Breakthrough in Automation

"A Fruitful Principle," by M. A. Gavrilov, Doctor of Technical Sciences, director of a laboratory, Institute of Automation and Telemechanics, Academy of Sciences USSR; Moscow, Nauka i Zhizn', No 8, Aug 58, pp 4-7

CPYRGHT

CPYRGHT

When asked whether there are new principles or discoveries in contemporary computers which will permit a breakthrough in automation, Dr Gavrilov replied, "With regard to that question, I think it is necessary to reply that the appearance of new relay elements, the utilization of the relay elements once they are developed in greater and greater quantities, and the development of new circuits for new operations are the bases for accomplishing such an advance."

Citing the generally unexpected success of machine translation as an example, Gavrilov pointed out the difficulties involved in making predictions on the direction and rate of development which can be expected in automation and telemechanics.

34. Numerical Solution of Certain Integral Equations Without Computer

"On the Problem Concerning the Numerical Solution of Integral Equations of the Stephan Problem," by L. I. Rubinsteyn, Ufa Petroleum Institute: Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Matematika, No 4 (5), 1958, pp 202-215

In an article by the author, which appeared in Doklady Akademii Nauk SSSR, Vol 58, No 2, 1947, pp 202-214, the one-dimensional problem of Stephan was reduced to a system of nonlinear integral equations of the Volterra type, for which convergence of the Picard iteration was proved. The practical realization of the method presented had not yet been verified by numerical calculation. In the present work this gap is filled for the simplest example in which the volume of calculations is approximately one sixth the volume of the calculations in the most general case.

This decrease in the volume of calculations permitted carrying them out without the utilization of high-speed computers or the help of technicians. At the same time it is so short that the calculation conducted permits one to speak concerning the effectiveness of the method in the general case.

35. Optimum System for Arbitrary Criterion of Bayes Type

"Determination of the Optimum System According to an Arbitrary Criterion," by V. S. Pugachev; Moscow, Avtomatika i Telemekhanika, Vol 19, No 6, Jun 58, pp 519-539

A method is described which enables one to determine the optimum system using an arbitrary criterion of the Bayes type in the class of all systems possible for which this criterion exists under extremely general assumptions concerning signal and noise. The solution of the problem is reduced to the finding of certain linear operators and to the finding of the minimum for a certain function or functional.

36. Stability of Nonlinear Systems

"Concerning the Stability of Periodic Conditions in Nonlinear Systems Having a Stepwise Characteristic," by M. A. Ayzerman and F. R. Gantmakher; Moscow, Avtomatika i Telemekhanika, Vol 19, No 6, Jun 58, pp 606-608

A method is described which enables one to find a linear approximation equation which solves the problem of the stability of the periodic solution for a system having a stepwise characteristic.

37. Optimal Systems for Acquiring and Reproducing Signals in Presence of Noise

CPYRGHT

"At the General Meetings of the Departments" (unsigned article);
Moscow, Vestnik Akademii Nauk SSSR, No 8, Aug 58, PP 65-66

"At the General Meeting of the Department of Technical Sciences [of the Academy of Sciences USSR held 16-17 June 1958] ...the paper of V. S. Pugachev, Doctor of Technical Sciences, was devoted to new methods of determining optimal systems for acquiring and reproducing signals in the presence of noise. This problem arises in many areas of contemporary engineering, particularly in the solution of such problems as automatic measurement and extrapolation of variable quantities, automatic tracking of moving objects, reception of radio signals, reproduction of sound and images in television systems, designing of automatic systems of control for machine tools, production processes, flying, weather forecasting, etc.

"The new effective methods, developed by Pugachev, for solving problems of acquiring and reproducing signals in the presence of noise are based on the principle of canonical forms of random functions which make it possible to unite all known methods of solution of similar problems existing not only earlier but even the new ones presented in this paper. These new methods are highly general and make it possible to solve practically all contemporary problems of acquisition and reproduction of signals in any conditions, including even those for which previously there were no methods of solution: determination of optimal systems practically for any given criterion, numerous optimal systems with arbitrary number of inputs and outputs, and optimal systems designed for reproduction of signals representing themselves as functions of vector arguments.

"These methods make it possible to obtain certain new general results, for example, to demonstrate that in the normal law of distribution of signals and noise optimal systems are linear for all criteria belonging to a very broad class.

"The theory presented in the paper has great practical significance, especially for new prospective automatic systems -- self-adjusting and self-organizing."

38. First East German Electronic Computer Being Tested

"The First Electronic Computer of the GDR in Testing" (unsigned article); Berlin, Radio und Fernsehen, No 15, Aug 58, p 477

The D 1/2, an electronic digital computer developed by several years of joint work by the mathematicians of the Dresden Technische Hochschule and VEB Funkwerk, Dresden, is now undergoing tests.

In a demonstration, the machine computed the logarithms of the numbers 1-10 with an accuracy of 10^{-12} . The D 1/2 can carry out 100 computations to 20 decimal places in a single second. An addition requires 1.4 milliseconds, a multiplication 30 milliseconds, and a division 45 milliseconds.

The entire instrument has 800 tubes, 100 relays, and 1,000 selenium rectifiers. It has an operating and control section, a scanning section, and a hand-perforating device for the preparation of the programming tapes. The magnetic storage drum can store 2,080 numbers or three times as many commands, which corresponds to a capacity of receiving about 150,000 dual informations. The numbers and commands are fed to the machine by either a tape or an electric typewriter.

The Research Center for the Aviation Industry wants a computer of this type for full-time operation.

Materials

39. Photoemission From HgSe

"Photoelectron Emission From Mercuric Selenide," by O. M. Sorokin, Leningrad State University imeni A. A. Zhdanov; Moscow-Leningrad, Zhurnal Tekhnicheskoy Fiziki, No 7, Jul 58, pp 1413-1423

"This work is concerned with a study of the photoemission from mercuric selenide (HgSe) in which impurities, apparently, have considerable effect. Mercuric selenide belongs to that group of compounds which has a structure of the ZnS type and is characterized by large drift mobility. The relationship between electron conductivity and the Hall carrier concentration and temperature for HgSe in a solid solution has a typical 'metallic' nature. However, according to previously obtained data, the energy spectrum of an HgSe compound has a forbidden energy zone of a definite width. An attempt is made in this paper to explain this nonconformity."

The author concludes that "pure HgSe appears to be a semiconductor and not a metal or semimetal."

"Results show that, during photoelectron emission, changes of the photoelectron work function with change of wavelength are possible. This factor must be considered in the use of semiconductor photocathodes even if they do not exhibit a photoconductive effect."

This work was conducted by the Chair of Electrophysics of the Scientific Research Physics Institute of Leningrad State University.

40. Effect of Pressure on Conductivity of Silicon Crystal

"On the Question of the Change in Electrical Conductivity of Silicon at Superhigh Pressure," by Yu. N. Ryabinin, L. D. Livshits, and L. F. Vereshchagin, Laboratory of the Physics of Superhigh Pressures, Academy of Sciences USSR; Moscow-Leningrad, Zhurnal Tekhnicheskoy Fiziki, No 7, Jul 58, pp 1382-1386

The relationship between conductivity of p-type silicon crystals and pressure is examined and an analysis is made of the results of measurements of resistance at pressures of one to 28,000 kg/cm².

The resistance was measured at atmospheric pressure and found to equal 77.7 ohms at 20°C. Resistance was constant for changes in polarity and independent of the magnitude of current within 0.2-10 ma.

Approximately 80 measurements were made of the resistance of the sample. As a result of these measurements, it was established that, as pressure increases from atmospheric pressure to 25,000 kg/cm², the resistance of silicon decreases by approximately 1.3% of its initial value.

In conclusion the authors state that the electrical resistance of p-type silicon is, apparently, strongly affected by many factors such as chemical purity, composition of the sample, and thermal and mechanical properties.

41. Method for Determining Diffusion Length in Germanium

"Examination of the Photomagnetolectric Effect as a Method for Determining the Volume Length of Diffusion in Germanium," by S. G. Kalashnikov and Ye. G. Landsberg, Institute of Radio Engineering and Electronics of the Academy of Sciences USSR; Moscow-Leningrad, Zhurnal Tekhnicheskoy Fiziki, No 7, Jul 58, pp 1387-1393

A study is made of the applicability of the photomagnetolectric effect in determining the volume length of diffusion and the speed of surface recombination in germanium. Certain existing conclusions of the theory are examined and a comparison is made between values of diffusion length obtained by this method and values obtained by the photoelectric method. Results of both methods were in agreement within the limits of random errors of measurement.

In determining diffusion length, measurements were made simultaneously of photomagnetolectric emission and photoconductivity which made it possible to disregard the effect of surface recombination on the illuminated surface.

Among the advantages of the photomagnetolectric method for measuring diffusion length are the following:

1. Measurements of both n- and p-type samples may be easily made.
2. Measurements of very small diffusion lengths are possible even in heavily alloyed samples.
3. The method requires no complicated apparatus.

[For additional information on materials, see Item No 9 and 43.]

Miscellaneous

42. Soviet Patents in Field of Electronics

"Publication of Awarded Authorship Certificates for Inventions Registered With the State Invention Register of the USSR" (unsigned article); Moscow, Bulleten' Izobreteniy, No 4, 1958, pp 34-60

Class 21a¹, 1101. No 112484 -- B. P. Terent'yev and Yu. V. Bogoslovskiy; A Method for Automatic Reception of Telegrams

Class 21a¹, 1105. No 110118 -- A. G. Smiryagin, L. A. Korobkov, and S. F. Shavrin; A Method of Storing and Reproducing of Telegraph Signals Coded Combinations

Class 21a¹, 3201. No 111706 -- L. A. Korobkov, V. Ye. Belovitskiy, and A. B. Lobanov; Fast-Operating Tape Electronic Terminal Telegraph

Class 21a¹, 3413. No 112443 -- A. P. Nefed'yev and B. V. Krusser; Two-Sided Target Transmitting Television Tube

Class 21a⁴, 802. No 112115 -- V. M. Ivanova, A. I. Belokonev, and A. B. Aronov; Circuit for Quartz Local Oscillator

Class 21a⁴, 813. No 112482 -- A. A. Shenogin; Noise Generator of Centimeter Range Waves

Class 21a⁴, 22. No 111811 -- A. A. Piotrovskiy; Controlled Waveguide Power Divider

Class 21a⁴, 4601. No 111219 -- V. L. Frumovich; Device for Controlling the Antenna Pattern Directivity

Class 21a⁴, 54. No 112125 -- F. K. Sergiyenko and I. M. Nemzer; Device for Conversion of Binary Code Into a New Code Insensitive to Changes of Polarity or Phase of the Signal by 180°

Class 21a⁴, 73. No 112258 -- I. V. Guzeyev and V. M. Ginzburg; Waveguide Type Device for Transmission of High-Frequency Energy

III. ENGINEERING

43. Progress of Work on Rhenium in the USSR

"Research on Rhenium (An All-Union Conference)," by Ye. M. Savitskiy and S. A. Ross; Moscow, Vestnik Akademii Nauk SSSR, Vol 28, No 8, Aug 58, pp 121-122

CPYRGHT

"Recently, a number of extensive investigations on the properties of rhenium has been carried out. On the basis of these investigations many very important and promising applications of this rare metal and its compounds and alloys in radioelectronics, electrical engineering, the chemical industry, the production of heat-resistant alloys, etc., can be envisaged.

"For the purpose of exchanging experience, coordination, and determination of the most promising lines of research to be conducted on rhenium, the Institute of Metallurgy imeni A. A. Baykov, the Institute of Mineralogy, Geochemistry, and Crystal Chemistry of Rare Elements of the Academy of Sciences USSR, and the Interdepartmental (Mezhduvedomstvennaya) Commission on Rare Metals at the State Scientific-Technical Committee of the Council of Ministers USSR conducted at Moscow on 26-27 May 1958 an All-Union Conference in which representatives of scientific research institutions, higher educational institutions, industrial enterprises, and state planning organizations participated.

"More than 30 reports dealing with raw material resources, the technology of the production of rhenium, methods of analysis, the physico-chemical properties of rhenium, and possibilities of the application of this metal as well as of its compounds and alloys were presented and discussed at the conference.

"The great expansion of research on rhenium both in the USSR and abroad was noted.

"At the same time, it was pointed out that the volume of the production of rhenium is inadequate, the purity of the rhenium produced is insufficient, the metal is too expensive, and not enough work is being done on expanding the raw material basis for the production of rhenium.

"As a result of investigations which have been done, rhenium and its alloys can already be applied in the industry as a material for electrical contacts, some parts of radio engineering equipment, as a material for thermocouples (tungsten-rhenium alloys), and as an alloying element for heat-resistant and titanium alloys. Also very promising is the coating with rhenium of tungsten filaments for incandescent bulbs, electrolytic coating with rhenium and its alloys of copper, tungsten, graphite, chromium-nickel alloys, and other materials, the application of rhenium for the manufacture of springs operating at high temperatures, the use of rhenium as a catalyst, etc.

"Taking into consideration the extensive possibilities existing in the USSR as far as supplies of raw material are concerned and the fact that fields of application have already been developed, the conference recognized as necessary the taking of urgent measures aimed at a sharp increase in the production of rhenium and the organization of the industrial production of intermediate products made of rhenium and its alloys. The resolution of the conference emphasized the importance of prospecting for raw material containing rhenium and of the investigation of forms in which rhenium occurs in ores and minerals. The urgent necessity of developing technological methods for extracting rhenium in connection with the conversion of copper concentrates containing this metal and of developing technological procedures for recovering rhenium from dusts was also emphasized.

"With the purpose of coordinating scientific research on rhenium and exchanging experience in this field, the organization of a special coordination committee at the Institute of Metallurgy imeni A. A. Baykov was recognized as necessary. Representatives of the leading scientific research organizations and of the industry are to be assigned to this committee."

44. Compensating Networks Improve Gyrostabilizer Characteristics

"Improvement of Dynamic Characteristics of a Gyrostabilizer With the Aid of Compensating Networks," by I. T. Borisenok, Moscow; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, No 5, May 58, pp 21-28

The general theory of one-axis, two-axis, and three-axis gyrostabilizers was developed in the works of B. V. Bulgakov, A. Yu. Ishlinskiy, Ya. N. Roytenberg, and others. For providing stability and the required indexes of the quality of operation in the scheme of the gyrostabilizer, electrical compensating networks which convert the signal picked off the precession axis of the gyroscope are introduced in the scheme of the gyrostabilizer.

The purpose of this article is to compare the dynamic characteristics of one-axis gyroscopic stabilizers equipped with various passive compensating networks. The comparison of gyrostabilizers with the same sharp static characteristic showed that a gyrostabilizer with a compensating network of the second order has the following advantages over a stabilizer with a link of the first and, specifically, the second order: (1) transient processes are damped faster and (2) deviations under the effect of harmonic external forces are considerably decreased.

45. Supersonic Studies Solve Critical Design and Structural Problems

CPYRGHT

"At the General Meetings of the Departments" (unsigned article); Moscow, Vestnik Akademii Nauk SSSR, No 8, Aug 58, p 65

"At the General Meeting of the Department of Technical Sciences [of the Academy of Sciences USSR held 16-17 June 1958] G. I. Petrov, Corresponding Member of the Academy of Sciences USSR (elected an Academician at the General Meeting of the Academy of Sciences USSR on 20 June 1958), delivered a paper on the motion of a real gas with velocities considerably exceeding the speed of sound.

"A rapidly developing aviation and rocket technology has set forth increased requirements for accuracy of obtained experimental and design data and has placed before aerodynamics many new and difficult tasks. For designing and planning craft which fly in the atmosphere at velocities considerably exceeding the speed of sound, and power plants, the study of the motion of a gas in the immediate vicinity of the surface of the craft where the influence of viscosity and heat conductivity appear acquires a special significance.

