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~~UNCLASSIFIED~~ SCIENTIFIC INFORMATION  
REPORT

20 MARCH 1959

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CENTRAL INTELLIGENCE AGENCY

# SCIENTIFIC INFORMATION REPORT



20 March 1959

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PLEASE NOTE

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

SCIENTIFIC INFORMATION REPORT

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I. BIOLOGY

1. Biology, the Future Leader in Natural Science

"The Scientific Front -- To a Youth Entering Science," by Academician A. N. Nesmeyanov, president of the Academy of Sciences USSR; Moscow, Tekhnika Molodezhi, No 10, 1958, pp 10-11

CPYRGHT

"...Physics today is the leader of natural science. Following it is chemistry, especially the field of high-molecular compounds in which our country is preparing to effect new, great strides, having constructed a powerful plastics artificial material, and synthetic fiber industry and having rapidly advanced the chemistry of high-molecular compounds with an over-all result of advancing chemistry as a whole.

"As a result of this, it is my firm conviction and that of many other scientists that in the next 10 years biology will become the leader in natural science since, in the final analysis, man is more concerned with life than with anything else.

"We chemists dream of the time when biologists can, by using chemical and physical reactions, direct the life of cells and when chemists can utilize these principles, based on the chemical activity of cells, in the chemical industry. You know that a cell is basically a microfactory. Only now have we begun to understand how a cell produces protein, without which there is no life. A cell 'stamps' them, just as a part is stamped in industry. In this function, it uses nucleic acid.

"In a similar way, the viruses 'stamp' the surrounding proteins in the body of a host, from a chemical point of view appearing as nucleoproteids which are capable of replication as the result of using its nucleic acid as a 'stamp.'

"Somewhere close to this lies the enigma of cancer, which is the result of incorrect, irregular cell reproduction by an organism. Did the stamping mechanism break down? Was it brought in from without? By a virus? Or develop within the organism? You can be sure of this, the normal proteins of cell replication, which are connected with the 'die' action on nucleic acid in the cell of the tissue, have been disrupted.

"In this area of enigmas involving life, there is another interesting problem -- heredity, which is transmitted through embryo cells. How in the nature of one single cell, which later grows into a complex organism, can the many characteristics which produce a son not only belonging to the species but also in many ways similar to the mother and father be 'coded'?

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"Genetics, undoubtedly, is one of the growing areas in natural science, where, in addition to cytology and other branches of biology, physics, chemistry, and elements of mathematics, such as information theory, are also included. There are many such basic enigmas of life in biology, the investigation of which will have many practical results. Therefore, in the near future, biology will be the leader of natural science.

"...Man did not enter the cosmic era, which formerly seemed fantastically far away but now is awaiting the first flight to the moon, by words but by deeds. There is no doubt that even we will see these flights. We will remember the importance which Columbus' discovery of America had for humanity, but this discovery was only done within the confines of the globe."

II. CHEMISTRY

Crystallography

2. Second Conference on Crystal Growth, 23 March-1 April 1959

Moscow, Vestnik Akademii Nauk SSSR, No 1, Jan 59, p 140

The Second Conference on Crystal Growth, organized by the Institute of Crystallography of the Academy of Sciences USSR and the Scientific Council on the Problem of Crystal Formation, will be held from 23 March to 1 April 1959. More than 100 papers are supposed to be delivered at the conference. Scientists of the People's Democracies will present a considerable number of papers. An exhibition of synthetic crystals and equipment for growing them is being organized for the conference.

Fuels and Propellants

3. A Method for the Determination of Aromatic Hydrocarbons in Jet Fuel Kerosene

"A Method for the Determination on the Basis of Structural and Group Composition Data of the Total Quantity of Aromatic Hydrocarbons in Aviation Kerosenes Containing Unsaturated Hydrocarbons," by M. F. Nagiyev and L. I. Tryapina, Petroleum Institute of the Academy of Sciences Azerbaydzhan SSR; Baku, Doklady Akademii Nauk Azerbaydzhanskoy SSR, Vol 14, No 12, Dec 58, pp 977-983

A method is proposed for the determination of the total quantity of aromatic hydrocarbons and the quantity of aromatic hydrocarbons with unsaturated side chain in jet fuel kerosenes ["aviation kerosenes"] containing unsaturated hydrocarbons. The total content of aromatic hydrocarbons and aromatic hydrocarbons with unsaturated side chains was determined in jet fuel kerosenes produced by the thermal cracking of different mazuts. It was found that from the standpoint of the production of kerosenes containing the least quantity of aromatics the mazut derived from Karachukhur crude is the best raw material among the three types of mazut investigated.

4. Compounds of Hydrogen Peroxide With Ammonia

"On the Interaction of Hydrogen Peroxide With Ammonia," by K. Ye. Mironov, Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, Academy of Sciences USSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 1, Jan 59, pp 153-157

The constitutional diagram of the system  $H_2O_2 - NH_3$  was determined. It was established on the basis of this diagram that four solid phases exist in the system, i. e., hydrogen peroxide, the compound  $NH_3 \cdot H_2O_2$  (m.pt. =  $+25^\circ$ ), the compound  $2 NH_3 \cdot H_2O_2$  (which melts incongruently at minus  $93.5^\circ$ ), and ammonia. The existence and stability of the compounds formed are based on the acidic properties of hydrogen peroxide. The errors made in previous investigations by workers who tried to establish the existence of the compound  $2 NH_3 \cdot H_2O_2$  are pointed out.

5. The Constitutional Diagram of the System Hydrogen Peroxide - Ethylene Glycol

"The Problem of the Constitutional Diagram of the System Hydrogen Peroxide - Ethylene Glycol" by D. V. Rode and A. V. Zachatskaya; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 1, Jan 59, pp 243-244.

Data obtained in work on the determination of the constitutional diagram of the system hydrogen peroxide - ethylene glycol are described. The liquidus of hydrogen peroxide could be determined only from 51.35 to 100 mol % of peroxide and the liquidus of ethylene glycol only from 0% to 37.80 mol % of peroxide. In the concentration range of 37.80 - 51.35 mol % of hydrogen peroxide no determinations could be made, because no crystals form in the solutions at these concentrations: vitrification instead of crystallization takes place.

The solutions that were investigated proved to be quite stable for periods up to 230 days. It could be confirmed that hydrogen peroxide is miscible with ethylene glycol in all proportions without separation into layers and that work with the solutions in question is safe unless contact with other organic substances (e.g., those of the skin or clothing) occurs.

6. The Decomposition of Calcium Peroxide

"The Decomposition of Calcium Peroxide in a Carbon Dioxide Atmosphere," by M. M. Pavlyuchenko and Ya. S. Rubinchik, Belorussian State University imeni V. I. Lenin; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 1, Jan 59, pp 50-55

It was established in the work described that anhydrous calcium peroxide does not react with dry carbon dioxide at temperatures lower than that of its dissociation. Sodium hydroxide and magnesium dioxide, which were used as catalysts, did not have an effect on the reaction under these conditions. Beginning with the temperature of 145° anhydrous calcium peroxide decomposes in a stream of moist carbon dioxide. Addition to the calcium peroxide of solid sodium hydroxide, magnesium dioxide, or cuprous oxide increases by several times the velocity of the decomposition of calcium peroxide in the whole range of temperatures investigated in the work described (14.5 - 52.5°). The hydrate  $\text{Ca O}_2 \cdot 8\text{H}_2\text{O}$  decomposes in a carbon dioxide stream in the absence of catalysts in the whole range of the temperatures investigated (15 - 70°). The addition of solid catalysts (sodium hydroxide or magnesium dioxide) to the hydrate increases the rate of decomposition by several times. The increased reactivity of hydrates is due to the formation of a labile phase of the peroxide after dehydration of the hydrate. The peroxide in this phase is converted more rapidly into the final products of the reaction. The mechanism of the decomposition of peroxides of alkaline earth metals in the presence of moisture and carbon dioxide is considered. The mechanism of the catalytic action of sodium hydroxide, magnesium peroxide, and cuprous oxide is also subjected to consideration.

7. Ionization Processes in a Gas Stream Behind a Shock Wave

"Investigation of Rapid Ionization Processes in a Gas Stream Behind a Shock Wave," by A. A. Brandt and R. Kh. Kurtmulayev, Physical Faculty of Moscow State University; Moscow, Pribory i Tekhnika Eksperimenta, No 6, Nov-Dec 58, pp 94-97

A method is described for measuring the coefficient of thermal ionization of gas in a stream following a shock wave propagating with a velocity of approximately 3 km/sec. The duration of the ionization process indicated oscillographically, which depends on the velocity of the shock wave, comprised 200 microseconds. The method that has been developed makes it possible to measure the ionization constant in a certain finite number of points (10-15) distributed uniformly along the course of the process with the result that the ionization pulse and the steepness of fronts can be determined. The measurements were conducted with the aid of a volume resonator at a wave length of 10 cm.

8. A Device for Measuring Pressures During Explosions

"On the Measurement of Rapidly Changing Pressures in a Gaseous Medium," by S. G. Zaytsev, Power Institute, Academy of Sciences USSR; Moscow, Pribory i Tekhnika Eksperimenta, No 6, Nov-Dec 58, pp 97-99

The design and method of construction of a piezoelectric sensitive device are described. In contrast to the operation of most appliances for the same purpose, the device's own oscillations are not induced by the action of force impulses when the duration of the period of front increase becomes negligibly small. With the use of the device described, it is possible to determine the form of pressure impulses which correspond to the explosion shock (in the range of 0.5-100 atmospheres) and carry out these determinations within a period of time T the beginning of which coincides with the moment at which the explosion shock begins to act on the sensitive device. For the devices used, this period of time comprises 60-200 microseconds.

The piezoelectric element is a cylinder of sintered barium titanate 10 millimeters high and having a diameter of 13 millimeters.

Herbicides

9. Investigation of the Herbicide MG-T

"Herbicide MG-T Against Quack Grass," by A. K. Eglite, Candidate of Agricultural Sciences; Moscow, Zashchita Rastiniy ot Vrediteley i Bolezney, No 6, Nov-Dec 58, pp 40-41

During 1954-1957 the Soviet Union has been conducting investigations on the effect of MG-T against quack grass. A technological process for the production of MG-T (the hydrazide of maleic acid) has been developed by the Institute of Agricultural Problems under the direction of S. A. Giller, Academician of the Academy of Sciences Latvian SSR. This compound is being produced by the Riga Chemical Combines. It is supplied in the form of a 33% concentrate, which has a syrupy consistency.

Small doses of MG-T act on all plants, slowing down their growth. Higher dosages produce chlorosis and bring about gradual loss of the plants over a period of 1-3 months. Therefore, its use in the field without injury can only be accomplished by utilizing it before crops are planted.

The preparation is best used as a 3-10% water solution with the addition of 0.1% of a wetting agent (QP-10 or OP-7). MG-T is toxic to both humans and animals.

10. Herbicides From Wood Pulp

"Herbicides From the Phenols of Resins Obtained by the Thermolysis of Wood," by V. Kovalev and D. Tishchenko, Forestry Technology Academy imeni S. M. Kirov; Moscow, Zhurnal Prikladnoy Khimii, No 11, Nov 58, pp 1708-1715

It was shown that a mixture of chlorophenoxyacetic acids (containing approximately 28-30% of chlcrine, having a gram equivalent weight of approximately 235-250, and obtained from the phenol fraction of wood distillate boiling at 180-2100) is a good herbicide with a selective action, which destroys dicotyledonous plants and certain deciduous plants. This mixture contains no more than 25% of 2,4-D and 2M-4Kh (2-methyl-4-chlorophenoxyacetic acid). The high physiological activity of the mixture is the result of the presence of a considerable quantity (up to 40%) of chloroguaiacoxyacetic acids, which are synergetic to 2,4-D, and are stimulants of plant growth.

Industrial Chemistry

11. A Symposium on the Chemistry of Organosilicon Compounds

"A Symposium on the Organic and Nonsilicate Chemistry of Silicon at Dresden, 12-14 May 1958," by V. A. Ponomarenko; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 11, Nov 58, pp 1401-1403

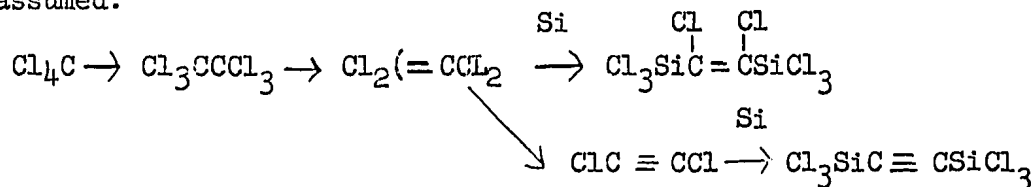
A symposium on the organic and nonsilicate chemistry of silicon organized by the [German] Chemical Society of the GDR [Society of German Chemists] was held at Dresden, 12-14 May 1958. Twenty-eight reports were presented at the conference: 13 by GDR chemists, 8 by USSR chemists, and 7 by chemists from West Germany. More than half the reports dealt with research in the field of the organic chemistry of silicon while the rest were concerned with problems of the nonsilicate chemistry of silicon, the analysis of organosilicon compounds, and some special applications of organosilicon compounds in technology. In addition to representatives of GDR scientific institutions and industry active in the field of organosilicon compounds and USSR and West German chemists, representatives from Czechoslovakia participated. Besides the official delegation of the Academy of Sciences USSR consisting of N. S. Nametkin (chief of the delegation), M. G. Voronkov, A. A. Zhdanov, D. N. Andreyev, and V. A. Ponomarenko, 24 other scientific workers and engineers from the USSR participated in the symposium.

One of the most extensive reports presented by a GDR participant was that by R. Mueller, chief of the Institute of Silicone and Fluorocarbon Chemistry at Radebeul. In this report, which was of a theoretical nature, Mueller outlined the history of organic and inorganic silicon chemistry, from the standpoint both of resemblances of silicon with carbon and of differences between these two elements. Employing the concept in regard to the participation of the 3d orbit of silicon in the formation of coordination bonds, Mueller attempted to explain from a unified standpoint the mechanisms of such reactions of organosilicon compounds as saponification, fluorination, polymerization, and hydrolysis.

The problem of the mutual influence of atoms on each other which is apparent in vibrational spectra (Raman and infrared spectra) of silicon compounds was the subject of a detailed paper given by G. Kriegsman. Investigation of interatomic distances and bond energies of a number of organosilicon compounds enabled the author of this paper to confirm that there is an especially strong interaction between silicon and bonds formed by it with electronegative elements. This characteristic of the bonds of electronegative elements with silicon, which has been observed before, is due to a tendency of the silicon atom to full the unoccupied 3d orbit.

A report by S. Munkelt (GDR) dealt with the synthesis of alkenylsilanes from chloroalkylsilanes by dehydrochlorination with the use of ferrosilicon at elevated temperatures. Munkelt developed a continuous method for the production of alkenylsilanes (vinyl trichlorosilane, allyl trichlorosilane, and others) by means of this reaction. This method may become of practical importance. A paper by G. Beyer reported the results of a very thorough investigation of the reaction of carbon tetrachloride with silicon in the temperature range of 200-400°. The author of the paper established the optimum conditions for this reaction (at a temperature of approximately 310°) at which the maximum quantity of products of direct synthesis containing Si-C bonds is obtained and a relatively small amount of silicon tetrachloride is formed. The compounds  $\text{Cl}_3\text{Si}-\overset{\text{C}}{\underset{\text{Cl}}{\text{C}}}\equiv\overset{\text{C}}{\underset{\text{Cl}}{\text{Si}}}-\text{Cl}_3$ ,  $\text{Cl}_3\text{SiC}=\overset{\text{C}}{\text{Si}}-\text{Cl}_3$ , and  $(\text{Cl}_3\text{Si})_4\text{C}$

could be isolated from the mixture of products. The following reaction mechanism is assumed:





The reports by USSR organosilicon chemists were given on the second and third days of the symposium. Papers that originated at a number of USSR laboratories conducting research on organosilicon compounds were presented by K. A. Andrianov, B. N. Dolgov, A. D. Petrov, and A. V. Topchiyev.

Acting in Andrianov's name and also representing his own institute (the Institute of Organoelemental Compounds at Moscow), A. A. Zhdanov presented two reports dealing with the synthesis of polyorganometalsiloxanes containing titanium, phosphorus, aluminum, and other metals. These reports are representative of a line of research on which Andrianov had concentrated during recent years and which he pursued intensively during that time. Interesting results pertaining to the action of different organic and inorganic acids and aldehydes on diethyldiethoxysilane and its mixtures with triethylethoxysilane, which leads to the formation of polydiethylsiloxane liquids, were reported in a paper by N. S. Leznov, L. A. Sabun, and K. A. Andrianov. D. N. Andreyev (Institute of Silicate Chemistry at Leningrad) reported data on the action of silent electric discharges on  $\text{CH}_3\text{SiCl}_3$  and  $(\text{CH}_3)_2\text{SiCl}_2$ . The products of condensation that are formed, viz.  $\text{Cl}_3\text{SiCH}_2\text{Si}(\text{Cl}_2)\text{CH}_2\text{SiCl}_3$ ,  $\text{Cl}_3\text{SiCH}_2\text{CH}_2\text{Si}(\text{Cl})_2\text{CH}_2\text{SiCl}_3$ ,  $\text{CH}_3\text{Si}(\text{Cl})_2\text{CH}_2\text{Si}(\text{Cl})_2\text{CH}_3$ , and others, were investigated in detail in the work described. The results obtained can be explained satisfactorily by assuming a radical chain mechanism of the reaction.

A detailed report by M. G. Voronkov (Institute of Silicate Chemistry, Leningrad) reported the development of two new methods for the synthesis of different alkylalkoxysilanes and siloxanes by the splitting of straight-chain and cyclic polysiloxanes with alkoxysilanes and halogenosilanes in the presence of nucleophilic reagents (KOH and others) and electrophilic reagents ( $\text{FeCl}_3$ ). The mechanisms of these two reactions were analyzed in detail in Voronkov's report. A paper by A. V. Topchiyev, N. S. Nametkin, T. I. Chernysheva, and S. G. Durgar'yan (Petroleum Institute of the Academy of Sciences USSR, Moscow) reported in detail new results obtained in the investigation of the addition of different alkyl-, aryl-, and chlorosiliconhydrides to allyl- and diallylsilanes, allyloxysilanes, allyl alcohol, dimethylethynylcarbinol, and other tertiary alcohols. Benzoyl peroxide and platinized carbon were used as catalysts.

Two reports from the Institute of Organic Chemistry (Moscow) were presented at the symposium. A report by A. D. Petrov, S. I. Sadykh-zade, and L. L. Shchukovskaya dealt with the synthesis and investigation of the properties of different acetylenic and dienic organosilicon compounds. V. A. Ponomarenko reported the results of work on the synthesis of a number of fluorinated organosilicon monomers such as  $\text{CH}_3\text{Si}(\text{Cl})_2\text{CF}_2\text{CF}_2\text{H}$ ,  $\text{CH}_3\text{Si}(\text{Cl})_2\text{CF}_2\text{CF}(\text{Cl})\text{H}$ ,  $\text{CH}_3\text{Si}(\text{Cl})_2\text{CH}_2\text{CF}_2\text{H}$ ,  $\text{RSi}(\text{Cl})_2\text{CH}_2\text{CH}_2\text{CH}_2\text{OCF}_2\text{CF}_2\text{H}$ ,  $\text{RSi}(\text{Cl})_2\text{CH}_2\text{CH}_2\text{CH}_2\text{OCF}_2\text{CF}(\text{Cl})\text{H}$ , etc., by the addition of silicon hydrides to unsaturated compounds containing fluorine in the presence of catalysts such as platinized carbon, platinized silicon dioxide, and  $\text{H}_2\text{PtCl}_6$ .

The symposium held at Dresden indicated that the scope of theoretical work, synthetic work, and applied investigations in the field of the organic and inorganic chemistry of silicon has expanded considerably in the GDR during recent years. The same applies to West Germany.

The visitors from the USSR and Czechoslovakia had the opportunity to familiarize themselves with the Institute of Silicone and Fluorocarbon Chemistry at Radebeul and with the industrial production of silicones at Nuenchritz. The principal task of the Institute of Silicone and Fluorocarbon Chemistry is the development of methods for the production of organosilicon compounds and fluoroorganic materials and their application in different fields of technology and industrial production. Approximately 210 scientists, engineers, laboratory assistants, workers, and auxiliary personnel are employed at the institute. Emphasis on work dealing with the solution of practical problems is typical for all laboratories of the institute, viz., those of direct synthesis, of silicone oils, silicone rubber, silicone resins, varnishes, and lacquers, fluoroorganic materials, the division of experimental installations, the analytical laboratory, and the laboratory of physical and physicochemical testing of polymers. Because of the work done at the institute, the production of silicones in the GDR (at Nuenchritz) became possible. The production in question involves the direct synthesis of methylchlorosilanes and the production of methylphenylsilicone lacquers, oils, lubricating greases, antifoam agents, waterproofing compounds, and other materials.

It is planned to expand the production of organosilicon materials considerably during the next few years. With this aim in view, the Institute of Silicone and Fluorocarbon Chemistry, at Radebeul and the industrial installation manufacturing silicones at Nuenchritz will be considerably expanded. The construction of new laboratories and plant departments has already begun.

"A Scientific Conference on Organosilicon Compounds at Dresden"  
by A. A. Zhdanov, Candidate of Chemical Sciences; Moscow, Vestnik Akademii Nauk SSSR, Vol 29, No 1, Jan 59, pp 115-117

A Scientific Conference [Symposium] on Organosilicon Compounds was conducted by the Society of German Chemists [German Chemical Society], 12-14 May 1958, at Dresden. Scientists from the GDR, West Germany, USSR, and Czechoslovakia participated in the conference.

In his introductory address R. Mueller (Dresden), director of the Institute of Silicone and Fluorocarbon Chemistry, pointed out the increasing scientific and technical importance of the class of chemical compounds with which the papers given at the conference were concerned. In another report presented by him at the conference, he discussed the principal characteristics of organosilicon compounds, which are related to the electropositive nature of the silicon atom.

F. Henglein (Karlsruhe, West Germany), G. Kohlschuetter (Darmstadt, West Germany), and V. Kuchen (Aachen, West Germany) gave reports at the conference. Henglein reported on the synthesis of polymers composed of metal-siloxane groupings containing lead or tin atoms and the synthesis of organoboron polymers (free of silicon) composed of boryl-formal groupings.

A number of papers presented at the conference dealt with the polycondensation of organosilicon monomers.

A paper by G. Schott and G. Berge (Rostock, GDR) described research on the polycondensation of diethylsilanediol and dibenzyl-, diphenyl, di-p-chlorophenyl -, and di-p-bromophenylsilanediols. As criteria for following the course of the reaction, the content of hydroxyl groups, the viscosity of the polymer that had formed, and the loss in weight during the polycondensation were used.

Interesting reports on the interaction of carbon tetrachloride with silicon, the etherification of phenylsilanetriol with diazomethane, the conversion of chloroalkylchlorosilanes to alkenylchlorosilanes, higher cyclic silanes, the preparation and properties of polysilanes, the coloration of silicon compounds, the structure of solid dioxodisiloxanes in the powdered state, some siloxanes composed of mono-, tri-, and tetrafunctional groupings, and practical applications of organosilicon compounds were also presented at the conference.

12. Some Scientific Work To Be Done Under the Current Seven-Year Plan and "Inzhenerno-Fizicheskiy Zhurnal"

"Soviet Science and the 21st Congress of the CPSU" (unsigned article); Minsk, Inzhenerno-Fizicheskiy Zhurnal, Vol 2, No 1, Jan 59, pp 3-5

Soviet scientists, designers, engineers, technologists, and workers bend every effort to fulfill the assignments of the May 1958 Plenary Session of the Central Committee CPSU concerning the acceleration of the development of the chemical industry with particular emphasis on synthetic

materials and products made of them. The use of new methods, particularly employment of radiation emitted by radioactive substances, opens up wide prospects for the chemical industry. Radioactive isotopes will bring about a revolution in the petroleum conversion industry; cracking of crude petroleum by radiation will become possible.

Many-sided mechanization and automation of production will require application of the latest scientific results in the fields of semiconductors and electronics. Research in these two fields is being conducted on an extensive scale in the USSR. Science and technology are faced with the task of developing artificially produced materials to be applied in all fields of technology. The new technology requires heat-resistant, lightweight, and mechanically strong noncorroding metals and alloys, heat-resistant plastics, and exceptionally strong fibers and fabrics for special applications.

At the Academy of Sciences Belorussian SSR work is being advanced in the fields of theoretical and experimental physics, mathematics, chemistry, nuclear engineering, automatics and computer techniques, metal physics, and biology.

To establish closer contacts between physicists on the one hand and engineers and designers on the other hand, a number of scientific and technical periodicals has been created, including Inzhenerno-Fizicheskiy Zhurnal, which covers developments in engineering physics on an all-union scale and has been published by the Academy of Sciences Belorussian SSR since January 1958.

The principal task of this periodical is to contribute to the most rapid introduction of the achievements of technical physics into practical engineering work. The first year of the publication of the periodical (1958) has shown that there is a great need for a journal of this type. Articles published in the journal gave information on work done at institutes of the Academy of Sciences USSR, academies of union republics, higher technical educational institutions, universities, specialized branch scientific research institutes, and plant laboratories, and on results obtained by production engineers active in different cities of the USSR. The principal scientific fields covered by the journal have crystallized. They comprise hydrodynamics, the theory of machines and mechanisms, heat transfer and mass transfer, transfer in dispersed media, the physics of combustion, the physics of semiconductors, thermodynamics, nuclear engineering, physico-chemical mechanics, technological processes, spectroscopy and spectral analysis, the physics of metals and alloys, equations of mathematical physics, and the theory of heat conduction. Two hundred twenty articles altogether were published during 1958. One of the characteristics of the journal is a many-sided treatment of scientific and technological problems. In addition to theoretical methods, engineering and technological methods of investigation receive considerable attention and results of tests carried out at semiplant installations are reported. Mutual exchange of results obtained at scientific research institutes and plant laboratories will contribute to further development of physics and technical progress in the principal branches of industry, as well as progress of the national economy as a whole.

Insecticides

13. New Organophosphorus Compounds Investigated

"New Organophosphorus Compounds for the Control of Harmful Eurygasters," by B. A. Arshnikov, Candidate of Biological Sciences, Ukrainian Scientific Research Institute for Plant Protection: Moscow, Zashchita Rasteniy ot Vreditel'ey i Bol-ezney, No 6, Nov-Dec 58, pp 39-40

Because of the extensive crop damage caused by Eurygasters and because of the inefficiency of 5.5% DDT dust and the high toxicity of metaphos (metaphos is toxic to warm-blooded animals and expensive) the Ukrainian Institute for Plant Protection has conducted investigations on a series of new preparations: a 60% concentrate of methylmercaptophos, a 30% concentrate of the thiono isomer of mercaptophos, technical chlorophos, a 64% concentrate of tetraethyldithiopyrophosphate, a 50% concentrate of vinly phosphate, a 30% wetting powder of metaphos, and others. Methylmercaptophos is less toxic to warm-blooded animals than mercaptophos, chlorophos, or DDT. Also, a 5% solution of a new organophosphorus insecticide, K-20-35, synthesized by the Institute of Organic Chemistry Academy of Sciences Ukrainian SSR, was investigated.