"By experimental investigations it was shown that the velocity distribution both in the laminar and the turbulent boundary layer at velocities on the edge which exceed the speed of sound, are similar to the subsonic boundary layer and are excellently described by exponential laws. In supersonic flow in regions with very sharp linear deformations of flow parameters (the basis for compression shock and others) the basic aspects of boundary layer theory and phenomena occurring here cannot be described by parabolic-type equations. In these regions it is possible to use equations for a nonviscous gas but under conditions of mixed vortex flow.

"The study of the interaction of strong jumps from the boundary layer made it possible to establish certain general rules to explain and predict a number of phenomena connected with flows in diffuser ducts, pressure chambers, flow past wings, with the operation of air brakes and in other cases having important practical significance.

"Numerous semiempirical methods of computing coefficients of heat transfer and friction in supersonic flow in the turbulent boundary layer are based on the application of integral relations and the establishment of the relation between local boundary layer characteristics and local coefficients of heat transfer and friction, while the results obtained by different methods disagree.

"For the experimental study of heat transfer and friction in turbulent supersonic flow the development and finishing of a very fine method of direct measurement of local coefficients of heat transfer and friction is required. As Petrov noted, the experiments conducted make it possible

to establish the nature of the boundary layer structure and to evaluate methods of decreasing thermal flows which are extremely important for developing methods of protecting structures from thermal effects at very high flight velocities."

46. Bigimbal Arrangement Improves Gyrostabilized Platform

"On the Motion of a Gyrostabilized Platform Mounted in a Bigimbal," by N. T. Kuzovkov, Moscow; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, No 7, Jul 58, pp 94-97

A bigimbal is an ordinary gimbal supplemented by a stirrup device, i.e., a bow with a slit, in which a rod slides which is rigidly connected with the inner gimbal ring. The general theory of bigimbals was developed by A. Yu. Ishlinskiy and G. V. Chekhovich. In an article on the basis of certain results of this theory (Ishlinskiy, A. Yu., Mekhanika spetsial'nykh giroskopicheskikh sistem [Mechanics of special gyroscope systems], Publishing House of the Academy of Sciences Ukrainian SSR, Kiev, 1952) equations of small oscillations of a gyrostabilized platform in a bigimbal about a position characterized by large deviation angles of the outer ring and stirrup are constructed. A comparison of these equations with equations of the same type platform mounted in an ordinary gimbal (Kuzovkov, N. T., "On the Motion of a Gyrostabilized Platform at High Deviation Angles," Izv. AN SSSR, OTN, No 1, 1958) are also made.

47. Loading and Roll Angle Calculations

"Calculation of Loading and Angles of Roll of An Airplane Moving On a Space Trajectory," by R.D. Irodov; Moscow, Trudy Tsentral'nogo Aero-Gidrodinamicheskogo Instituta imeni Prof N.Ye. Zhukovskogo, No 702, 1957, 22 pp

Formulas and graphs are presented to find the flight parameters necessary to maintain an airplane on any given trajectory, i. e., for finding the necessary angle of roll, angle of pitch, and normal loading for an airplane at a given point for a given angle of slope of trajectory, angle of incidence of the principal normal and radius of curvature of the trajectory at that point.

Formulas and graphs are also given for solving the converse problem of finding the trajectory characteristics of an airplane for given flight parameters, i.e., for finding the radius of curvature of the trajectory, the angle of incidence of the principal normal and the angle of slope of the trajectory at a given point for a given loading, angle of roll, and angle of pitch at that point.

The authors say these formulas may be useful in solving various problems related to trajectories of airplane flight particularly for airplanes moving on space trajectories.

This work was designed for engineers and scientific workers concerned with problems of flight dynamics.

48. Bending and Stresses in Cantilever Plates

"Application of a Corrective Function Method in Calculations of Deformations of Cantilever Plates," by V.M. Frolov; Moscow, Trudy Tsentral'nogo Aero-Gidrodinamicheskogo Instituta imeni N.Ye. Zhukovskogo, No 705, 1957, 36 pp

A method is presented for the calculation of bending and stresses of rectangular and triangular cantilever plates. The method is based on the assumption that during loading the transverse sections of the plates parallel to the junction become deformed. Solutions are given for problems on rectangular and triangular plates based on the concept of bending functions in the form of the sum of a basic function determined by a so-called beam theory and a corrective function. The corrective function is derived by improving the beam theory by a method which appears as a physical sequence and an additional approach which permits reducing the stated problem to integration of sufficiently simple differential equations.

Calculations indicated that in transverse bending of a rectangular plate the cross sections are deformed. The magnitude of these deformations and also the law for their changes longitudinally depend on the relative length of the plate. In the case of constant loading the values of bending for a fully anchored root section appear insignificantly small in comparison with total plate bending. Bending stress curves for rectangular plates of different lengths show that there is a certain redistribution of stresses near the junctions which is caused by the effect of the junctions but which has no effect on total strength.

In triangular plates the deformation of cross sections has a local character. For plates with a fully anchored root section the bending of cross sections is small compared to basic bending values for both constant loading and when a concentrated forces is applied to the apex. In the case of oblique fastening, strength-of-material formulas for wedge-shaped beams are not suitable for calculation of bending of triangular plates. Calculations of bending stresses along sections of triangular plates with oblique junctions showed a sharp redistribution of stresses near the junctions. During elastic deformations in certain obliquely anchored plates the increase of stresses at the trailing edge portion of the junction may be 2-5 times greater than the average stresses obtained through the strength of materials theory.

The authors conclude that the corrective function method permits better accuracy for approximated solutions of a number of problems in structural mechanics of cantilever plates.

This book is designed for engineers dealing with calculations of strength of short-span wings and turbine blades and for scientific workers specializing in the applied theory of elasticity and structural mechanics.

49. Equations of Disturbed Flight Movements in Structural Diagram Form

"The Airplane As An Object of Control (Structural Diagrams of Equations for Disturbed Movement of An Airplane)," by V.S. Vedrov, G.L. Romanov, V.N. Surina; Trudy No 74, Ministerstvo Aviatsionnoy Promyshlennosti SSSR, 1957, 43 pp

A study is made of the concept of equations for the disturbed movements of an airplane in the form of single-circuit structural diagrams. A concise analysis is made of the characteristics of the individual links and their change with change of speed and flight altitude. Aerodynamic coefficients characteristic of a modern subsonic jet airplane are used in calculations of link characteristics for altitudes of 5 and 12 kilometers and flight speed of 800 km/hr. Derivations are made for transfer functions during control with rudders and ailerons and also for simplified expressions of transfer functions in relation to the range of frequencies which correspond to a breakdown of the disturbed movement into simple types.

This work proved that the system of differential equations for both laterally and longitudinally disturbed movements of an airplane (equations in variants) can be presented in the form of a simple single-circuit structural diagram with links of the first and second order whereupon the signals on the input and output of the links have a specific physical value. This structural concept of systems of equations makes it possible easily to apply modern methods in the general theory of control such as the frequency method, the theory of compensating circuits, structural analysis, etc., in the study of problems of stability and control. It permits giving simple approximated expressions for transfer functions of the airplane control system in relation to the frequency ranges of different types of movement. In particular, in contrast to existing methods which give approximated transfer functions for rapid angular movements relative to the center of gravity, with this method it is easy to obtain approximated expressions for transfer functions for sluggish movements connected with displacements of center of gravity. This concept also makes it possible to set up approximated differential equations for different practical cases.

In a section on transfer functions of organs of control and simplification of equations of movement and transfer functions the authors say, "In this section we analyzed various simplifications for the case of an 'ordinary' airplane practically free of aperiodic instability. Such an analysis and corresponding simplifications can be easily accomplished in any case where the characteristics of the airplane are strongly different from the ordinary."

The authors acknowledge the assistance of Doctor of Technical Sciences M.A. Tayts and Engineer Ye.N. Arsen'yev in preparing the work for publication and also that of Technicians Z.N. Frolova, A.S. Verevkina, and K.A. Lapshina who conducted all the calculating and formulating work.

50. Ferroresonant Voltage Regulator

"Theory of Ferroresonant Voltage Regulator," by D. I. Bogdanov, Moscow, Vestnik Electro-Promyshlennosti, No 7, Jul 58, pp 43-47

Magnetically soft materials with rectangular hysteresis loop are widely used at present in electrical equipment. Examples of such materials are the alloys N50P and N65P which have a coefficient of loop "rectangularity" above 85%. The type E310, E320 and E330 steel which are generally used in the form of annealed tape wound in the shape of a toroid also have a rather high coefficient of loop "rectangularity" up to 85%. These steels are generally annealed at 900°C and subsequently cooled in the air.

The article discusses theory and calculation procedure for ferroresonant regulators with saturable cores having a sharply rectangular hysteresis loop.

In his calculations the author proposes a simplification of the hysteresis loop representation by merely using three straight lines. The author postulates that this simplification is justified by the fact that the magnetic field intensity of a saturable core is great compared to the coercive force.

The optimum parameters of the voltage regulator are finally established after several variance of calculations for the saturable core.

51. Reorganization of Soviet Machine Building Institute

"Scientific Research Institute for Normalization in Machine Building," (unsigned article); Moscow, Standartizatsiya, No 3, Jun 58, p 48

The All-Union Scientific Research Institute of Machine Building Technology (VNIITMash) of the Glavniiprojekt under the State Planning Committee together with the experimental plant "Krasnyy Fakel" have been transferred to the Committee on Standards, Measures, and Measuring Instruments.

The All-Union Institute of Machine Building Technology is being reorganized into the All-Union Scientific Research Institute for Normalization in Machine Building and will have an experimental base.

IV. MATHEMATICS

52. Biorthogonal System

"Concerning One Biorthogonal System," by R. M. Martirosyan, Institute of Mathematics and Mechanics, Academy of Sciences Armenian SSR; Yerevan, Doklady Akademii Nauk Armyanskoy SSR, Vol 27, No 1, Jan 58, pp 3-11

In the work by Langer, which appeared in Transactions of the American Mathematical Society, Vol 31, 1929, p 868, a simultaneous expansion was given for a pair of functions in terms of the eigen functions of an equation having the form $y'' - 2a_1\lambda y' + \lambda^2 y = 0$ (in the simplest case) with given boundary conditions. The analogous problems for equations of the fourth order were first considered by Papdovich in connection with certain problems of the theory of elasticity (Stroitel'naya Mekhanika Kobablya, [Structural Mechanics of Ships], Vol 2, Leningrad, 1941). For equations of the second order an expansion in terms of eigen functions, somewhat different from the expansion of Langer, was first presented in the work of N. Kh. Arutyunyan, M. M. Dzhrbashyan, and R. A. Aleksandryan, which appeared in Izvestiya Akademii Nauk Armyanskoy SSR, Seriya Fiziko-Matematicheskikh Nauk, Vol 10, No 1, 1957. Their work arose in connection with the solution of a mixed problem for hyperbolic equations containing a mixed derivative. The latter reference served as the basis for investigations of M. M. Dzhrbashyan who constructed the appropriate integral transformations on the semiaxis $(0, \infty)$.

Thorough consideration of these results raises the following problem: Let φ_k denote the eigen elements of the equation $(A^* + w_2 E)(A - w_1 E)\varphi = 0$ in the Hilbert space H . In what manner can the system φ_k be completed with three consecutive elements in order to obtain a biorthogonal system in the space $H = H \times H$ with a suitably chosen scalar product?

This work is devoted to the solution of this problem. The work consists of two parts. In the first part the construction is given for the indicated biorthogonal system. In the second part it is proved that generally it is impossible to expect completeness of the indicated system in the general sense of the word. Apparently, expansions in terms of the indicated biorthogonal system are possible only for elements belonging to the region of definition for the operator A .

Thus we consider the equation $(A^* + w_2 E)(A - w_1 E)\varphi = 0$, where A is an arbitrary symmetrical operator in the Hilbert space H while w_1 and w_2 are real numbers having the same sign.

53. Integrodifferential Operators

"On the Use of Some Integrodifferential Operators," by M. M. Dzhrbashyan, Academician, Academy of Sciences Armenian SSR, and A. B. Nersesyan; Moscow, Doklady Akademii Nauk SSSR, Vol 121, No 2, Feb 58, pp 210-213

In this work a series of new results in the theory of Dirichlet series and in the theory of quasianalytical classes of functions are presented. These results were obtained by the method of introducing special integrodifferential operators, combined with the notion of fractional integration in the Riemann-Liouville sense.

54. Quasiconformal Mappings

"The Use of the Variation Method in Solving Extremum Problems of Quasiconformal Mappings," by P. P. Belinskiy, Mathematics Institute of the Siberian Department, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 121, No 2, Feb 58, pp 199-201

In this work the problem is considered to find the maximum of the real function $F(z_1, \dots, z_k, w_1, \dots, w_k)$,

$$w_n = w(z_n) = u_n + i v_n.$$

It was assumed that reflection is conducted on a certain canonical region with normalization guaranteeing the singleness of the reflecting function for given characteristics. For example, let $w = w(z)$ be the reflection of the circle $|z| \leq 1$ on the circle $|w| \leq 1$, $w(0) = 0$, $w(1) = 1$. We will assume the function F as continuous and differentiable by u_n, v_n . On the strength of the class of q -quasiconformal reflection being closed, there exists a general q -reflection $w = f(z)$, for which F assumes the minimum value. We will assume from the start for simplicity that the extreme reflection is sufficiently smooth and will actually try to find it. Let the characteristics of the inverse reflection equal $p(w), \theta(w)$ (i.e., the infinitely small circle with its center at the point w), respective to the main axes $p(w) \geq 1$ and the angle $\theta(w)$ between the major semiaxis and the x axis.

55. Differential Equations of Banach Space

"On Certain Differential Equations in a Banach Space," by K. A. Breis; Kiev, Ukrainskiy Matematicheskiy Zhurnal, Vol 10, No 2, 1958, pp 115-120

The author studies linear differential equations of the form

$$dx/dt = A(\omega t) x$$

in which $x = x(t)$ is a vector function of the real variable t having values in a Banach space. $A(\omega t)$ is a linear limited operator, acting in a Banach space with values in that space, which is periodical with respect to t , and ω is the "great" parameter. The analyticity of the basic system of solutions of these equations with respect to the parameter $\epsilon = \omega^{-1}$ is established and an effective algorithm is given for obtaining the solution.

56. Nonautonomous Systems

"On the Theory of Nonautonomous Quasilinear Systems With Many Degrees of Freedom," by G. Ye. Kuzmak; Kiev, Ukrainskiy Matematicheskiy Zhurnal, Vol 10, No 2, 1958, pp 128-146

The system of equations considered is

$$dx_j/dt + \sum_{i=1}^n a_{ji} = \epsilon f_j \left[x_1, \dots, v_{p-1}(t), \dots, v_n(t), \epsilon, \right]$$

(j = 1, 2, \dots, p)

ϵ being a small parameter.

It is assumed that for $\epsilon = 0$, the system above becomes a linear system of equations with constant coefficients, which has no equal characteristic numbers. The functions $v_{p+1}(t) \dots v_n(t)$ are known.

A method is suggested for solving the system above which permits the obtaining of the approximate relations suitable for the study of the solution over a long interval of time. This method is applied to the cases connected with the existence of different linear dependences between characteristic numbers of the linear system. By means of the method aperiodic, periodic, and quasiperiodic solutions and the solutions tending to them may be studied.

Several examples are given.

57. Integral Representation of Measurable Functions With Kernels

"Concerning the Integral Representation of Measurable Functions With Kernels by Generating Unitary Transformations of the Space $L_2(0, \infty)$," by A. A. Talalyan, Institute of Mathematics and²Mechanics, Academy of Sciences Armenian SSR; Doklady Akademii Nauk Armyanskoy, SSR, Vol 26, No 5, Jun 58, pp 257-261

Let $K(x, t)$ and $L(x, t)$ be kernels of the unitary transformations of the space $L_2(0, \infty)$ such that the following assertions hold for any function $f(x)$ in $L_2(0, \infty)$:

$$\text{l. i. m.}_{a \rightarrow \infty} \int_0^a K(x, t) f(t) dt = g(x), \quad (1.1)$$

$$\text{l. i. m.}_{a \rightarrow \infty} \int_0^a L(x, t) g(t) dt = f(x), \text{ where, as}$$

usual, the notation $\text{l. i. m.}_{a \rightarrow \infty}$ denotes a limit in the sense of convergence

in L_2 for $a \rightarrow \infty$,

On the strength of the single-valuedness of the transformation,

$$\|g\|_{(0, \infty)} = \|f\|_{(0, \infty)} \quad (1.2)$$

Consequently, for any $a > 0$

$$\left\| \int_0^a K(x, t) f(t) dt \right\| = \|f_a\| \leq \|f\| = \|g\|,$$

and

$$\left\| \int_0^a L(x, t) g(t) dt \right\| = \|g_a\| \leq \|g\| = \|f\|, \quad (1.3)$$

where

$$f_a(x) = \begin{cases} f(x) & \text{for } 0 \leq x \leq a \\ 0 & \text{for } x > a \end{cases} \quad (1.4)$$

and

$$g_a(x) = \begin{cases} g(x) & \text{for } 0 \leq x \leq a \\ 0 & \text{for } x > a \end{cases} \quad (1.5)$$

We assume that for any $a > 0$ and $b > 0$ ($a, b \neq +\infty$)

$$\int_0^a \int_0^a K^2(x, t) dx dt < +\infty, \quad \int_0^a \int_0^b L^2(x, t) dx dt < +\infty. \quad (1.6)$$

The purpose of this work is to prove the following theorems:

Theorem I -- Let $K(x, t)$ and $L(x, t)$ be functions defined for $0 \leq x < +\infty$ and $0 \leq t < +\infty$, satisfying the relations (1.1), (1.2) and (1.6).

Then for any measurable function $f(x, t)$ defined for $0 \leq x < +\infty$ there exists a measurable function $\zeta(x)$ integrable on the square for each finite interval and having the property that the expression

$$\int_0^a L(x, t) \zeta(t) dt \text{ converges for } a \rightarrow \infty$$

on any finite interval $[0, +\infty)$, to $f(x)$.

In particular, when $f(x)$ is an almost everywhere finite function, a theorem stronger than theorem I holds. In order to formulate that theorem, we introduce the following definition: the sequence $\{f_n(x)\}$ of almost everywhere finite measurable functions converges in the mean to $f(x)$ on the segment $[a, b]$ in the generalized sense, if for any $\epsilon > 0$ there exists a set $E \subset [a, b]$ such that $\text{mes } E > b - a - \epsilon$ and the sequence $\{f_n(x)\}$ converges in the mean to $f(x)$ on the set E .

Theorem II -- Let $K(x, t)$ and $L(x, t)$ be functions defined for $0 \leq x < +\infty$ and $0 \leq t < +\infty$, satisfying the relations (1.1), (1.2), and (1.6). Then for any almost everywhere finite measurable function $f(x)$, defined for $0 \leq x < +\infty$ there exists a measurable function $\zeta(x)$, integrable and having that property that the expression

$$\int_0^a L(x, t) \zeta(t) dt \text{ converges in the mean in the}$$

generalized sense on each finite interval lying in $[0, +\infty)$, to $f(x)$.

The following theorem also holds:

Theorem III -- Let $K(x, t)$ and $L(x, t)$ be functions defined for $0 \leq x < +\infty$, $0 \leq t < +\infty$ and satisfying (1.1), (1.2), and (1.6).

Then there exists a measurable function $\zeta(x)$ different from zero, integrable on the square in every finite interval a possessing that property that the expression

$$\int_0^a L(x, t) \zeta(t) dt \text{ exists in the mean in the}$$

generalized sense for any finite interval lying in $[0, +\infty)$, to 0.

The method developed by the author in his work, concerning the convergence of series in a Basic space L_p which appeared in Izvestiya Akademii Nauk Armyanskoy SRR Seriya Fiziko-Matematicheskikh Nauk, Vol 10, No 1, 1957, was employed for proof of these three theorems.

58. Nonlinear Elliptical Differential Equations

"Concerning Certain Properties of Solutions for Nonlinear Equations of the Elliptical Type," by L. M. Kuks, L'vov State University imeni Ivan Franko; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Matematika, No 4 (5), 1958, pp 131-139

The work consists of two parts. In the first part linearization was performed based on the Chaplygin and Fragmen-Lindelef theorems. In the second part the Picone Identity is generalized for a quasilinear equation and by the use of it the Sturm theorem is proved. The comparison theorem is used for obtaining several criteria for the uniqueness of the Dirichlet problem.

V. MEDICINE

Bacteriology

59. Methods of Investigating Atmospheric Air Bacteriologically

"A Comparative Evaluation of Methods for the Bacteriological Investigation of Atmospheric Air," by V. I. Burgova, Informatsionnyy Byulleten' In-ta Sanitarii i Gigiyeny imeni Erismana (Information Bulletin of the Institute of Sanitation and Hygiene imeni Erisman), 1957, No 9, pp 22-25 (from Meditsinskiy Referativnyy Zhurnal, Series No 4, No 6, Jun 58, p 30)

CPYRGHT

"Three methods of testing air -- the sedimentation method and two aspiration methods (one utilizing membrane filters and the other the Krotov apparatus) -- were comparatively evaluated. Samples of air were taken in Moscow during all seasons of the year and a notation made of the temperature, relative humidity, and direction and speed of the wind. For the comparative evaluation methods, the results of each of these were evaluated on the basis of one m³ of air. A total of 430 analyses were made by the sedimentation method. A total of 460 air samples were tested with the aid of the membrane filters. Best results were obtained with No 3 type filters. The air was filtered at the rate of 10 liters per minute for 10 minutes. A total of 700 analyses were conducted utilizing the Krotov apparatus. The air was filtered at the rate of 25 liters per minute, and the plates rotated at the rate of 50-60 revolutions per minute. For determining the number of bacteria, 150 liters were collected, and for determining the cocci group and anaerobic microorganisms, 250 liters.

"After comparing the results obtained, it was determined that the sedimentation method gave higher bacterial air pollution indexes than the aspiration methods. Calculations made according to Omelyanskiy's formula showed that in one m³ of winter air there were 800 microorganisms; spring, 1,600; and fall, 10,000. According to the author, these high figures could have resulted from some accident while collecting the sample or possibly a mistake in calculation. Utilizing the membrane filter method, it was determined that one m³ of air contained 190 microorganisms in the winter, 580 in the spring, 1,500 in the summer, and 750 in the fall. Utilizing the Krotov method, it was determined that one m³ of air contained 240 microorganisms in the winter, 590 in the spring, 2,200 in the summer, and 1,800 in the fall. The author believes that the Krotov method gives more exact indexes of the bacterial pollution in the air because of the uniqueness of the construction of the apparatus which permits the sampling of all fractions of a bacterial aerosol."

Hematology

60. Program of Academy of Medical Sciences USSR for Study of Leukosis

CPYRGHT

"Khronika"; Kiev, Vrachebnoye Delo, No 8, Aug 58, p 895

"Since the etiology and pathogenesis of leukosis has not yet been determined and since world medical science has not provided an effective therapeutic substance for this disease, the Ministry of Health USSR has undertaken a series of measures. A program which calls for increased experimental and clinical research has been presented for a more detailed study of this problem.

"The Presidium of the Academy of Medical Sciences USSR has proposed that the Institute of Experimental Pathology and Cancer Therapy, the Institute of Oncology (Leningrad), and the Institute of Epidemiology and Microbiology imeni Gamaleya increase their work on the study of the etiology, pathogenesis, and experimental therapy of leukosis.

"Certain institutes have been given the responsibility of searching for new, effective chemotherapeutic substances and antibiotics. At the Institute of Pediatrics, Academy of Medical Sciences, a Hematological Department has been established and will concern itself with the study of leukosis and other blood diseases in children.

"To ensure uninterrupted experimental work, mice, with acute and mild forms of leukosis, should be bred and supplied to the proper organizations. In the coming year, a seminar will be held on the problem of leukosis.

"It has also been proposed that laboratories be organized, staffed, financed, and equipped for the study of the etiology, pathogenesis, and experimental therapy of leukosis at the Leningrad, Kiev, Khar'kov and Georgian institutes of hematology and blood transfusion.

"At the same time, because of overcrowding, special hematological departments are being established in all the republic and oblast hospitals.

"In some large cities, including Kiev and Khar'kov, hematological departments, with rooms having a capacity of 25-30 patients, are being organized in the scientific research pediatrics institutes.

"A laboratory for investigating chemotherapeutic substances and antibiotics for leukosis therapy is being established by the All-Union Scientific Research Chemicopharmaceutical Institute.

61. Blood Transfusion Reactions and Role of Cerebral Cortex

"The Role of the Functional Condition of the Cerebral Cortex in the Pathogenesis of Transfusion Reactions After Intergroup Transfusions," by M. P. Brusnitsina, Candidate of Medical Sciences, Khar'kov Medical Institute; Kiev,

CPYRGHT Vrachebnoye Delo, No 8, Aug 58, p 894

"The intervenous administration of a bromide, it was determined, can attenuate and in certain cases completely eliminate the reactions caused after transfusion of small amounts of intergroup blood, and, in addition, markedly lower the intensity of the reaction of the capillary system. The possibility of preventing a reaction following the transfusion of compatible blood after the intervenous administration of a bromide indicates that changes in cortical dynamics play an important role in the pathogenesis of these phenomena.

"This course of therapy should be carried out by 5-6 transfusions of intergroup blood in 3- to 8-milliliter dosage over an interval of 2-3 days. Intergroup transfusions should be controlled by determinations of the functional condition of the liver and kidneys."

62. Level of Blood Serum Proteins and Liver Proteins Altered in Tourniquet Shock

"Blood Serum Proteins and Liver Proteins Under Conditions of Tourniquet Shock," by A. V. Zhukov, Uch. Zap., 2-y Mosk. Med. In-t, (Scientific Reports of the Second Moscow Medical Institute), 1957, No 6, pp 36-40 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, Moscow, No 17, 10 Sep 58,

CPYRGHT p 82)

"The rate of inclusion of S³⁵-tagged methionine increased in the blood serum and liver during tourniquet shock caused by applying bands on the extremities of rabbits. This increase amounted to an 86% rise in albumins, 57% in globulins, and 38% in liver proteins. On cooling the extremity on which the tourniquet was applied, the rise in the inclusion of S³⁵-tagged methionine in the blood serum and liver proteins was less than at normal body temperature. Three hours after removing the tourniquet, the total protein content in the blood serum decreased, on the average, by 1.03%."

63. Immunological Shifts in Anemias and Rhesus Negativity Correlated

"Immunological Shifts in Patients With Hemolytic, Aplastic, and Hypoplastic Anemias," by M. A. Umnova, Yu. I. Loriye, and F. E. Faynshteyn, Central Order of Lenin Institute of Hematology and Blood Transfusion (director, Prof A. A. Bagdasarov, Active Member, Academy of Medical Sciences USSR), Ministry of Health USSR; Moscow, Problemy Gematologii i Perelivaniya Krovi, Vol 3, No 4, Jul/Aug 58, pp 16-23

To study immunological shifts in diseases of the blood system, the authors analyzed the blood of 115 patients suffering from various forms of hemolytic, hypoplastic, and aplastic anemias. Tests were run for erythrocytic heteroagglutinins, isoagglutinins, isohemolysins, and rhesus factors. The direct and indirect Coombs test was also run.

Results indicate significant immunological shifts, i. e., presence of immune antibodies and autoantibodies both fixed in the serum and in erythrocytes, and titer increase in normal, iso-, and heteroantibodies in patients with acquired hemolytic anemia. The authors also point out the prevalence of Rh negative subjects among patients with congenital hemolytic anemia and with the Marchiafava-Micheli syndrome.

The authors present two possible explanations for these facts:

1. Rh negativity, to a certain degree, predisposes people to the development of certain diseases.
2. Pathogenic factors which have caused certain diseases also affect the antigenic structure of the erythrocytes of these patients. The authors think the second explanation is the more probable.

The authors conclude that the pathogenic factors, which bring about deficient erythrocytes during the process of the latter's development, also affect the development of the antigenic structure of erythrocytes, as a result of which Rhesus receptors are either not formed or are inadequately developed. Further research is necessary to confirm this explanation, the authors conclude.

Immunology and Therapy

64. Report on Live Vaccines

CPYRGHT "Live Vaccines," by Prof B. El'bert; Moscow, Meditsinskiy Rabotnik, 16 Sep 58, p 3

"The protection of humans from diseases caused by bacteria and viruses by means of vaccines with specific immunity is an important branch of theoretical and practical immunology. This division of immunology, as is known, is called immunoprophylaxis. One of its methods is the use of live attenuated bacteria and viruses for vaccination.

"The use of artificial methods of immunoprophylaxis goes back to the distant past, when notions of the bacterial or viral nature of infectious diseases did not yet exist. Toward the beginning of the 20th Century, medicine and veterinary medicine already had methods of vaccinating against smallpox, anthrax, and rabies at their disposal.

"The significant achievements accomplished in the last four decades by Soviet authors in the study and application of live attenuated cultures of bacteria and viruses against the virulent pathogens of tuberculosis, plague, tularemia, brucellosis, influenza, and other infectious diseases are of great scientific interest. This affords the possibility of eradicating natural smallpox and decreasing the incidence of tularemia, tuberculosis, etc.

"The introduction of live attenuated bacteria leads to decreased function of the physiological mechanisms of protection from an infectious agent and the products of its vital activity. Research of Soviet authors showed that introducing live, weakly virulent, or not entirely virulent but at the same time immunogenic strains of bacteria into the organism facilitates the development of the vaccine process. The administration of such cultures is accompanied by the development of specific immunogenic shifts in the organism, and furthermore guarantees a completely or relatively harmless infection in response to a virulent agent.

"The selection of methods of conferring powerful inoculation immunity by the use of live vaccines is the result of research which makes it possible to discover the characteristics of the mechanism of infection and immunity of the corresponding pathological process. The possibility of introducing the method selected into antiepidemic practice is controlled by analysis of widespread epidemiological observations.

"Thus, the primary tasks of Soviet immunologists were the study of the conditions governing the genesis, development, and outcome of the infection process; routes of distribution of the pathogen in the organism; histomorphological, biochemical, and immunological response reactions; duration of parasitization of the infectious agent in the tissues; and, finally, its paths of egress into the surrounding medium. The same problems were also studied with respect to the vaccine process.

"The next task of the immunologists was the analysis of biological shifts of pathogenic microorganisms against which a method of specific immunoprophylaxis had been developed as the result of a study of the mutability of the pathogen in ontogenesis.

"Along with development of the leading principles of immunoprophylaxis, which assure the absolute protection of the human organism from specific infection, considerable attention was devoted to studying methods of obtaining live attenuated cultures, stabilization of the newly acquired characteristics, and selection of the most ideal method of administering the live vaccine. The method which corresponds to the route of introduction of the bacteria or virus in natural infection and the same tissues which are highly sensitive to the given pathogen is often considered the best for such administration. Thus, the tularemia pathogen causes a pathological process following any method of invasion of the organisms of humans and susceptible animals. However, the skin and mucous membranes of the upper respiratory tract are the routes of infection under natural conditions: bubonic, ulcerous-bubonic, anginous-bubonic, oculo-bubonic, and the pulmonary, nongeneralized form of tularemia. In accordance with this, we proposed the cutaneous method of immunization with live tularemia vaccine, which was found to be effective from the standpoint of intensity of developed immunity and is the simplest method under mass vaccination conditions.