On the basis of these experiments, it was concluded that chlorophos, because of its low toxicity of warm-blooded animals and plants, comparatively high solubility in water, and good retention of toxicity in solutions, has great prospects for use against Eurygasters.

However, further study should be conducted with the thiono isomer of mercaptophos and methyl mercaptophos.

14. Insecticides Containing Aliphatic Nitro Groups

"Insecticides Containing Aliphatic Nitro Groups; Part II -- Some DDT Analogs," by C. Szantay and R. Soos, Department of Industrial Organic Chemistry, Budapest Technical University; Budapest, Magyar Kemiai Folyoirat, Vol 64, No 12, Dec 58, pp 470-471

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"Some DDT analogs containing aliphatic nitro groups were prepared. It was established that the activity of these derivatives as insecticides is practically independent of the nature of the halogen atoms substituted in the benzene nucleus. It was furthermore established that the nitroalcohols formed as intermediates in the synthesis of compounds of this type have a considerable insecticidal activity.

CPYRGHT

"The toxicity of Calandra oryzae of compounds of this class was investigated. Calandra oryzae is a pest that damages rice crops."

Isotopes

15. Hydrogen-Deuterium Exchange by Ion-Exchange Resins

"Investigation of the Hydrogen-Deuterium Exchange Reaction on Ion-Exchange Agents; Part I, Cation-Exchange Agents," by P. F. Csanyé, Department of Nuclear Physics, Central Physics Institute, Hungarian Academy of Sciences; Budapest, Magyar Kémiai Folyóirat, Vol 64, No 11, Nov 58, pp 417-428

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"Hydrogen-deuterium exchange on cation-exchange resins (Amberlite IR-120 and Amberlite IRC-50) in aqueous solutions of deuterium oxide was investigated as a function of the temperature, the  $p_H$ , and the grain size of the resin.

"The rate of exchange and the last remaining fraction of molar concentration of deuterium are greater in the case of the sulfonated resin (IR-120) than that of the carboxyl resin (IRC-50), although the ion exchange capacity of the latter is greater.

"At 20° there is no measurable exchange between deuterium oxide and hydrogen atoms of the cation-exchange resin. As the temperature increases, the magnitude of exchange becomes greater in the case of amberlite IR-120. In the case of amberlite IRC-50, there is an increase up to approximately 75°. After this, the quantity of deuterium exchanged drops because of damage to the resin. In the case of both resins, the exchange rate increases with the temperature. If the  $p_H$  of the aqueous solution of deuterium oxide is changed by addition of hydrochloric or sulfuric acid, the finally exchanged quantity grows in the case of amberlite IR-120 with reduction of the  $p_H$ , because exchange takes place between the acid and deuterium oxide. In the case of amberlite IRC-50, the capacity for exchange becomes smaller when the  $p_H$  is reduced, because under such conditions the dissociation of the carboxyl groups is suppressed. The rate of exchange is greater in the case of both resins in acidic as compared with neutral solutions.

"The separation coefficient is always smaller than unity in the case of carboxyl resins, presumably because of the formation of hydrogen bridges between the carboxyl groups of the resin and the water bound to the resin. A similar phenomenon has been observed in the case of the acetic acid-deuterium oxide system.

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"In the case of the sulfonated resin, apparent separation coefficients were found which are greater than unity. This can be explained by the fact that a part of the  $\text{RSO}_3\text{H}$  groups form  $\text{RSO}_3^- \text{OH}_3^+$  ion complexes. The formation of complexes of this type is suppressed at low temperatures and favored by increases in the temperature."

[For additional information on isotope chemistry, see Item No 51.]

Nuclear Fuels and Reactor Construction Materials

16. Thermodynamics of the Formation of Uranium Oxyhalides

"The Thermodynamics of the Formation of Solid Oxyhalides of Uranium From the Standpoint of the Substitution Principle; Part III," by S. A. Shchukarev, I. V. Vasil'kova, V. M. Drozdova, and N. S. Martynova; Moscow, Zhurnal Neorganicheskoy Khimii, Vol IV, No 1, Jan 59, pp 33-38

The enthalpy of the formation of uranium tetrabromide was determined more precisely; it was found to be equal to -214.9 kilocalories. The enthalpies of the formation of gaseous as well as solid oxychlorides and oxybromides of uranium were compared systematically. The fact that the enthalpies of formation of solid oxychlorides and oxides of uranium are very close to each other is brought into relation with the energies of condensation of the compounds in question. The large energy of condensation of the oxychlorides makes them stable and reduces their tendency toward dismutation.

17. The Heats of Formation of Hydrates of Uranyl Chloride and Uranyl Bromide

"The Determination of the Heats of Formation of  $\text{UO}_2\text{Cl}_2$  aq;  $\text{UO}_2\text{Br}_2$ -aq;  $\text{UO}_2\text{Cl}_2 \cdot \text{H}_2\text{O}$ ;  $\text{UO}_2\text{Cl}_2 \cdot 3\text{H}_2\text{O}$ ;  $\text{UO}_2\text{Br}_2 \cdot \text{H}_2\text{O}$ ; and  $\text{UO}_2\text{Br}_2 \cdot 3\text{H}_2\text{O}$ ," by S. A. Shchukarev, I. V. Vasil'kova, V. M. Drozdova, and K. Ye. Frantseva; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 1, Jan 59, pp 39-41

The heats of dissolution of anhydrous uranyl chloride, anhydrous uranyl bromide, and the mono- and trihydrates of these compounds in water at 25° C and at infinite dilution were determined. The heats of formation of  $\text{UO}_2\text{Cl}_2$ -aq;  $\text{UO}_2\text{Br}_2$ -aq;  $\text{UO}_2\text{Cl}_2 \cdot \text{H}_2\text{O}$ ;  $\text{UO}_2\text{Cl}_2 \cdot 3\text{H}_2\text{O}$ ;  $\text{UO}_2\text{Br}_2 \cdot \text{H}_2\text{O}$ ; and  $\text{UO}_2\text{Br}_2 \cdot 3\text{H}_2\text{O}$  were calculated.

18. The System Uranyl Sulfite - Ammonium Sulfite - Water

"Investigation of the System  $UO_2 SO_3 - (NH_4)_2 SO_3 - H_2 O$  by the Solubility Method," by A. Ye. Klygin and N. S. Kolyada; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 1, Jan 59, pp 239-242

The solubilities of uranyl sulfite in solutions of ammonium sulfite of different concentrations were determined at 25°. The solubility product of uranyl sulfite at 25° and the over-all dissociation constant of the  $U O_2 (S O_3)_2^{2-}$  ion were calculated.

19. The Colored Complex Compounds of Some Rare-Earth Elements With Alizarin S and Aluminon

"Investigation of Colored Complexes of Some Rare-Earth Elements," by L. S. Serdyuk and G. P. Fedorova; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 1, Jan 59, pp 88-96

The reactions of the formation of colored complex compounds of lanthanum, cerium, and yttrium with Alizarin S and aluminon were investigated from the standpoint of applications in the colorimetric determination of the elements in question.

20. The Reaction of Zirconium With Morin

"Investigation of the Zirconium-Morin Complex; Photometric Determination of Zirconium," by A. Schneer and T. Halmos, Institute of General and Inorganic Chemistry, Lorand Eotvos University of Science; Budapest, Magyar Kemiai Folyoirat, Vol 64, No 10, Oct 58, pp 371-376

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"The properties of the complex compound formed by zirconium with morin were investigated. This compound is light-yellow, emits a green fluorescence in ultraviolet light, is readily soluble in water containing alcohol, and is stable in acidic solutions. It contains the two components in the molar ratio of 1:1. The apparent dissociation constant of the complex was calculated on the basis of a Job curve and found to have the value  $K_d = 2.6 \times 10^{-5}$ . This complex compound is suitable for the photometric determination of small quantities of zirconium. The optimum conditions for this determination were established."



21. Separation of Niobium, Titanium, and Tantalum

"Purification of Tantalum from Admixtures of Niobium and Titanium by the Ion-Exchange Method; Part 2," by the O. V. Al'tshuler and Ye. A. Subbotina; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 1, Jan 59, pp 28-32

The kinetics and equilibrium of the adsorption of tantalum from hydrochloric acid solutions on EDE-10 and AN-2F anion-exchange resins have been investigated.

The small retention capacity of the resins for tantalum, the absence of an exchange of tantalum for other ions present in solution, and the absence of isotopic exchange between adsorbed and dissolved tantalum indicate that the adsorption of this element from concentrated hydrochloric acid solutions is not of the ion-exchange type. A method is proposed for the purification of tantalum from admixtures of niobium, titanium, and other elements which form complex anions in hydrochloric acid solutions. This method is based on the difference between the mechanism of adsorption of these admixtures and the mechanism of adsorption of tantalum by anion-exchange resins. By using the method in question, tantalum was obtained which had a content of niobium amounting to 0.009% and a content of titanium lower than 0.05%.

It was established that, in connection with the purification of niobium from titanium with the use of a method proposed earlier by the authors of this article, the content of tantalum in niobium can be lowered by one order of magnitude. Niobium was thus obtained which contained approximately 0.040% of tantalum.

[For additional information on nuclear fuels and reactor construction materials, see Item No 64.]

Physical Chemistry

22. Recent Progress in Colloid Chemistry

"New Ways of the Development of Colloid Chemistry," by Academician V. N. Rebinder; Moscow, Vestnik Akademii Nauk SSSR, Vol 29, No 1, Jan 59, pp 44-51

Colloid chemistry has become of especial importance from the economic standpoint, because it deals with the physicochemical characteristics of materials used in the new technology, i.e., construction materials for different purposes, ceramics, metal ceramics, glass ceramics, fine-grained mechanically strong and heat-resistant metals and alloys, and materials consisting of high-molecular compounds.

At present it is possible to bring about continuous transitions from lyophobic to lyophilic systems, which is not only of interest from the scientific standpoint, but is also of great practical importance. Structurization phenomena consisting of the formation of spatial agglomerates, thickening, formation of gels, or complete solidification of systems which initially had a liquid consistency is typical for the intermediate stages which arise during these transitions. This makes it possible to obtain within an extensive range between ordinary liquids and solids technically important materials which possess predetermined structural and mechanical characteristics with respect to viscosity, elasticity, plasticity, and mechanical strength. Among those materials one may mention lubricating greases, structured and compacted clay soils, ceramics, metal ceramics, crystallized glasses (glass ceramics), various structural materials, and finely crystalline (i.e., highly disperse) metals and alloys. The theory of structure formation is at present the most important subdivision of a new border-line field of science, i.e., physicochemical mechanics.

The radical changes which took place recently in the science of dispersed systems and the major advances achieved in all its principal subdivisions have received a clear expression in the papers presented at the Fourth All-Union Conference on Colloid Chemistry that was held 13-16 May 1958 at Tbilisi. This conference was conducted by the Department of Chemical Sciences, Academy of Sciences USSR, together with the Academy of Sciences Georgian SSR. At this conference E. M. Natanson (Kiev) gave a paper in which he characterized the present-day state of research on colloidal metals. Natanson demonstrated that highly stable concentrated organosols of metals can form only when there is structure formation not only in the total volume of the dispersion medium, but also in the surface layers.

Reports by L. Ya. Kremnev and A. B. Taubman presented ideas which confirmed P. A. Rebinder and E. M. Natanson's concepts in regard to the role played by the structural mechanical barrier as a factor that assures a practically complete stabilization of dispersed systems. V. G. Levich proved on theoretical grounds that the high viscosity of protective films formed by stabilizers is insufficient for the prevention of coagulation of particles: a still stronger stabilizing effect is produced by the elastic network close to the surface of the particles.

A very interesting discussion took place on the problem of stability and factors producing stability. The following conclusions can be drawn on the basis of this discussion. The electrical charge of particles and the diffuse double layer of ions exert a sufficient stabilizing effect only in dilute disperse systems, i.e., suspensions and sols. The electric effects do not suffice for bringing about stabilization of concentrated dispersions: a structural mechanical barrier must form which exerts a strong stabilizing effect that under limiting conditions consists of the structurization of the total volume of the dispersion medium with the result that a condition is brought about which may be described as fixation or freezing of the whole system in its initial state. As an example, one may mention the highly stable foams used for extinguishing fires. They can be produced only with the aid of structure-forming stabilizers, namely surface-active substances which function as foam-forming agents that exert an action typical for the second type of soaps and soap-like substances with the result that formation of colloidal structures is brought about, primarily in the surface (adsorption) layer. Still more highly stabilized foams give rise to solid porous materials, e.g., foam plastics, porous concrete, etc., which are used for heat insulation and sound insulation and as materials that float because of their low specific weight.

[For additional information on physical chemistry, see Item No 7.]

#### Radiation Chemistry

23. Work on Isotopes and Radiation Chemistry at the Institute of Nuclear Physics, Academy of Sciences Uzbek SSR

"At the Institute of Nuclear Physics, Academy of Sciences Uzbek SSR," by V. P.; Moscow, Atomnaya Energiya, Vol 6, No 1, Jan 59, pp 79-80

At the Institute of Nuclear Physics of the Academy of Sciences Uzbek SSR, which was founded in 1956, research is being done on problems pertaining to peaceful uses of nuclear energy. The work done there includes research on fundamental nuclear physics. Investigations are also conducted

on the application of radioactive isotopes and penetrating radiation in various industrial fields, specifically in connection with the automatization of industrial processes. Work on radiation-induced processes in solids and liquids includes research on the action of gamma rays on silk, cotton, and cottonseeds.

As far as work on the application of radioactive isotopes in control devices is concerned, an investigation is being conducted on the automatization of a two-stage process for the disintegration and classification of sulfide ores at the Altyn-Topkansk Polymetal Combine. A device for the application in question has been designed by S. A. Azimov, M. Yu. Borukhov, and A. L. Lebedev. Furthermore, a standard [multipurpose] device is being developed for use at installations, the operation of which can be controlled with the aid of radioactive isotopes.

A group of scientists is conducting work on devices for the determination of the density and humidity of subsoils at great depths on the basis of the absorption and dispersion of gamma radiation emitted by radioactive isotopes. An improved device for measuring density with the aid of gamma rays has been developed at the institute. The margin of error in measurements of this type has been reduced to 1.5%.

Jointly with the Institute of Water Problems and Hydrotechnology of the Academy of Sciences Uzbek SSR, the Institute of Nuclear Physics is engaged in the solution of a number of problems connected with the development of Golodnaya Step' [the Hungry Steppe]. Among the problems investigated are those pertaining to the dynamics of subsoil waters, the control of the compacting of slopes of canal banks, and the diffusion of water and saline solutions through porous materials.

At the Laboratory of Radiogeology work is being conducted on the application of activation analysis for the determination of the content of dispersed elements in rocks.

At the Laboratory for the Application in Metal Physics of Radiation Emitted by Radioactive Substances a stereoscopic gamma-ray installation is being developed for the testing of metals. This laboratory extends help to a number of Tashkent enterprises as far as practical applications of isotopes and radiation in the industry are concerned.

All the investigations mentioned above are being conducted at the Division of Technology of the Institute of Nuclear Physics. At the Division of Nuclear Physics, work is being done on neutron physics, nuclear reactions, electronics, mass spectroscopy, radiation physics, and radiation chemistry. Work in the fields of radiation physics and radiation chemistry is done with the use of a cobalt installation equipped with a radiation source that has an activity of 4,000 curies. In collaboration with the Institute of the Silk Industry and the Physicotechnical Institute of the Academy of Sciences Uzbek SSR, research has been conducted on the killing of silkworm pupa and preservation of silkworm cocoons with gamma rays. It was demonstrated that it is possible to kill silkworm pupa in the cocoons with gamma rays. The effect of gamma rays on the mechanical characteristics and mechanical strength of natural silk was investigated. Similar investigations are being conducted on cotton fibers.

Work is being done on the action exerted by gamma rays on the adsorption properties of solids, the electrical conductivity of semiconductors, carbohydrates in aqueous solutions, etc. After a research reactor has been started at the institute, work will be done on neutron physics, nuclear reactions, and activation analysis. The nuclear reactor will be used for the production of radioactive isotopes, primarily those with a short half-life which are needed for applications at scientific research institutes and industrial enterprises of Central Asia.

#### Miscellaneous

24. Institute of Petrochemical Synthesis Organized Under Academy of Sciences USSR

"On the Organization of the Institute of Petrochemical Synthesis" (unsigned article); Moscow, Vestnik Akademii Nauk SSSR, No 1, Jan 59, p 123

The Presidium of the Academy of Sciences USSR has decreed that an Institute of Petrochemical Synthesis (Institute Neftekhimicheskogo Sintez) be organized within the system of the Department of Chemical Sciences of the Academy. The institute will have ten laboratories and a special design bureau. Academician A. V. Topchiyev has been named director of the institute, which will do research on polymer materials and on the development of new methods for synthesizing polyolefins.

With the organization of the Institute of Petrochemical Synthesis, the Institute of Petroleum under the Department of Technical Sciences, Academy of Sciences USSR, has been abolished.

25. New Chemistry Planning Institute Organized Under Armenian Sovnarkhoz

"New Scientific Research Institute" (unsigned article); Yerevan, Kommunist, 11 Nov 58

A new Scientific Research Planning Institute of Chemistry (Nauchno-Issledovatel'skiy Proyektnyy Institut Khimii) has been organized under the Armenian Sovnarkhoz in Kirovakan. Its director, E. Ter-Gazaryan, Candidate of Technical Sciences, points out that the institute will be responsible for the planning and cost estimation of new chemical production in the Armenian SSR.

26. Chemicometallurgical Institute Organized in Karaganda, Kazakh SSR

"Karaganda Chemicometallurgical Institute" (unsigned article); Moscow, Vestnik Akademii Nauk SSSR, No 1, Jan 59, p 84

The Karaganda Chemicometallurgical Institute (Karagandinskiy Khimiko-Metallurgicheskiy Institut) has been organized under the Academy of Sciences Kazakh SSR. The institute will include 17 laboratories and several divisions, which were previously under the Scientific Research Coal Institute, one of which is the Division of Ore and Coal Dressing.

The principal tasks of the institute will be the study of the natural resources of the Karagandinskiy, Kustanayskiy, and Severo-Kazakhstanskiy economic rayons, and to work out complex methods of utilizing them in the national economy.

III. EARTH SCIENCES

27. Future Improvements in the Seismological Service in the USSR

"On the Improvement of the Seismological Service and the Development of Scientific Research on Seismology" (unsigned article); Moscow, Vestnik Akademii Nauk SSSR, No 1, Jan 59, p 122

A report on the status of seismological service and the future development of scientific research on earthquakes and seismic regionalization of the USSR was discussed at a meeting of the Presidium of the Academy of Sciences USSR. The report was a joint product of the Institute of Physics of the Earth and the Council on Seismology of the Academy of Sciences USSR. As pointed out in the report, the network of seismological stations and the work in general on seismology has improved and has resulted in the publication of an Atlas Seysmichnosti SSR (Seismicity Atlas of the USSR); and, in addition, the Central Seismological Station in Moscow has systematically and continually issued information on all major earthquakes.

The report indicated that certain shortcomings exist in the organization and development of the work on seismology and in seismological stations. Research on certain problems is not sufficiently carried out and the time taken for completing specific tasks in this field is too great.

The Presidium has required the Council for Seismology to present a prospectus on the organization of a uniform seismological service in the USSR and, together with the Siberian Branch of the Academy of Sciences USSR, to develop a general plan on establishing new seismological stations during 1959-1960 in the Far East and the Baykal and Altay Mountain areas, and also a proposal for developing seismological research in Siberia.

The Presidium has recommended as necessary the establishment in the next 5-7 years, within the territory of the USSR, some four or five geophysical (seismological) observatories fully equipped with high-precision instruments.

The Institute of Physics of the Earth was required to expedite work on new methods of seismological regionalization and to improve work on the production of automatically controlled stations and more precise systems of seismic instruments for registering the intensity of earthquakes and shocks.

28. Institute of Geology and Mining of Mineral Fuels, Academy of Sciences USSR, Is Organized

"On the Organization of the Institute of Geology and Mining of Mineral Fuels" (unsigned article); Moscow, Vestnik Akademii Nauk SSSR, No 1, Jan 59, p 123

The Institute of Geology and Mining of Mineral Fuels (Institut Geologii i Razrabotki Goryuchikh Iskopayemykh) has been organized under the Department of Geologicogeographical Sciences, Academy of Sciences USSR, on the basis of corresponding laboratories of the Institute of Mineral Fuels and the former Institute of Petroleum, Academy of Sciences USSR. The institute will have 20 laboratories and will direct the activities of the Complex Southern Geological Expedition. The director of the institute is M. F. Mirchink, Corresponding Member of the Academy of Sciences USSR.

The institute will work on the development of new and improved methods of prospecting for petroleum and gas, and methods of the intensification in petroleum and natural gas production.



IV. ELECTRONICS

Communications

29. Signal Entropy in One-Dimensional Distribution

"Evaluation of Entropy in One-Dimensional Distribution as Represented by Several Empiric Instances," by G. B. Linkovskiy, Institute of Radio Engineering and Electronics, Academy of Sciences USSR; Moscow, Nauchnyye Doklady Vysshey Shkoly, Radiotekhnika i Elektronika, No 2, 1958, pp 3-6

A statistical evaluation of the maximum "differential entropy" for the case of one-dimensional distribution with assigned empiric instances, is presented in the article. The Kramer theory of asymptotic normalcy of random magnitude was applied to the analysis of the specific case.

30. Problems in Pulse Coincidence

"Quantitative Relationship for Coincidence of Pulses," by N. M. Sedyakin, Leningrad Air Force Engineering Academy imeni A. F. Mozhayskiy, Moscow, Nauchnyye Doklady Vysshey Shkoly, Radiotekhnika i Elektronika, No 1, 1958, pp 90-95

The problem of pulse coincidence is encountered in many fields of physics, radio engineering and electronics. General solution of the pulse coincidence problem is derived in this article. Quantitative relationship, characterizing the process of pulse coincidence, is found in exact form for a random number of pulses of various duration and repetition rate.

The information thus derived can find application in testing of equipment, evaluating pulse interference, in the search for radio signals, etc.

Components

31. Variable Band-Pass Discriminator

"Discriminator With Variable Band-Pass," by V. P. Demin, Chair of Theoretical Basis of Radio Engineering, Moscow Aviation Institute; Moscow, Nauchnyye Doklady Vysshey Shkoly, Radiotekhnika i Elektronika, No 2, 1958, pp 187-193

The article discusses the possibility of constructing a variable band-pass discriminator which utilizes the principle of detuned circuits. Changes in the band-pass width and sharpness of discrimination are accomplished by adjusting the discriminator circuit capacitance. The electronically controlled capacitance of the n-p semiconductor junction is utilized in this circuit.

An experimental investigation was conducted with discriminators incorporating capacitance elements in the form of DG-Ts22, DG-Ts24, DG-Ts27, P6A, and F6B semiconductor diodes and transistors at a rated frequency of 30 Mc.

The experiment has confirmed the feasibility of such a variable band-pass discriminator.

32. Phase Modulation Applied to Measurement of Nonelectric Values

"Application of Phase Modulation to Measuring Technique of Nonelectric Values," by V. I. Ivanov, Moscow Aviation Institute imeni S. Ordzhonikidze; Minsk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Energetika, No 11, Nov 58, pp 52-57

The phase-modulation method, based on conversion of phase-modulation signal to amplitude-modulated signal with high-percentage modulation, is finding useful application in measurement of nonelectric values. Theoretical postulates for the validity of this method, as well as a practical circuit with a capacitive pick-up unit, are presented in this article. The measuring circuit consists of a passive four-terminal network, in which a parametric pick-up unit is incorporated. High-frequency voltage from a stabilized oscillator is fed to input of the circuit. Best results are obtained when tubes with high amplification factor are used, such as 6N9 and 6N2P. The amplifier section of the device utilizes a differential amplifier, which automatically compensates for the voltage fluctuation of the power supply, thus assuring high accuracy of measurements. The final stage is assembled on the principle of a balanced bridge circuit with a cathode follower, which possesses high linearity and high current amplification. The balanced bridge incorporates 6N7 and 6Zh4 triodes and an electromagnetic oscillograph MPO-2.

It should be noted that the described method can be applied to measurement of small periodic phase changes in electric oscillations, but not exceeding one angular minute. Relative to the latter problem, notable research was carried out at the Gor'kiy Polytechnic Institute.

33. Germanium Power Transistor

"Powerful Germanium Transistor," by A. V. Krasilov, A. B. Polyanov, and Ye. S. Saltykova; Moscow, Elektrichestvo, No 1, Jan 59, pp 72-75

The newly developed 207 type germanium power transistor has expanded the field of their application to the control of power above one kw. Cold welding was utilized in the manufacture of this device to obtain the hermetic seal so essential to the stability of transistor operation. These transistors can operate on current as high as 20 a, which was made possible through the use of large emitter area ( $0.5 \text{ cm}^2$ ), more efficient emitter alloys, and annular construction of the emitter. The transconductance of this transistor varies from 25 to 40 a/v. The input impedance for conditions of a grounded emitter is about 0.5 ohms. This transistor operates satisfactorily up to a frequency of 15 kc.

The 207 power transistor can be utilized in various radio-engineering circuits and electrical devices. It can also be used as a contactless switch, as a voltage regulator and as an ultrasonic generator component.

34. Silicon Junction Diodes

"Silicon Junction Diodes," by G. A. Zilikman, Ya. S. Levenberg, I. P. Lukashova, Yu. I. Sidorov, and S. V. Fronk, Moscow, Elektrichestvo, No 1, Jan 59, pp 64-68

Silicon junction diodes possess the following advantages over the germanium type: low reverse current, high rectification factor, efficient operation at temperatures above  $100^\circ\text{C}$ , ease of series connection, stable operation in the region near a breakdown. The fusion method for preparation of silicon diodes is most widely used at present.

The article discusses the technology of preparation of the D202 and D205 silicon diodes by method of fusion of aluminum with the n-type silicon. A gold-antimony (1% Sb) alloy, in which the antimony acts as the donor, is used to obtain nonrectifying contact and electrode.

The parameters of the D202, D203, D204, and D205 silicon diodes are as follows, respectively: reverse voltage, 100, 200, 300 and 400 v; reverse current, 0.5, 0.5, 0.5 and 0.5 milliamps; rectified current, 400, 400, 400 and 400 milliamp; direct voltage drop, 1.0, 1.0, 1.0 and 1.0 v.

It is believed that in the near future it will be possible to build diodes for 1,000 v reverse voltage, rectifier piles to sustain voltage of several tens of kilowatts, power diodes for current of several tens of ampere, and diodes of very small reverse current and high operating frequency.