"The theoretical treatment of the problem of specific protection of humans from tularemia and the practical accomplishment of immunoprophylaxis with live antitularemia vaccine are great achievements of Soviet immunologists. The attempts of a number of investigators abroad and in the USSR to base the effectiveness of active immunization on the subcutaneous injection of killed suspensions of virulent tularemia bacilli concluded without results.

"The key to the resolution of this problem is our work in cooperation with N. A. Gayskiy on the study of the mechanism of infection and immunity in experimental tularemia. This research demonstrated that it was possible to achieve specific protective immunity against massive doses of virulent agent as a result of vaccination with weakly virulent but immunogenic B. tularense cultures which differ from virulent strains only slightly in regard to antigenic characteristics. The complex character of the antigen of virulent and vaccine strains is substantiated by the most recent research (Olsuf'yev and associates, etc.). The stability of the properties of Gayskiy vaccine strain

No 1.5 for humans and guinea pigs despite numerous passages through white mice, has also been completely proved. Histological examination showed that the vaccine strain caused the development of an inflammatory process which was localized principally at the site of introduction of the vaccine and in the regional lymph nodes, and which was benign in character. After subsequent infection with a virulent culture, the changes also bear the character of a productive type of inflammation.

"The high effectiveness of the cutaneous method of vaccination has been demonstrated by antiepidemic practice. This method completely guarantees the establishment of immunity against any form of infection of the human with *B. tularensis* via the respiratory tract, skin, mucous membranes, or intestines.

"The condition of infection allergy is an index of immunity. It can be affirmed that a single cutaneous vaccination was the decisive factor in decreasing the incidence of tularemia and even in eradicating it completely in a number of oblasts in the USSR. Along with the method of preventing natural smallpox by vaccine, the method of immunoprophylaxis of tularemia is the most effective of all methods we know for protection from infectious diseases. Such is the opinion of leading representatives of Soviet microbiology epidemiology, and the clinical management of infectious diseases, such as Zhdanov, Timakov, Rudnev, Vygóchikov, Gromashevskiy, and Bilibin. The research of Tinker and Drozhevskina, Puchkova, Yudenich, Sil'chenko, Kazberyuk, Olsuf'yeva, Yemel'yanova, and many other Soviet scientists has been highly significant in the resolution of theoretical and practical problems of immunoprophylaxis of tularemia. The research of Faybich and his co-workers played a large part in the creation of a stable preparation, i.e., the dry tularemia vaccine. The next task is to obtain new vaccine strains capable of establishing a defense against cultures of *B. Tularensis* with maximum virulence.

"Soviet immunologists also contributed to resolving the problem of immunoprophylaxis of tuberculosis. Sober and objective scientific evaluation of the facts made it possible for the public health organs to introduce antituberculosis vaccination into practice, gradually and then on a wide scale.

"One of the most important conditions which guarantee the immunogenicity of live vaccines is their capacity to be preserved and to vegetate in tissues. The intracutaneous and cutaneous methods of administering BCG and the combination of the cutaneous and oral methods of vaccination against tuberculosis (Gel'berg) satisfy this principle in its most pronounced form. We established the significance of 'residual virulence' of vaccine strains in regard to immunoprophylaxis of tularemia and a number of other infections: only those strains in which a definite degree of virulence is maintained have immunizing properties; then an immunologically and morphologically complex reaction occurs slowly between the microorganisms of the vaccine which are introduced and the cells of the host tissues.

"The work of Soviet immunologists also led to the development of effective methods of immunization against pappataci fever (Ananyan) and dermal leishmaniasis (Kozhevnikov). Pshenichnikov's investigation of the modifiability of typhus rickettsia in the process of their adaptation to the organism of the typhus carrier has prospects. The introduction of 'fixed' typhus virus to guinea pigs causes an atypical infection in them, and a simultaneous increase in titer-specific antibodies and the development of resistance against highly virulent rickettsia. It can be stated that Soviet immunology has come close to obtaining a live typhus vaccine. It is also pertinent to speak of the persistent research of Soviet authors on the resolution of the problem of immunoprophylaxis of influenza and on the production of attenuated and immunogenic strains of typhoid and dysentery pathogens (investigation of the Timakov laboratory and our own).

"Results obtained in working out the problem of live vaccines verify the significant achievements of Soviet immunologists. Further improvement of our knowledge in the field of physiological bases of immunological processes and the principle biochemical factors in infectious diseases will make it possible, to a still greater degree, to arm the Soviet public health service with reliable methods of specific prophylaxis."

65. Action of Some Antibiotics on Bacterial Toxins

"The Inactivating Action of Antibiotics on Certain Bacterial Toxins," by V. N. Dergach (for the Degree of Doctor of Medical Sciences), Khar'kov Medical Institute; Kiev, Vrachebnoye Delo,

№ 8, Aug 58, p 893

"It was determined that biomyacin, sanazin, levomycetin, and synthomycin possess inactivating properties in relation to botulin, tetanus, staphylococcus, and diphtheria toxins. Their detoxification and disintoxification effects are increased with increased dosage; however, higher than optimal dosages decrease this effect.

"The strongest action is obtained by the combination of levomycetin and biomyacin with sanazin which should be administered internally at a very early stage. After the combined administration of these antibiotics and specific sera, the therapeutic effect of the preparations is markedly increased. Changes in the functional condition of the central nervous system show an effect on the intoxications studied and the effectiveness of the antibiotics.

"Urethan narcosis facilitates the course of botulin intoxication; detoxification, disintoxification, and the therapeutic action of these antibiotics and their combinations with specific sera are also facilitated by this type of narcosis.

"Caffeine had no marked effect during the course of botulin intoxication, was useful to patients suffering diphtheria, and made the condition of patients suffering from tetanus of staphylococcus worse.

"The results of this work can serve as an experimental basis for new and more effective therapy of botulism, tetanus, and diphtheria by the correct combination of antibiotics and specific sera."

66. Simple Method for Treating Burns With Plaster of Paris

"A Simple Method for Treating Burns With Ordinary Plaster of Paris," by L. A. Mel'nik, Chair of Surgery (head, Prof V. M. Gin'kovskiy), Odessa Institute for Advanced Training of Physicians; Moscow-Khar'kov, Ortopediya, Travmatologiya, i Protezirovaniya, No 1, Jan/Feb 58, pp 35-38

Clinical observations were made on the action of ordinary gypsum powder in the treatment of 264 burn patients at the Surgery Clinic of the Odessa Institute for the Advanced Training of Physicians.

Ninety-six of the patients had burns covering up to 20% of the body surface; 97 patients, 21-30%; 37 patients, 31-40%; and 34 patients, more than 40%.

It was found that ordinary gypsum is an excellent physical antiseptic and can be successfully used in the therapy of burns. The gypsum eliminates pain in the burned area, prevents plasmorrhaxis and markedly reduces toxemia. The gypsum scabs formed on the burned area protect it from secondary infection and external irritants and accelerate the healing process.

Burn therapy with ordinary gypsum provides good cosmetic and functional results. It significantly decreases use of bandages.

Microbiology

67. Adaptation of Tick-Borne Encephalitis Virus to Unfavorable Conditions

"A Study of the Adaptation of Tick-Borne Encephalitis Virus Strain 'YaS-8' to Unfavorable Conditions for Its Development," by A. K. Subladze and P. S. Andonov, Institute of Virology imeni D. I. Ivanovskiy; Moscow, Voprosy Virusologii, Vol 3, No 4, Jul/Aug 58, p 229

CPYRGHT

"The volume of works devoted to the study of the adaptation modifiability of the tick-borne encephalitis virus is not large. It is known that prolonged passage of the virus in white mice does not produce profound changes in its biological activity or antigenic characteristics. Passage of the tick-borne encephalitis virus on chick embryos, exactly as in the case of Czechoslovak tick-borne encephalitis virus, does not produce qualitative changes. Modifiability of the virus on culture in tumor tissue has been described. R. M. Shen reported on modifiability of the virus of louping-ill of sheep following its culture in mouse sarcoma. S. G. Zvyagin described the modifiability of tick-borne encephalitis virus obtained through passages on Kroker's sarcoma -- the disappearance of pathogenic and the preservation of immunogenic characteristics. A. V. Pshenichnov and O. A. Kychanova reported on reinforcement of the virulence of the virus following passage of the virus on Kroker's sarcoma. A. I. Ivanenko observed a regular tendency of the pathogenic characteristics to increase with complete preservation of viral neurotropicity on continued passage on Erlich's ascitic carcinoma.

"Culturing the virus in chick embryo tissue culture (22 passages) did not cause marked changes in its biological activity or antigenic structure. Work was done on passing the virus in susceptible animals. A. K. Shubladze and S. Ya. Gaydamovich reported the possibility of adapting the louping-ill virus to the rat organism by passing it through white rats. A. I. Drobyshevskaya did not detect changes in the original characteristics of the tick-borne encephalitis virus on passing it through the brains of guinea pigs and white rats.

"The aforementioned works indicate the possibility of changing certain characteristics of the virus on the one hand, and the difficulty, on the other.

"We attempted to adapt 'YaS-8' strains from the tick-borne encephalitis virus group to unfavorable developmental conditions -- to tissues of de-embryonated eggs, to nerve tissue of guinea pigs immune to the virus, and to pulmonary tissue of white mice.

CPYRGHT

"In the adaptation experiments, 23 passages in de-embryonated eggs, 25 passages in white mice, by the intranasal introduction of virus-containing lung suspensions, 9 passages in guinea pigs with intermediate passages in chick embryos, and 7 passages in guinea pigs by intracerebral infection without intermediate passages were performed.

"A certain degree of adaptation was noted after passages in de-embryonated eggs and after intranasal infection of white mice.

"After passage in de-embryonated eggs, the virus was preserved through 12 passages, although it was not successfully observed after the first infection of white mice. A stable, adapted variant of passed virus was not obtained in any of the experiments."

68. Rapid Method of Detecting Tick-Borne Encephalitis Virus

"The Problem of Detecting the Tick-Borne Encephalitis Virus by the Method of Luminescence and Electrophoresis (Preliminary Report)", by V. K. Izotov and O. V. Baroyan, Institute of Virology imeni D. I. Ivanovskiy; Moscow, Voprosy Virusologii, Vol 3,

CPYRGHT No 4, Jul/Aug 58, pp 217-220

"It is known that many organic substances fluoresce in the visible part of the spectrum when irradiated with ultraviolet rays. This capacity is employed in luminescent microscopy, which permits detailed study of microscopic biological objects which fluoresce.

"Luminescent microscopy is applied for observing the herpes, foot-and-mouth, lymphogranuloma, and swine plague viruses. Observations of the viruses of chickenpox, shingles, encephalitis, psittacosis, and other infections were carried out with fluorescing antibodies.

"In this research, luminescent analysis was used for detecting different zones of fluorescence during paper electrophoreses of viral and control suspensions of mouse brains. These methods were tested for the observation of tick-borne encephalitis virus.

"Mouse brains which contained tick-borne encephalitis virus ('Sof'in' strain) served as infection material. Sterile brain was pulverized in a centrifuge test tube with a glass rod until a 20-50% suspension in physiological solution was obtained. This virus suspension was centrifuged for 5-10 minutes at 1,000-1,500 rpm; supernatant fluid with a virus titer of 10^{-5} to 10^{-6} was used in the experiments.

"A plexiglass apparatus was used for electrophoresis. This apparatus (Figure 1) is a horizontal pan with electrode racks which hold up to 5 liters of buffer solution. The carbon electrodes in the pan have a diameter of 12 mm and are distributed along the whole length of the electrode rack. The pan is completely covered by glass plates on top and by rubber strips along the edges. A rectifier designed for an output of 10-12 ma and a voltage of 50-350 v serves as a source of constant voltage. The buffer solution is veronal-medinal, pH 8.6; ion strength 0.05. Dyes -- (1) fluorochrome acridine orange No 255 (one mg per 100 ml of physiological solution) and (2) acid blue-black (10 mg per 100 ml of physiological solution). The electrophoresis apparatus was set up in an isolated room for safety purposes.

"Chromatographic paper No 1 and 4, Second Leningrad Paper Factory, was used in the experiments. Eight to ten strips of paper 36 x 3 cm with glazed surface are suspended on the edges of an interior cuvette of the apparatus. So that the dry strips of paper will not sag into the pan, they are fastened to the cathode and anode poles with plexiglass plates. The remaining free ends of the paper strips are not dropped into the buffer at first.

"A 0.03 ml amount of the viral brain suspension being investigated is put on the paper strip at a distance of 0.5 cm from the edges of the bend in the paper at each pole.

"After 20-30 minutes, when the drops have dried completely, a small volume (0.02 ml) of acridine orange solution is put on this same place with a wire loop so that the dye will not run beyond the edges of the spot formed by the brain suspension. After 20-30 minutes, when the drops of dye have dried, the strips of paper are saturated with buffer solution by means of a pipet or with filter paper, their ends are lowered into the electrode container, and the current is turned on.

"The following are put on control strips of paper: (1) brain suspension from healthy mice and acridine orange solution, and (2) acridine orange solution.

"In addition to the experiments performed in the foregoing manner, another series of experiments was done on separation (by paper electrophoresis) of brain suspension; the fractions were observed by means of acid blue-black dye.

"Toward the end of electrophoresis, the paper strips are dried at 100° for 20 minutes in order to fix the proteins and inactivate the virus. After drying, the electrophorogram is scanned for fluorescence by means of the L-80 apparatus (the L-80 was designed for luminescent analysis of vitamins; a PRK-4 lamp serves as a source of excitation, the light filter transmits ultraviolet rays with a wavelength of 400-320 mμ) or are stained with acid blue-black dye.

"Results of the experiments --- After electrophoresis of brain suspensions subsequently stained with acid blue-black dye (18 hours, gradient potential 2-3 v/cm using a 0.3-0.4 ma current per strip of paper), the most rapidly moving fraction was detected on the electrophorogram. This fraction was considerably more pronounced on electrophorograms with a virus brain suspension (Figure 2).

"To explain the difference in natural fluorescence of viral and control brain suspensions after electrophoresis, we were obliged to alter the experimental conditions somewhat, i. e., electrophoresis was carried out for 90 minutes, the gradient potential was 6 v/cm, and the current was 0.9-1.2 ma for one strip of paper. Under these conditions, two bluish spots --the natural fluorescence of the viral and control suspensions-- were observed on the electrophoregrams in the ultraviolet rays (Figure 3).

"The first fluorescing spot was located at the point where the material was applied; more intensive fluorescence was seen in the virus suspension. The second fluorescing spot was located at a distance of 2-3 cm from the first on the anode side.

"If acridine orange is applied and electrophoresis is carried out with a viral and a control suspension, the difference between them both in degree of fluorescence and in color of fluorescence is clearly differentiated with ease. Fluorescence of a sharp orange color, characteristic for the virus suspension, was observed on the paper strip on which the brain suspension and the fluorochrome were subsequently put, and was considerably weaker for the control suspension.

"To determine the specificity of the natural fluorescence which we observed in the virus suspension, we attempted to extinguish this phenomenon by neutralization with specific antisera. It was established that the natural fluorescence is sharply extinguished after treatment of a virus antigen with specific antisera. The same virus suspension, treated with normal or heterological immune serum, continued to give characteristic fluorescence.

"Conclusions follow.

"1. The paper electrophoresis method permits detection of the presence of tick-borne encephalitis virus in mouse brain suspensions within 18 hours.

"2. The combination of the paper electrophoresis method and luminescent analysis shortened the time necessary for observation of the tick-borne encephalitis virus in mouse brain suspensions to as little as 1 1/2 hours; the specificity of the natural fluorescence of the virus suspension observed during this process can be demonstrated by the phenomenon of extinguishment with specific antiserum."

An illustration of the apparatus and two electrophoregrams are included in this article.

Pharmacology

69. Effect of Diazolin on Typhoid Fever

"The Effect of Diazolin on Typhoid Fever Intoxication of Rabbits," by Z. A. Popenenkova, Department of Chemotherapy, Institute of Pharmacology and Chemotherapy, Academy of Medical Sciences USSR; Moscow, Farmakologiya i Toksikologiya, No 4, Jul-Aug 58, pp 86-87

Typhoid intoxication was induced in rabbits by internal administration of sterile typhoid vaccine (subjected to heating) prepared from laboratory strain E. typhosa 4446 in doses of 25 billion microorganisms per kg of body weight. This dosage was fatal to the animals after 12-60 hours.

It was determined that a 10 mg/kg dose of diazolin given 1-2 times every 24 hours had no effect on the death rate of the animals.

Public Health, Hygiene, and Sanitation

70. Disinfection of Air With Volatile Oil Aerosols

"The Problem Concerning the Disinfection of Air With Aerosols of Volatile Oils," by D. K. Vedibeda, Kiev Institute for the Advanced Training of Physicians; Moscow, Gigiyena i Sanitariya, No 8, Aug 58, p 80

Investigations concerning the disinfection of air with the volatile oils from eucalyptus, coriander, and lavender were conducted in a hermetically sealed room where a 2% emulsion of the volatile oils in quantities of 0.25, 0.5, and 1.5 mg per m³ were dispersed. In addition, a 0.5 ml suspension of Staphylococcus albus, in a concentration of 10 million microorganisms per ml, was dispersed in the chamber.

The results indicate: (1) The volatile oils possess bactericidal activity in relation to Staphylococcus albus during the droplet phase of the aerosol, especially with the larger doses (0.75-1.25 ml); (2) the bactericidal activity of the aerosols as well as the action time increases with an increase of concentration; (3) the greatest bactericidal activity was achieved with the volatile oils of eucalyptus, and the least with lavender.

71. Expansion of Health Service Facilities in RSFSR

"Plan for Expansion of Health Service in the RSFSR for 1958,"
by V. I. Mayevskiy, Sovetskaya Meditsina, No 5, May 58, pp

CPYRGHT 121-125

"The State Plan for development of the national economy of the RSFSR for 1958 was confirmed at the fifth session of the Supreme Soviet RSFSR, held in January 1958. Aside from providing for rapid industrial expansion, the plan for 1958 also gave much attention to growth in the field of health protection.

"The plan for 1958 provides for considerably greater growth of the physical base of health service establishments over 1957. Construction work is rapidly increasing on new hospitals, outpatient clinics, nurseries, sanatoriums, sanitary-epidemiological stations, pharmacies, homes for medical workers, facilities to house medical schools, dormitories for students, and medical plants. The growing network of medical and sanitary establishments are being supplied, with improving efficiency, with modern diagnostic equipment, medical instruments, and more effective medical preparations.

"The plan for 1958 stresses the following problems on the solution of which the main attention must be concentrated:

"1. Speeding up construction of buildings to house hospitals and outpatient clinics (rayon hospitals in particular).

"2. All-out effort to increase the number of buildings to be used as nurseries for children of employed women.

"3. An increase in the production of medical goods needed by medical and sanitary establishments.

"4. Construction of homes for medical workers and dormitories for medical students.

"5. An increase in the number of sanatoriums which would be able to accommodate people who need some special form of hospitalization.

In table below shows the growth of medical establishments in the RSFSR during the 3-year period 1956-1958.

"Analysis of the figures in Table 1 point, first of all, to the steady and rapid growth of medical establishments that are under the jurisdiction of the Ministry of Health RSFSR. The physical base for medical aid to the population is becoming more efficient and is expanding. During 1958 alone, the hospital network in the RSFSR will be increased by more than 42,000 beds.

Table 1. Principal Indicators of Development of Therapeutic Establishments of Ministry of Health RSFSR During 1958 in Comparison With 1956-1957, Not Counting Therapeutic Establishments of Union SubOrdination (Ministry of Communications and Ministry of Health USSR)

<u>Categories Covered by Plan</u>	<u>1956</u>	<u>1957</u>	<u>1958 (planned)</u>
Total No of hospital beds (in 1,000)	755.4	797.6	839.8
In cities	509.8	538.6	566.2
In rural areas	175.7	184.0	192.6
For psychoneurotics	69.9	75.0	81.0
Total increase of hospital beds during year (in 1,000)	35.2	41.1	42.2
No of tuberculosis, maternity, and children's beds (Counting those reserved for communicable disease)			
No of tuberculosis beds (1,000)	58.4	64.4	68.2
No of maternity beds (1,000)	84.2	88.0	92.1
No of beds for children (1,000)	113.7	121.6	128.7
No of hospital beds for each 10,000 people			
In RSFSR	70.0	72.6	75.6
In cities	98.9	103.0	107.2

CPYRGHT

<u>Categories Covered by Plan</u>	<u>1956</u>	<u>1957</u>	<u>1958 (planned)</u>
No of rayons, with rayon center in rural areas, without hospital in rayon center	100.0	93.0	84.0
Rayons with hospitals under construction	13.0	18.0	45.0
No of feldsher-midwife posts (1,000)	42.5	43.2	44.4
Total No of positions for medical officers in medical-sanitary establishments (in 1,000)	215.8	225.0	239.0
In cities	180.7	189.0	201.5
In rural areas	35.1	36.0	37.5
Total No of positions for physicians in cities (in 1,000)			
Medical district therapists	13.4	16.7	19.6
Medical district pediatricians	10.8	11.3	12.8
Total No of physicians per 10,000 people (in 1,000)	16.6	17.0	17.7
In cities	30.6	31.4	32.4
In rural areas	3.5	3.7	4.0

"It is evident from Table 1 that half of the new hospital beds which will be available during 1958 will be reserved for pregnant women, children, tuberculosis patients, and psychoneurotic patients. Approximately 44% of the total number of new beds made available during 1958 will be apportioned among rayons of the Urals, Siberia, and the Far East. The need for hospitalization in those areas is particularly great because of rapid industrial expansion there.

"By the end of 1958 there will be 75.6 beds for each 10,000 people against 72.6 beds for each 10,000 people in 1957; in cities the change will be from 100.7 beds to 107.2 beds per 10,000 people; in rural areas, from 31.0 to 32.1 beds per 10,000 people. To properly appraise the difference in allocation of beds in urban and in rural areas, it must be borne in mind that among the patients who will be cared for by city, rayon, and oblast hospitals, 25-30% will come from rural areas. Consequently, the rural population will actually be provided with greater hospital care than appears on paper. Furthermore, in classifying the therapeutic establishments into rural and urban, it must be borne in mind that rayon hospitals and medical district hospitals, which are situated in sparsely populated areas, are usually considered to be either cities or workers settlements, but actually they serve the rural population working in the kolkhozes around them.

"However, despite considerable growth of the network of hospital establishments that will take place during 1958, the problem of providing hospital service to all who need it will not be solved and, as before, must be given principal attention when plans are formulated for expanding health service in the RSFSR during the next few years.

"Table 1 shows that the number of rayon centers without any hospitals has dropped to 84. Buildings to house hospitals will be under construction in 45 of such rayons.

"Training of a large number of physicians within a short period of time would be a great achievement in the socialist health service. Table 1 shows that the number of physicians per 10,000 people increased each year in the RSFSR. In 1958 there will be 17.7 physicians for each 10,000 people. In other words there will be 565 people for each physician. According to available data for 1953, there were 763 people for each physician in the US; 1,100 people for each physician in England; 1,130 people for each physician in France; 750 people for each physician in German Federal Republic; and 820 people for each physician in Italy.

"The principal indicators of growth of children's establishments in RSFSR, during 1958, are shown in Table 2.

CPYRGHT

Table 2. Principal Indicators of Development of Establishments for Children in the RSFSR During 1958 (establishments under jurisdiction of Council of Ministers RSFSR) in Comparison With 1956-1957

<u>Categories Covered by the Plan</u>	<u>1956</u>	<u>1957</u>	<u>1958 (Planned)</u>
Total No of spaces in permanent nurseries for children listed in national budget (in 1,000)	576.1	624.6	678.7
In cities	413.5	452.0	491.9
In rural areas	162.6	172.6	186.8
No of additional spaces in permanent nurseries for kolkhoz children (in 1,000)	6.4	8.0	9.0
No of spaces in homes for children and homes for mothers and children (in 1,000)	30.3	30.0	30.0
Total No of spaces in permanent nurseries for children up to 3 years old	82.0	87.9	94.3
In cities	116.0	124.4	134.1
In rural areas	39.7	41.5	44.4
No of spaces in nurseries for children for each 100 employed women	4.0	4.3	4.5

"The need for expanding the network of nurseries in the RSFSR depends on the tempo of industrial growth. The number of women working in factories, plants, construction, sovkhoses, and in cultural and service establishments is increasing. It can be seen from Table 2 that the number of spaces in nurseries during 1958 will increase by 54,000 over 1957.

"A need for nurseries exists in kolkhozes. Buildings are being constructed to house nurseries in kolkhozes of Ryazanskaya Oblast, Belgorodskaya Oblast, Kurskaya Oblast, and Voronezhskaya Oblast, and in Krasnoyarskiy Kray and Stavropol'skiy Kray. Funds for construction of these buildings have been made available by the kolkhozes. In Ryazanskaya Oblast, 460 buildings were constructed to house nurseries. Those buildings were constructed in a record time. Sufficient evidence exists that the 1958 plan for expansion of nurseries will be overfulfilled considerably.

"The problem of getting nurseries built must be solved within a short time. In planning health service for the next few years, therefore, expansion of nurseries must be the primary thought of health agencies and of local executive committees of workers' deputies.

"Figures showing expansion of sanatoria facilities in the RSFSR are given in Table 3.

Table 3. Principal Indicators of Expansion of Sanatorium Facilities in RSFSR During 1958 in Comparison With 1956-1957

<u>Categories Covered by Plan</u>	<u>1956</u>	<u>1957</u>	<u>1958 (Planned)</u>
Total No of spaces in sanatoriums when fully occupied (in 1,000)	137.3	140.9	147.0
Those occupied around-the-clock	116.0	122.0	126.5
Total No of spaces in tuberculosis sanatoriums for adults and children (in 1,000)	72.8	73.3	73.7
No of spaces in sanatoriums provided for in national budget on basis of expenditure allocated for public health (in 1,000)	69.6	72.4	75.7

"Table 3 shows that the number of spaces in sanatoriums during 1958 will increase by 6,100. This increase will be due to the fact that the number of special sanatoriums, reserved for treatment of patients with gastrointestinal diseases, disease of the heart, joints, tuberculosis of osseus tissue, etc., will decrease.

"Sanatoriums must be looked upon as therapeutic establishments with a definite mission: to carry on a particular form of hospitalization. Sanatoriums take care of both people who are still ill and convalescents from some severe illness. Hospitals and sanatoria supplement each other; for that reason, expansion of sanatorium facilities must be coordinated with construction of hospitals. Construction of buildings for sanatoriums is particularly urgent in the central zone of the RSFSR and in the Urals, Siberia, and the Far East. Taking that into consideration, the plan for 1958 will provide for sufficient expansion of sanatorium facilities.

"Furthermore, any lag in construction of rest homes cannot be permitted to go unnoticed. The Ministry of Health RSFSR must in the future give some thought to rest homes and allocate funds for their construction.

"A considerable increase in funds for capital construction has been allocated so that the plan for development of health service in the RSFSR during 1958 can be carried on without any interruption. (See Table 4).

Table 4. Capital Investment for Construction of Hospitals, Nurseries, and Sanatoriums by Ministries, Departments, and Councils of National Economy RSFSR for 1958 in Comparison With Capital Investment During 1956 and 1957

<u>Categories Covered by Plan</u>	<u>1956</u>	<u>1957</u>	<u>1958 (Planned)</u>
Total amount of capital investment (million rubles)	979.5	1,036.7	1,334.3
By Ministry of Health RSFSR	429.4	483.6	550.0
For hospitals	524.5	771.7	896.9
For nurseries for children	84.0	183.7	247.6
For sanatoriums and rest homes	121.0	98.0	131.0
Public health facilities added (beds)	13,200	19,478	24,074
By Ministry of Health RSFSR (beds)	4,050	6,521	7,000
Sanatoria (beds)	1,370	1,369	1,641
Rest homes (spaces)	1,390	1,200	1,550
Nurseries for children (spaces)	26,549	31,218	42,603
Housing areas for Medical workers and dormitories for students in medical educational institutions added (1,000 sq m)	32.7	33.5	36.0

CPYRGHT

"It can be seen from Table 4 that the total amount of capital investment for construction of buildings to house establishments that render health service will increase during 1958 by 28% over 1957.

"The amount of money allotted for construction of hospitals and outpatient clinics is 16% higher than it was in 1957; for expansion of nurseries, 35% higher. In line with the expansionist policy, expenditures for other health service establishments is also higher for 1958. Hospital capacity will increase by more than 24,000 beds: this increase is 23.5% greater than that which was planned for 1957. There will be 42,000 spaces more in nurseries by the end of 1958. This increase in the number of nurseries surpasses the 1957 increase by 37%.

"Allocation of money for construction of sanatoriums and resorts for 1958 is higher by one-third. Aside from the fact that there will be 1,600 more beds available in sanatoriums and 1,500 more spaces in rest homes by the end of 1958, considerably more money has been allocated for installations of general nature (buildings to house hydropathic and mud-bath establishments, resort outpatient clinics, dining halls, etc.).

"The Soviet government has been liberal in allocating money for construction of buildings to house therapeutic establishments, sanatoriums and homes for children. It is the duty of all health agencies to utilize the money in an economical and efficient manner, reduce the cost of construction, create a situation that is conducive to comfort of patients, reduce the construction time, and avoid dispersing funds by constructing too many buildings.

"Manufacture of medical equipment, such as instruments, and medical preparations, is of great importance for efficient medical aid to the population. No measures of any kind to reduce incidence of any disease can be carried out if a shortage exists in medicaments and medical equipment.

"Figures in Table 5 show the trend of growth of medical industry in the RSFSR during 1958.

CPYRGHT

Table 5. Growth in Production of Medical Goods in Establishments of Councils of National Economy RSFSR

<u>Categories Covered by Plan</u>	<u>1956</u>	<u>1957</u>	<u>1958 (planned)</u>
Gross Product (million rubles)	2,169.9	2,501.5	2,802.8
Production of chemicals and drugs	1,575.1	1,807.5	2,052.5
Production of medical instruments and equipment	417.9	485.1	515.9
Production of medicinal glass and other articles	176.9	208.9	234.4
Commodity production (million rubles)	2,143.4	2,551.4	2,857.9
Important manufactured goods			
Pyramidon (tons)	293.3	322.3	365.0
Phtivazidum (tons)	120.6	155.9	156.0
Endocrine preparations (million rubles)	83.6	90.0	99.35
Streptomycin (% of 1955)	124.7	179.3	233.4
Biomycin (% of 1955)	214.2	209.9	326.5
Syringes (1,000)	2,186.0	2,282.5	2,500.0
Pharmaceutical wares (1,000 pieces)	739.3	917.9	1,008.1

CPYRGHT

"Fulfillment of the plan for expanding the physical base of health protection throughout the RSFSR during 1958 is a great new contribution toward creation of an efficient socialist health service in our country. There is no doubt that all medical workers in the RSFSR -- physicians, pharmacists, feldshers, and nurses -- as well as laborers, engineers, technical workers, and service personnel of medical industries, construction trusts, and administrations will exert all their efforts not only toward fulfillment, but also toward overfulfillment of the plan for 1958."