35. Development of New Vacuum Components in USSR

"To Improve the Products of the Electrovacuum Industry," by N. V. Zaryanov; Moscow, Vestnik Svyazi, No 1, Jan 59, p 11

The article contains the following passages:

"The further development of multichannel radio-relay lines of communications, which are the most economical means for long-distance transmission of TV and hundreds of telephone channels, will require further improvement of existing and development of new radio tubes with high factor of merit and increased life-time (10,000 - 20,000 hrs). This will be especially important because intermediate points on radio-relay lines of communications, in most cases, will be unattended. The service life of a traveling-wave tube used in radio-relay equipment, should be not less than 10,000 hrs. In such tubes it is expedient to utilize electrostatic focusing of the electron beam or focusing with the aid of permanent magnet.

"At powerful wire-broadcasting centers and at radio broadcasting stations, a shortage is experienced in good modulator tubes of 0.5, 1.0, 10 and 20 kw capacity. The electrovacuum industry must develop a series of high-quality modulator tubes with forced air cooling for new transmitters and with water cooling for modernizing the transmitters of older series.

"The urgent problem at present is the development of 3, 25, and 50 kw beam tetrodes with activated cathode and forced air cooling. The development of power metallo-ceramic tetrodes with forced air and water cooling of 5 kw capacity and above, for operation at frequencies of 300-500 and 1,000 Mc and to be used in TV transmitters, should be continued."

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36. Semiconductor Attenuators

"Attenuator Loads Made of Semiconductor Ceramics," by Ya. I. Panova, Leningrad Electrotechnical Institute; Kiev, Izvestiya Vysshikh Uchebnykh Zavedeniy, Radiotekhnika, No 3, May-Jun 58, pp 329-336

The article discusses the characteristics and technology of preparation of silicon carbide-porcelain wave-guide attenuators. A high level of power is maintained in the wave guide when the attenuating lining is hermetically sealed to the metallic walls of the wave guide.

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"One of the most important problems of the day is the development and manufacturing of wave guide load resistors which can handle power of the order of one kilowatt or greater, and power of several megawatts in the pulse. For such a case, a large amount of attenuator material has to be used; thus the "volume" type attenuator material is useful. The requirements for matching such loads, generally, are not very strict (the voltage traveling-wave ratio within the operating frequency range can be up to 1.1), but other requirements are imposed such as high dielectric strength at UHF, thermal stability, stability of parameters for continuous operation, ruggedness, and thermal shock resistance.

"During the past several years, the Chair of Dielectrics and Semiconductors, Leningrad Electrical Engineering Institute has been engaged in developing terminating wave-guide attenuators made from semiconductor material or semiconductor magnesium ceramics."

High grade attenuators were manufactured from a mixture of black silicon carbide and UF-46 grade porcelain by means of powder technology.

37. Injection Effect in Transistors

"The Injection Effect of Minority Carriers on Input Impedance of 'Channel' Transistors," by Z. A. Zubritskiy; Khar'kov State University, Kiev, Izvestiya Vysshikh Uchebnykh Zavedeniy, Radiotekhnika, No 4, Jul-Aug 58, pp 445-450

In "channel" (field-effect) transistors current control is effected with the aid of an electric field. Such an electric field regulates the width of the space-charge channel in which the current carriers are drifting. The application of an electric field to control the current permits a very high input impedance in such transistors.

On the basis of this study, it was concluded that the role of minority carriers in the transistor channel is very pronounced, thus to a greater degree determining the channel characteristics of the transistor, as well as the input impedance and thermal stability. From the standpoint of behavior of minority carriers, the "channel" type transistors can be divided into two basic classes: the oscillatory type, with heavy injection of minority carriers caused by the drain, and the amplifying type, in which all measures are taken to reduce the concentration of minor carriers. Both types of these transistors have their own advantages and disadvantages which determine their field of application.

38. New Television Receiver "Yubiley"

"Television Receiver 'Yubiley'" (unsigned article); Moscow, Vestnik Svyazi, No 1, Jan 59, cover page

The Radio Engineering Industry has developed the small size television receiver, the "Yubiley." The set is designed for reception on twelve channels. The set has 13 miniature tubes; its sensitivity is 275 microvolts. The screen size is 350 x 250 mm.

The power supply can be drawn from an a.c line of 110, 127 or 220 v. The set consumes about 125 w of power.

39. New Soviet Standard Signal Generator

"Standard Signal Generator GSS-28m" (unsigned article); Moscow, Vestnik Svyazi, No 1, Jan 59, cover page

The GSS-28m generator of standard signals is intended for testing of receiving sets, antennas, and other kinds of radio equipment. It generates superhigh frequencies calibrated with respect to frequency, power, modulation frequency band, pulse duration, and pulse repetition rate.

The frequency range of the generator is from 3,750 to 7,500 Mc, and the frequency deviation does not exceed  $\pm 2\%$  of the scale value. The output of the generator is 10 milliwatts on the milliwatt output and from 10 to  $2 \cdot 10^{-6}$  microwatts on the microwatt output.

The power supply can be drawn from 110, 127 or 220 v ac line. Power consumption is about 300 voltamperes.

40. Theory of Noisy Quadrupole

"A Contribution to the Theory of Noisy Quadrupoles," by R. Paul, Werk fuer Bauelemente der Nachrichtentechnik, Teltow; Berlin, Nachrichtentechnik, No 12, Dec 58, pp 548-568

After a general treatment of the noisy quadrupole, characteristic noise values are given, from which the noise figure can be compiled. For junction transistors in the audio range and thermal noise values of networks, noise values are obtained, preferably by means of measurements in the case of transistors, but by means of computation from the signal parameters in the case of the thermal noise value of networks. The noise figure is discussed in detail. With a certain dimensioning of the signal generator, the noise figure has an absolute minimum.

The second part of the article considers the noise component in the circuit. The circuit can influence the noise figure in various ways. General transformation equations are given for the calculation of any desired circuits. Reactance noise and thermal noise are treated separately. Possible reductions of the noise figure are given, and simple examples of thermal noise values of networks are compiled in a table.

The third part treats circuitry. The noise behavior of a single stage, reactance feed-back transistor amplifier is discussed, as is its behavior with feedback via an ohmic resistance. Whereas, in the first case, the noise figure drops, in the latter case it rises. The matching of noise and output can coincide in the case of the grounded base circuit, but they are connected with a decrease of signal amplification.

Computers and Automation

41. High-Accuracy Multiplier

"Precision Multiplier Unit," by L. N. Fitsner; Moscow, Avtomatika i Telemekhanika, No 1, Jan 59, pp 62-69

The article describes the circuit of a high-accuracy multiplier suggested by A. A. Fel'dbaum and the author, which is much simpler and more easily adjustable than the circuits in American practice.

This high-accuracy multiplier circuit consists of voltage dividing unit, "coarse" system, "fine" system, and the adder unit. The input voltage to the voltage dividing unit is split into two parts, the main and auxiliary. The main voltage component is fed to the "coarse" system and auxiliary to the "fine" system. The outputs of the "coarse" and "fine" systems are mixed in the adder unit. The transient processes of the circuit require about 3-5 millisecc. The accuracy of the multiplier is about 0.01-0.02 % of the output voltage scale.

42. Multifrequency Telemetry

"Pulse Multifrequency Telemetry Devices," by F. A. Katkov; Moscow, Avtomatika i Telemekhanika, No 1, Jan 59, pp 54-61

In multifrequency telemetry and telesignaling systems using electromechanical relays operating in a narrow frequency band of two to three cycles, high stability electromechanical vibrators should be used. The frequency band occupied by the described telemetry-telesignaling system is only 200 cycles, allowing assumption of a low level of interference in the course of the design of the circuit.

A universal chart is given for determination of frequency in the multifrequency signal depending on required number of commands and the operating frequency. In this telemetry system sampling for the conditions of the components can be carried out periodically with the aid of a specially programmed switch.

The described telemetry-telesignaling system can find application in automatic control of many industrial processes. Another urgent problem is the development of multifrequency contactless telemetry-telesignaling systems.

43. Slot Hydrointegrators

"Slot Hydrointegrators," by L. V. Kuz'menko, Laboratory of Hydrogeological Problems, Academy of Sciences USSR; Moscow, Nauchnyye Doklady Vysshey Shkoly, Elektromekhanika i Avtomatika, No 2, 1958, pp 85-93

A hydrointegrator for the analysis of various engineering problems has been recently developed and described in patents (authorship certificates No 734629 and No 856493). In this integrator, the analogy between the flow of heat, for example, and the motion of viscous fluid in a narrow slot is utilized. The basic components of the instrument are two closely spaced, parallel plates. In the slot between the two plates, is placed the examined model and a laminar-flow fluid is circulated. One of the plates has a highly polished surface and is rigidly mounted in a metal frame. The size of the polished surface is 65 x 150 cm. The other surface is formed by a plastic material spread over a plate. A rough metal net is firmly fixed to the plate to hold securely the plastic material. The motion of the fluid between the plates can be observed through a glass window. The model in question is cut from the attached plastic material.



The device consists of the following basic components: the frame, fixed plate, movable plate with a layer of paraffin, mechanism for lifting and lowering the movable plate, tanks for the fluid and piping for bringing the fluid to the slot. This hydrointegrator also has a device for simulating heat capacity and heat transfer. By admitting dye through the slot the direction of lines of flow simulating the heat flow are observed and photographed.

The low cost (9,000 rubles) of the instrument, speed with which problems can be solved, ease of observation, possibility of studying nonstationary processes are the main advantages of the hydrointegrator.

#### 44. Ferrite Elements Used in Output Unit

"Output Unit on Magnetic (Ferrite) Elements for a Universal Digital Computer," by Yu. A. Makhmudov; Baku, Izvestiya Akademii Nauk Azerbaydzhanskoy SSR, Seriya Fiziko-Tekhnicheskikh i Khimicheskikh Nauk, No 6, Jun 58, pp 23-37

The results of calculations on a computer are given at the output unit. An output unit consists of a printer and a control circuit. At present, the ST-35 telegraph gear is employed in a number of printers. Its application permits the simultaneous punching of the results on perforated tape while the results are printed. In this manner, information may be read into the computer again, if it is necessary for the solution of other problems.

It is possible to print the results of a calculation from the arithmetical, as well as from the storage, unit of the computer. In particular, the output unit may be employed for the verification of the prepared blocks of the fixed storage unit. The results of the calculations are printed in the decimal number system.

The central control unit of the computer guarantees the simultaneous functioning of the printer with the block of the arithmetic unit. That is, if after the command, in which there is reference to output, there follows a second command in which there is no reference to output, the latter is performed in the computer. However, if there is reference to output in the next command, then the latter command may not be performed. This command is stored in the command analyzer, UAK, until the printing of the preceding command has been completed. Only then is the next command, stored in the analyzer, performed. Such a control permits the simultaneous performance of other operations with the printing of the results.

The simultaneous operation of the printer and blocks of the arithmetic unit is possible due to the fact translation of numbers from the binary to the decimal system is performed by a special circuit built in the output. For this reason, arithmetic blocks are not required during translation.

Interaction of the Individual Assemblies of the Output Unit:

The output unit consists of the following assemblies:

1. Binary-to-binary-decimal-code converter
2. Binary-decimal-to-ST-35-code converter
3. Input distributor of the digits of a number
4. Circuit of the number storage
5. Local program pickup
6. Pickup for coded pulses
7. Converter for one digit coded pulses
8. Output distributor of number digits
9. Output assembly

As was mentioned above, the results of the calculations is printed in the decimal system. Inasmuch as the result is obtained in the binary system after calculations in the computer, it is necessary to translate the binary number into a decimal number.

In view of the fact that the ST-35 is used as a printer, it is necessary to translate the results of the calculation into the code of the ST-35 before printing. Immediate transfer from the binary system to the ST-35 code is impossible. For that reason, the result is translated from the binary code into the binary-decimal code at the beginning. After this, the binary-decimal code of a number is fed at the second translator, where it is translated into the code of the ST-35. The translator from the binary-decimal code to the ST-35 code only translates one decimal digit at a time. The decimal digits of a number are obtained one after the other, beginning with that of the highest order at the output of the binary-to-binary-decimal-code translator. An input distributor is used for distribution of the digits of a number according to their weight. The digits of a number, expressed in ST-35 code, are successively obtained at the output of the binary-decimal-to-ST-35-code translator. The output distributor arranges them in the chart of the stored number according to their weights.

With feeding of the number at the binary-to-binary-decimal translator, a starting impulse is supplied at the input of the local program pickup. After this, the pickup generates the controlling pulses necessary for the functioning of all the assemblies of the output device.

The coded pulse pickup generates the unique pulses corresponding to the coded pulses of the ST-35 arranged according to time. These unique pulses are fed at the input of the switch for coded pulses of one digit, where they are transformed into a series of pulses.

### Electromagnetic Wave Propagation

#### 45. Characteristics of Corrugated Wave Guide

"Study of Electron Bunches in Corrugated Wave Guides," by V. N. Parygin and R. E. Shikhlinskaya, Chair of Theory of Oscillations, Physics Faculty, Moscow State University; Moscow, Nauchnyye Doklady Vysshey Shkoly, Radiotekhnika i Elektronika, No 2, 1958, pp 66-73

The article discusses excitation of a corrugated-wall wave guide in case of uniform motion of electron bunches along the wave guide axis. The solution of the problem of corrugated wave guide excitation was carried out with the aid of a perturbation method, when the depth of corrugations were small compared to the length and other linear dimensions of the wave guide. In such a case, an interaction between electron flow and first spatial harmonic (direct or reverse) of the unretarded wave takes place.

Electron frequency multipliers, utilizing separately formed electron bunches in their transit through a wave guide with corrugated walls, were examined experimentally.

Several tubes are described which can serve as a basis for the construction of narrow-band and wide-band frequency multipliers in the millimeter-wave range.

#### 46. Wave Guide Delay System

"Periodic-Structure Delay System with Contactless Plates," by D. I. Voskresenskiy, R. A. Granovskaya, L. N. Deryugin, Ye. D. Naumenko and N. V. Trunova; Kiev, Izvestiya Vysshikh Uchebnykh Zavedeniy, Radiotekhnika, No 4, Jul-Aug 58, pp 480-489

An analysis is given of a delay system appearing in the form of a rectangular wave guide with two rows of symmetrically placed plates which do not touch the wave guide walls. Such wave guides are intended for operation with the traveling-wave tubes having a dc field for supplementary

acceleration of electrons in the interaction space. The influence of the system dimensions on its electrical characteristics is examined. A method of "cold" measurement of variance curves, utilizing a resonant model of the system, is described. The variance curves for several types of such delay systems were obtained experimentally.

This article was recommended for publication by the Chair of Radio-Transmitting Equipment of the Moscow (Order of Lenin) Aviation Institute imeni Sergo Ordzhonikidze.

47. Interference-Immune Traveling-Wave Antenna

"Traveling-Wave Antenna With Controlled Directivity of Null Reception," by S. Ya. Braude, A. V. Men' and I. Ye. Ostrovskiy Institute of Radiophysics and Electronics, Academy Science Ukrainian SSR; Kiev, Izvestiya Vysshikh Uchebnykh Zavedeniy, Radiotekhnika, No 4, Jul-Aug 58, pp 415-421

One of the means of combating radio interferences arriving from a known direction is by utilizing a receiving antenna having controlled directivity of null reception, i. e., one that permits change of antenna pattern direction so as to neutralize the noise coming from a known, direction. The control of the null-pattern is effected generally by an antenna-goniometer system consisting of two stationary loop antennas and a goniometer.

The article describes a receiving antenna assembly which was checked experimentally on intermediate and middle-wave ranges. Such an antenna can suppress two or more of the radio noises arriving from various directions. The antenna array consisted of several close-to-the-ground single-wire antennas connected to the input through a special bank of phase inverters. Such an antenna was found to be effective in case of ground wave reception and not effective in case of sky wave.

Instruments and Equipment

48. Molecular Clock

"Molecular Clock," by N. G. Basov, I. D. Murin, A. P. Petrov, A. M. Prokhorov and I. V. Shtrakhin, Physics Institute imeni P. N. Lebedev, Academy of Sciences USSR; Gor'kiy, Izvestiya Vysshikh Uchebnykh Zavedeniy, Radiofizika, No 3, 1958, pp 50-53

At the Physics Institute imeni P. N. Lebedev the theory was worked out and a model built of molecular oscillator operating on  $J = 3, K = 3$  lines of  $NH_3$  (frequency about 23,870 Mc). It was shown that the relative frequency stability of two molecular oscillators can be as high as  $10^{-11}$ .

It was shown experimentally that the frequency of a molecular oscillator can be tuned to the frequency of spectral lines with an accuracy of  $10^{-20}$  cycles, i. e., the molecular oscillator can serve as an absolute frequency (time) standard with an accuracy of  $10^{-9}$ .

At two laboratories of the Institute (Laboratory of Oscillations and Laboratory of Atomic Nucleus), the work of building a molecular clock is approaching its final phase. The new molecular clock will permit measuring frequencies in the range of  $10^4 - 10^7$  cycles with an accuracy of  $10^{-9}$  for a period less than 100 sec, measuring time intervals with an accuracy of  $2 \cdot 10^{-7}$ , generating  $5 \cdot 10^5$  cycle oscillations and its multiples, with an absolute stability of  $10^{-9}$ .

Since the power of a molecular oscillator is only of the order  $10^{-9}$  to  $10^{-10}$  w, a high-stability quartz oscillator was incorporated into the molecular-clock circuit. The new molecular clock incorporates three molecular oscillators, two of which operate alternately in the main circuit; the third serves to tune the first two with high precision.

49. Method for Measurement of Q-Factor in Resonators

"Phase Method for Measuring Q-Factor of Resonators with UHF," by M. M. Karliner; Gor'kiy, Izvestiya Vysshikh Uchenykh Zavedeniy, Radiofizika, No 3, 1958, pp 95-103

The article describes a method and device for measuring the loaded and natural Q-factor of cavity resonators. The method is based on measurement of phase-shift in the amplitude-modulated signal which travels through the resonator and is reflected back. The device permits direct reading of Q-factor on a pointer-type instrument. The consistent error of the instrument does not exceed 4%, while the extreme error might be as high as 6.5%. Experimental verification was conducted on the 3-cm range and the correctness of theoretical calculation was confirmed.

This method can be utilized to investigate the physical properties of various substances by placing them in cavities (resonators) and measuring small changes in Q-factor. The device is assembled with the following components: UHF oscillator, modulating oscillator, decoupling attenuator, measuring line with movable probe, crystal detector, amplifier, phase shifter, phasemeter, indicator and cavity resonator. The modulated frequency can be varied from 2.5 to 20 Mc. The phasemeter operates on a fixed frequency of 500 kc. This device will be used to study ferromagnetic resonance in nickel and ferrites.

50. Radiotelescope With Scanning Radiation Pattern

"Radiotelescope With Scanning Radiation Pattern Operating on 10-cm Wave," by I. G. Moiseyev, Crimean Astrophysical Observatory, Academy of Sciences USSR; Gor'kiy, Izvestiya Vysshikh Uchebnykh Zavedeniy, Radiofizika, No 3, 1958, pp 159-161

At the Crimean Astrophysical Observatory a radiotelescope was installed for continuous observation of the Sun's radio-emission. Such observations were conducted on the 10 cm wave. The telescope was mounted on a parallactic stand which facilitated automatic tracking of the Sun. The required noise immunity was attained by modulating the signal with an oscillating radiation pattern. The antenna assembly of the telescope consists of a truncated parabolic reflector with two horn radiators. The radiators are connected by a section of rectangular wave guide in such a manner that the planes of polarization are mutually perpendicular. A ferrite stub with porcelain activator is mounted in the wave guide. Under the action of a variable magnetic field, the ferrite stub rotates the plane of polarization in the wave guide by  $\pm 45^\circ$ .

The radiotelescope is calibrated with the aid of a noise generator, which is mounted in place of one of the radiators. The modulation frequency is 180 cycles. Sensitivity of the radiotelescope for frequency band of 2.5 Mc and a time constant of 3 sec is  $4^0$  to  $5^0$ . Effective antenna area is  $13 \text{ m}^2$ . The Sun's radio emission is recorded on a paper tape.

The design of individual mechanical components of the radiotelescope was done by B. P. Abrazhevskiy and the radio-engineering components by V. A. Yefanov and P. N. Stezhka.

51. A Boron Counter for Neutrons

"A Boron Counter of High Efficiency" by V. N. Bykov and V. A. Levdik; Moscow, Pribery i Tekhnika Eksperimenta, No 6, Nov/Dec 58, p 113

A counter is described which is filled with enriched  $\text{BF}_3$  ( $88\% \text{ B}^{10}$ ) at a pressure of 700 millimeters of Hg and has a transparent end window. Because of the use of a window that is highly transparent to radiation and other design features, this counter is a very sensitive device for the detection of neutron radiation. It is to be used in structural investigations by the method of neutron diffraction.

52. Precision Instrument for Measuring Piezoelectric and Electrostrictive Deformation

"Quasi-Static Measurement of Piezoelectric and Electrostrictive Deformations," by G. Schmidt, Institute of Experimental Physics, University of Halle (Saale); Berlin, Experimentelle Technik der Physik, No 6, 1958, pp 250-258

The instrument described here (illustrated on front cover of this issue) is used to measure, in the temperature range 20-150 deg C, the piezoelectric or electrostrictive deformations produced by a low-frequency alternating field. Adjacent to the surface of the object to be tested is a capacitance sensing device which, with the aid of a vhf-oscillator and a demodulator, transforms the periodic changes of spacing into a proportional ac-voltage.

The test result is either indicated directly or obtained by means of a null method. The error amounts to about  $3 \cdot 10^{-8}$  and  $2 \cdot 10^{-9}$ , respectively. In both cases the result relates to the piezomodulus  $d_{11}$  ( $6.9 \cdot 10^{-8}$  CGS) of the quartz oscillator used.

[For additional information on instruments, see Item No 8.]

Materials

53. Tantalum Tellurides

"Investigation of the System Tantalum-Tellurium," by Yu. M. Ukrainskiy, A. V. Novoselova, and Yu. P. Simanov; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 1, Jan 59, pp 148-152

Among the chalcogenides of tantalum, only the sulfides and selenides had been investigated. No data concerning the system tantalum - tellurium had been published prior to the work reported. The investigation carried out in this instance established the existence of the compound  $TaTe_3$ , indicated that a lower tantalum telluride exists, and yielded information on intermediate phases and compounds with a variable composition.

54. A Method for the Production of Pure Antimony for Semiconductor Applications

"The Production of Ultrapure Antimony Metal," by I. Szep and P. Endroedi, Telecommunication Research Institute; Budapest, Magyar Kemiai Folyoirat, Vol 64, No 11, Nov 58, pp 409-412

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"A relatively simple method is described for the production of antimony metal the purity of which satisfies the requirements of semiconductor metallurgy. With the use of the method described, technical antimony is refined by fractional distillation and then converted into antimony trisulfide. The precipitate of  $Sb_2S_3$  is dissolved in hydrochloric acid and the antimony trichloride distilled off. The antimony trichloride is then purified by repeated distillation in quartz equipment. The pure trichloride is decomposed with water and ammonia. The trioxide that is obtained is reduced with gaseous hydrogen to metallic antimony. The final product, which is free of arsenic and heavy metals, has a purity of no less than 99.999 %."

55. Synthetic Mica Under Development

"Synthetic Mica, the Dielectric of the Future," by Engr A. Kolpakov; Moscow, Leninskoye Znamya, No 225, 23 Oct 58, p 3

Fluorophlogopite is a synthetic mica consisting of the same chemical elements as natural mica, except that one of the chemical groups in natural mica is replaced with fluorine.

Natural mica contains hydroxyl groups, which, on heating of the mica begin to react with each other with the result that water is eliminated at temperatures above 600-700 degrees. When this occurs, the insulating qualities of natural mica are destroyed.

Already as early as 70 years ago, the Russian mineralogist K. D. Khrushchev studied the chemical composition and mineralogical characteristics of synthetic mica after demonstrating that fluorine can be substituted for the hydroxyl group in natural mica and synthetic mica produced in this manner.



Fluorophlogopite retains its insulating qualities up to temperatures of 1,300 degrees and fully meets modern requirements with regard to applications in radio, radar, atomic reactors, and rocket technology. But while fluorophlogopite is easily and quickly made in the laboratory, thus far methods have not been found to produce crystals large enough for the production of condensers, gaskets, and insulators. The principal difficulty is a purely scientific, crystallographic problem: certain laws governing the growth of large synthetic mica crystals are not yet sufficiently clear.

Soviet scientists are continuing work on the subject. A number of scientific research institutes are dealing with this problem, with scientific supervision over the research work in question being exercised by the Institute of Crystallography, Academy of Sciences USSR. Scientists at this institute have made considerable progress toward solving the problem of semi-industrial production of synthetic mica.

The scientists are confident that the problem of producing large crystals of synthetic mica can be solved in the next 2-3 years, if enough personnel are assigned and adequate technical resources are devoted to the project. Unfortunately, solution of the problem has not yet been assigned a high priority. This attitude must be changed in the near future.

After having started with a small plant that began operation in 1954, the US now has several plants which produce a synthetic mica. The material produced in the US consists of small crystals. These crystals are powdered and then pressed into solid sheets.

56. Electrostatic Charging of CdS Single Crystals

"On the Electrostatic Charging of CdS Single Crystals Under the Effect of High Electrical Fields," by K. W. Boer and U. Kuemmel, Second Physics Institute of Humboldt University and the Laboratory for the Physics of Breakdown, German Academy of Sciences; Leipzig, Annalen der Physik, Vol 2, No 5/6, 11 Nov 58, pp 217-224

It is shown that unilluminated CdS single crystals are charged negatively or positively during the passage of current through them, thus violating the quasi-neutrality condition. These charges are interpreted through the assumption of a spatially inhomogeneous conductivity of the single crystals and are considered to be a part of the known dielectric aftereffects. It is shown, that the conduction process of CdS single crystals in high fields cannot be interpreted through the limitation of space charge as a result of electron injection from the cathode, as suggested by Rose and Smith (Physic. Rev. 97, 1531 (1955)).

V. ENGINEERING

Aero Engineering

57. Jet Thrust Deflection Aerodynamic Study

"Aircraft Take-Off by Deflection of the Gas Stream of a Jet Engine," by G. I. Andrenko, Chair of Aerodynamics, Khar'kov Aviation Institute; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Seriya Aviatsionnaya Tekhnika, No 3, 1958, pp 8-15

The take-off of an aircraft which has turbojet engines equipped with a device to shorten take-off distance is discussed. The device makes it possible to direct downward the stream of gases coming from the engine. The same device can also be used to decrease landing speed and shorten braking distance by deflecting the stream in the direction of the aircraft motion. An advantage of the method is that the additional lifting force obtained is practically independent of the velocity of the plane.