72. Prophylaxis of Infectious Diseases in Uzbek

CPYRGHT "The Prophylaxis of Infectious Diseases in Uzbek SSR," by G. Makkhamov, Voprosy Krayevoy Patologii (Problems in Regional Pathology); Moscow, 1957, pp 257-258; (from Meditsinskiy Referativnyy Zhurnal, Part IV, 1958 Supplement, p 52)

"The incidence of infectious diseases has decreased from year to year in the Uzbek SSR. The incidence of malaria during 1953, was one tenth of that in 1949; pappataci fever, one twenty-second; typhus, by less than one tenth. The incidence of new cases of brucellosis during 1953 was half the number in 1949.

"These successes in the fight against infectious diseases were attained primarily because of the work of 190 sanitary-epidemiological stations which employ more than 600 doctors. In addition to the Institute of Malaria and Parasitology, 143 antimalaria stations and 400 anti-malaria points have been established. There are also two republic and six oblast antibrucellosis stations, and ten oblast houses for sanitary instruction. A Scientific Research Sanitary Hygiene Institute was also established."

73. Hospital Center in Angarsk

CPYRGHT "A City in the Taiga," by M. Mirskiy, Special Correspondent of Meditsinskiy Rabotnik in Agarsk, Irkutskaya Oblast, Meditsinskiy Rabotnik, 9 Sep 58, p 2

"Looking over the sun-soaked and widely dispersed city of Angarsk, driving along its wide asphalt avenues, looking admiringly at blocks of four- and five-story houses, makes it difficult to believe that only 10 years ago a Siberian taiga sprouted all over this area. At one time a hunter would stray here occasionally in search of wild animals, and rarely did any fisherman pursue the course of the Siberian river Kitoy.

CPYRGHT

"Remnants of taiga can be found here even now. Powerful cedars, thick-set pines, tall spruce trees, and well-shaped birches can be seen growing on every inhabitable block and in the yard of every house. These Siberian giants on the streets and in the yards give the city a unique appearance.

"Furthermore, these islands of tiyga in the city of Angarsk are not there for decorative purposes. They reduce noise to a considerable extent and they purify the air, filling it with a spicy woodland aroma.

"The city of Angarsk was planned well. Large industrial establishments are situated far from the main residential area. The residential area and the industrial section are separated by a wide stretch of primeval taiga. That explains why the air here in Angarsk is always fresh, pure, and clear. The snow-covered peaks of the Sayany mountain range can be seen in the distance on a clear day.

"Employees of the sanitary-epidemiological station are always on the alert to protect the population against air pollution and against unsanitary conditions. The people of Angarsk are great advocates of cleanliness. Hundreds of activists and public spirited citizens help the medical workers maintain proper sanitary conditions. They are the ones who conduct inspections and give instruction in sanitation to workers in industrial establishments and on construction projects.

"Considerable construction is going on in Angarsk and the work is progressing well. Homes that are being constructed here have all necessary conveniences, i. e., water supply a sewer system, and central heating. A heating plant in operation in Angarsk guarantees a sufficient supply of heat for every apartment in the city even during the severe Siberian winter.

"Much attention is given in Angarsk to therapeutic establishments and institutions for children. A special center was built housing among other things a 500-bed central hospital. The separate buildings housing the hospital facilities are well arranged and the equipment in them is excellent. The hospital has separate buildings for the therapeutic and surgical wards, a ward for children, a maternity home, and an outpatient clinic. Physicians assigned to the hospital are devoted and competent. The total number of physicians, feldshers, midwives, and nurses employed in the therapeutic establishments and children's institutions of the city is almost 1,500.

CPYRGHT

"The chief of the city health department, M. A. Usova, released the names of the following best medical workers of Angarsk: traumatologist A. A. Antochenko; oculist G. A. Panchernikova; and head of the surgical ward, surgeon G. A. Matveyeva. Matveyeva performed hundreds of operations during her 6 years with the hospital. Many people are indebted to her for their good health and expressed their confidence by electing her a deputy of the city council.

"Senior nurse of the hospital for communicable diseases Ye. N. Zakharova, head of Nursery No 2 N. M. Shchuko, and a number of others were also elected deputies of the city council. They all are active in the work of the permanent committee on health of the city council of workers' deputies.

"The life led by medical workers is the same as that led by construction workers and other workers of this fine Siberian city."

Accompanying this article is a photograph of "the children's building of the hospital center in the city of Angarsk."

74. Effects of Heat on Workers Investigated

"On the Basis of Recommendations of Scientists-Hygienists," by the Tashkent correspondent of Meditinskiy Rabotnik, Meditinskiy Rabotnik, 26 Aug 58, p 4

CPYRGHT

"For years employees of the Tashkent scientific research institute of sanitation have been studying the effects of high altitude on the human organism. It is known that exposure to heat, especially in shops where the temperature is high, results in loss by humans of a considerable amount of moisture. Scientists have been attempting to solve the problem of normalizing the water-salt metabolism and thereby conserving the necessary amount of liquid in the organism, thus preventing desiccation.

"Research has been carried on at the Uzbek metallurgical plant imeni V. I. Lenin. Observations have been made for the past 3 years of a new drinking substance, a cherry extract. One group of workers in the rolling mill and open-hearth plant used the cherry extract; another group used a 0.5% gaseous solution of salt. After 3-4 days, the first group turned to drinking the salt solution and the second group, the cherry extract. This made it possible to compare the effectiveness of various drinking substances. It was found that the cherry drink was more palatable, quenched thirst much better, and contributed to improvement in appetite and efficiency. Those who drank the cherry extract perspired less.

CPYRGHT

"Cherry drink is used now in all shops where the temperature is high.

"Other research projects are carried on at the institute. Scientific worker Z. B. Amanov is trying to find a way to improve the working conditions in grain establishments. He proposed a number of measures which would prevent recurrence of occupational diseases. Installation of artificial ventilation and improvement in the working conditions of people who look through eyepieces of optical instruments were based on recommendations proposed by him."

Radiology

75. Safety Measures for Working With Ionizing Radiation

"Measures for Improving the Protection of Medical Personnel Working With Sources of Ionizing Radiation and Radioactive Substances," from the Ministry of Health USSR; Kiev, Vrachebnoye Delo, No 8, Aug 58, p 891

During the past few years, the use of apparatuses and instruments which contain a source of ionizing radiation or radioactive isotopes has increased greatly. This is especially true in clinics and institutions working on malignant tumors, diseases of the blood, the endocrine system, etc. Because of unsatisfactory working conditions for the personnel who work with these special apparatuses, instruments, and radioactive substances themselves, the wider introduction of these methods into the public service is being delayed.

A check has revealed a series of sanitary regulation violations. The Kiev Roentgen-Radiological and Oncological Institute is reported as one of the organizations cited for infraction of sanitary regulations. At the institute, radioactive substances were stored in a vault which had no provision for protection from gamma radiation.

Minister of Health USSR M. D. Kovrigin has directed the ministers of the union republics, the president of the Academy of Medical Sciences, and the directors of the various scientific research institutes to organize and carry out, together with labor union organizations during the third quarter of 1958, a thorough investigation of the provisions for protecting personnel working with radioactive substances and apparatuses. The results of these investigations should be reviewed at the meetings of the collegium of the ministries of the union republics, the presidium of the Academy of Medical Sciences USSR, and at industrial conferences.

All radiological institutions working with exposed and enclosed radioactive substances will make provision for protective equipment this year. In addition, beginning with 1959, all oblast, republic, and city suppliers will be required to provide X-ray equipment with complex protective equipment.

Furthermore, all responsible organizations working with radioactive substances should indoctrinate their personnel in the proper handling of these substances.

76. Desoxyribonucleic Acid Metabolism Inhibited in Radiation Sickness

"Metabolism of Nucleic Acids in Radiation Sickness of Average Severity," by Ye. A. Dikovenko, Uch. Zap., 2-y Mosk. Med. In-t, (Scientific Reports of the 2d Moscow Medical Institute), 1957, No 6, pp 132-136 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 17, 10 Sep 58, p 93)

CPYRGHT

"The intramuscular administration of P³² (10-15 microcuries) into rats after their irradiation by 300 r of X rays (radiation sickness of medium severity) inhibited the deposition of nucleic acids in the majority of organs tested. This inhibition was more pronounced for desoxyribonucleic acid than for ribonucleic acid. Changes in nucleic acids in the tissues, on the whole, seemed to be primarily changes in desoxyribonucleic acid. Restoration of nucleic acid metabolism started on the 4th day, and followed a wavelike pattern. By the 14th to the 18th day it attained its normal level. The restoration of normal function and structure was delayed in the organs greatly affected by radiation sickness."

77. Method for Detecting Antileukocytic Antibodies in Serum of Patients Suffering From Anemia and Chronic Radiation Sickness Described

"Antileukocytic Antibodies in Hypoplastic Anemia and Chronic Radiation Sickness," by Prof A. A. Bagdasarov, Active Member of Academy of Medical Sciences USSR; K. M. Dvolaytskaya-Barysheva, Doctor of Medical Sciences; F. I. Bolotnikova; M. P. Bogoyavlenskaya, and F. E. Faynshteyn, Central Order of Lenin Institute of Hematology and Blood Transfusion (director, Prof A. A. Bagdasarov, Active Member of Academy of Medical Sciences USSR); Moscow, Problemy Gematologii i Pevelivaniya Krovi, Vol 3, No 4, Jul/Aug 58, pp 10-16

Various immunological reactions were tested to detect antileukocytic antibodies in the serum of healthy people and patients suffering from various diseases. A total of 500 serum tests on healthy people and 119 serum tests on patients suffering from chronic radiation sickness, chronic hypoplastic anemia, hemolytic anemia, and subacute hypoplastic anemia were conducted.

Diagrams represent the presence of leuko-agglutinins in the blood of patients, the leuko-agglutinin titer in the blood serum of patients with partial hypoplastic anemia, and the leuko-agglutinin titer in the blood serum of patients with chronic radiation sickness.

CPYRGHT

Results indicate the following:

- "1. By using agglutination methods, antileukocytic antibodies were detected in the blood serum of patients with chronic and partial hypoplastic anemia, and those with chronic radiation sickness and hemolytic anemia.
- "2. No leuko-agglutinins were detected in the blood serum of healthy people.
- "3. Repeated investigations revealed the persistent presence of leuko-agglutinins, especially in the serum of patients with partial hypoplastic anemia.
- "4. The leuko-agglutinin titer decreased with the use cortisone and ACTH."

78. Vitamin B₁₂ and Folic Acid Can Preserve Blood Thromboplastic Activity During Radiation Injuries If the Animal's Lumbar Region Is Shielded

"The Effect of Vitamin B₁₂ and Folic Acid on the Thromboplastic Activity of the Blood During Experimental Radiation Sickness," by B. A. Kudryashov, G. V. Andreyenko, and N. P. Sytina, Moscow State University imeni M. V. Lomonosov; Moscow, Doklady Akademii Nauk SSSR, Vol 118, No 4, 1 Feb 58, pp 701-704

Since it is known that hemorrhage in irradiated animals is a result of decreased prothrombokinase (factor III) of the blood platelets and that the administration of vitamin B₁₂ and folic acid increase the thrombokinase activity of the blood, the authors conducted experiments on albino rats x-irradiated with 250, 400, and 800 r. Some were shielded by lead plates, and received vitamin B₁₂ and folic acid in their diets; others were not shielded.

Results indicate the following:

After the irradiation of rats by doses of 400 r, thromboplastic activity of blood changed at the same rate whether the animals received vitamin B₁₂ or not. The same negative result was obtained with the administration of folic acid, both alone and in combination with vitamin B₁₂. Vitamin B₁₂ or folic acid exerted a favorable effect in preserving the level of thromboplastic activity when the lumbar area of the animals was protected from irradiation.

The authors conclude that the simultaneous intramuscular administration of vitamin B₁₂ and folic acid to rats is effective to a large degree in restoring and preserving the thromboplastic activity of blood at the normal physiological level if the lumbar region is protected during irradiation.

79. Principles of Treatment of Bone Fractures Combined With Radiation Injury

"Basic Principles in the Treatment of Bone Fractures in Penetrating-Radiation Injuries," by Prof I. L. Krupko, Chair of Orthopedics and Traumatology (head, Prof I. L. Krupko), Military-Medical Order of Lenin Academy imeni S. M. Kirov; Moscow-Khar'kov, Ortopediya, Travmatologiya, i Protezirovaniye, No 1, Jan/Feb 58, pp 3-8

In recent years the entire membership of the Chair of Orthopedics and Traumatology of the Military-Medical Order of Lenin Academy imeni S. M. Kirov has been engaged in the study of various problems connected with the course and treatment of combined injuries. Experiments were carried out on 462 animals which were exposed to X rays or to radiation from a cobalt source in a dose ranging from 400 to 800 r. Most of the animals were kept under observation for a 30-day period; some, for 4 months.

The following aspects in the treatment of fractures associated with radiation injury were studied: Characteristics of the course of simple, compound (infected), and gunshot fractures; surgical treatment of open (gunshot) wounds; surgical intervention in simple fractures; use of antibiotics and methods of administration; and primary suture.

Results of the investigation include the following findings:

Trauma (fracture, especially an infected one) makes the course of radiation much more serious.

The basic principle in the treatment of combined radiation injuries consists of the early initiation of complex therapy for the prevention and treatment of radiation sickness (repeated transfusion of small amounts of blood, administration of leukocyte mass, cysteine, bromides, dimedryl [benadryl], polyvitamins, etc.) and use of the latent period of radiation sickness for more active and radical surgical intervention. The basic problem is to attain maximum therapeutic effect prior to onset of the peak of radiation sickness.

Surgical intervention should be radical. Using large doses of antibiotics (penicillin and streptomycin), one should, if possible, fix the bone fragments with a metallic pin and apply initial sutures to the wound, thus leading to healing of the wound before the peak of radiation sickness.

Metallic osteosynthesis and primary suture following radical surgical treatment of wounds, combined with use of antibiotics do not aggravate the course of radiation sickness but, on the contrary, alleviate it.

80. Treatment of Infected Fractures in Radiation Sickness

"Some Characteristics of the Course of Infected Fractures in Penetrating-Radiation Injuries by V. M. Dem'yanov, Candidate of Medical Sciences, Chair of Orthopedics and Traumatology (head, Prof I. L. Krupko), Military-Medical Order of Lenin Academy imeni S. M. Kirov; Moscow-Khar'kov, Ortopediya, Travmatologiya, i Protezirovaniye, No 1, Jan/Feb 58, pp 9-13

A study was made of certain characteristics of the course of infected fractures as related to the degree of irradiation and the seriousness of the fracture, and to the use of antibiotics, surgical treatment and metallic osteosynthesis, for the purpose of preventing the development of infection in penetrating-radiation injuries.

The experiments were carried out on 71 rabbits, 49 of which were exposed to x-irradiation.

It was found that an infected fracture of the radius, when the animal was irradiated with a dose of 400 r, caused a slight worsening of the condition of the animal.

An infected fracture of the femur significantly aggravated the general condition of the animals irradiated with a dose of 600 r. The majority of these animals died during the first 10 days.

In the case of an infected fracture of the femur in irradiated animals, a marked leukopenia was noted during the first 2 weeks. The leukopenia usually changed (between the 16th-23d day) to leukocytosis.

Surgical treatment terminating with metallic osteosynthesis and use of antibiotics significantly improved the condition of the irradiated animals with an infected fracture of the femur, leading to early recovery of the supporting function of the limb.

81. Comparative Evaluation of Conservative and Operative Methods of Treating Fractures in Penetrating-Radiation Casualties

"The Problem of the Comparative Evaluation of the Conservative and Operative Methods of Treating Fractures in Penetrating-Radiation Casualties," by B. I. Bushkin and A. V. Vorontsoye, Chair of Orthopedics and Traumatology (head, Prof I. L. Krupko), Military-Medical Order of Lenin Academy imeni S. M. Kirov; Moscow-Khar'kov, Ortopediya, Travmatologiya, i Protezirovaniye, No 1, Jan/Feb 58, pp 13-16

Experiments were carried out on 65 rabbits x-irradiated with a dose of 600 r to obtain the following: a comparative evaluation of the healing of the fracture of a long tubular bone in penetrating-radiation injuries, both without fixation of the fragments and with intramedullary fixation; and the optimal early period for surgical intervention in fractures in radiation casualties.

The authors conclude that in penetrating-radiation casualties with simple fractures, where there are indications for surgical intervention, an intramedullary osteosynthesis with a stainless steel pin, and auto-, homo-, and heterotransplants may be used.

A stainless steel pin and a heterotransplant, when introduced intramedullarily, inhibit callus formation slightly but do not prevent a favorable union of the fracture; auto- and homotransplants stimulate callus formation.

Trauma, in the form of a fracture and the operative fixation of the fragments received a few hours after irradiation, leads to a marked aggravation of the course of radiation sickness; the same trauma, when received on the second day, aggravates the course of the radiation sickness to a lesser degree.

82. Course of Intra-Articular Bone Injuries in Penetrating-Radiation Casualties

"Characteristics of the Course of Intra-Articular Bone Injuries in Experimental Penetrating-Radiation Casualties Under Aseptic Conditions," by Prof G. A. Garibdzhanyan, Chair of Orthopedics and Traumatology (head, Prof I. L. Krupko), Military-Medical Order of Lenin Academy imeni S. M. Kirov; Moscow-Khar'kov, Ortopediya, Travmatologiya, i Protezirovaniye, No 1, Jan/Feb 58, pp 17-20

Of the 50 rabbits used in the experiments, 31 were x-irradiated with a dose of 600 r. Subsequently, all of them were subjected to surgical intervention--fracture of the olecranon or injury to the distal end of the femur. At various periods, a study was made of the characteristics of fracture healing and bone regeneration in the animals.

In the rabbits subjected to single general x-irradiation and intra-articular bone trauma, inhibition of the regenerative process was noted in the bony tissue on the 20th-30th day in comparison with the nonirradiated control animals. At later periods, from the 50th to the 60th day, the above difference in regeneration became insignificant. Delayed regeneration was especially noted on irradiation of young rabbits and in animals with a severe or fatal form of radiation sickness. X-irradiation significantly aggravates the postoperative course leading to a fatal outcome in many cases.

The animals which were irradiated 20 hours before the operation withstood the operative trauma significantly better than those rabbits which were irradiated 3-4 hours prior to surgery.

83. Data on Course and Treatment of Combined Injuries in Radiation Sickness

"Some Experimental Data on the Course and Treatment of Combined Injuries in Radiation Sickness," by Prof. A. A. Nikitin; Moscow-Khar'kov, Ortopediya, Travmatologiya, i Protezirovaniye, No 1, Jan/Feb 58, pp 21-24

In experiments on rabbits afflicted with radiation sickness of a moderate degree as a result of x-irradiation, complicated by fracture of the radius and a third-degree burn, surgical treatment of the tissues gave best results when carried out during the latent period of the radiation sickness.

Surgical treatment under these circumstances consists of debridement followed by permanent suture of the wounds and transfer of skin patches or free skin grafts.

Union of the bone fragments occurred at the same time in two animals which were not subjected to surgical treatment as in those animals which were given surgical treatment of the burned tissues in the area of the fracture followed by permanent suture of the wound or free skin graft.

Combined injuries, in the form of a fracture of a long tubular bone or a third-degree burn of the tissues, complicated the course of radiation sickness of a moderate degree.

Infection of the fracture and the burned area with a culture of hemolytic streptococcus (strain No 50) significantly exacerbated the course of radiation sickness.

84. Course of Fractures in Mild Radiation Sickness

"Course of Fractures in Mild Radiation Sickness," by S. S. Tkachenko, Candidate of Medical Sciences, Chair of Orthopedics and Traumatology (head, Prof I. L. Krupko), Military-Medical Order of Lenin Academy imeni S. M. Kirov; Moscow-Khar'kov, Ortopediya, Travmatologiya, i Protezirovaniya, No 1, Jan/Feb 58, pp 24-29

Experiments were carried out on rabbits to study the characteristics and mending of fractures in mild radiation sickness. In animals suffering from radiation sickness, a delay in formation of bony callus was noted, especially during the peak of the sickness. Trauma intensifies the course of radiation sickness. The death rate of the animals is increased and occurs at an earlier period.

Veterinary Medicine

85. Expanded Diagnostic Facilities for Infectious Animal Diseases

"Diagnostic Consulting Rooms for the Regional Veterinary Hospitals," by O. G. Shpringbakh, the Omskaya Oblast Veterinary Bacteriological Laboratory; Moscow, Veterinariya, No 6, Jun 58, p 62-63

Since 1949, Omskaya Oblast has carried out the planned systematic liquidation of brucellosis. However, the network of interregional veterinary bacteriological laboratories was found to be inadequate since usually one laboratory served a radius of 100-300 kms as a result of which the blood of infected animals was difficult to acquire. In addition, climatic conditions during the winter and spring added great hardships. As a result, blood tests were delayed from 3-7 days after collection thus significantly lowering the diagnostic value of the serological reactions and the timeliness of the diagnosis. It was therefore decided to organize diagnostic consulting rooms in the regional veterinary hospitals. The purpose of these rooms is to conduct mass serological investigations for brucellosis control and other laboratory tests.

At present, there are 16 diagnostic rooms in operation in the oblast. Each station is staffed by a physician, a feldsher and a sanitary worker. The Siberian Scientific Research Veterinary Institute has organized courses to prepare physicians for this type of work. The course program includes: techniques for conducting and evaluating agglutination reactions; brucellosis therapy; hematological tests for infectious equine anemia; and bacterioscopic investigations for tuberculosis, paratuberculosis, anthrax, epizootic lymphangitis, mange, ringworm, hemosporidia, and helminthiasis.

Miscellaneous

86. Visiting Session of Academy of Medical Sciences USSR in Tashkent

"Visiting Session of the Academy of Medical Sciences USSR," (unsigned article); Moscow, Meditsinskiy Rabotnik, No 73 12 Sept 58, p 1

In the latter half of September 1958 a visiting session of the Academy of Medical Sciences USSR will be held in Tashkent. The session will be concerned with the problem of the pathology of the digestive organs.

The program will include reports on infectious and parasitic diseases and in part on the problem of enteric pathology in Central Asia. The problems of noninfectious gastrointestinal diseases and their treatment will also be discussed. Some of the specific problems will concern the physiology of digestion under conditions of high temperatures, disturbances of metabolism during enterocolitis, the role of nutrition in the prophylaxis of gastrointestinal diseases, etc. A special session will be devoted to the problem of combating helminthiasis.

The participants in the session will also discuss the prospective plan for the development of medical science in the USSR for 1959-1965, and future problems of medical science in the Uzbek SSR, Kazakh SSR, Turkmen SSR, Kirgiz SSR, and Tadzhik SSR.

87. Congress of Medical Workers of Uzbekistan

"Congress of Medical Workers of Uzbekistan," (unsigned article); Moscow, Meditinskiy Rabotnik, No 74, 16 Sep 58, p 1

A congress of medical workers of Uzbekistan, attended by more than 1,000 persons, was opened on 15 September 1958. In his report, R. S. Sagatov, Minister of Health Uzbek SSR, pointed out that at present there are 8,500 physicians in the republic, which is 84 times greater than the number of physicians prior to the 1917 revolution. He also said that the state spends some 114 rubles for the health of each person in the republic, while in 1914 only some 14 kopecks were spent. Within the republic, there are nine scientific research institutes and four medical vuzes, and more than half of the more than 1,000 workers in these institutions have a degree of doctor of sciences or candidate of sciences.

It was pointed out at the congress that many new rural hospitals, lying-in-homes, sanatoriums, nurseries, and rest homes are being built in the republic.

88. First Moscow Medical Institute and Moscow Pharmaceutical Institute Combined

"Unification of Medical and Pharmaceutical Institutes," (unsigned article); Moscow, Meditinskiy Rabotnik, No 73, 12 Sep 58, p 4

The Ministry of Health RSFSR has issued a directive concerning the unification of the Moscow Pharmaceutical Institute with the First Moscow Medical Institute imeni I. M. Sechenov. The merger does not affect the designation of the First Moscow Medical Institute imeni I. M. Sechenov which retains its former name.

89. Birthday of Czechoslovak Academician

"Local and Foreign News" (unsigned article); Prague,
Obrana Lidu, 23 Aug 58, p 2

Karel Silink, MD, director of the Research Institute for Endocrinology (Vyzkumny ustav endokrinologicky) in Prague and one of the leading Czechoslovak endocrinologists, will be 50 years old on 24 August 1958.

VI. PHYSICS

Nuclear Physics

90. Positron Annihilation

"Investigation of Angular Distribution of Gamma Quanta at Annihilation of Positrons in Liquid Hydrogen and Helium," by A. S. Basina, K. A. Basko a, B. S. Dzhelepov and M. A. Dolgoborodova, Scientific Research Institute of Physics, Leningrad State University imeni Zhdanov; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 22, No 8, Aug 58, pp 968-975

The method of measurements and the equipment used in these studies do not differ much from those described in Izv AN SSSR. Ser Fiz, Vol 20, 1956, p 951. The source of positrons was a radioactive Cu-64 foil.

The results of measurements were plotted in curves of angular distribution of quantum events for liquid H and He and were compared with the same type of curves of positron annihilation in an aluminum absorber. The experimental data were reduced to a unity of solid angle. The curves of angular distribution for H and He differed in shape from those for Al. The curves obtained for Al by the authors agree with those obtained by R. Green and A. Stewart (Phys Rev, Vol 98, 1955, p 486, and by S. de Benedetti et al. Phys Rev Vol 99, 1955, p 596). But the curves for H and He exhibited a narrower maximum and a much wider base. Such a shape could be explained by the possibility of positronium formation in H and He by positrons of sufficient energy. The narrower maximum of curves of angular distribution for H and He should probably be correlated to annihilation of the formed parapositronium, while a wider maximum of curves of angular distribution indicates that the parapositronium is not fully stopped. The widening of curves for H and He may also be due to a decay by two-quantum process of orthopositronium as a result of the pickoff of a bound electron with an oriented spin.

Cases of gamma-quanta flying apart under a wide angle probably occur on account of annihilation of positrons not fully stopped. It is strange that such cases occur rather seldom for Al.

The curve of angular distribution for He is wider than for H, which probably is related to higher velocity of electrons in the He atom.

The analysis of experimental data shows a possibility of positronium formation in He.

91. Iron-Free Magnetic Beta-Spectrometer

"Compensation of the Terrestrial Magnetic Field," by E. M. Krisyuk and G. D. Latyshev, Chair of Physics of the Leningrad Institute of Railroad Engineering (Imeni Obraztsov); Moscow, Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 22, No 8, Aug 58, pp 976-984

In the design of an iron-free magnetic beta-spectrometer with double focusing ($r_0 = 50$ cm) attention had to be paid to compensation of the terrestrial magnetic field within the operating range of the instrument. In the Leningrad area the vertical component of the terrestrial magnetic field has the value of about 0.5 oersted and the horizontal about 0.15 oersted. Therefore the vertical component had to be compensated with an accuracy up to $-2 \cdot 10^{-4}$ and the horizontal up to $6 \cdot 10^{-4}$ within the operating range of the spectrometer shaped as a cylinder 60 cm in radius and 80 cm high. Several compensating systems are analyzed, including the location of the instrument; the construction of a system of coils creating a sufficiently uniform field compensating for the terrestrial magnetic field within the operating range; and the construction of a device capable of varying automatically the current of the system so as to compensate for the variations of the terrestrial magnetic field. The creation of a compensating uniform field consisting of several symmetrical rings with current is described.

92. Conversion Electrons of Gd-149 and Eu-149

"Spectrum of Conversion Electrons of Gd-149," by N. M. Anton'eva, A. A. Bashilov, B. S. Dzhelapov, and B. K. Preobrazhenskiy, Scientific Research Physics Institute, Leningrad State University imeni Zhdanov; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol. 22, No 8, Aug 58, pp 895-905

The spectrum of conversion electrons of a gadolinium fraction, separated from a Ta target which was irradiated in the synchrocyclotron, was studied by means of a "ketron" magnetic spectrometer (Izv AN SSSR, Ser Fiz, Vol 14, 1950, p 263), with a resolving power of 0.5%. It was established that the intensities of the conversion lines of Gd fraction varied with time at different speeds, indicating the presence of several isotopes or isomers in the compound. For the separation of conversion lines of various isotopes the spectrum was repeatedly measured within certain time intervals. It was established that Gd-149 with a half-life of 9 ± 1 days is transformed by means of electron capture into Eu-149 and by further emission of 3 MeV into Sm-145. The decay behavior of Gd-149 is illustrated in graphs and tables. This study permits some conclusions on the multipolarity of nuclear transitions into Eu-149.

CIA/PB 131891-T8

Approved For Release 1999/07/20 : CIA-RDP80-01470R000100010

~~UNCLASSIFIED~~

SCIENTIFIC INFORMATION
REPORT

17 OCTOBER 1958

2 OF 2

"Spectrum of Conversion Electrons Gd-147 and Eu-147," by N. M. Anton'yeva, A. A. Bashilov, B. S. Dzhelepov, and B. K. Freobrazhenskiy, Scientific Research Physics Institute, Leningrad State University imeni Zhdanov; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 22, No 8, Aug 58, pp 906-918

As a continuation of the previous work the total conversion spectrum of the Gd fraction, containing several isotope lines was studied. The decay curves following the intensity drop of the conversion lines with time permitted the establishment of the existence of a previously unknown isotope Gd-x with a half-life of 35 ± 1 hrs. It was also established that the differences of energies of K, L and M conversion lines equal: $K - L = 40.5 \pm 0.2$ keV and $K - M = 46.8 \pm 0.3$ keV. Therefore the indicated transitions occur in the Eu nucleus after an electron capture in Gd.

It was concluded that the Gd isotope of half-life 35 ± 1 hrs transforms into a radioactive isotope of Eu which as a result of an electron capture undergoes a transformation of a half-life of 25 ± 1 days into Sm and excites in the latter transitions with energies of 120 and 200 keV.

A recently published work by V. Shirley, W. Smith and J. Rasmussen, Nucl Phys Vol 4, 1957, p 395, shows that Gd-147 was obtained from $Sm + \alpha$ and $Eu + d$ reactions.

93. Experimental Thermonuclear Reactions in USSR

"Some Investigations of the Institute of Atomic Energy of the Academy of Sciences USSR in the Field of Controlled Thermonuclear Reactions," by I. V. Kurchatov; Moscow, Atomnaya Energiya, Vol 5, No 2, Aug 58, pp 105-110

Work on controlled thermonuclear reactions began simultaneously in the USSR, the US, and the UK in 1950-1951, but was kept secret up to 1956. In 1956, the USSR declassified research on pulse discharges in straight tubes filled with deuterium. Most proficient in this research were A. D. Sakharov and I. Ye. Tamm. They worked on the possibility of thermal isolation of hot plasma by means of a magnetic field and heating the plasma by electric current. In order to prevent the escape of particles along the magnetic field a toroidal chamber was suggested in which the magnetic lines would wind around themselves. A forward step was made by G. I. Budker in 1953 by his suggestion of magnetic "mirrors." Later this system received the name of adiabatic traps. The institute paid special attention to this type of development promising a steady thermonuclear reaction. In principle the apparatus consisted of a straight cylinder with a longitudinal magnetic field strengthened at the ends. The charged

particles are reflected by the "mirrors" (condensed magnetic fields). Several methods of heating the plasma were devised, among which the injection of ions, preliminarily accelerated to the necessary energy, was considered the best. This was the basic design of the most important adiabatic trap -- the equipment "Ogra" constructed under the guidance of I. N. Golovin. It consists of a straight tube with a longitudinal magnetic field constant in time into which molecular ions H_2^+ at 200 kev are injected. It is expected that the equipment "Ogra" will provide hydrogen plasma of 10^{13} cm^{-3} density, although some unexpected complications are always possible, the most hazardous among them being presumably collective interaction of particles. The theoretical physicist R. Z. Sagdeyev observed a form of instability due to pressure anisotropy of the plasma.