A preliminary wind-tunnel study of a model with two engines located on the wings and equipped with the deflecting device showed that the overall picture of pressure distribution on the model changes as a result of the interaction between the deflected stream and the airflow. The airflow in front of the stream is slowed down, causing an increase in the pressure on the lower surfaces of the nacelles and a portion of the wings and an increase in pressure on the upper surface of the wings. As a result, for a given attack angle and air flow velocity, the lifting force increases.

A study of the influence of only the deflected gas stream on the air flow over the aircraft showed that the longitudinal moment coefficient is practically unchanged. To balance the aircraft then, the axis to thrust should be approximately along the center of gravity, meaning that the engines should be located on the wings. If the aircraft is still unbalanced, so-called gas rudders are required on the rear fuselage.

58. Numerical Method for Calculating Stresses in Frames Described

"On the Investigation of Stresses in Longitudinal Elements of Thin-Walled Framed Structures," by L. A. Kolesnikov, Chair of Strength of Materials, Khar'kov Aviation Institute; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Seriya Aviatsionnaya Tekhnika, No 3, 1958, pp 25-33

A successive approximation method is given for the numerical solution of the equations of the bending of rods of variable cross section subject to large and small displacements. An estimate of the error, which can be

made arbitrarily small, is possible with the method. The method is illustrated with a sample calculation of the compression member of a two-member, thin-walled beam. The theoretical results are compared with actual measurements. The method is suitable for use with computers.

59. Force in Retraction Strut of Landing Gear Calculated

"Determination of the Required Force in the Retraction Strut of a Space Mechanism For Retraction of Landing Gear," by V. M. Khaldeyev, Chair of the Design and Planning of Aircraft, Kazan' Aviation Institute; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Seriya Aviatsionnaya Tekhnika, No 3, 1958, pp 16-24

An analytical method of calculating the load on the retraction strut of a landing gear is given. The method makes it unnecessary to carry out laborious preliminary calculations of the kinematics of the mechanism. A sample calculation is given.

60. Delta Wing With Minimum Drag

"Delta Wing Having Minimum Wave Resistance for a Fixed Volume," by Ye. V. Bulygina, Chair of Higher Mathematics, Novosibirsk Electrical Engineering Institute; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Seriya Aviatsionnaya Tekhnika, No 4, 1958, pp 9-16

Calculations are presented for the surface of a supersonic delta wing possessing minimum wave resistance for a fixed volume. Profiles of this wing are parabolic with slight variations at the root section. Drag of the calculated wing is 40 percent less than that of a similar delta wing with rhombic profile.

61. Calculating Flight Performance Characteristics According to Mach Number

"Calculation of Flight Performance Characteristics of a Supersonic Turbojet Airplane," by V. B. Lebedev, Chair of Aerodynamics, Khar'kov Higher Aviation-Engineering Military School; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Seriya Aviat-sionnaya Tekhnika, No 4, 1958, pp 22-29

Basic flight performance characteristics of supersonic jet aircraft are determined by a method based on the comparison of corresponding available and required thrust values for a given Mach number of flight instead of a given altitude as in the graphoanalytical method. Calculations are performed for the thrust required in steady normal turns and stable horizontal flight at constant altitude and Mach number and an analysis is made of changes in required thrust with altitude at a constant Mach number. Maximum and minimum Mach numbers and maximum altitudes of horizontal flight are determined and a solution is given for overloading in maximum turns according to available thrust.

62. Oscillations of an Elastic Plate at a Fluid Surface

"Oscillations of an Elastic Plate in a Fluid," by A. S. Povitskiy, Chair of Airplane Aeromechanics, Moscow Aviation Institute; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Seriya Aviatsionnaya Tekhnika, No 4, 1958, pp 30-35

A study is presented of the two-dimensional problem concerning oscillations of an elastic plate set at the surface of a limitless fluid which is considered ideal. Conditions for fixing the plate, density distribution, and the law for change in plate thickness are arbitrary. Natural frequencies of a plate fixed at two opposing sides and one supported at two opposing sides are calculated by a method which may be applied in the solution of the more complex problems of finding natural frequencies of asymmetrical and higher forms of oscillations.

[For additional information on aero engineering, see Section IX, Physics, Mechanics.]

Electrical Engineering

63. All-Union Conference on Electric Locomotive Building

"Summary of the Second All-Union Scientific-Technical Conference on Electric Locomotive Building" (unsigned article); Novochoerkassk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Elektromekhanika, No 8, 1958, pp 3-4

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The article contains the following passages:

"A resolution was passed to call the conference on electric locomotive building at least once every 3 years. [Comment: The second conference was held in Novochoerkassk in July 1958.]

"In conjunction with the urgent problems advanced at the conference, the present issue [No 8, 1958] of the periodical Elektromekhanika on the whole is devoted to problems of electric locomotive building. In the article B. V. Suslov, chief designer at the Novochoerkassk Electric Locomotive Building Plant, a review of new types of electric locomotives built at the plant and their characteristics is given.

"Of special interest was the report presented at the conference about the new method for analysis of electric locomotive characteristics with the aid of electronic analogs. The articles by Eng A. L. Kurochka of the same plant, Eng N. Kh. Sitnik, and A. P. Bolyayev, docent of Novochoerkassk Polytechnic Institute, were devoted to the mentioned problem.

"It was noted at the conference that single-phase, direct-current electric locomotives, particularly the electric locomotives with gas-filled rectifiers, are the most promising."

Materials and Processes

64. A Magnesium-Thermic Procedure for the Production of Boron Carbide

"Magnesium-Thermic Production of Boron Carbide," by G. V. Samsonov, Institute of Powder Metallurgy [Cermets] and Special Alloys, Academy of Sciences Ukrainian SSR; Kiev, Ukrainskiy Khimicheskii Zhurnal, Vol 24, No 6, Nov-Dec 58, pp 659-664.

The Magnesium-thermic reduction of boric acid anhydride in the presence of carbon (carbon black) to produce boron carbide was investigated. It was established that the optimum conditions for the process are reduction

of a charge consisting of briquettes at 1,000-1,200°C and washing out of the magnesium oxide with acid. Carrying out the process under these conditions makes it possible to produce boron carbide of a rigid stoichiometric composition corresponding to  $B_4C$  which is practically free of unreacted carbon. This is very difficult to achieve in the thermal reduction of boric anhydride with carbon.

It was established that a peculiar characteristic of the process is formation of particles of two high-melting phases which prevent each other's growth. As a result, the boron carbide is obtained in the form of a fine powder which can be sintered easily into dense products.

It is pointed out that boron carbide is one of the hardest materials available to modern technology and that it also exhibits a superior resistance to wear and a high chemical stability (G. V. Samsonov, L. Ya. Markovskiy, Uspekhi Khimii, Vol 25, 1956, p 90). Furthermore, boron carbide can be used as a starting material for the production of other boron compounds; for instance, metal borides (G. A. Meyerson and G. V. Samsonov, Zhurnal Prikladnoy Khimii, Vol 27, 1954, p 1135). Because of the high cross-section of neutron capture of boron, boron carbide is a useful material for control rods of nuclear reactors.

#### 65. Zirconium Dioxide - Chromium Cermets

"Investigation of  $ZrO_2$  - Cr Cermets," by L. P. Kachalova and A. I. Avgustinik, Chair of Ceramics Technology, Leningrad Technological Institute imeni Lensovet; Ivanovo, Izvestiya Vysshikh Uchebnykh Zavedeniy, Khimiya i Khimicheskaya Tekhnologiya, No 5, Dec 58, pp 70-75

Because some investigators obtained results indicating that it is possible to stabilize zirconium dioxide with titanium, it was of interest to investigate the possibility of the stabilization of this oxide with metallic chromium. By preparing cermets that consist of zirconium dioxide and chromium, it ought to be possible to develop materials which combine the properties of a highly refractory oxide with the high heat conductivity of the metal component.

Using zirconium dioxide mixed with 20% or more of chromium powder, it was possible to prepare cermets which exhibit a high mechanical strength and a considerable heat resistance. Because the metal component of the cermet bears the strain involved in all the volume changes originating by reason of the high-temperature polymorphic transformations of the monoclinic zirconium dioxide, a stabilizing effect is produced.

Preliminary partial oxidation of the chromium in samples or addition of 3% of chromium trioxide was found to contribute to the formation of stable cermets when samples containing 10% of chromium were used; it was established that the mechanical strength is increased, but the heat resistance is not improved by the addition of chromium trioxide.

Microscopic and X-ray diffraction investigation of samples of the cermet did not disclose the formation of any phases besides the two consisting of monoclinic zirconium dioxide and metallic chromium. The samples of the zirconium dioxide - chromium cermets proved heat-resistant in tests carried out in molten steel at 1650°. They withstood up to 20 changes of temperature.

In tests in molten brass at 1,020°, the cermets of the compositions investigated withstood more than 20 temperature changes.

Zirconium dioxide - chromium cermets are not moistened by molten metal. Their solubility in the metal depends on the composition of the cermet: when the chromium content is higher than 50%, the solubility increases considerably.

The highest mechanical strength and the greatest heat resistance were exhibited by the cermets Kh-40 (60% of zirconium dioxide and 40% of chromium) and Kh-50 (50% of zirconium dioxide and 50% of chromium). Cermets of these particular compositions can be recommended for industrial application.

During vacuum annealing, evaporation of metallic chromium takes place: for this reason, annealing in vacuum should be carried out in as short a time as possible. Annealing in an indifferent gas rather than in vacuum is recommended.

#### 66. New Process of Boiler Water Demineralization

"Sodium-Chlorine Ionizing of Water for Industrial Boilers and Evaporators," by L. S. Foshko, A. S. Losev, and F. G. Prokhorov, All-Union Heat Engineering Institute; Moscow, Teplotekhnika, No 1, Jan 59, pp 44-48

A new process of sodium-chlorine ionizing of feed water which utilizes a weakly alkaline anion-exchange agent continuously regenerated by common salt solution has been studied under laboratory conditions and with the aid of experimental filters.

The sodium-chlorine ionizing process is based on the passage of water through two filters, the first one containing a cation-exchange agent and the second a strongly alkaline anion-exchange agent. The regeneration of the filter with the aid of common salt solution is attained through the introduction of sodium cation-exchange and chlorine anion-exchange agents. During the passage of treated water through the first cation-exchange filter, the process of na-cationization, i.e., the exchange of cation present in the water for the sodium ions, takes place. During the subsequent passage of Na-cationized water through the second anion-exchange filter, the exchange of anions for chlorine ions takes place.

The advantages of the chlorine-sodium ionizing process are: simplicity of equipment, reliability of operation, and low cost of reagent (common salt). The process permits reduction of mineral content in feed water down to 0.2 mg/l, even when the original content is as high as 1,000 mg/l.



VI. MATHEMATICS

67. All-Union Conference on Mathematical Linguistics, Leningrad, April 1959

"Mathematics Assists Linguistics," by L. Bad' and Ya. Kunina;  
Leningradskaya Pravda, 4 Dec 58, p 4

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"An All-Union Conference on Mathematical Linguistics will be held in April 1959 at Leningrad University. Scientists from Moscow, Leningrad, Kiev, Yerevan, and other cities of the country will participate."

VII. MEDICINE

Contagious Diseases

68. Effects of Several Antibiotics on B. anthracis

"The Action of Several Antibiotics on the Anthrax Pathogen in vitro," by N. M. Nechayeva, Sb. Nauchn. Tr. L'vovsk. Zoovet. In-t, No 8, 56, pp 58-60 (from Referativnyy Zhurnal -- Biologiya, No 10, 25 May 58, Abstract No 43232, by M. I. N.)

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"The anthrax pathogen is very sensitive to penicillin, streptomycin, ekmolin, biomycin, and synthomycin. The expediency of testing these antibiotics on animals experimentally infected with anthrax is considered."

69. Diagnosis of Typhoid With Vi-Bacteriophage

"Accelerated Bacteriological Diagnosis of Typhoid With the Aid of Vi-Bacteriophage," by A. G. Matus, Sb. Tr. Mold. N-I In-t Epidemiol. Mikrobiol. i Gigiyeny, No 2, 56, pp 77-87 (from Referativnyy Zhurnal -- Biologiya, No 10, 25 May 58, Abstract No 43272, by Ya. I. Rautenshteyn)

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"The possibility of using Vi-phage for accelerating the identification of typhoid hemocultures was examined. According to sensitivity to Vi-phage, it was successfully determined, during the first step of blood investigation within 2-3 hours after visible growth appeared and without having to resort to biochemical and serological examination of the cultures (crushing the hemoculture droplets on the surface of the agar and pouring on the Vi-phage), that the hemocultures contained typhoid bacilli. It was demonstrated, by the Vi-phage identification method combined with the phage-typing method, that the same type of typhoid Bacillus Phage is always isolated from different patients in contact with a general source of the disease."

70. Botulism in Yugoslavia

"Botulism. A Report of Four Cases," by Dr Marija Bacun and Dr Helena Hellenbach; Zagreb, Lijecnicki Vjesnik, Vol 80, No 5/6, 1958, pp 310-319

After a general discussion of the etiology, occurrence, and clinical treatment of botulism, the authors report on four cases encountered at the Zagreb Hospital of Infectious Diseases during the period 1949-1957; these four cases of botulism are the only ones ever encountered at the hospital. The cases were all unrelated; in all four patients the characteristic symptoms appeared 5-24 hours after partaking of infected pork or

sausage. Two of the cases were relatively mild; ophthalmoplegia and dysphagia regressed completely in 2-3 weeks. In the two other cases, a paralysis of the respiratory musculature occurred; in one of these cases, brief treatment in an iron lung brought the patient successfully through the crisis, but in the other case the inability to breathe came so suddenly that the patient died before the respirator could be put to use. Two of the patients entered the hospital under suspicion of diphtheria; one entered for observation; and only one with a diagnosis of botulism. This latter case involved special diagnostic difficulties, since the woman patient had taken atropine drops during the first hours of the disease. In all cases except one, a polyvalent serum was used against the botulism, accompanied by symptomatic therapy. Only in one case was the remains of the contaminated ham examined bacteriologically, with negative results. In the fatal case, the serum of the woman patient was found through tests on mice, to contain the botulinus toxin. The etiological agent could not be typed.

Epidemiology

71. Ixodes Ticks in the Belorussian SSR

"The Species Composition and Distribution of Ixodes Ticks in Belorussia," by Arzamasov, Vestsi AN BSSR, Ser. Biyal. N.: Izv. AN BSSR, Ser. Biol. N., No 1, 57, pp 99-111 (from Referativnyy Zhurnal -- Biologiya, No 10, 25 May 58, Abstract No 43428, by N. A. F.)

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"Ixodes apronophorus Sch., I. crenulatus Koch, and I. trianguliceps Bir., are recorded for the first time in Belorussia; new data on local distribution, and the host cycle for I. ricinus, Dermacentor marginatus, and D. pictus are presented."

72. Ixodes Ticks in the Ukrainian SSR

"Ixodes Ticks in the Artificial Forest-Steppe Areas of the Ukrainian SSR," by S. M. Brovko, Nauchn. Zap. Dnepropetr. Un-t., No 54, 1955, pp 61-65 (from Referativnyy Zhurnal -- Biologiya, No 10, 25 May 58, Abstract No 43427, by N. A. F.)

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"Six species of ticks from the Ixodidae family were recorded: Ixodes ricinus L., I. crenulatus Koch, Haemaphysalis punctata Can, et Fanz., Dermacentor marginatus Sulz., Rhipicephalus rossicus Jak. et K.-Jak., and Hyalomma plumbeum Panz."

73. Ixodes Ticks Distribution in Southern Kazakhstan

"Ticks of the Ixodoidea Family in Southern Kazakhstan," by A. V. Levit, Tr. In-ta Zool. AN KazSSR, No 7, 57, pp 59-71 (from Referativnyy Zhurnal -- Biologiya, No 10, 25 May 58, Abstract No 43429, by N. A. Filippova)

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"Sixteen species of Ixodoidea ticks were observed on wild and agricultural animals near Lake Biyli-Kul' and in the Kara-Tau Mountains: *Argas persicus* Oken, 1818, *A. vespertilionis* Latr., 1796, *Ornithodoros lahorensis* Neum., 1908, *Ixodes* sp., *Haemaphysalis numidiana turanica* Posp.-Str., 1946, *H. punctata* Can. et Fanz., 1877, *Dermacentor marginatus* Sulz., 1776, *D. daghestanicus* Ol., 1929, *Rhipicephalus turanicus* B. Pom., 1940, *R. pumilio* P. Sch., 1935, *Rh. schulzei* Ol., 1929, *Hyalomma asiaticum asiaticum* Sch. et Schl., 1929, *Hyal. detritum* p. Sch., 1919, *Hyal. scupense* P. Sch., 1918, *Hyal. anatolicum* Koch, 1944, *Hyal. plumbeum* Panz., 1795. The biotypes and hosts of the ticks are presented."

Hematology

74. Blood Coagulation System Modified in Hypothermia

"Modification of the Blood Coagulation System in Hypothermia," by Ts. I. Abakeliya; Tbilisi, Soobshcheniya Akademii Nauk Gruzinskoy SSR, Vol 21, No 3, Sep 58, pp 343-347

The effect of hypothermia on the blood coagulation process was studied in experiments on 13 dogs. The generally accepted methods of cooling combined with the application of ganglion blocking substances and physical chilling were used until body temperatures of 28 degrees were achieved. The cooling process was then halted, although body temperatures continued to drop until they were stabilized at temperatures of 24-26 degrees. Half an hour after the body temperatures were stabilized, a warming process was begun. Blood coagulation processes were under observation from the very beginning of the experiments. On the basis of the observations, the following conclusions were drawn:

1. Definite changes in the blood circulation system expressed by a prolonged period of coagulation, a decrease in the quantities of thrombin and fibrinogen, and a sharp decrease in the number of thrombocytes took place when hypothermia was applied.

2. These changes were reversed on the 10th day after the chilling, and the blood coagulation system became completely normalized.

3. The state of hemostasis must be closely watched during surgery and in the postoperational period.

75. Book Published on Biochemistry of Blood Coagulation

Biokhimiya Svertyvaniya Krovi, (Biochemistry of Blood Coagulation), by Ya. V. Belik and Ye. L. Khodorova, Publishing House of the Academy of Sciences Ukrainian SSR; Kiev, 1957 (from Ukrainskiy Biokhimicheskiy Zhurnal, Vol 30, No 6, 1958, pp 944-947)

This book on the biochemistry of blood coagulation reviews both Soviet and non-Soviet literature on the subject. A total of 747 sources of literature are quoted dating back to the 19th Century. The various topics discussed are: the historical background of the study of blood coagulation, the various components of the blood coagulation system, and the interrelationships between these components. The book concludes with a description of the methods of determining these various components, and then describes their clinical significance.

76. Czechoslovak Research on Colorimetric Determination of Cholinesterase Activity

"Colorimetric Determination of Cholinesterase in Human Blood," Maj Jiri Tulach, Department of Defense Against Biochemical Materials and Toxicology (Katedra ochrany proti BCHL a toxikologie); Prague, Vojenske Zdravotnicke Listy, Nov 58, pp 513-515

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

Immunology and Therapy

77. Determination of Spore Concentration in STI Vaccine

"Determination of the Spore Concentration in Live Anthrax Vaccine STI With the Help of an Optical Bacterial Standard," by P. A. Ivashkevich, B. Ya. Mikhaylov, G. I. Rozhkov, and A. L. Tamarin; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 30, No 1, Jan 59, 36-37

A more rapid and convenient method for standardizing bacterial suspensions is described in this article. The purpose of the research was to determine a correction factor for standardizing live STI antianthrax vaccine by using the bacterial standard of the State Control Institute imeni Tarasevich. Twenty different spore cultures of the STI strain and 8 series

of prepared vaccine were investigated in 100 experiments. In each case, the cell concentration was determined simultaneously by optical bacterial standards and by direct calculation in Byurker or Goryachev chambers. The specifications of the phase-contrast microscope employed are given in the text, and the methodology of the experiments is described. Results are presented in a table. The conclusions offered on the basis of these results are as follows:

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"1. The active quantity of spores in STI cultures and vaccine was found to be 12 times less when using GKIVS [State Control Institute of Vaccines and Sera] optical bacterial standards.

"2. The data obtained can be used in production for standardizing STI vaccine more precisely."

It is stated that analogous data were obtained in additional experiments. The correction factor for the optical bacterial standard for an STI spore suspension should be one-twelfth and not the one-fifth factor used at present.

78. Combined Vaccine Against Plague and Tularemia

"The Leukocytic Reaction in Mice Immunized With a Live Associated Vaccine Against Plague and Tularemia," by N. F. Kalacheva, Scientific Research Institute of Microbiology and Epidemiology of Southeastern USSR; Moscow Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 30, No 1, Jan 59, pp 43-44

Experiments in which the leukocytic reaction in response to the introduction of the two live vaccines and to subsequent infection with corresponding virulent cultures were performed on white mice to study the development of immunological reactions in associated vaccination with live plague and tularemia vaccines.

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"The observations showed that a mass of plague pathogens and only isolated leukocytes (2-5 in a field) were contained in smears of peritoneal exudate from control animals 4 hours after intraperitoneal infection with plague pathogens. Compact growth of *B. pestis* was observed in the majority of cases in blood seedings from these animals. In smears of peritoneal exudate from mice previously immunized with plague monovaccine and infected with a corresponding culture, isolated pathogens were encountered, but not in all animals; the number of leukocytes attained an average of ten per field. After seeding the blood, the growth of cultures was seen to proceed with almost the same intensity as in the controls. In peritoneal exudate smears from mice immunized with the associated vaccine and infected with

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a plague culture, bacteria were not observed individually, and sharply pronounced leukocytosis was revealed (from 15-20 leukocytes per field). After the blood was seeded, the growth of plague pathogens was not obtained from all animals in the experiment, and was only observed in the form of isolated colonies. The leukocytic reaction was weak in exudate from control mice infected with *B. tularensis*--an average of--one to five cells per field were observed. Compact growth of *B. tularensis* cultures was obtained in all cases after seeding the blood.

"The leukocytic reaction was sharply pronounced--ten or more leukocytes per field were encountered--in mice immunized with tularemia monovaccine and infected intraperitoneally with a corresponding culture. Growth of *B. tularensis* was observed only in isolated cases (5 out of 20) after seeding blood on yolks. The leukocytic reaction was sharply pronounced--more than 20 were seen in a field--in mice immunized with the associated vaccine and infected with a *B. tularensis* culture. Blood seedings either remained sterile (75%), or growth was less intense than it was in controls.

"The data presented show that the use of a combination of two live vaccines provides better protection to the organism than does the use of monovaccines. This statement is substantiated by the fact that antagonism between the aforementioned antigens in the animal organism is absent; conversely, a reinforcement of the defensive reaction was observed in several cases.

"The use of the peritoneal test in the research has a number of advantages over the usual method of determining immunity according to the survival rate--there is almost no correlation with animal intoxication, as in the survival rate test and affects the anti-infection character of immunity."

#### 79. Resume of Progress in Tissue Therapy

"New Data on the Theory and Practice of Tissue Therapy," by Doctor of Medical Sciences S. R. Muchnik and Scientific Co-workers F. Sysoyev, I. I. Chikalo, and V. V. Skorobinskaya, Ukrainian Scientific Experimental Research Institute of Eye Diseases and Tissue Therapy imeni Academician E. P. Filatova (director, Prof N. A. Puchkovskaya); Kiev, Oftal'mologicheskiy Zhurnal, No 8, 1958, pp 451-459

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"Twenty-five years have gone by since Academician E. P. Filatov proposed the tissue therapy method.

"During this period, tissue therapy has been introduced into practical medicine, and it is now one of the most effective methods of treating various diseases. After first becoming widespread in the Soviet Union, tissue therapy was accepted by foreign countries and at present there is hardly a country in which this method is unknown or unused. Tissue therapy is a nonspecific therapeutic method having complex action on an organism. Although there is a huge amount of work in this field, the mechanism of the action of tissue preparations is not yet fully explained; this fact points out the need for further research in this direction. Only by a thorough study of the chemistry of biologically active preparations, of conserving tissue, and of their effect on the organism will a firm basis for developing the best rational therapy by tissue preparations be obtained.

"In this article, we will present certain data obtained in recent years as a result of experimental and clinical research on the problem of tissue therapy.

"Among the many investigations, the most interesting are those works dedicated to the problems concerning the effect of tissue preparations on the resistivity of an organism to pathogenic factors having an infectious and toxic nature, as well as the investigations concerning the mechanism of this resistivity.

"Earlier investigations showed that the direct administration of tissue preparations to an organism changes its immunobiological reactivity, and activates phagocytes, the production of antibodies, and barrier functions. In the experiments conducted by D. S. Shchastniy (1955), it was shown that the prophylactic treatment of animals by preparations of conserved tissue increases their resistivity to experimental gas gangrene. Animals treated 24 hours prior to the affliction showed the best resistance to the action of gas gangrene.

"In earlier works (Burgaft, 1949), it was shown that the direct treatment of frogs by tissue preparations markedly increased their resistance to the action of lethal doses of strychnine. This was confirmed by Ts. M. Barg in 1954. In 1957, V. P. Solov'yeva and also I. I. Chikalo showed that the prophylactic treatment of animals by tissue preparations markedly decreased the appearance of toxicosis produced by the subcutaneous administration of potassium permanganate solutions to the organism. As is known, the administration of this substance in predetermined dosage leads to acute cirrhotic changes in the liver, usually having fatal consequences in animals. Under the effect of tissue preparations (aloe extracts), as indicated by the experiments, the resistance of the animals increased. V. V. Skorodinskaya, Ye. A. Vyrlan, and V. N. Kefer (1958) noticed an increase in the antitoxic function of the liver in 24 out of 45 patients under their care.



"Much interest has been stimulated by the fact that tissue therapy can be used in conjunction with other therapeutic agents. For example, along with streptomycin, phthivazide, PASK, and tibone, it can be used in the treatment of tuberculosis.

"In 1951 at the radiosurgical department of the Central Roentgenological and Cancer Institute of the Ministry of Health USSR, tissue preparations were used on 50 patients suffering various degrees of radiation sickness. The use of these preparations proved highly effective. Also, in 1958, D. Baldan-Dorza showed that as a result of tissue preparations used on rabbits exposed to X-rays of 620 r, only a mild form of radiation sickness appeared. A. F. Shcherbine (1958) also showed the effectiveness of using tissue preparations on experimental animals exposed to irradiation.

"These and other data concerning the efficacy of tissue therapy in treating skin diseases, scar processes, chronic ulcers, dystrophy, chronic malaria, and many other diseases indicate that preparations from conserved tissues increase the protective reaction of an organism and its immunogenic properties.

"What is the mechanism of rebuilding an organism which occurs under the effect of tissue therapy?

"Experimental investigations during the past few years permit a deeper insight into the changes in metabolic processes which are produced by tissue therapy. These include investigations by I. V. Savitskiy (1957), which showed that tissue preparations increase the restoration of protein and formed elements of the blood during anemia and after blood loss and markedly increase the process of blood regeneration. The author, in cooperation with I. A. Eudchnov and A. A. Shcherbinaya, conducted experiments on the inclusion of radioactive amino acids as well as radioactive phosphorus and iron preparations in the proteins of various tissues and organs, including the hemopoietic. Experiments indicated that tissue preparations increase the inclusion of the above-mentioned compounds in the plasma protein of blood, the erythrocytes, and hemopoietic organs. Under the effect of tissue preparations, the restoration of protein and formed elements of the blood is accomplished by the restoration of the proteins.