94. Mathematical Analysis of Reactors

Chislennyye Metody Rascheta Yadernykh Reaktorov (Numerical Computation Methods for Nuclear Reactions) by G. I. Marchuk; Moscow, 1958, 381 pp, (Supplement No 3-4 to Atomnaya Energiya)

The book is an outline of numerical computation methods for thermal, intermediate, and fast nuclear reactors. Particular attention is paid to problems of critical mass, the space-energy distribution of the flux and the efficiency of neutrons. Methods for reducing basic and adjoint equations of the reactor to a system of multigroup diffusion equations are given. Kinetic equations are solved by numerical methods.

The book contains only mathematical analysis of reactor computation. The numerical computations were carried out in 1953-1956 by the writer with cooperation of Ye. I. Pogudalina, E. S. Maksimova, V. V. Smelov, G. A. Ilyasova, I. P. Markelov, I. P. Tyuterev, and others. All these methods have been tested theoretically and experimentally prior to being introduced into practice. The numerical methods were developed under the guidance of Active Member of the Ukrainian Academy of Sciences A. I. Leypunskiy. Many contributions are due to L. N. Usachev and A. S. Romanovskiy, in particular on adjoint equations and on the perturbation theory. L. N. Usachev, V. Ya. Pupko, V. A. Kuznetsov, B. F. Gromov, G. I. Toshinskiy, N. I. Buleyev, S. B. Shikhov, V. V. Orlov, T. Kh. Sedel'nikov and others took active part in creative discussions of the problems.

Theoretical Physics95. Solution Given for Equations of Magnetohydrodynamics

"On Motions With Homogeneous Deformations in Magnetic Hydrodynamics," by A. G. Kulikovskiy; Moscow, Doklady Akademii Nauk SSSR, Vol 120, No 5, 11 Jun 58, pp 984-986

A class of solutions is indicated for the equations of magnetohydrodynamics for an infinitely conducting medium. The law of the motion is given in the Lagrange form as

$$x_i = M_{ij}(t)x_j^0 + M_i(t),$$

where x_i are the the orthogonal coordinates of a particle and x_i^0 are the coordinates at $t = 0$. The equations for the lines of force, which are continuous, adiabatic, and frozen, are given as

$$\varphi = \frac{1}{\Delta} \varphi^0, \quad p = \frac{1}{\Delta} p^0, \quad H_i = \frac{1}{\Delta} M_{ij} H_j^0,$$

where Δ is the determinant of the matrix $\|M_{ij}\|$.

The following solution is obtained:

$$\begin{aligned} H_i^0 &= h_{ik} x_k^0 + h_i && (h_{ik} \text{ and } h_i, \text{ constants}), \\ \varphi^0 &= \text{const}, && p^0 = p_{ij} x_i^0 x_j^0 + p_i x_i^0 + \text{const} \\ &&& (p_{ij} \text{ and } p_i, \text{ constants}). \end{aligned}$$

A discussion of the solution for various initial conditions is given.

Luminescence

96. Electroluminescence Analysis

"Investigation of Relaxation Processes in Electroluminescence,"
by A. N. Georgobiani and M. V. Fok, Physics Institute imeni
Lebedev; Leningrad, Optika i Spektroskopiya, Vol 5, No 2
Aug 58, pp 167-171

Waves of brightness arising at excitation of phosphor ZnS-Cu, Al by trapezoidal pulses of various front steepness, amplitude and frequency are studied, as well as the glowing of electroluminescence and the action of infrared light on the brightness waves. The application of pulses of trapezoidal form permits the explanation of peculiarities of electroluminescence related to relaxation of a polarizing charge, and also somewhat facilitates the comparison with computations which are simplified for this type of excitation. The obtained results indicated that the constant and the variable components of glowing of the electroluminescent condenser are connected to various region of the phosphor crystal. It is attempted to explain the experimental material from a unique point of view.

"Effect of Stored Amount of Light on the Intensity of Electroluminescence of ZnS-Cu, Al Phosphor," by Ye. Ye. Bukke, L. A. Vinokurov and M. V. Fok, Physics Institute imeni Lebedev, Academy of Sciences USSR; Leningrad, Optika I Spektroskopiya, Vol 5, No 2, Aug 58, pp 172-178

Experimental data were obtained on the relation of brightness of electroluminescence at room temperature and at temperature of liquid nitrogen to the amount of light stored in the phosphor. It was established that at low temperature the brightness of electroluminescence decreases simultaneously with the rising amount of stored light. Attempt is made to analyze theoretically one possible explanation of the observed effect. The possibility is indicated of expanding the excited state from the narrow spaces of the crystal of the electroluminophor with a strong electric field to the whole volume.

"Decay of the ZnS-Cu Phosphor Afterglow in Coordinates $\lg J$, $\lg t$, and $\lg (1 + pt)$," by F. I. Vergunas and L. R. Krasovskaya, Gor'kiy State University; Leningrad, Optika i Spektroskopiya, Vol 5, No 2, Aug 58, pp 162-166

Analysis of E. I. Adirovich's theory Nekotoryye voprosy teorii lyumini-
nistsentsii kristalloy (Some Problems in the Theory of Luminescence of
Crystals) Moscow, 1956, of ideal phosphors leads the author to the conclu-
sion that the elementary decay law does not concur with experimental data.
Results of experimental research show that the decay curves of afterglow
depending on localization levels of the same depth may be approximately
represented by hyperbolas only in coordinates $\lg J$, $\lg (1 + pt)$, where p
is the probability of thermal freedom of localized electrons. However, in
coordinates $\lg J$ and $\lg t$ these relations are curvilinear.

VII. MISCELLANEOUS

97. Number of Soviet Dissertations Shows Marked Decline for 1957

The following table gives the numbers of candidate and doctoral dissertations defended at Soviet higher educational institutions during 1957 and registered in the State Bibliography USSR. The table is the result of a survey of Knizhnaya Letopis', No 6-52, 1957, and No 1-21, 1958, a Soviet publication listing titles of such dissertations. The 1957 total shows a marked decline from the 1956 total of 6,836.

CPYRGHT

<u>Sciences</u>	<u>Candidate</u>	<u>Doctorate</u>	<u>Total</u>
Philosophical	62	1	63
Historical	126	11	137
Economic	169	15	184
Juridical	26	7	33
Physicomathematical	248	52	300
Chemical	214	21	235
Geographic	34	5	39
Geologicalmineralogical	95	26	121
Biological	275	46	321
Technical	799	95	894
Agricultural	295	30	325
Veterinary	82	8	90
Medical	784	143	927
Pharmaceutical	6	--	6
Pedagogical	97	4	101
Philological	105	15	120
Fine arts	10	2	12
Architectural	8	1	9
Total	3,435	482	3,917

98. Session of General Assembly of Academy of Sciences Kazakh SSR

"Session of the General Assembly of the Academy of Sciences Kazakh SSR" (unsigned article); Alma-Ata, Vestnik Akademii Nauk Kazakhskoy SSR, No 6, Jun 58, pp 4-5

A general assembly of the Academy of Sciences Kazakh SSR was held 9-10 June 1958. Academician K. I. Satpayev, president of the academy, gave the opening address. He discussed the tremendous achievements in the development of culture and science in Soviet Kazakhstan during the past year. He pointed out that it is difficult to mention any mineral raw material that has not been discovered within the territory of the Kazakh SSR.

During the session a number of reports were given: Academician A. B. Bekturov, director, Institute of Chemical Sciences, Academy of Sciences Kazakh SSR, spoke on the future growth of the chemical industry in Kazakhstan; A. L. Tseft, Corresponding Member, Academy of Sciences Kazakh SSR, spoke on "The Fundamental Problems of Nonferrous Metallurgy and Their Solution in Principle"; G. D. Latyshev, Corresponding Member, Academy of Sciences Kazakh SSR, spoke on the use of the magnetic resonance of protons for scientific and technical problems; and Academician Sh. Ch. Chokin, academician-secretary, Academy of Sciences Kazakh SSR, spoke on the results of the scientific activities of the academy during 1957 and the goals of the academy for 1958. Twenty-two persons participated in the discussion of these reports.

The following director of an institute of the academy was confirmed: D. L. Shamis, director, Institute of Microbiology and Virology, Academy of Sciences Kazakh SSR.

The election of active and corresponding members to the academy was conducted at the session. The following were elected active members (last name first): Darkanbayev, Temir Baybusynovich; Zakharov, Vadim Pavloich; Latyshev, Georgiy Dmitriyevich; Margulan, Al'key Khakanovich; Mikhaylov, Vladimir Vladimirovich; Musrepov, Gabit Musrepovich; Pentkovskiy, Mstislav Vyacheslavovich; Takibayev, Zhabaga Suleymenovich; and Tseft, Adrian Luk'yanovich. The following were elected corresponding members: Aytaliyev, Zharkhan Aytaliyevich; Balakayev, Maulen Balakayevich; Vatishchev-Tarasov, Stepan Dmitriyevich; Beklemishev, Nikolay Dmitriyevich; Ben'kovskiy, Vasilii Grigor'yevich; Bublichenko, Nikolay Lazarevich; Bykov, Boris Aleksandrovich; Ismailov, Yesmagambet Samuratovich; Klyshev, Lukban Klyshev; Musin, Alikhan Chuzhebayevich; Musefin, Gabiden; Ponomarev, Viktor Dmitriyevich; Sil'chenko, Mitrofan Semenovich; and Shamis, David Lazarevich.

99. General Assembly of All Departments of Academy of Sciences Kazakh SSR

"Session of the General Assembly of All Departments and General Assembly of the Academy of Sciences Kazakh SSR" (unsigned article); Alma-Ata, Vestnik Akademii Nauk Kazakhskoy SSR, No 6, Jun 58, p 3

A session of the general assembly of all departments of the Academy of Sciences Kazakh SSR was held 6-7 June 1958. At the session a report on the results of scientific research for 1957 and the goals for 1958 of the Department of Mineral Resources was given by Academician R. A. Borukayev, academician-secretary of the department. A similar report on the Department of Physicomathematical Sciences was given by M. V. Pentkovskiy, Corresponding Member, Academy of Sciences Kazakh SSR and acting academician-secretary of the department.

V. G. Ben'kovskiy, Doctor of Technical Sciences and deputy director of the Institute of Petroleum, Academy of Sciences Kazakh SSR, gave a report on soil corrosion of petroleum equipment and anticorrosion defense measures. S. D. Batishchev-Tarasov, Lenin Prize winner, gave a report on the geologicogeophysical studies conducted in the Trans Ural region. Zh. S. Takibayev, Candidate of Physicomathematical Sciences and head of the Laboratory of Cosmic Rays, Institute of Nuclear Physics, Academy of Sciences Kazakh SSR, reported on new data concerning the character of explosive nuclear disintegration in high-energy regions.

A report on scientific research conducted during 1957 by the Department of Biological and Medical Sciences was given by Academician N. U. Bazanova, academician-secretary of the department.

N. D. Beklemishev, Doctor of Medical Sciences and deputy director of the Institute of Regional Pathology, Academy of Sciences Kazakh SSR, reported on results and prospects of the development of health-resort studies in Kazakhstan.

A report on the activities of the scientific institutions of the Department of Social Sciences for 1957 and its tasks for 1958 was given by Academician S. N. Pokrovskiy, academician-secretary of the department.

100. Soviet Scientists Named to Czechoslovak Academy of Sciences

"Soviet Scientists Awarded Czechoslovak Diplomas" (unsigned article); Prague, Obrana Lidu, 26 Aug 58, p 1

On 25 August 1958 at the Czechoslovak Embassy in Moscow, a group of Soviet scientists were awarded diplomas, by which they were named to the Czechoslovak Academy of Sciences.

These scientists, who were elected by the seventh assembly of the academy at the end of 1957, are Aleksandr Nesmeyanov, president of the Academy of Sciences USSR, and vice-presidents Konstantin Ostrovityanov, Mikhail Lavrent'yev, Aleksandr Topchiyev, and Ivan Bardin.

101. Czechoslovak Scientists Honored

"High Honors to Scientific Workers" (unsigned article); Prague, Obrana Lidu, 28 Aug 58, p 1

Academician Eduard Cech, laureate of the State Prize, has been awarded the Order of the Republic for his important scientific activity and for extraordinary merit in the development of Czechoslovak mathematics. Engr Dr Prof Vladimir Kosil, principal of the Advanced School for Agriculture, has been awarded the Order of Work for outstanding service in building the Advanced School for Agriculture and for distinguished scientific activity in the field of agronomy.

102. East German Editorial Calls for More Industrial Research on Contract

"The Key," editorial by G. Barth; Berlin, Nachrichtentechnik, No 8, 58, p 337

In reference to the problems of developing and producing enough ferrites for the East German telecommunications industry, this editorial makes the following statements:

"...A continuous working arrangement must be set up between the scientific institutes and practice.

"The introduction of contract research will help to cement the relationship between the universities and industry, to bring science and production closer together, and thereby increase scientific accomplishments. Science does not work apart from the requirements of the national economy....

CPYRGHT

"At present, the industrial enterprises have only a limited number of scientists at their disposal. Contract research is one way of overcoming this. A well-planned employment of the scientifically qualified personnel in the industrial enterprises is also important. A false attitude of the industrial enterprises toward scientists often delays the transition of finished research assignments to production. The industrial enterprises are also reluctant to increase the number of engineers and to employ people with the right qualifications. In many cases the young scientific trainees are underestimated, and it is difficult for young engineers to get into production work. The extent of these problems is not generally understood, and the situation should be rectified immediately. Young scientists and engineers were not given assignments in the VEB Roehrenwerk 'Anna Seghers'. The technical director of the plant was of the opinion that the young engineers were no good if their first experiments did not produce the desired results."

103. Hungarian Dissertations for May 1958

"Report of the Scientific Qualifications Committee, New Doctors and Candidates for May 1958" (unsigned notes); Budapest, Magyar Tudomány, Jul 58, pp 292-293

Peter Szor was made Doctor of Chemical Sciences on the basis of his dissertation, "The Temporal Course of the Tumefaction of Large Molecule Polymers." His opponents were Academicians Aladar Buzagh, Jenő Egervary, and Geza Schay.

Pal Elodi was made Candidate of Biological Sciences on the basis of his dissertation, "A Study of the Connection Between Structure and Function in Homologous Proteins." His opponents were Academician F. Bruno Straub and Daniel Bagdy, Candidate of Medical Sciences.

Kalman Kovacs was made Candidate of Chemical Sciences on the basis of his dissertation, "The Synthesis of Optically Clear Alpha-poly-L-glutamic Acid and Alpha-poly-D-glutamic Acid. The Transformation of Polyglutamic Acids Into Basic Polypeptides." His opponents were Academician Zoltan Csuros and Laszlo Vargha, Corresponding Member [of the academy].

Mrs Laszlo Szabolcs was made Candidate of Biological Sciences on the basis of her dissertation, "A Study of the Connection Between Structure and Function in Homologous Proteins Under Circumstances of enzymatic Hydrolysis." Her opponents were Academician F. Bruno Straub and Mihaly Gerendas, Candidate of Biological Sciences.

* * *