"The works presented above are only a part of the contributions in this field during the past years, and the work indicates that this method is being quickly developed. Certain problems concerning the nature of biogenic stimulators and their mechanism of action need further study. The wide application of tissue therapy, its high therapeutic effectiveness, and its popularity among patients bids the biologist, physiologists, biochemists, and clinical physicians to further study this new method of therapy which is one of the outstanding accomplishments of Soviet medicine."

80. Shock Therapy

"The Antishock Action of Magnesium Ions," by N. I. Nagnibeda, Chair of Surgery, Leningrad Institute for the Advanced Training of Physicians; Kiev, Novyy Khirurgicheskiy Arkhiv, No 5 (215), Sep-Oct 58, pp 100-106

Guinea pigs were used in experiments conducted to test the effectiveness of magnesium ions when used in the therapy of shock. A rate of shock was induced in the animals by the introduction of a mixture of insoluble barium chloride, normal blood serum, and a sodium chloride solution into the blood stream. However, when half of the serum in the mixture was replaced by a solution of magnesium sulfate, the incidence of shock was considerably reduced. In other experiments in which a state of acute shock was developed in the animals by the introduction of insoluble barium chloride and normal blood serum into the blood stream, the substitution of magnesium hyposulfite for the blood serum prevented the development of shock. Several series of experiments were carried out; in practically all cases, the use of magnesium ions either completely prevented the development of shock or considerably reduced its incidence.

81. Pathogenesis and Treatment of Third Degree Burns by Novocain Blockade and Medicated Sleep

"The Pathogenesis and Treatment of Chemical Burns" (Second report), by Kh. Dzh. Gaysin, Clinic of General Surgery and Chair of Pathological Anatomy Kazakhstan State Medical Institute; Alma Ata, Zdravookhraneniye Kazakhstana, No 8, 1958, pp 40-42

Chemical burns were inflicted on rabbits which were then treated with a vagosympathetic novocain blockade and/or medicated sleep, using a daily solution of sodium amytal.

Clinical and histological studies indicate that under the effect of novocain blockade and medicated sleep, third-degree chemical burns heal faster than untreated burns. This accelerated healing process is evidenced by the decreased intensity of the inflammatory processes, speeded sloughing off of the dead tissue, and speeded granulation and epithelialization.

Oncology

82. Complex Method of Cancer Therapy

"Experimental Complex and Pathogenic Therapy of Advanced Forms of Cancer," by Prof I. T. Shevchenko, Kiev Roentgen-Radiological Institute and Chair of Oncology, Kiev Institute for the Advanced Training of Physicians; Kiev, Novyy Khirurgicheskiy Arkhiv, No 5 (215), Sep-Oct 58, pp 3-8

The application of the so-called "complex method of therapy," in cases of first, second, and third degree neoplasms is proposed. The method comprises special radical measures such as surgery and radiation treatments combined with pathogenic therapy which tends to stimulate the protective reactions of the organism and inhibit the development of malignant growths. Steps should be taken to improve the functions of hemopoiesis. The administration of the preparation "Lymphin," prepared from lymphatic ganglia of cattle, should be added to this complex of measures. A diet based on individual needs is advocated. Empirical data are available on the usefulness of radishes, garlic, and maize in the diet. Rest is essential.

83. Cancer Therapy

"Drug Therapy of Malignant Tumors," by Prof R. I. Sharlay; Kiev, Novyy Khirurgicheskiy Arkhiv, No 5 (215), Sep-Oct 58, pp 9-14

The author advocates the use of drugs, among them hormones, chemotherapeutical preparations, antibiotics, antihistamines, and others in the therapy of malignant growths. The mechanism of action of the drugs depends on the manner in which the diseased cells, as well as the normal cells, react to the same stimulus. The use of hormones, for instance, is based on the fact that cancer cells of some organs, as well as the normal cells of the same organ, react similarly to the same stimulus, while the use of chemotherapeutic drugs is based on the difference in the reaction of diseased and normal cells to a similar stimulus. Selectivity based on the use of the proper drug for a specific type of malignancy must be practiced. On the basis of his personal observations and the literature data available, the author comes to the following conclusions:

1. Surgical removal of parts or organs affected by malignant growths is necessary; if this is not possible, radiation in combination with drug therapy should be applied.
2. Drug therapy should be applied in cases of existing or possible postsurgical metastases.
3. Selective drug therapy must be combined with surgery and radiation.

84. Radioactive Cobalt in Cancer Therapy

"Therapy of Tumors of the Prostate Gland With Radioactive Cobalt," by V. A. Mokhort, Chair of Urology, Belorussian Institute for the Advanced Training of Physicians; Minsk, Zdravookhraneniye Belorussii, Vol 4, No 10, Oct 58, pp 22-24

Published data and clinical observations, this article says, indicate the effectiveness of the application of radioactive cobalt in cases of cancer of the prostate gland. Therapy with radioactive cobalt is preferable to rentgenotherapy since the gamma rays of Co<sup>60</sup> are absorbed by the soft as well as the osseous tissues, and skin and organ tolerance to these rays is greater than to roentgen rays. Tumor reaction to the cobalt rays is high. Cobalt radiation was administered to the patients by means of the GUT-SO-100 apparatus, in a dose of 8844 r. Complications from the use of radiation were rectitis, cystitis, and epidermitis. These, however, did not require the termination of the therapy. The immediate therapeutic effect of the use of radioactive cobalt was satisfactory, the author states in conclusion, although the comparatively small number of observations conducted requires further study for definite conclusions.

85. ACS in Tumors Therapy

"The Effect of ACS [Antireticular Antitoxic Serum] on the Development of Induced Tumors in Animals Subjected to the Action of Ionizing Radiation," by G. F. Dyadyusha, Laboratory of Pathophysiology, Ukrainian Scientific Research Sanitary-Chemical Institute, Ministry of Health Ukrainian SSR; Kiev, Novyy Khirurgicheskyy Arkhiv, No 5 (215), Sep-Oct 58, pp 16-22

The effect of ACS on the development of malignant tumors in the organisms of rats subjected to ionizing radiation was determined in experiments conducted on the animals. Tumors were induced in the rats by the subcutaneous administration of a carcinogen. The animals were divided into three groups. The animals of the first group were subjected to ionizing radiation in a dose of 200 r on the day preceding the administration of a carcinogen; the second group of rats received the same treatment as the first group, but in addition were given antireticular antitoxic serum to stimulate the connective tissue system; the animals in the third group were given the carcinogen but were not irradiated or treated.

The experiments established that the development and growth of induced tumors in the irradiated rats was influenced by the condition of the connective tissue system; that induced tumors developed later in animals treated with ACS than in animals not treated with ACS; that the percentage of cases in which tumors developed was smaller in animals treated with ACS than in animals not treated with ACS; that the irradiated rats with induced tumors treated with ACS lived longer than the untreated animals; and that as a result of irradiation with doses of 200 r, conditions favorable to the development of induced tumors in the organisms of the rats not treated with ACS were created. On the basis of the data obtained, it is thought that treatment with ACS of patients who develop malignant growths or who are undergoing treatment with large doses of ionizing radiation may be of great benefit. It may also be assumed that the application of ACS in combination with other therapeutic agents may contribute to the prevention of malignancies as a result of penetrating radiation. Results are summarized in two tables.

86. Blastomogenic Chemicals

"The Blastomogenic Activity of Dicyclohexylamine and Dicyclohexylamine Nitrite," by G. B. Pliss, Laboratory of Experimental Oncology, Institute of Oncology of Academy of Medical Sciences USSR; Moscow-Leningrad, Voprosy Onkologii, Vol 4, No 6, Nov-Dec 58, pp 659-669

Experiments were conducted on rats and mice to determine the effect of exposure to the prolonged action of cyclohexylamine, dicyclohexylamine, and dicyclohexylamine nitrite on the animal organism. The chemicals are now being widely utilized in industry and agriculture, and according to experimental data, are highly toxic and are readily absorbed by the undamaged skin. The chemicals were administered to the animals in food and by subcutaneous injections. Sunflower oil and water were used as solvents. The organs of the animals after their death were subjected to macro- and microscopic examinations. The experiments established the toxicity of the chemicals, cyclohexylamine being the least toxic of the three. It was found also that cyclohexylamine is not blastomogenic; that dicyclohexylamine and its nitrite are blastomogenic, the first producing sarcoma at the point of injection of the chemical, and the second capable of inducing tumors which differ morphologically, in various parts of the body far removed from the point of injection. The blastomogenic activity of the chemicals may be regarded as being of a relatively weak character since the tumors developed only in a small number of animals, and then only after a prolonged period of time. Results of the experiments are shown in six illustrations and three tables.

87. Experimental Cancerogenesis in Monkeys

"Results of 18 Years of Work Conducted in Sukhumi on Experimental Cancerogenesis in Monkeys," by N. N. Petrov, N. A. Krotkina, Ye. M. Barabadze, A. V. Vadova, V. I. Gel'shteyn, R. A. Mel'nikova, Z. A. Postnikova, and E. Ya. Smoylovskaya, Laboratory of Experimental Oncology, Sukhumi Institute of Pathology and Therapeutics; Moscow-Leningrad; Voprosy Onkologii, Vol 4, No 6, 1958, pp 643-655

This article is a summation of the work done by the authors during the past 18 years to establish the possibility of experimentally inducing malignancies in animals. The results of the experiments were as follows:

1. The possibility of inducing experimental malignancies in the animal organism has been established.
2. The maxilla and the bone marrow of the long bones have been found the most dependable organs for the development and observation of experimental tumors.
3. Radioactive substances and insoluble radioactive isotopes of silver have been found most suitable for the induction of malignant tumors in monkeys.
4. Hyperestrinization of the animals with estrogenic substances in doses of hundreds and thousands and more milligrams continued for a period of many months is frequently accompanied by the development of atypical proliferations of an infiltrating character in the uterus, which by penetrating into the peritoneum frequently cause the death of the monkeys through loss of blood.
5. Observations of experimental cancerogenesis in monkeys provided considerable data on the biophysicochemical etiology of malignant growths. Two tables and 13 illustrations and a bibliography of 10 titles are included.

88. dl-Dihydrosarcomycin in the Therapy of Cancer

"Effect of dl-Dihydrosarcomycin and Its Combination With Omain on Ehrlich's Ascitic Tumor," by N. I. Vol'fson and V. Ye. Komar, Laboratory of Experimental Oncology, Institute of Oncology; Moscow-Leningrad, Voprosy Onkologii, Vol 4, No 6, Nov-Dec 58, pp 730-734

This article is a report on the results of experiments conducted on mice to determine the effect of dl-dihydrosarcomycin, a close analogue of sarcomycin, on the ascitic tumor of Ehrlich. The antibiotic dl-dihydrosarcomycin was synthesized at the Institute of Medical Chemistry of the Academy of Medical Sciences USSR and submitted by Prof V. N. Orekhovich, the director of the institute, to the Laboratory of Experimental Oncology for testing. The ascitic liquid was injected into the experimental animals intraperitoneally in doses containing from 100,000 to 10 million and more tumor cells. The animals were then administered different doses of dl-dihydrosarcomycin and dl-dihydrosarcomycin in combination with omain at various periods of time. The experiments revealed that the antibiotic was toxic to the mice in doses of 2.5-4.0 milligrams; when administered in the early stages of the development of the affection it is capable of inhibiting the growth of the ascitic tumors; the action of the calcium salt of the antibiotic is similar to that of dl-dihydrosarcomycin itself; the combined application of dl-dihydrosarcomycin with omain enhances its inhibiting effect on the growth of the Ehrlich ascitic tumor. It is known that omain and its derivatives have no effect on ascitic tumors. It is, therefore, thought that the stronger inhibiting effect of the combination is due not to the combined application of the two preparations, but to some other mechanism of action. Two tables are included in the text.

89. Antibodies Formed Upon Immunization With Tumor Tissue

"Detection of Antibodies in the Complement-Fixation Reaction in Rabbits Immunized With Various Types of Vaccines From Brown-Pearce Tumor," by A. M. Gardash'yan and R. M. Radzikhovskaya, Division of Immunology and Malignant Tumors of Institute of Epidemiology and Microbiology imeni N. F. Gamaleya, Academy of Medical Sciences USSR; Moscow-Leningrad, Voprosy Onkologii, Vol 4, No 6, Nov-Dec 58, pp 655-659

This article reports on results of studies which were conducted to explain the formation of antibodies in rabbits immunized with vaccines from Brown-Pearce tumor and the correlation between the intensity of the immunity conferred and the titer of the complement-fixation antibodies. The rabbits were vaccinated with five different types of vaccine, which consisted of tumor cells lysed with cytotoxic sera and the supernatant liquid obtained by centrifuging the vaccines. The vaccinations were carried out in two cycles. The vaccines were subcutaneously injected to the rabbits in the

First cycle as follows: three injections of one milliliter each, two injections of 2 milliliters each, and one injection of 3 milliliters. During the second cycle, the rabbits received three injections in doses of 2 milliliters each. The injections were carried out at intervals of 6-7 days, with an interval of 57 days between the cycles. Immunity was tested by injecting the animals with suspensions of Brown-Pearce carcinoma in dilutions of 1:20 to 1:160. On the basis of the experiments it was concluded that: immunization of the animals with vaccines from the Brown-Pearce tumor stimulated the formation of complement-binding antibodies; that there was no correlation between the degree of intensity of the immunity and the presence of antibodies in rabbits immunized with a vaccine from the Brown-Pearce tumor and that therefore the presence of the antibodies did not indicate that immunity to tumors had been acquired; and that neither the number of injections nor the quantity of the injected vaccine affected the titer of the antibodies. Two tables are given to show results.

90. Induced Tumors of the Thyroid Gland

"Experimental Tumors of the Thyroid Gland," by N. P. Napalkov, Laboratory of Experimental Oncology, Institute of Oncology, Academy of Medical Sciences USSR; Moscow-Leningrad; Voprosy Onkologii, Vol 4, No 6, Nov-Dec 58, pp 738-750

This article is a survey of Soviet and foreign literature on the development of malignant tumors of the thyroid gland and on experimental methods of inducing such malignancies. On the basis of the published data available, the author concludes that experimental malignant growths of the thyroid gland may be induced in animals by the following methods:

1. By administering cancerogenic substances to the experimental animals.
2. By disturbing the secretion of the thyroid hormones.
3. By feeding rations with a low iodine content to the animals.
4. By the prolonged administration of antithyroid substances to the animals.
5. By the combination of the action of cancerogenic substances and disturbed hormone balance.
6. By the action of ionizing radiation on the thyroid gland.
7. By the combined action of the above-mentioned factors with the additional administration of chemical cancerogens.



The ability of all these factors to induce experimental tumors of the thyroid gland is based on their capacity to depress synthesis of the thyroid hormones, and thereby to create conditions which permit the constant and prolonged irritation of the gland membrane.

Pharmacology and Toxicology

91. Effect of NIUIF-100 on Gastric Secretion

"Effect of NIUIF-100, a Chemical Poison, on the Secretion Functions of the Stomach," by G. A. Zhiznevskiy, Chair of Hygiene and Pharmacology, Minsk Medical Institute; Minsk, Zdravookhraneniye Belorussii, Vol 4, No 10, Oct 58, pp 56-58

Two dogs were used in experiments conducted to determine the effect of NIUIF-100 -- parathion -- on gastric secretion functions. The poison was administered to the dogs in milk, in doses of 5 milligrams per liter of milk. The results of the experiments revealed that NIUIF-100 depressed the cholinesterase activity in the blood serum, creating an imbalance in the acetylcholine-cholinesterase system; prolonged administration of the poison produced a disturbance of the gastric secretion functions expressed by a change of the quality and quantity of the gastric juice, a change dangerous to the animal organism.

92. Effect of Aminazine on the Uterus

"On the Effect of Aminazine on the Contracting Activity of the Uterus," by V. K. Zubovich, Chair of Obstetrics and Gynecology, Minsk Medical Institute and Luga Rural Division Hospital, Pliisk Rayon, Molodechenskaya Oblast; Minsk, Zdravookhraneniye Belorussii, Vol 4, No 9, Sep 58, pp 43-46

Report on the results of the experiments which were carried out to determine the effect of aminazine, a drug now used in obstetrical and gynecological practice, on the contracting activity of the uterus. A total of 165 experiments were conducted. The aminazine was administered to the animals in a nutritive liquid medium. On the basis of the experiments it was concluded:

1. Aminazine, in therapeutic doses of 1-2 milligrams per kilogram of body weight, has no effect on the contracting activity of the uterus.
2. Large doses of aminazine, 3 milligrams or more per kilogram of body weight, sharply decrease and sometimes paralyze the ability of the uterus to contract.

3. The action of the drug depends on the individual peculiarities of the organism, the species of the animal, and the functional condition of the uterus.

93. Cancer Therapy With Antibiotics

"On the Problem of the Search For and Evaluation of New Anti-tumor Antibiotics," by O. K. Rossolimo, Laboratory of Experimental Study of the Therapeutic Properties of New Antibiotics, Institute for the Search of New Antibiotics, Academy of Medical Sciences USSR; Moscow-Leningrad, Voprosy Onkologii, Vol 4, No 6, 1958, pp 674-679

Mice were used in the experiments in which 246 new antibiotics were tested in search of antibiotics to be utilized in the therapy of malignant growths. Mice were inoculated with Crocker's sarcoma and with Ehrlich-type Ascitic carcinoma cells. Treatment was begun from 24 hours to the fourth and sixth day after the inoculation. The results of the experiments were as follows:

1. Of the total number of antibiotics tested, 187 were found to be ineffective in the therapy of cancerous growth.
2. The greatest part of the remaining 59 antibiotic substances were found to possess the ability to arrest the growth of tumors only when administered in toxic doses. The arrest of the growth of the malignant tissues was accompanied by the inhibition of the growth of normal tissues.
3. Only 5.7 percent of the antitoxic substances were found to possess the ability to suppress the growth of malignant tumors in a degree greater than that of normal tissue when administered in nontoxic doses.

Physiology

94. Human Physiology at High Elevations

"Human Physiology in Highly Elevated Areas," by I. Yerokhin and A. Tsyurul'nikov; Moscow, Meditsinskiy Rabotnik. 26 Dec 58, No 103 (1747), p 4

The author of this article state that mountain climbing is becoming popular in the USSR. In 1958 alone over 100 Soviet people achieved the distinction of scaling mountains to heights of over 7,000 meters above sea level.

A brigade of physicians from the two largest vuzes (higher educational institutions) of the country, the Moscow University imeni Lomonosov and the Moscow Higher Technical School imeni Bauman, accompanied an expedition of mountain climbers to Tyan'-Shan'. They recorded the effects of high altitude on human physiology. The physiological studies consisted of investigations of the functions of the cardiovascular and respiratory systems, a three-factor [trekhmomentnaya] composite functional test based on the method used by S. P. Letunov, oxyhemometry, laboratory methods of investigation, etc.

Physiological observations were begun even before the mountain climbers left Moscow. Observations of how the human organism adjusts itself during gradual ascent to higher altitude were made during the entire trip which members of the expedition took to Frunze (340 meters above sea level), Przhival'sk (1,200 meters above sea level), Ken-Su (2,700 meters above sea level), and during several weeks of travel with the caravan from Ken-Su to their base at the foot of the peak Pobeda on a glacier "Zvezdochka" (4,300 meters above sea level).

Physician Boris Romanov (who is an expert mountain climber) climbed to the top of Vostochnaya Pobeda mountain, which is 7,050 meters above sea level. The mountain climbers continued to ascend under extremely adverse meteorological conditions along the peak of Pobeda from Vostochnaya Pobeda to the main summit of 7,439 meters above sea level. The authors of this article state that they were members of this group and that, together with other mountain climbers, they succeeded in conquering a number of vertical, snowbound, glacial walls and steep, rocky elevations. This ascent to a higher altitude is of great interest from the physiological viewpoint, because such a long stay at such a high altitude has never been recorded.

On the basis of the physiological data obtained and the medical observations made, it was possible to envision the functional condition of the human organism which creates the desire to go mountain climbing. The significance of yearlong training was clarified. Exercise taken by members of the expedition consisted of bicycle riding, light physical exercises during the spring-autumn season, and skiing during the winter months. At the start of the mountain climbing season, all members of the expedition were in good physical condition. This made it possible to reduce the number of acclimatizing ascents. Specifications approved in 1956 recommend a 2-month acclimatization period with two intermissions for descent to an altitude of 2,000 meters.

The authors of this article state that the acclimatization period lasted only 20 days during their expedition. Despite this, mountain sickness was observed in only 3 out of 65 participants. These three people were unable to train properly before they joined the expedition. Mountain sickness, therefore, depends not so much on the adaptability of each individual to conditions found at high altitudes, but on exercises which adapt the human organism to these conditions. Yearlong training helps save time and helps conserve the strength of each mountain climber during each stage of acclimatization.

The authors of this article refer to statements of specialists in mountain climbing in countries outside the USSR. These specialists abroad seem to think that only a handful of exceptionally well-trained mountain climbers can endure conditions found at an altitude of 7,000 meters for a period of more than 3 or 4 days unless they are provided with oxygen equipment. An English mountain climber Lou [Low or Lowe] established a record in 1953 by remaining at an altitude of 7,000 meters for 11 days during an expedition to Mount Everest. It took 14 days to climb along the ridge of the peak of Pobeda; this was done under extremely adverse meteorological conditions. Members of the expedition felt well and remained cheerful. An increase in the pulse rate and changes in arterial pressure and in respiration frequency were noted during climbing; these functions rapidly became normal after crossing was completed, with no ill effects.

Sleep is considered necessary during mountain climbing. The authors of this article state that everyone slept well and the supply of somnifacient drugs remained unused. Absence of appetite or any disturbance in appetite, considered to be typical during ascents to high altitudes, was not noted among members of the expedition. Proper rationing of drinking water was one of the decisive factors in maintaining efficiency among members of the expedition: the mountain climbers received at least 3 liters of liquids per 24 hours.

Final processing of results of the studies made will aid in solving such questions as selection of the most reasonable period of stay at various altitudes for acclimatization purposes, the optimum altitude admissible during any one expedition, the tempo of climbing and the intensity of activity during ascent to high altitudes, the judicious use of drinking water, and food consumption.

More extensive and more detailed investigations must be conducted before the problems confronting the mountain climbers can be solved. The authors state that studies must be continued under actual mountain climbing conditions. They conclude their article by saying that results of their expedition indicate that this can be done with a minimum expenditure

of funds. So far all studies have been conducted by physicians who are mountain climbing enthusiasts; mountain climbing and physiological studies must be conducted in a systematic manner and according to plan, and must be directed by such scientific establishments as the Institute of Physiology, the Central Scientific Research Institute of Physical Culture, and other similar organizations.

95. Hematological Changes Following the Freezing and Burning of Tissues

"Concerning the Problem of the Biochemistry of Thermal Trauma," by P. V. Afanas'yev, V. G. Yakovlev, G. L. Frenkel', and Z. D. Khmel'nitskaya, Izv. A. N. Kirg SSR, (Izvestiya Akademii Nauk Kirg SSR), 1958, Vol 5, 121-131; (From Referativnyy Zhurnal -- Khimiya Biologicheskaya Khimiya, No 23, 10 Dec 58, Abstract No 30895)

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"The freezing of dogs' extremities causes the dissociation of glycogen, and consequently the accumulation of the sugar in the circulating venous blood and the enrichment of the arterial blood with sugar. The same picture is observed with regard to residual nitrogen. The level of protein nitrogen falls in the arterial blood but rises in the venous. Thirty minutes after subjecting animal tissue to burns there is a sharp rise of residual nitrogen, sugar, and pyrroacemic acid in the burned tissues. These components seep into the venous blood, and their level, in the general circulation, gradually rises."

96. Book Published on Biochemistry of Trauma

Biokhimiya Travmy (Biochemistry of Trauma), by Prof L. S. Cherkasova, Publishing House of the Academy of Sciences Belorussian SSR; Minsk, 1957, 191 pages

The subject of trauma due to various mechanical, thermal, chemical, radiation, etc. causes is discussed with regard to wounds of soft tissues, bone fractures, and complications resulting from suppurative infections.

Special subjects discussed include: "Physiological Bases for the Study of Trauma"; "Biochemical Disturbances due to Infectious Complications of Wound Processes"; "Biology of Bone Tissue and the Biochemical Characteristics of Bone Fractures"; "Biochemical Disturbances Arising due to Gunshot Osteomyelitis..."; and "General Metabolic Reactions of an Organism to Trauma." Finally 18 pages of literature from Soviet and non-Soviet sources are cited.

Public Health, Hygiene, and Sanitation

97. 1957 Research in Ukrainian SSR

"In the Ministry of Health Ukrainian SSR: Results of Scientific Research Efforts During 1957" (unsigned article), Vra-chebnoye Delo, No 11, Oct 58, pp 1227-1228

The Collegium of the Ministry of Health Ukrainian SSR met in regular session to hear the report of the Deputy Chairman of the Scientific Council of the Ministry of Health Ukrainian SSR, N. B. Man'kovskiy. He spoke on the progress of scientific research work in the Ukrainian SSR during 1957. He stated that although new methods of prevention, diagnosis, and treatment of many infections were developed during 1957 and although valuable therapeutic preparations were discovered and new instruments were designed, approval and practical application of new instruments, drugs, methods of treatment, and medical techniques is proceeding very slowly. Heads of some institutes take too much time to submit plans for practical utilization of results of scientific research. The experimental shops of the Administration of the Medical Industry of the Ministry of Health are slow in manufacturing newly designed medical appliances.

No definite decisions have yet been made concerning the establishment of scientific testing shops for manufacture of various models of mechanical devices and the organization of a laboratory for producing chemotherapeutic preparations in quantities sufficient for proper testing in clinical practice. Many therapeutic and preventive medical establishments have received no information concerning new drugs and new medical techniques.

The Ministry of Health Ukrainian SSR approved the plan for clinical testing and practical application of new methods of treatment which were proposed during 1957 and endorsed by the collegium.

The deputy chairman of its Scientific Council further stated that it was decided to suggest that scientific research institutes and medical institutes direct their efforts toward solution of the most important problems with which the medical science and health service are confronted. All plans for practical application of results of scientific research must be presented each year to appropriate commissions of the Scientific Council of the Ministry of Health Ukrainian SSR not later than 30 January. Any research work done on subjects that are not of republic level, but which have practical application in medical practice, must be sent directly to the Scientific Medical Council.

The Administration of the Medical Industry and the Main Administration of Pharmacies (GAPU) have been charged with the function of formulating regulations dealing with the Central Scientific Experimental Shop (which designs and produces models of new devices and instruments used in experiments) and dealing with the factory that approves and manufactures pharmaceutical preparations in quantities needed for testing in clinical practice. The Administration of Major Construction has been made responsible for the entire preliminary work, consisting of the early preparation of blueprints in 1959 for construction of shops, an experimental laboratory, and the above-mentioned factory of pharmaceutical preparations.

The Ukrainian Institute of Sanitary Chemistry, the Ukrainian Institute of Experimental Endocrinology, and the Kiev and Odessa Institutes of Epidemiology and Microbiology have been given funds to manufacture sufficient quantities of pharmaceutical preparations for experimental purposes.

The administrations of republic and oblast scientific societies, scientific medical libraries, and GAPU must improve their methods of disseminating information concerning drugs and medical equipment manufactured in the USSR and abroad and concerning newest therapeutic and preventive methods to therapeutic and preventive medical establishments.

In its resolution, the collegium pointed out that research has been managed well in the following fields: tuberculosis and its control, industrial hygiene in the leading branches of industry and agriculture, helminthiasis and its control, poliomyelitis, physiology and pathology of the higher nervous system, dysentery and its control, and control of blindness and glaucoma. Research in the treatment of rheumatism, chemotherapy of malignant neoplasms, vaccination against influenza, treatment of acute children's infections, the physiology of digestion, the pathogenesis and therapy of radiation sickness, and complications arising during pregnancy and childbirth has been progressing well.

Greater attention must be given to results of research on protection against air pollution and pollution of reservoirs in industrial zones, on estimating maximum permissible concentrations and degree of toxicity of poisonous agricultural chemicals, on new surgical methods of treating pulmonary tuberculosis, and on the albuminous blood substitute VK-8.

Problem commissions have shown improvement in coordinating the work of various institutes. As a whole, all medical establishments have been conducting scientific research in a manner that can be considered satisfactory; a number of substantial shortcomings can be noted, however. The problem commissions of the Scientific Council of the Ministry of Health Ukrainian SSR do not supervise in an adequate manner over an entire year. Research institutes do not always receive systematic aid, and at times no proper notice is taken of the work progress in the laboratories of institutes.

Research institutes quite often receive no information of research efforts of related scientific establishments. Commissions and leading institutes do not evaluate progress the year, but confine themselves to mechanical tabulation of results. Research in too many subjects is allowed to be carried on in some institutes: this leads to dissipation of energy; such institutes should channel their manpower to solving the most important problems. Preventive medicine has not received the attention it deserves. For example, research in preventing cardiovascular diseases, silicosis, endemic parotitis, and some others has not been progressing very well. Sufficient interchange of information between some institutes and various chairs and laboratories is lacking. The directors of the Kiev Institute of Orthopedics and Traumatology, the Odessa Institute of Psychoneurology, and the Stalino Institute of the Physiology of Labor have been slow in carrying out their plans.

The cross section of administrative personnel of the Ministry of Health Ukrainian SSR do not take a sufficiently active part in planning the scientific research that is being carried out in various institutes of the republic and do not supervise execution of their plans.

The problem commissions must intensify their efforts in guiding the work of scientists in the republic so that progress can be made in the following fields of medicine: hypertension, coronary insufficiency, malignant tumors, tuberculosis, silicosis, and communicable diseases among children.

It would be expedient to establish "creative collectives" of clinicists and representatives of theoretical medicine to strengthen in each institute a desire for developing specific problems, taking into consideration the type of its personnel, their mission, and their technical equipment. The deleterious practice of trying to solve several problems at the same time must be discontinued.

It is further stated in this article that the collegium considers it necessary to expand exploitation of statistical information and to analyze morbidity and mortality figures in a more profound manner. This may make it possible to see more clearly the results of preventive medical measures. Working conditions in medical research establishments must be improved. There is a necessity for re-examining the structure of scientific research institutes, strengthening them with additional personnel, and reinforcing the principal laboratories and divisions with modern equipment, instruments, laboratory supplies, and reagents.



The collegium pointed out that the Dneprovsk, Stanislav, Vinitza, Odessa, and L'vov Medical Institutes and the Ukrainian Institute of Eye Diseases have not been describing their work in an adequate manner. The collegium noted that good work has been done by the following members of the problem commissions: Docent I. I. Ovsiyenko and Prof Ye. S. Shul'man, in the field of helminthiasis control; Prof I. L. Bogdanov, in the field of poliomyelitis; Prof N. A. Puchkovskaya, in the field of control of blindness and glaucoma; and Prof A. F. Makarchenko, in the field of industrial hygiene in the leading branches of industry and agriculture.

Radiology

98. Purification of Air From Radioactive Aerosols by Various Filters

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"Purification of Air From Radioactive Aerosols" (unsigned article); Moscow, Meditsinskiy Rabotnik, No 96, 2 Dec 58, p 3

"During work with radioactive substances at various laboratories and scientific research institutes, radioactive aerosols having deleterious effects on people are admitted into the air. To trap these aerosols and purify atmospheric air, the Moscow Institute of Labor Protection of the All-Union Central Council of Trade Unions has developed new methods which use filtration materials made from crumbled rubber, porous air-permeable rubber, foam plastic, and filtration cardboard. Filters saturated with radioactive substances caught from air dust are burned in special furnaces and the ashes are buried in the ground.

"Depending on the thickness of the stuffing (if the thickness of the stuffing is sufficient) in the filter mesh, which is stuffed with crumbled rubber for one-phase purification, and the thickness of filtration cardboard for two-phase purification, air purification is 99% efficient. In especially important cases, use is made of three-phase purification, in which cases special "FPP-15" filter tissue is used.

"All these types of filters have been subjected to tests at the physicochemical laboratory of the institute and have proved highly effective. Presently, they are being used under working conditions."

99. Prophylactic Ultraviolet Irradiation of Food Products Recommended

"The Effect of Ultraviolet Irradiation on Mineral and Nitrogen Metabolism in Adolescents," by A. P. Shitskova and K. A. Kalinina, Division of Nutritional Hygiene of Moscow Scientific Research Institute of Sanitation and Hygiene imeni F. F. Erisman, Ministry of Health RSFSR; Moscow, Gigiyena i Sanitariya, No 11, Nov 58, pp 37-43

At present, there are sufficient data to prove that solar light through its ultraviolet effect causes a number of complicated processes in the skin and in the reticuloendothelial and central nervous systems, synthesizes vitamin D, increases the immune reaction, and stimulates metabolism.

In the research described, several food products (meat, eggs, cheese, milk, sausage, sugar, etc.) were irradiated and then given to four adolescents, and the metabolism of calcium, phosphorus, nitrogen, and magnesium were studied.

Results indicate that prophylactic ultraviolet irradiation increases the positive balance of minerals and nitrogen. The increase in these experiments was 34.9 to 62.4; 22.2 to 41.9; 26.2 to 32.1 percent for Ca, P, and N respectively, and 88 to 117 mg per day for Mg.

The authors conclude that prophylactic ultraviolet irradiation activates the metabolic rate and increases the capacity of the organism to utilize nitrogenous and mineral substances, especially calcium.

100. Postirradiation Changes in the Sorption Properties of Free Cells Closely Linked to Rate of Metabolism

"The Effect of Ionizing Radiation on Sorption Properties of Free Cells," by Ye. A. Ivanitskaya, Institute of Biological Physics, Academy of Sciences USSR; Moscow, Biofizika, Vol 4, No 1, Jan 59, pp 71-77

The aim of this research was to study the effect of X rays on the sorption capacity of free cells for radioactive colloidal silver ( $Ag^{110}$ ), i.e., erythrocytes and cells of Ehrlich's ascitic carcinoma.

Results indicate the following:

"The sorption of colloids by unirradiated cells at 37°C occurs within 5-10 minutes, after which a state of equilibrium is reached. After irradiation, this sorption capacity of the cells decreases and attains a maximum decrease (40%) 24 hours after irradiation of cells by 1,000 r. The sorption of radioactive colloidal gold ( $Ag^{110}$ ) decreases sharply when experiments are conducted at 0°C. In addition to changes in sorption properties after irradiation, a decrease was noted in the electrokinetic motion of erythrocytes. Changes in sorption properties of erythrocytes and in Ehrlich's ascitic carcinoma cells indicate that changes occur in the surface properties of these cells, and these changes, apparently, are closely linked with the rate of metabolism."

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101. Changes in the Physicochemical Properties of Erythrocytes Due to Gamma-Ray Effects

"Changes in the Physicochemical Properties of Erythrocytes Due to Gamma-Ray Effects," by Yu. A. Kriger and Ye. S. Yelkhovskaya, Soil Biology Faculty of Moscow Order of Lenin University imeni M. V. Lomonosov; Moscow, Biofizika, Vol 3, No 6, 1958, pp 711-716

Human erythrocytes isolated from plasma were washed, centrifuged, and then subjected to gamma radiation, and the changes were studied with an electron microscope.

Results indicate the following:

1. Human erythrocytes subjected to gamma rays (a dose of 42 kr, 700 rpm/min), then incubated, exhibit an increase of low frequency electrical resistance, which is substantiated by the swelling of the erythrocyte stroma without rupture.

2. Human erythrocytes subjected to a dose of 84 kr exhibit insignificant amounts of electroconductivity which is connected with definite disturbances in submicroscopic structure of the erythrocyte.

3. Irradiation of erythrocytes without subsequent incubation causes increased ion migration into the electron-free medium, as compared with ion migration of control erythrocytes.

4. Suspensions of irradiated erythrocytes in distilled water exhibit a gradual decrease of their low frequency resistance, which is a phenomenon similar to stroma porosis.

The authors conclude that these results contradict Faill's hypothesis which assumes that the mechanisms for hypotonic hemolysis and radiation hemolysis are identical.

102. Decrease of Irradiated Erythrocyte Resistance in Alkaline Medium Linked to Damage in the Lipid Containing Surface Layer

"On the Decreased Resistance of Irradiated Erythrocytes in an Alkaline Medium and the Relationship of the Latent Period of Alkaline Hemolysis to Radiation Dose," by K. S. Trincer, Institute of Biological Physics, Academy of Sciences USSR; Moscow, Biofizika, Vol 4, No 1, Jan 59, pp 78-83

Structural changes, in the surface layer of red blood corpuscles, caused by radiation are substantiated by changes in permeability, osmotic pressure, thermal resistance, surface charge, photolability, and inhibition of sorption properties. Since radiation inhibition of the sorption properties of cells has been explained by changes in the surface layer of cells, the present research attempts to study structural changes in the surface layer of erythrocytes under the effect of penetrating radiation by determining the limits of acid and alkaline resistance of the erythrocytes in isotonic solutions.

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The author makes the following conclusions:

"The resistance of irradiated erythrocytes to the subsequent effect of an alkaline medium is sharply decreased as compared with the resistance of unirradiated erythrocytes. This is apparently linked to the radiation injury of the lipid components of lipoproteins in the surface layer of the cells.

"The resistance of irradiated erythrocytes to acidic medium is approximately equal to that of unirradiated erythrocytes.

"The correlation of the latent period in the process of alkaline hemolysis to the dose of radiation can be expressed as a simple decreasing exponential function.

"The author theorizes that the surface layer of erythrocytes contains a large number of independent radiosensitive areas, the damage of which substantiates the 'Target Theory.'"

103. Effect of Ionizing Radiation on Plant Lipoxidase Enzyme System

"Changes in Lipid Metabolism of Plants Under the Effect of Ionizing Radiation," by Ye. V. Budnitskaya, L. G. Borisova, and A. G. Pasynskiy, Institute of Biochemistry imeni A. N. Bach, Academy of Sciences USSR; Moscow, Biokhimiya, Vol 23, No 6, Nov/Dec 58, pp 849-855

The present research is an in vivo study of the effects of X-ray irradiation on lipoxidase activity in sprouts of various plants (wheat, barley, soya, pea, etc.).

The authors make the following conclusions:

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"Data, established for the first time in plants, confirm that significant changes occur in the lipoxidase enzyme system in in vivo experiments due to X-ray Irradiation.

"A higher sensitivity to the effect of ionizing radiation has been determined in lipoxidase activity in in vivo leaves of plants, and changes in lipoxidase activity were induced by significantly lower doses (30-50 %) in in vivo than in in vitro tests. A phase of enzyme system activation by comparatively lower doses of irradiation and shorter incubation period after irradiation was also noted. It was established that changes in the relative permeability of leaves of plant sprouts due to the effect of ionizing radiations, which confirm the presence of disturbances in the internal cellular structure, facilitate the leakage of electrolytes into the external medium. A change in the over-all permeability, or a change in the internal structure, probably leads to the changes observed in the activity of lipoxidase after the irradiation of plant sprouts.

"A significant increase was noted in the quantity of peroxides of unsaturated fatty acids after the exposure of sprout leaves of beans and barley to low doses of irradiation (1,000 r); this was probably brought about by an enzymatic effect.

"One may postulate that the significant physiological effect and the toxic property of peroxides of unsaturated fatty acids play a great role in the intoxication of plants under radiation effects."

104. Effects of Local and Distant X-Ray Irradiation of Mouse Ovaries

"The Role of Local and Distant Effects of General X-Ray Irradiation on Injuries to Mouse Ovaries," by O. N. Petrova, Institute of Genetics of Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 123, No 6, 21 Dec 58, pp 1018-1021

The estrus cycle and the fertility of female mice were studied with regard to local X-ray irradiation of the ovaries, to the simultaneous irradiation of the ovaries and the head, the to total irradiation.

Results indicate that irradiations with single 100 r doses are non-lethal but sterilizing, and exert very injurious effects on the ovaries regardless of whether the irradiation is general or limited to the gonadal region. Furthermore, data indicate a significant parallelism between the course of the disturbed estrus cycle and the irreversibly destroyed fertility after either general irradiation or local irradiation of the ovaries.

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The author concludes that, [REDACTED] nonlethal but sterilizing dose of (100 r) X rays is a result of the effect of direct local injuries."

105. Effect of Ionizing Radiation on Glutathione and Coenzyme A

"The Effect of Ionizing Radiation on Certain Nonprotein Thio-Compounds of Animal Organisms," by M. B. Gintsburg, Ukrainian Scientific Research Sanitary Chemical Institute; Kiev, Biokhimiya, Vol 23, No 6, Nov/Dec 58, pp 840-844

The effect of ionizing radiation on nonprotein sulfur-containing compounds, i.e., glutathione and coenzyme A (C<sub>o</sub>A), was studied. Changes in the activity of C<sub>o</sub>A and changes in glutathione content after irradiation, and changes in the activity of C<sub>o</sub>A in various rat tissues under the effect of arsenic-containing thio-compounds were determined.

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Results indicate the following:

"The activity of C<sub>o</sub>A in rat liver and brain is significantly decreased at definite periods after total irradiation as compared with the normal controls.

"The activity of C<sub>o</sub>A in the liver and brain of irradiated rats under the effect of thio-poisons is inhibited significantly more than that of control normal animals. The quantity of glutathione in the liver of irradiated rats is slightly increased within 24 hours, while the quantity of glutathione in the brain remains unchanged all during the 48-hour experimental period.

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"Thus, as a result of irradiation, the sensitivity of CoA toward thio-poisons, at definite periods after irradiation, is distinctly increased in the tissues of irradiated animals as compared with the normal controls (in the liver in 48 hours, and in the brain during the 24-48-hour period)."

106. Certain Biochemical Changes in Tissues Exposed to Very Large Doses of Ionizing Radiation

"Biochemical Changes due to the Effect of Large Doses of Ionizing Radiation," by R. Ye. Libinzon; Moscow, Biofizika, Vol 4, No 1, Jan 59, pp 89-100

Biochemical changes due to the effect of very large doses of ionizing radiation (gamma rays) on bone marrow, spleen, liver, brain, and eggs were studied. Essentially, the following responses were observed: (a) irradiation of dogs by 114-240 kr caused immediate "death under rays"; (b) irradiation of dogs by 15-120 kr produced symptoms of nervous system injury, and death within 24 hours; (c) irradiation of dogs (and of rats) by 5-10 kr caused a special form of acute radiation sickness, and death in 4 days; and (d) doses below 1,200 r produced the most classical picture of acute radiation sickness, characterized by injury to the hemopoietic system.

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The author makes the following general conclusions:

"The decrease in DNA and RNA due to large doses of ionizing radiation is detected sooner, and the fall is greater in bone marrow than in the rest of the tissues studied. The average decrease in the DNA level in the various tissues of the animals dying in the ionizing radiation field was 38%, while that in bone marrow was 50%. The greatest nucleic acid decrease was in bone marrow, then in spleen, and then liver. Changes in nucleic acids found in brain tissue and in eggs were not significant. The extent of DNA and RNA decrease in tissues was linked to the duration of animal survival.

"Irradiation of animals in powerful fields of ionizing radiation induced essential changes in the composition of DNA. These changes were substantiated by decreased DNA nitrogen content.

"Total irradiation of dogs by very large doses of ionizing radiation produced a manifold increase in the nonprotein nitrogen of blood serum. A rise in the serum protein level was observed in all animals subjected to radiation doses of 15-240 kr.

"Adenosinetriphosphate activity in the bone marrow decreased 50% 5 hours after irradiation with 50 kr, but no changes were detected in spleen, liver, or brain enzyme activity."



107. Postirradiation Therapeutic Effect of Certain Nucleotides and Nucleosides

"The Effect of Certain Nucleotides and Nucleosides on the Regeneration of Hemopoietic Tissue After Irradiation," by Z. Karpfel', Yu. Soshka, and V. Drashil, Institute of Biophysics of the Czechoslovak Academy of Sciences; Moscow, Biofizika, Vol 4, No 1, 1959, pp 64-70

Since it has been demonstrated by many researchers that the synthesis of desoxyribonucleic acid is significantly decreased after irradiation, the present research attempted to modify DNA synthesis and through this modification cause the regeneration of hemopoietic tissue by the use of certain nucleotides and nucleosides that are part of the DNA molecule.

Substances used for postirradiation therapy included thymidylic acid, desoxycytidylic acid, desoxycytylic acid, desoxycytidylic acid plus thymidylic acid, desoxyadenylic acid, desoxyadenylic acid plus desoxyguanine, cytidylic acid, desoxypyridine, and desoxycytidine.

The effect of desoxyribonucleotides and desoxyribonucleosides was evaluated according to the blood picture, and the effect of desoxycytidylic acid and cytidylic acid was studied with regard to the synthesis of DNA in vitro bone marrow suspensions and in vivo tests on mice.

Results verify that of the substances used, desoxyribonucleotides which contain the pyrimidine base exert the most favorable postirradiation effect both on the blood picture and on animal survival. In this research, desoxycytidylic acid, and its mixture with thymidylic acid, when used in small doses, exerted the best effect, and the use of thymidylic acid alone in large quantities also had a favorable effect. Desoxyribonucleosides had an unfavorable effect. Ribonucleotides were ineffective.

108. Histoautographic and Histochemical Research on the Inclusion of Radioactive Phosphorus in Various Cells of the Nervous System

"Histoautoradiographic and Histochemical Study of the Inclusion of P<sup>32</sup> Into Nerve Cells," by N. D. Gracheva, Central Scientific Research Roentgenoradiological Institute; Moscow, Doklady Akademii Nauk SSSR, Vol 123, No 5, 11 Dec 58, pp 937-940

The characteristics of phosphorus metabolism in the nerve cells of various branches of the nervous system of rabbits were studied. Differential histoautoradiographic and histochemical studies determined the rate of inclusion and the relative level of radioactive phosphorus in RNA, DNA, and phospholipids after various subcutaneous doses of this isotope were administered.

109. Neutron Radiation Effects on Caryopses Tested

"Research on the Effect of Neutrons on Dry Caryopses of Diploid and Tetraploid Winter Rye," by L. P. Breslavets and Z. F. Milesenko, Institute of Biological Physics, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 120, No 2, 11 May 58, pp 429-430

Research was conducted on dry grains of diploid and autopolyploid rye (Moscow selected variety) and on tetraploid grains irradiated with various doses of hot neutrons in an effort to compare the radiosensitivity of various types of herbs and grains to hot neutron radiation.

Experiments indicate that, judging by rate of sprouting and height of 18-day seedlings, the tetraploids which have a slower rate of growth under control conditions are less sensitive and have greater resistance to neutron radiation than the diploids.

110. Radiation Disturbances of Nucleic Acids Related to Changes in Oxidative Phosphoryllation

"On the Capacity of Desoxyribonucleic Acid to Stimulate Oxidative Phosphoryllation After Irradiation," by A. M. Kuzin and Ye. V. Budilova, Institute of Biological Physics, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 120, No 2, 11 May 58, pp 361-363

Experiments were conducted on albino rats irradiated with 1,000 r, and desoxyribonucleic acid was administered to them before and after irradiation, and changes in oxidative phosphoryllation were determined.

Results indicate that unirradiated desoxyribonucleic acid is capable of stimulating oxidative phosphoryllation in hepatic suspensions of irradiated animals. Irradiation of solutions of desoxyribonucleic acid causes depolymerization and partial decomposition and completely deprives DNA of its stimulating effect on oxidative phosphoryllation.

These results point to a still unexplained link between the DNA of the nucleus and oxidative phosphoryllation in the mitochondria and give probable bases for assuming that changes in nucleic acids resulting from irradiation are linked with the simultaneous induction of disturbances in oxidative phosphoryllation in irradiated cells.

111. X-Ray Radiation Effects on Brain Tissue Composition

"The Effect of X Rays on Nerve Tissue Metabolism," by P. F. Minayev and R. I. Skvortsova, Vopr. Biokhimi i Nervn. Sistemy (Problems of the Biochemistry of the Nervous System), Kiev, Academy of Sciences Ukrainian SSR, 1957, 289-294 (from Referativnyy Zhurnal - Khimiya Biologicheskaya Khimiya, No 23, 10 Dec 58, Abstract No 30991)

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"Local irradiation of the cerebellum of guinea pigs by X-ray doses of 16,000 and of 9,000-12,000 r caused very insignificant changes in the glutamic acid (a decrease of 6-12 mg %) and glutamine (a rise of 5-14 mg %) content in the brain tissue. The quantity of ammonia remained unchanged in all cases of local irradiation of the cerebellum. After total irradiation by doses that exceed the lethal dose by 2-4.5 times (1,000 and 2,000 r), the level of glutamic acid in the brain is decreased by 20-38 mg %, and the level of glutamine is also decreased, while there is an insignificant rise in the ammonia level."

112. Polosukhin Antishock Fluid Combined With Drip Hemotransfusion in Peptone Shock

"Comparative Evaluation of Certain Methods of Treatment of Experimental Shock Under Conditions of Radiation Sickness," by Yu. M. Bryakin, Institute of Clinical and Experimental Surgery of the Academy of Sciences, Kazakh SSR; Alma Ata, Zdravookhraneniye Kazakhstana, No 8, 1958, pp 42-48

Experiments for studying the course and treatment of peptone shock against a background of radiation sickness were conducted on dogs. Specific items included: (a) the use of A. P. Polosukhin's antishock fluid (25 ml of sodium chloride, 1.5 ml of calcium chloride, 0.5 ml of sodium hypophosphate, and distilled water to bring the volume to 500 ml); (b) the use of E. A. Asratyan's antishock fluid (16 ml of sodium chloride, 1.5 ml of sodium bromide, 1.2 ml of sodium bicarbonate, and distilled water to bring the volume to 1,000 ml); (c) the use of the neuroplegic mixture (2 mg of aminazine, 2 mg of dimedrol, 0.1 ml of a one-% morphine sulfate solution, 0.1 ml of a one-% atropine sulfate solution, and physiological salt solution to equal 10 ml per kg body weight); (d) transfusion of fresh whole blood; and (e) the combined use of A. P. Polosukhin's antishock fluid plus fresh blood. Control and experimental dogs were irradiated with 500 r total X-ray dose.

The data obtained indicate that "experimental peptone shock arising during the initial phase of acute radiation sickness is characterized by a high mortality rate."

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"Experimental peptone shock arising in dogs during the peak of acute radiation sickness is absolutely lethal.

"Experimental peptone shock arising in dogs during the peak of acute radiation sickness is characterized by a poorly expressed erectile phase, an extremely severe torpedo phase, and by acute leukopenia.

"The lowest resistance of dogs in peptone shock and under conditions of acute radiation sickness coincides with the peak of acute radiation sickness.

"Experimental data for shock therapy against a background of acute radiation sickness prove that the antishock fluid of A. P. Polosukhin is most effective, especially in conjunction with drip hemotransfusion."

113. Prophylactic and Therapeutic Use of Vitamin B-Complex and Vitamin B<sub>12</sub> Alone on the Course of Radiation Sickness

"The Effect of Vitamin B-Complex on the Resistance of an Organism To Radiation Effects," by A. N. Liberman, Central Scientific Research Laboratory of Kharkov Naval Academy imeni S. M. Kirov; Kiev, Fiziologicheskii Zhurnal, Vol 4, No 6, Nov/Dec, 58, pp 814-820

Three series of tests conducted on cats and mice in an attempt to study the prophylactic and therapeutic effects of vitamin B-complex on radiation sickness demonstrated the following:

1. The therapeutic use of vitamin B-complex (B<sub>1</sub>, B<sub>2</sub>, B<sub>6</sub>, B<sub>12</sub>, PP, folic acid, and paraaminobenzoic acid) has a favorable effect on the course of radiation sickness, increases the survival rate, decreases loss of body weight, and aids in the oxidation-reduction processes in the cellular respiration of a number of vitally important organs.
2. On the contrary, the combined use of a preliminary injection of vitamin B-complex and its therapeutic use during radiation sickness causes a more severe course of radiation sickness, decreases the survival rate, increases loss of body weight, and impairs the oxidation-reduction processes in a number of vitally important organs.
3. The combined preliminary and therapeutic use of vitamin B<sub>12</sub> alone produces positive shifts in oxidation-reduction processes in a number of organs, but these shifts are less pronounced than those resulting from the therapeutic use of vitamin B-complex.

114. Scientific Reviews of Biological Sciences Commences Series With Radiobiology

Itogi Nauki, Biologicheskiye Nauki, No 1 Radiobiologiya, Biologicheskoye Deystviye Ioniziruyushchikh Izlucheniy, (Scientific Reviews, Biological Sciences, No 1, Radiobiology, Biological Effects of Ionizing Radiations), edited by Prof A. M. Kuzin, (Doctor of Biological Sciences;) Moscow, 1957, 436 pages

This book was written because work accomplished in various fields of radiobiology, both in Soviet and non-Soviet countries, is expanding at such a rapid rate that regular scientific reviews, of which this is the first, in radiobiology have become necessary. Most of the work on radiobiology appearing in this review was accomplished between 1953 and 1955. It is suggested that regular reviews in radiobiology appear every 2-3 years to bring scientists up to date with the progress.

The different chapters dealing with various topics are reviewed by specialists actively engaged in their respective fields of radiobiology, although not all the fields are thoroughly reviewed. Topics discussed in detail include the following: problems connected with the effect of massive doses of ionizing radiation; biological effects of chronic irradiation with small doses of radiation with regard to sensitivity and immunity; gonadal sensitivity and genetic dangers, and the possibility of the formation of new types of organisms; limits of permissible doses of radiation; the use of radiation in agriculture and entomology; and the dangers of possible migration and concentration of radioactive elements in nature.

The book concludes with a discussion of the peaceful uses of ionizing radiation, and protection from its harmful effects.

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Surgery

115. Tantalum Suturing

"Apparatus for Nerve Suturing," by T. V. Kalinina and Engr L.I. Kukushkin, Scientific Research Institute of Experimental Surgical Apparatuses and Instruments; Moscow-Leningrad, Vestnik Khirurgii imeni I. I. Grekov, Vol 81, No 11, Nov 58, pp 122-126

This article gives a brief description of an apparatus for utilizing tantalum for suturing nerves. It consists of a sleeve with projections which, when manipulated by the surgeon, become embedded in the epineurium of the cut nerve and pull the cut ends of the nerve together; clamps through which the suture passes are then released, suturing the nerve and forming a knot. Tantalum causes little tissue reaction.

116. New Surgical Instrument

"New Instrument for Dilating the Lumens of Blood Vessels," by D.A. Donetskiy, Institute of Surgery imeni A. V. Vishnevskiy, Academy of Medical Sciences USSR; Moscow-Leningrad, Vestnik Khirurgii imeni I. I. Grekov, Vol 81, No 11, Nov 58, pp 120-122

A description of a new instrument used in surgery to dilate lumens of blood vessels, to insert cannulas, and to facilitate the suturing of blood vessels in cases of deep-seated chest and abdominal injuries is given in this article. It consists of two pairs of narrow plates assembled in such a manner that when pressure is exerted, the ends of the instrument diverge into four mutually perpendicular directions.

Miscellaneous

117. Instruments and Apparatus

"New Medical Instruments," by M. Mirskiy; Moscow, Meditinskiy Rabotnik, No 9 (1757), 30 Jan 59, p 4

This article describes new surgical and medical instruments now being exhibited. Among the exhibits is a new reflector light "Svet-14" for use in surgery. The new light has 14 reflectors and illuminates an area of about 400 millimeters providing a light of 20,000-60,000 luxes. The light has a television camera which can be replaced by either a photo or a movie

camera, and a microphone. Special radiation equipment which emits ultraviolet rays and makes possible the diagnosis of tumors, fungus infections, and other pathological tissue modifications is attached to the light. The new light was designed at the Laboratory of Optical and Technical Light Instruments of the All-Union Scientific Research Institute of Medical Instruments and Equipment.

Other exhibits include a new device for the administration of gas anesthetics; several new diagnostic and therapeutic instruments for physicians specializing in otorhinolaryngology, among them an olfactor for determining the sensitivity of the olfactory sense; a rhinopneumometer for determining the permeability of the nasal passages; a hydroionizator--an original and highly productive aerosol generator which can convert aqueous solutions of drugs into clouds of finely dispersed aerosols. The latter may be used not only for the prophylaxis and therapy of respiratory diseases, but also for the disinfection of air and dwellings. It may also be successfully used as a generator of hydroions.

Other exhibits include a so-called vacuum-extractor for use by gynecologists and obstetricians, and which is to replace the forceps now used; a container for storing radioactive cobalt preparations which permits the storing of such preparations with a charge equal to 650 milligrams of radium; an apparatus for diagnosing tumors by means of ultrasound, making it possible to identify a malignant growth before it can be diagnosed by means of X rays; the apparatus "SEA-1" for the automatic counting of erythrocytes and leukocytes; a special headlight for use by otorhinolaryngologists; a "karbometer" which makes it possible to determine the concentration of carbon dioxide in exhaled air; a spirometabalograph for determining basal metabolism; a new model of a universal inhalator; apparatuses for the electrical stimulation of respiration and for use in microwave therapy; a phonoecardiograph, and other instruments and apparatuses.

#### 118. Air Blast Injuries

"B. N. Nifontov, Vozdushnaya Vzryvnaya Travma (Air Blast Trauma)," review by N. A. Chalisov; Moscow-Leningrad, Vestnik Khirurgii imeni I. I. Grekov, Vol 81, No 9, Sep 58, pp 150-151

This article is a critical review of this 160-page book (Medgiz, 1957) written by B. N. Nifontov. It consists of six chapters; a conclusion; appendixes containing lists of drugs, instruments, and equipment which should be available at first aid points which serve persons suffering from air blast injuries; and a bibliography of Soviet and foreign literature on the subject.



In the first chapter, the author briefly cites literature dealing with the history of the problem, the mechanism of air blast waves, and their effect on human and animal organisms. The final section of the chapter is devoted to a description of the characteristics of atomic bomb explosions.

The second chapter is devoted to a description of the experiments which were made by Nifontov to explain the pathogenesis and cause of injuries caused by air blast waves.

A pathological-anatomical picture of the changes which take place in the organism as a result of air blast waves is given in the third chapter. Death in most cases is caused by injuries to the blood vessels, and the pulmonary blood vessels in particular.

Chapters 4 and 5 deal with the nature of injuries which may be caused by air blasts. These may be grouped as follows: general contusion by air waves; reactions caused by air waves; air wave contusion of the chest and abdomen; air wave contusion of the auditory organs; contusion of the brain. The symptoms of each group are described in detail.

In the sixth chapter the author deals with the therapeutic methods to be used in case of air blast traumas.

Nifontov is criticized for his failure to include in the bibliography the works of such well-known scientists as A. L. Abashev-Konstantinovskiy, L. I. Smirnov, P. Ye. Snesarev, and N. A. Zavadskiy. The reviewer concludes that despite the number of defects, the book contains information of interest to military field surgeons.

119. Presidium Sessions of Academy of Medical Sciences USSR

"In the Presidium of the Academy of Medical Sciences USSR,"  
by M. A. Ivanova; Moscow, Vestnik Akademii Meditsinskikh Nauk SSSR, No 1, Jan 59, pp 91-95

The 24 September 1958 session of the Presidium of the Academy of Medical Sciences USSR heard the report of the Deputy Chairman of the Problem Commission, Prof N. Ye. Sukharevoy, on the "Status of the Present and Future Development of the Problem of Acute Children's Infections in 1959-1965."

According to the report, methods for obtaining a highly active and highly purified scarlet fever toxin have been developed, and the immunological effectivity of the so-called "mirror immunization" against scarlet fever has been studied. The report also indicated certain shortcomings in the organization and struggle against children's infections.

In his report, Sukharevoy proposed the following to improve future development of the problem of acute children's infections: (1) a more complete study of the reaction of the child's organism to active immunization against various infections--the study of this reaction has not been conducted thus far in the USSR; (2) the study of the evolution of infectious diseases; (3) the study of the process of recuperation after acute children's infections.

During the discussion of the report Prof D. A. Zhdanov stated that it was imperative to improve clinical statistical research and to improve the qualifications of pediatricians and other medical workers in the field of acute children's infections. Other speakers discussing this report were Prof I. V. Davydovskiy, Prof. L. V. Grechishnikova, Prof V. D. Soboleva, Prof Ye. M. Ravikovich, and Prof O. D. Sokolova-Pomareva.

In the 1 October 1958 session of the Presidium, Prof M. M. Nevyadomskiy's report on his research on the establishment of the microparasitic nature of tumor cells was made. After considerable discussion of his report, it was established that there have been no new findings in the work of Nevyadomskiy.

120. Plenum in Moscow on the Problem of Decreasing Infectious Diseases

"Plenum of the All-Union Council of Sanitary Education," by S. Shukhman; Minsk, Zdravookhraneniye Belorussii, No 10, Oct 58, p 74

A plenum of the All-Union Council of Sanitary Education was held in Moscow in July 1958 concerning the problem of decreasing infectious diseases. A report by V. M. Zhdanov, Deputy Minister of Health USSR, pointed out that one of the most important factors for lowering the incidence of infectious diseases is the need for improving sanitary education among the masses during 1959-1965. Other speakers included P. F. Divakov, M. A. Rayg, S. I. Rizov, and Orlova, Senior Inspector, Main State Sanitary Inspectorate, Ministry of Health USSR. It was pointed out at the plenum that by 1957 the incidence of dysentery and diphtheria had decreased more than half in Khar'kov since 1953.

121. All-Union Conference of Neurosurgeons To Meet in Late March 1959

"All-Union Conference of Neurosurgeons" (unsigned article); Moscow, Meditinskiiy Rabotnik, 13 Feb 59

The All-Union Conference of Neurosurgeons, which had been scheduled to meet in Moscow from 23 to 28 February 1959, has been postponed until 23 March 1959. The conference will last until 28 March.

VIII. METALLURGY

[For information on metallurgy, see Section V, Engineering, Materials and Processes.]

IX. PHYSICS

Atomic and Molecular Physics

122. Radiation of Moving Point Charge Considered

"Radiation of a Point Charge Moving Uniformly Along the Axis of a Circular Opening in an Infinite, Ideally Conducting Plane," by V. Bobrinev and V. Braginskiy, Moscow State University imeni M. V. Lomonosov; Moscow, Doklady Akademii Nauk SSSR, Vol 123, No 4, 1 Dec 58, pp 634-636

The radiation of a point charge moving with uniform velocity along the axis of a circular hole in an infinite, ideally conducting plane is considered. The electric field in the wave zone is determined as the sum of the solution of the nonhomogeneous wave equation with homogeneous boundary conditions and the solution of the homogeneous equation with nonhomogeneous boundary conditions. An expression for the radiation of the point charge is given.

123. Cherenkov Radiation

"Cherenkov Radiation Emitted by Dipole Moments," by V. L. Ginzburg and V. Ya. Eydman, Physics Institute imeni Lebedev, Academy of Sciences USSR, and Gor'kiy State University; Moscow Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 6 (12), Dec 58, pp 1508-1512

Cherenkov radiation emitted by electric and magnetic dipoles moving in a continuous medium or in a channel or slit is analyzed.

124. Astigmatism of Electron Lenses

"On the Measurement of Astigmatism of Electrical Electronic Lenses," by R. Gobrecht, Heinrich Hertz Institute for Oscillation Research, German Academy of Sciences, Berlin-Adlershof; Berlin, Experimentelle Technik der Physik, No 6, 1958, pp 241-249

If a strict rotational symmetry of the electric field to be projected is assumed, no astigmatism can occur in the projection of an object point located in the optical axis. Even if the object point is a very short

distance from the axis, no astigmatic error can be observed. The first signs of astigmatism appear when the main beam angle is about 2 degrees, corresponding to a distance of the object point from the optical axis of 3.5 mm. The first measurable deformation of the image figure is produced at an object point distance of 5 mm and a slit diameter of 3 mm.

With increasing focal length the astigmatic image increases in size, but this increase is relatively slight in the case of an accelerating lens. Both the slit diameter and the distance of the object point from the optical axis influence the degree of astigmatism. The computation of the Seidel coefficient on the basis of image error theory leads to expressions which are complicated; an easier method is by determining the value of the astigmatic error experimentally.

Two electron lenses were used in the experiments

	Electrode $\phi$ D	Electrode Length	Total Length of Lens	Eccentricity $\epsilon$	$\epsilon/D$
No 1	40	44.5	90	5	0.125
No 2	60	44.5	90	10	0.167

125. Influence of Ionizing Gas Atmosphere on Solid Surfaces

"The Influence on Solid Surfaces by an Ionizing Gas Atmosphere. III. The Reduction of Oxide-Containing Zinc by  $H^+$ ," by W. Lippert and H. Schmellenmeier, Potsdam; Berlin, Experimentelle Technik der Physik, No 6, 1958, pp 276-278

Investigations of the reducing effect of hydrogen ions on zinc-oxide containing zinc films, which form the cathode of a glow discharge in hydrogen, confirm the inclusion hypothesis of Seeliger. The dependence of reduction on current shows that the decrease of zinc atoms with depth in the surface layers is not exponential, but very rapid. The process is therefore not one of diffusion.

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126. Effective Ionization Potential in Plasma

"On the Calculation of the Effective Ionization Potential in Plasmas," by H. Rother, Institute for Radiation Sources, (East) German Academy of Sciences, Berlin; Leipzig, Annalen der Physik, Vol 2, No 5/6, 11 Nov 58, pp 326-328

In recent years, several theoretical considerations have been proposed for the problem of the total energy levels and the ionization energy in ionized gasses. Whereas, for the calculation of the total energy levels in general, a raw estimation of the term (limiting quantum) number  $n_g$  is sufficient, thermodynamically less plausible assumptions are often introduced in order to compute the drop of the ionization potential  $\Delta U_i$ .

The separation of the Coulomb field by the Debye potential has been considered responsible for the limitation of the term number. For an effective density of state  $N_e \leq 10^{18} \text{cm}^{-3}$ , the optical limit of existence is more strongly reduced by the probability of transition of the valence electrons to neighboring ions; but for  $N_e \geq 10^{18} \text{cm}^{-3}$ , ( $T=8,000^\circ\text{K}$ ), an adiabatic dispersion model is no longer applicable, since only a few charged particles are left in the Debye sphere. Experimental values obtained for  $n_g$  seem to indicate another, heretofore not considered, influence on  $\Delta U_i$ . Apparently there is an independent limiting of the term (limiting quantum) number by the ionization frequency of atoms excited by electron collision.

The term (limiting quantum) number computed here in relation to the carrier density is in better agreement with experimental values (plotted here from spectrograms of varied mercury discharges) than that computed by other methods.

Electricity

127. Action of a Circular Current

"The Interaction Between a Medium and a Ring Type Current Incident on It," by V. N. Tsyтовich, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 6 (12); Dec 58, pp 1407-1416

The spectral distribution of the current in a ring which impinges with a constant relativistic velocity on a medium possessing arbitrary  $\epsilon(\omega)$  and  $\mu$  is analyzed. The reflection criterion for nonrelativistic velocities and expressions for the acting forces are derived.

Low Temperatures

128. Lambda Transition in He

"Observation of a Lambda Transition in Helium for a Heat Flow Through a Phase Boundary." by V. P. Peshkov, Institute of Physical Problems, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 6 (12), Dec 58, pp 1350-1354

Experiments on the density and temperature discontinuity observed at the boundary between the superfluid and nonsuperfluid helium in the presence of a heat flow are described. The reasons for stability of the boundary are explained, and some examples of violation of stability at large densities of the heat flow are presented.

Mechanics

129. Contractions of Cylindrical Shells Studied

"Stability of Cylindrical Shells From the Viewpoint of the Mathematical Theory of Elasticity," by K. F. Voytsekhovskaya, Institute of Mathematics, Academy of Sciences Ukrainian SSR; Moscow, Doklady Akademii Nauk SSSR, Vol 123, No 4, 1 Dec 58, pp 623-626

The stability of the contraction of a cylindrical shell is considered on the basis of the equations of the mathematical theory of elasticity with consideration of the deformation of the boundary surface of the body, but without consideration of the turning components.

130. Stability of Wakes Investigated

Formation of Oscillations in the Wake of a Body," by V. N. Arkhipov, Moscow State University imeni M. V. Lomonosov; Moscow, Doklady Akademii Nauk SSSR, Vol 123, No 4, 1 Dec 58, pp 620-622

The stability of a plane-parallel flow of a viscous incompressible fluid on which a two-dimensional perturbing motion is imposed is investigated. Tollmien's expression is used for the velocity distribution in



the wake of a body. It is noted that the results support hypothesis advanced by Petrov that the system of vortices in a wake is a result of perturbations which develop after the transition to a state of instability.

131. Stability of Periodic Motions in Discontinuous Case Considered

"On the Stability of Periodic Motions," by M. A. Ayzerman and F. R. Gantmakher; Moscow Physicotechnical Institute; Prikladnaya Matematika i Mekhanika, Vol 22, No. 6, Nov/Dec 58, pp 750-758

The stability of the periodic solution  $z = z^0(t)$  with period  $T$  of the system of differential equations

$$\frac{dz}{dt} = f(z, t) ; f(z, t+T) = f(z, t)$$

is investigated. It is noted that Lyapunov [Liapounoff], Poincare, and others assumed that the right sides of the above equations are continuous and can be represented as the sum of a linear term plus a nonlinear remainder. In this paper, the more general discontinuous case is considered where the surfaces of the discontinuity are given as

$$F_{\alpha}(z, t) = 0 \quad (\alpha = 1, 2, \dots)$$

and it is assumed that the right sides  $f(z, t)$  of the equations can have discontinuities at these surfaces.

It is shown that Lyapunov's theorem on linear approximation and the theorem of Andronov and Vitt, that a unique root of the characteristic equation need not be assumed in investigations of stability in the autonomous case, can be generalized to the more general systems considered in the paper. The method of point transformations is used instead of the direct Lyapunov method, and variation equations are used instead of the representation of the functions  $f(z, t)$  by the sum of a linear term and a nonlinear remainder.

132. Solutions to Equations for Rotation of a Top Given

"On Certain Particular Solutions of the Problem of the Motion of a Heavy Solid Body Around a Fixed Point," by A. A. Bogoyablenskiy, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 22, No 6, Nov/Dec 58, pp 738-749

Several sets of solutions are given to the equations for the motion of a heavy solid body around a fixed point in the case when the center of gravity of the body lies on one of the main axes of inertia. Various initial conditions are considered.

133. Bonnet's Theorem Generalized and Applied to Motion of Two Attracting Bodies

"On Bonnet's Theorem," by V. A. Yegorov, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 22, No 6, Nov/Dec 58, pp 721-729

Bonnet's theorem is generalized to show that a point acted on by a resultant force can move along a certain curve if motion along this curve is possible under the action of the component forces. The generalized theorem is applied to certain statements of Lagrange and Talkvist concerning motion along the branches of hyperbolas in the problem of two stationary attracting centers.

Bonnet's theorem is stated as follows:

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"If several masses  $m, m', m'', \dots$  are subject to the forces  $F, F', F'', \dots$ , are moving from a point A with velocities  $v_0, v_0', v_0'', \dots$ ; are of different magnitudes but have the same direction, and describe the same curve ACB, then a certain mass M which is subject of the resultant of the forces  $F, F', F'', \dots$ , which moves from the point A with velocity V, and which has the same direction as the velocities  $v_0, v_0', v_0'', \dots$  will describe the curve ACB only if the forces  $F, F', F'', \dots$  are independent of time and the initial kinetic energy  $MV_0^2$  of the mass M is equal to the sum  $mv_0^2 + m'v_0'^2 + m''v_0''^2 + \dots$  of the kinetic energies of the masses  $m, m', m'', \dots$ "

134. Oscillations of Pendulum With Moving Fulcrum Studied

"On One Case of Small Oscillations of a Physical Pendulum With Moving Fulcrum," by V. D. Andreyev, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 22, No 6, Nov/Dec 58, pp 730-737

The problem of small oscillations near the position of relative equilibrium of a symmetrical physical pendulum with fulcrum point which moves close to the Earth's surface is considered. The parameters of the pendulum are chosen such that at the position of relative equilibrium the axis of dynamical symmetry coincides with the direction to the center of the Earth.

Small oscillations of the axis of dynamical symmetry of the pendulum near the direction to the Earth's center are considered for the case when the axis of dynamical symmetry does not coincide with the direction to the Earth's surface at the moment motion begins. The oscillations are studied to determine the degree of stability of the position of relative equilibrium. It is assumed that the fulcrum point of the pendulum moves along the Earth's surface, taken as a sphere, and that the Earth's gravitational field is neutral. Also considered is the case of arbitrary motion of the fulcrum point close to the Earth's surface and the nonneutrality of the Earth's magnetic field is taken into account. The compensating moments which must be applied to the pendulum in order that a position of relative equilibrium exist are also determined for this case.

135. Compression of Solid Body by Shock Wave Studied

"Physical Phenomena Observed During the Expansion in Vacuum of Bodies Compressed by Strong Shock Waves," by Ya. B. Zel'dovich and Yu. P. Rayzer; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 6 (12), Dec 58, pp 1402-1406

The glow appearing in an opaque initially solid body after compression by a strong shock wave with subsequent expansion in vacuum is studied. Condensation of vapor of the substance and recombination of ions and electrons under these conditions are also studied. The possibility of using this glow to measure the temperature of the body is discussed.

136. Perturbations Caused by Nose Section of Rocket Considered

"On the Solution of a Certain Variation Problem of Supersonic Flows," by G. I. Kostychev, Chair of Aerodynamics, Kazan' Aviation Institute; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Seriya Aviatsionnaya Tekhnika, No 3, 1958, pp 3-7

The problem of determining the shape of a body of rotation with minimum wave resistance under perturbed flow is considered. The author comments that in a previous paper he considered the shape of a wing profile or the nose section of a body of rotation which would have minimum wave resistance under supersonic flow at constant velocity. In practice however, it is noted, cases of a body in a perturbed flow are frequently encountered, such as in calculating the nonnose stages of a multistage rocket, where flow perturbations introduced by the nose stage must be considered.

137. External Ballistics of Free-Flight Rockets

"Solution of the Basic Problem of the External Ballistics of Free-Flight Rockets for One Optimum Flight Condition," by A. S. Galiullin, Chair of Higher Mathematics, Kazan' Aviation Institute; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Aviatsionnaya Tekhnika, No 4, 1958, pp 17-21

Applying basic assumptions of B. I. Feodos'yev and G. B. Sinyarev (Vvedeniye v Raketnyu Tekhniku [Introduction to Rocket Engineering], Oborongiz, 1956), this article presents solutions for problems concerning minimum target delivery time of a free-flight rocket. Conclusions on movement stability are derived using results of an earlier work by the author A. S. Galiullin, K Ustoychivosti Dvizheniya Tyazhelykh Tochki Peremennoy Massy [On the Stability of Movement of a Heavy Point of Variable Mass], Works of the Kazan' Aviation Institute, No 37, 1957).

138. Deflection of a Satellite From an Elliptic Orbit

"Descent of a Satellite on an Elliptic Orbit," by A. T. Barabanov and E. A. Rayzberg, Chair of Aerogas dynamics, Leningrad Military-Mechanical Institute; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Aviatsionnaya Tekhnika, No 4, 1958, pp 3-8

A study is presented of the problem of determining the deviation of a satellite from the elliptic orbit on which it would have moved in the absence of air resistance. As the disturbing force only drag is taken

into account and, considering its influence weak, the method of small perturbations is applied in solution of the problem. Given elements of modulus and eccentricity for an undisturbed orbit, the constructional parameter of the satellite and the value of density as a function of altitude, the descent and change in orbit period of the satellite may be determined by applying functions derived in this work.

### Nuclear Physics

#### 139. Coulomb Energy of W-Isotopes

"Coulomb Excitation of High Energy Nuclear Levels in Even Isotopes of Tungsten," by D. G. Alkhazov, A. P. Grinberg, G. M. Gusinskiy, K. I. Yerokhina, and I. Kh. Lemberg, Leningrad Physicotechnical Institute, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 6 (12), Dec 58, pp 1325-1334

Natural tungsten and samples of tungsten enriched with isotopes of W-182, W-184, and W-186 were irradiated with 8.3- to 14.5-Mev alpha particles. The existence of the following excited states has been established: W-182 - 1.22 Mev; W-184 - 0.90 Mev; W-186 - 0.73 Mev. The reduced transition probabilities to the ground state  $B(E2)$  calculated for each of these levels were found to be, respectively, 0.051, 0.038, and 0.40 (in units of  $e^2 \times 10^{-48} \text{ cm}^4$ ). The assumption that these levels are of a vibrational type is discussed.

#### 140. Energy Spectra of Cosmic Radiation

"Energy Spectra and Nuclear Interactions of Cosmic Ray Particles," by N. M. Kocharyan, G. S. Saakyan, and Z. A. Kirakosyan, Physics Institute, Academy of Sciences Armenian SSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 6 (12), Dec 58, pp 1335-1349

Results of investigation carried out at an altitude of 3,200 meters above sea level at the Aragats high-altitude laboratory during 1953-1956 are presented. The energy distributions of protons and  $\mu$ -mesons with

energies up to 100 Bev were investigated. The measured proton and  $\mu$ -meson spectra can be approximated respectively by the expression

$$3.2 \times 10^{-3}(2+E)^{-2.8dE} \text{ (for } E > 3 \text{ Bev)} \text{ and } 0.5(5+E)^{-3dE} \text{ (for } E > 4 \text{ Bev)}.$$

Data are presented for the cross sections for inelastic nuclear interactions of high energy  $\pi$ -mesons and protons in graphite, copper, and lead. The proton and  $\pi$ -meson inelastic nuclear interaction cross section  $\sigma_a$  were found to be equal. In graphite, copper, and lead, respectively, the following values were found:  $\sigma_a = 0.65, 0.75 \sigma_0$ , and  $0.9 \sigma_0$ , where  $\sigma_0 = \pi(1.4 \times 10^{-13} A^{1/3})^2$  is the geometrical nuclear cross section.

#### 141. Various Zn-69 Reactions

"The Ratio Between the Isomeric and Ground State Yields of Zn-69 Produced in Various Nuclear Reactions," by K. I. Zherebtsova, T. P. Makarova, Yu. A. Nemilov, and B. L. Funshteyn, Radio Institute, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 6 (12), Dec 58, pp 1355-1357

The ratio between the amounts of Zn-69 atoms produced in the isomeric and ground states in the Zn-68 (d,p)Zn-69, Ga-69 (n,p)Zn-69, and Ga-71(d, $\alpha$ )Zn-69 reactions was studied. In the first reaction the relative yield of the isomeric state first increases with the deuteron energy and then remains constant (about 0.5 of the ground state yield). In the second reaction the ratio is 1.4 for a neutron energy of 14 Mev and in the third reaction about 0.5 for a deuteron energy of 6-8 Mev. The results obtained are discussed on the basis of various interaction mechanisms (direct interaction and compound nucleus formation).

#### 142. Decay of Carbon Nuclei

"Multicharged Particles Emitted in Disintegration of Carbon Nuclei by 660-Mev Protons," by V. I. Ostroumov and Yu. P. Yakovlev, Leningrad Polytechnic Institute; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 6 (12), Dec 58, pp 1358-1363

Multicharged particles ejected from a thin polystyrene film bombarded with 660-Mev protons and possessing ranges larger than 20  $\mu$  were investigated by means of nuclear emulsions. The effective cross section for the

production of these particles and their angular and energy distribution have been obtained. Measurements of the thicknesses of tracks produced by the fragments were employed to determine the charge of particles with ranges above  $40 \mu$  in the emulsion.

143. Gamma Emission From As-76

"Hard Gamma-Radiation From As-76. The As-76 Decay Scheme," by L. V. Gustova and O. V. Chubinskiy, Leningrad State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 6 (12), Dec 58, pp 1369-1379

Measurements of the hard gamma radiation emitted by As-76 have been carried out. Six gamma-lines with energies of 1.21, 1.43, 1.76, 2.08, 2.42, and 2.65 Mev have been observed and their relative intensities have been determined and found to be  $\sim 500$ ;  $\sim 54$ ; 37; 100; and 5.7 - 4.6, respectively. The decay scheme of As-76 is discussed. It is suggested that the following excited states exist in the Se-76 nucleus: 0.56 Mev ( $2+$ ); 1.21 Mev ( $2+$ ); 1.76 Mev ( $1.2+$ ); 2.07 Mev ( $1.2+$ ); 2.42 Mev ( $2.3+$ ); and 2.64 Mev ( $3+$ ). It is also suggested that levels with energies  $\sim 1.02$  Mev and  $\sim 1.26$  Mev ( $0+$  or  $4+$ ) may exist.

144. Proton Polarization

"Polarization of Protons Elastically Scattered on Si-28 Nuclei," by P. V. Sorokin, A. K. Val'ter, I. Ya. Malakhov, and A. Ya. Taranov, Physicotechnical Institute, Academy of Sciences of Ukrainian SSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 6 (12), Dec 58, pp 1386-1390

The degree of polarization of protons scattered through angles of  $60^\circ$ ,  $90^\circ$ ,  $125^\circ$ , and  $150^\circ$  in the center-of-mass system and energy interval of 1.6-2.2 Mev is determined on basis of a phase shift analysis of experimental data on the elastic scattering cross section. Polarization at angles of  $60^\circ$  and  $90^\circ$  has been measured, the  $\text{He}^4$  nucleus being used as analyzer. Computations and experimental results agree within the accuracy of measurements.

145. Radio Waves in Atomic Explosions

"Radio Emission in an Atomic Explosion," by A. S. Kompaneyets, Institute of Chemical Physics, Academy of Sciences USSR, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 6 (12), Dec 58, pp 1538-1544

It is shown that in an atomic explosion in which gamma quanta are emitted symmetrically radio waves are emitted due to the presence of a current in the ionized air. The duration of the oscillations in each half wave is of the order of 10 microsec and for equal asymmetry of gamma-ray emission the amplitude of the oscillations weakly depends on the total emission.

146. Meson Decay

"Electron-Positron Pairs Formed at the Decay  $\pi^0 \rightarrow e^- + e^+ + \gamma$ ," by Yu. A. Budagov, S. Viktor, V. P. Dzhelepov, P. F. Yermolov, and V. I. Moskalev, Joint Institute of Nuclear Research; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 6 (12), Dec 58, pp 1575-1577

Observations were carried out in a diffusion chamber filled with hydrogen under 25 atm pressure and located in the path of 150-Mev  $\pi^-$ -mesons from the synchrocyclotron of the Joint Institute for Nuclear Research (see "Report on the Conference on Wilson Chambers, Diffusion and Bubble Chambers," by the same authors. Joint Institute for Nuclear Research, November 1957). Fourteen cases were observed of charge exchange in  $\pi^-$ -meson decay on hydrogen with a subsequent decay of  $\pi^0$ -meson according to R. H. Dalitz scheme (Proc. Phys. Soc., A 64, 667, 1951) to an electron-positron pair and a  $\gamma$ -quantum. The experimental results are tabulated and the energies of the electron and positron calculated from the curvature of the track within an accuracy of 15%. The research on the subject continues and further results will soon be published.

147. Triple Scattering of 660-Mev Protons

"Triple Scattering of 660-Mev Protons. 1. Measurement of the Depolarization Parameter  $D(90^\circ)$ ," by Yu. P. Kumekin, M. G. Meshcheryakov, S. B. Nurushev, and G. D. Stoletov, Joint Institute for Nuclear Research; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 6 (12), Dec 58, pp 1398-1401

Experiments on triple scattering of 660-Mev protons are described. The depolarization parameter  $D(90^\circ)$  has been found equal to  $0.93 \pm 0.17$ . The result indicates that pp-scattering through an angle of  $90^\circ$  is mainly due to the  $C(\sigma_1 + \sigma_2)_n$  term in the scattering matrix.



148. Modeling of Star Production

"A Model of the Multiple Production Process," by G. I. Kopylov, Joint Institute for Nuclear Research; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 6 (12), Dec 58, pp 1426-1434

The suggestion of constructing a "random star table" capable of reproducing the theoretical concepts about the multiple production of elementary particles in a form suitable for comparing with experiments is analyzed. It is shown that a table of this type can be set up for energies up to 10 Bev.

149. High-Energy Mu-Mesons

"Passage of High-Energy Mu-Mesons Through Matter," by I. L. Rozental', and V. N. Strel'tsov, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 6 (12), Dec 58, pp 1440-1446

The traversal of thick layers of matter by high-energy mu-mesons is analyzed taking under consideration the ionization losses, Bremsstrahlung, emission of pairs, and "star" production. The distribution of the energy losses are taken into account for the last three processes. It is shown that the account of the distribution function leads to a decrease of the mu-meson flux at sea level computed on the basis of the mean energy losses.

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

Plasma Physics

150. Shock Waves in Magnetohydrodynamics

"The Stability of Shock Waves in Magnetohydrodynamics," by S. I. Syrovatskiy, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 6 (12), Dec 58, pp 1466-1470

The interaction between shock waves in a magnetic field and magnetohydrodynamic waves of small amplitude is analyzed. The condition of stability with respect to spontaneous emission of weak magnetohydrodynamic waves by a shock wave has been obtained. The conditions under which the linear equations for a small perturbation are not solvable have been found. This case is interpreted as a disintegration of the shock wave.

151. Pinch Vibrations

"Surface Vibrations of a Charged Pinch in a Longitudinal Magnetic Field," by Ch'ao Kai-hua, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 6 (12), Dec 58, pp 1475-1480

The problem of surface vibrations and stability of a hydrodynamic charged pinch located in an external magnetic field is analyzed. The study is an extension of the well-known work of Kruskal-Schwarzschild and R. J. Taylor (Proc Phys Soc, B70, pp 31 and 1049, 1957) on the stability of an unchanged hydrodynamic pinch. A dispersion equation for surface waves is found and various consequences related to the vibration spectrum are analyzed. It is observed that from the experimental point of view these results may be useful for the clarification of the nature of radiation from a plasma in a magnetic field, a problem which still awaits final solution.

152. Plasma Decay Rates

"Comparison of the Decay Rates of Plasma in Hydrogen and Deuterium," by G. I. Glotova, V. L. Granovski, and V. I. Savoskin, All-Union Electrical Engineering Institute; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 6 (12), Dec 58, pp 1380-1385

The deionization rate in hydrogen and deuterium at pressures  $p$  of 15-600  $\mu$  Hg, tube diameters  $d = 3.2-6.5$ , cm, and values of the preceding current  $I_0 = 60 - 1500$  ma was studied with the help of oscillography of.

the ion current recorded with a negative probe. Under the specified conditions the relative deionization rate in H and D decreased with time. The pressure dependence of the rate of the process is not a monotonic function and passes through a maximum at  $pd \sim 10^{-1}$  to 1 mm Hg. The ratio of the deionization "time constant" (initial, as well as final) in D and H  $\tau_D/\tau_H$  is close to 1.4, i. e.,  $\sim \sqrt{m_D/m_H}$  for all pressures under diffusion conditions ( $p < p_m$ ), as well as under recombination conditions ( $p > p_m$ ). The latter signifies that under these conditions volume recombination mainly occurs in triple collisions with neutral molecules ( $M^+ + e + M$ ).

Radiophysics

153. Equations for Waveguides Discussed

"Asymptotic Behavior of the Characteristic Functions of the Equation  $\Delta u + k^2 u = 0$  With Boundary Conditions on Equidistant Curves and the Scattering of Electromagnetic Waves in a Waveguide," by V. P. Maslov, Moscow State University imeni M. V. Lomonosov; Moscow, Doklady Akademii Nauk SSSR, Vol 123, No 4, 1 Dec 58, pp 631-633

The solution of the equation

$$\Delta u + k^2 u = 0$$

is considered in the region bounded by either two closed equidistant curves, two equidistant curves and two normals, or two infinite equidistant curves. The application of the equation to waveguides of various shapes is shown.

Solid State Physics

154. Magnetic Anisotropy of Crystals

"Magnetic Anisotropy of Single Crystals  $\text{CuSO}_4$  in the Antiferromagnetic State," by N. M. Kreynes, Institute of Physical Problems, Academy of Sciences USSR, All-Union Institute of Physico-technical and Radio Measurements; Moscow, Zhurnal Eksperimental'nov i Teoreticheskoy Fiziki, Vol 35, No 6 (12), Dec 58, pp 1391-1397

The magnetic anisotropy of a single crystal of anhydrous copper sulfate has been measured between  $1.5^\circ$  and  $300^\circ$  K. The transition to the antiferrous state has been found to be accompanied by an anomalous growth of  $\chi_{\perp}$ , the parallel susceptibility varying in the usual way. A quadratic temperature dependence has been established for  $\chi_{\parallel}$ . A possible magnetic structure of  $\text{CuSO}_4$  is discussed.

155. Paramagnetic Resonance

"Influence of Electron Paramagnetic Effect on the Faraday Optical Effect at Low Temperatures," by G. V. Skrotskiy, P. S. Zyryanov, and T. G. Izyumov, Ural Polytechnic Institute; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 6 (12), Dec 58, pp 1471-1474

An expression has been derived for the angle of rotation of the polarization plane of a light wave in a sample located in a constant and in radio-frequency magnetic fields in the neighborhood of paramagnetic resonance. Agreement with experimental data is approximate.

156. Ferromagnetic Resonance

"Ferromagnetic Resonance in a Circulatory Polarized Electromagnetic Field of Arbitrary Amplitude," by G. V. Skrotskiy and Yu. I. Alimov, Ural Polytechnic Institute; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 6 (12), Dec 58, pp 1481-1484

An analysis of the exact solution of the magnetization equations of motion is carried out. The dependence of the magnetization components on the amplitudes of the constant magnetizing and radio frequency fields is determined. Theoretical and experimental results are compared.

157. Exciton Absorption

"Electromagnetic Waves in a Crystal in the Region of Exciton Absorption," by A. S. Davydov and A. F. Lubchenko, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 6 (12), Dec 58, pp 1499-1507

A theory is developed which yields the absorption coefficient and refraction index in absorption bands corresponding to exciton excitations in molecular crystals at low temperatures. It is shown that the structure of the absorption band may be used to determine the sign of the effective exciton mass. Conditions are found which yield a zero refractive index at the short wave side of the excitation band. Electromagnetic waves of these frequencies are completely reflected from the surface of the crystal and enter it at a very small depth. This effect disappears with increase of temperature.

158. Motion in an Electromagnetic Field

"Motion of a Charged Particle in an Anisotropic Medium," by G. A. Beglashvili and E. V. Gedalin, Tbilisi State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 6 (12), Dec 58, pp 1513-1517

Expressions for the electromagnetic field components are derived and the total energy losses are determined for a charged particle moving in an anisotropic gyroelectric and gyromagnetic medium.

159. Superconducting Alloys

"Theory of Superconducting Alloys." I. The Electrodynamics of Alloys at Absolute Zero," by A. A. Abrikosov and L. P. Gor'kov, Institute of Physical Problems, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 6 (12), Dec 58, pp 1558-1571

A theory of superconductors containing impurities at zero temperature is presented. The dependence of the penetration depth on the impurity concentration is examined assuming the concentration to be small. The electrodynamic equations in an alternating field have been obtained for superconductors having an electron free path smaller than the correlation length.

160. Proton Resonance in Nematic Phase of p-Azoxy Anisole

"The Fine Structure of Magnetic Proton Resonance in Crystalline-Liquid p-Azoxy Anisole," by H. Lippmann, VEB Vakutronik, Dresden; Leipzig, Annalen der Physik, Vol 2, No 5/6, 11 Nov 58, pp 287-312

A detailed analysis is made of the three line components which make up the proton resonance absorption signal from the nematic phase of p-azoxy anisole. The mobility of the individual molecules and of the methyl protons has an influence on the nuclear magnetic dipole interactions, which determine the line form and the mean second moment. The intermolecular and, to a certain degree, the intramolecular nuclear magnetic interactions are reduced to such an extent that elementary nuclear magnetic interaction "cells" can be delineated within the molecule.

The degree of order and the average angle of deviation of the longitudinal axes of the molecule, and the oxygen valency angle of the methoxy group, are computed from the experimental data.

The article is an abstract from a dissertation presented to the Physics Institute, Karl Marx University, Leipzig; Dr A. Loesche of Leipzig, Dr W. Maier of Freiburg i. Br., and Dr K. H. Weber of Dresden, are thanked for their support of the thesis work.

Spectroscopy

161. Theoretical Spectroscopy Conference

Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 22, No 9, Sep 58, pp 1015-1156

This issue of the periodical is devoted to the Materials of the 11th All-Union Conference on Theoretical Spectroscopy held in Moscow, 2-10 December 1957, and is a continuation of issue No 6, 1958. The following subjects are discussed:

"Computation of Electric and Magnetic Properties of Complex Molecules Based on the Free Electron Model," by M. N. Adamov, M. G. Veselov, and T. K. Rebane, Leningrad State University imeni Zhdanov, pp 1015-1018.

An improvement of the previously postulated free electron model is attempted.

"Calculations of Absorption Spectra of Molecules of Unsaturated Hydrocarbons Based on a Metallic Model," by L. A. Borovinskiy, pp 1019-1022.

Two topics are analyzed: the calculation of the absorption spectrum of benzene based on the metallic model taking into account the periodic potential and the interaction of pi-electrons and the analysis of conditions under which wave functions combine in calculations of molecules containing branched chains consisting of C-C bonds.

"Theory of Oscillatory Spectra of Unsaturated Compounds," by L. M. Sverdlov, M. G. Borisov, Yu. V. Klochkovskiy, Ye. P. Kraynov, V. S. Kukina, and N. V. Tarasova, Saratov Automobile Road Institute, All-Union Correspondence Automobile Road Institute, pp 1023-1025.

The investigations showed that the substitution of hydrogen atoms in ethylene by alkyl radicals hardly changes the field strength of the remaining ethylene group or of the alkyl radicals.

"Quantum-mechanical Theory of Line Intensity in Raman Spectra," by I. I. Sobel'man, Moscow Physicotechnical Institute, pp 1026-1029.

"Intensities and Depolarizations in Raman-Spectra of  $C_6H_6$ ,  $C_6D_6$  and symmetrical  $C_6H_3D_3$ ," by M. A. Kovner and B. N. Snegirev, Saratov State University imeni Chernyshevskiy, pp 1030-1033.

"The Correspondence Between Absorption and Luminescence Bands of Complex Molecules," by B. I. Stepanov, Institute of Physics and Mathematics, Academy of Sciences Belorussian SSR, pp 1034-1037.

It is shown that the curve of the fluorescence band is related to the curve of the long-wave absorption band by a universal correlation.

"Different Types of Concentration Quenching and the Possibility of Their Separation," by V. L. Levshin and Ye. G. Baranova, Physics Institute imeni Lebedev, Academy of Sciences USSR, pp 1038-1042.

The formation of nonluminescent associations at increased concentrations is noted and their number determined. Methods for the separation of the quenching processes are developed.

"The Problem of Correlation Between the Integral of Kravets and the Duration of the Excited State of Molecules," by M. D. Galanin and Z. A. Chizhikova, Physics Institute imeni Lebedev, Academy of Sciences USSR, pp 1043-1046.

Experimental data illustrated by some examples of the correlation between  $1/\tau_0$  (where  $\tau_0$  is the average time of excited state) and the area of the first absorption band for luminescing materials with a high quantum yield are presented.

"The Kinetics of Quenching of Fluorescence of Solutions by Foreign Materials," by B. Ya. Sveshnikov, V. M. Shirokov, L. A. Kuznetsova, and P. I. Kudryashov, pp 1047-1050.

The presented experimental demonstrations of a nonexponential extinction law of fluorescence of quenched solutions are not only a good proof of the diffusion theory of fluorescence quenching by foreign materials, but also the first experimental confirmation of the Smolukhovskiy-Kolmogorov-Leontovich formula (Z. Phys. Chem., 92, 129, 1917; Phys. Z. Sow., 4, 1, 1933), which states that the velocity of diffusion depends on time passed since the start of diffusion due to Brownian movement.

"The Action of Light Gases on Electronic Absorption Spectra and the Interaction Between Molecules of Aromatic Compounds," by B. S. Neporent, pp 1051-1053.



The discussion and review are aimed at clarification of the as yet unknown mechanism of intermolecular interactions N - N, as well as the mechanism of "protective" action against interaction with atoms of light gases according to the scheme  $N + A \rightarrow N' + A$ .

"Spectral Investigations of Intermolecular and Intramolecular Interaction of Nitro- and Amino-Groups in Some Derivatives of Benzene," by V. I. Danilova, V. D. Gol'tsev, and N. A. Prilezhayeva, Siberian Physico-technical Institute, Tomsk State University, pp 1054-1057.

It is shown that in the system aniline-nitrobenzene complexes of the compounds in ratio 1:1 are formed. The bond strength in these complexes is about  $0.6 \text{ kcal mol}^{-1}$ . The intermolecular bond between  $\text{NH}_2$  and  $\text{NO}_2$  groups in molecules of nitroaniline increases from the para- to the meta- and then to the ortho-isomer. The maximum of absorption shifts toward long waves.

"The Dependence of Spectra of Aromatic Nitrocompounds on the Angle of Rotation of the Nitro-Group Around the C - N Bond," by P. P. Shorygin and Z. F. Il'icheva, Physicochemical Institute imeni Karpov, pp 1058-1062.

"Study of Oscillation Spectra in the Region of Valency Oscillations of CH," by M. M. Sushchinskiy, pp 1063-1067.

Spectral equipment of high dispersion was used as well as polarized light in order to separate lines of different polarization. The additivity of Raman spectra was established for different types of paraffins. This phenomenon has a full analogy in infrared spectra.

"Study of Temperature Dependence of the Line Intensity of Raman Spectra," by A. I. Sokolovskaya and P. A. Bazhulin, Optical Laboratory imeni Landsberg, Physics Institute imeni Lebedev, Academy of Sciences USSR, pp 1068-1072.

Experimental results showed that the intensity of Stokes combination lines drops with rising temperature. This intensity also depends on the structure of the molecule and the type of bonds participating in the oscillation.

"Raman Spectra of Some Unsaturated Cyclic Hydrocarbons," by V. T. Aleksanyan, Kh. Ye. Sterin, A. A. Mel'nikov, and A. F. Plate, Laboratory of Commission on Spectroscopy of the Academy of Sciences USSR; Chair of Petroleum Chemistry, Moscow State University imeni Lomonosov, pp 1073-1078.

"Oscillation Spectra of Some Organophosphorus Compounds," R. R. Shagidullin, Kazan' Affiliate of the Academy of Sciences USSR: Commission on Spectroscopy of the Academy of Sciences USSR, pp 1079-1082.

An attempt has been made to establish whether or not spectroscopic data can be used for the characterization of individual atom groups and for drawing conclusions in regard to the structure of some new organophosphorus compounds, the synthesis of which is under study in Kazan' under the leadership of Academicians A. Ye. and B. A. Arbutov.

"Raman Spectrum of Vitreous Germanium Dioxide," by V. V. Obukhov-Denisov, N. N. Sobolev, and V. P. Cheremisinov, Physics Institute imeni Lebedev, Academy of Sciences USSR, pp 1083-1085

It was found that a characteristic peculiarity of the Raman spectrum of germanium dioxide as well as of silicon dioxide is the presence of a continuous spectrum adjacent to the exciting line 4358 Å, but its intensity is lower in the spectrum of  $\text{GeO}_2$  than in the spectrum of  $\text{SiO}_2$

"Study of Effect of Various Elements on the Structure of Silicate Glasses by the Method of Raman Spectroscopy," by Ya. S. Bobovich and T. P. Tulub, pp 1086-1088.

"Spectroscopy of Negative Radiation Energy Fluxes," by B. I. Stepanov and Ya. S. Khvashchevskaya, Belorussian State University; Institute of Physics and Mathematics, Academy of Sciences Belorussian SSR, pp 1089-1092.

An attempt is made to justify the concept of a negative flux. This concept contributes to the clarification of many experimental facts and facilitates wider application of many known formulas of theoretical optics.

"Infrared Absorption Spectra and Spectra of Thermal Emission of Some Molecular Compounds in Various States of Aggregation," by O. V. Fialkovskaya, Institute of Physics, Academy of Sciences Ukrainian SSR, pp 1093-1096.

"Infrared Reflection Spectrum of Boric Anhydride at High Temperatures," by Ye.P. Markin and N. N. Sobolev, Physics Institute imeni Lebedev, Academy of Sciences USSR, pp 1097-1099.

"Infrared Absorption Spectra of Molecular Compounds With Metal Halides," by A. N. Terenin, V. N. Filimonov, and D. S. Bystrov, Scientific Research Physics Institute, Leningrad State University imeni Zhdanov, pp 1100-1102.

"The Problem of Defining the Hydrogen Bond Concept," by V. M. Chulanovskiy, Scientific Research Physics Institute, Leningrad State University imeni Zhdanov, pp 1103-1106.

An attempt is made to draw the attention of researchers on intermolecular interactions to experimental phenomena, characteristic for the hydrogen bond only, and to correlate these phenomena with properties peculiar to the hydrogen atom.

"Investigation of the Hydrogen Bond in Glycol and Diphenols," by V. I. Malyshev and V. N. Murzin, Optics Laboratory imeni Landsberg, Physics Institute imeni Lebedev, Academy of Sciences USSR, pp 1107-1108.

"The Structure of the Band of OH-Oscillations in Spectra of Crystals Containing a Hydrogen Bond," by A. I. Stekhanov, p 1109.

It is considered that the doublet structure of the band is due to the tunnel effect of the proton (cf. paper by the author in DAN SSSR, 106, 433, 1956) which may occur in crystals containing a hydrogen bond.

"Infrared Absorption Spectra of Lithium-Organic Compounds, Intermolecular Lithium Bond," by A. N. Rodionov, D. N. Shirogin, T. V. Talalayeva, and K. A. Kocheshkov, Physicochemical Institute imeni Karpov, pp 1110-1113.

"Study of Intermolecular Interaction in Polyethylene by Means of Infrared Absorption Spectra," by I. I. Novak, Leningrad Physicotechnical Institute, Academy of Sciences USSR, pp 1114-1116.

It is concluded that the doublet structure of the absorption bands 7 and 14  $\mu$  may be explained, in accordance with Davydov's theory, by a resonance interaction of oscillations of CH<sub>2</sub>-groups of neighboring molecules in the crystal lattice.

"Effect of Temperature and of the State of Aggregation on the Infrared Absorption of Carbon Tetrachloride," by M. P. Lisitsa and V. N. Malino, Kiev State University imeni Shevchenko, pp 1117-1121.

"Change in the Infrared Spectrum of Ammonia as a Result of Transition From the Gaseous to the Liquid State," by I. V. Demidova and L. D. Shcherba, State Institute of Applied Chemistry, pp 1122-1124.

"Infrared Spectra of Salt Solutions," by Ye. N. Vasenko, A. P. Chernyavskaya, and N. V. Chernaya, L'vov Polytechnic Institute, pp 1125.

"Investigation of the Keto-Cis-Trans-Enol Equilibrium by Means of Infrared Absorption Spectra," by M. Ye. Movseyan, M. I. Kabachnik, S. T. Ioffe, and K. V. Vatsuro, Physics Institute imeni Lebedev, Academy of Sciences USSR, Commission on Spectroscopy, Academy of Sciences USSR, Institute of Organoelemental Compounds, Academy of Sciences USSR, pp 1126-1130.

The obtained spectroscopical data confirm the generalized formula for the equilibrium constant of keto-cis-trans-enol tautomerism.

"Spectroscopic Study of the Structure of Some Complex Compounds," by A. A. Babushkin, Institute of Physical Chemistry, pp 1131-1135.

Three investigations described are devoted to the study of structure of intermolecular compounds. Two of them deal with complex compounds of boron trifluoride with molecules containing nitrogen and oxygen and one with the effect of water of crystallization on the structure of para and meta tungstates of sodium.

"Spectroscopic Methods of Investigation of Catalytic Transformations on Metallic Films," by V. M. Gryaznov, V. D. Yagoskiy, and V. I. Shimulis, Laboratory of Molecular Spectroscopy of the Chemical Faculty of the Moscow State University imeni Lomonosov, pp 1136-1140.

"Methods of Free Nuclear Induction in Weak Magnetic Fields as Applied to Certain Problems of Radio Spectroscopy of High Resolving Power," by A. A. Morozov, A. V. Mel'nikov, and F. I. Skripov, Scientific Research Physics Institute of Leningrad State University imeni Zhdanov, pp 1141-1144.

A method of observation of free nuclear precession applicable to very weak fields (terrestrial magnetic field) was devised by M. Packard and R. Varian (Phys. Rev. 93, 941, 1954). Two examples of application of the above method are given. In the first, the fine structure of nuclear resonance signals due to indirect interaction of nonequivalent nuclei in a molecule is studied. The second concerns metrological applications and also has a bearing on the theory of magnetic shielding of nuclei in molecules.

"Rotational Spectrum of H<sub>2</sub>O Vapors in the Region of 50-1500  $\mu$  (200-7 cm<sup>-1</sup>)," by N. G. Yaroslavskiy and A. Ye. Stanevich, pp 1145-1149.

"Determination of the Molecular Structure of HDSe From Its Rotational Microwave Spectrum," by V. G. Veselago, Physics Institute imeni Lebedev, Academy of Sciences USSR, pp 1150-1153.

"Rotational Constants of FH<sub>2</sub>C-CH<sub>2</sub>Cl<sup>35</sup> Molecules," by I. A. Mukharov, Physics Institute imeni Lebedev, Academy of Sciences USSR, pp 1154-1156.

Theoretical Physics

162. Einstein's Theory of Gravitation

"The Coordinate Conditions in Einstein's Theory of Gravitation," by I. G. Fikhtengol'ts; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 6 (12), Dec 58, pp 1457-1465

Some relations connected with covariance of the field equations under a transformation of the variables have been derived. The relation between the coordinate conditions and invariance of the field Lagrangian has been established. The geometrical and physical properties of coordinate systems corresponding to the coordinate conditions thus derived are analyzed.

163. Spin Structure of Gamma-Quanta

"Spin Structure of the Scattering Matrix for Reactions Involving Gamma-Quanta," by V. I. Ritus, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 35, No 6 (12), Dec 58, pp 1485-1487

A representation of the scattering matrix for reactions involving gamma-quanta (of the type  $\gamma + b \rightarrow a' + b'$  and  $\gamma + b \rightarrow \gamma' + b'$ ) is examined in the form of an expansion in spin operators  $Q_i$  which are invariant under rotation. A method of setting up the independent operators  $Q_i$  is proposed and their number is determined. The restrictions which the condition of invariance under time reversal imposes on the form and number of operators  $Q_i$  are analyzed. Some examples are given of a representation of the S matrix in terms of operators  $Q_i$  for reactions in which the spin of the particle b and system  $a' + b'$  ( $\gamma + b \rightarrow a' + b'$ ) and the spin of particles b, b' ( $\gamma + b \rightarrow \gamma' + b'$ ) do not exceed unity.

164. New Computation for Shock Waves in Gravitational Field

"Shock Waves of the Gravitational Field," by H. Treder, Research Institute for Mathematics, (East) German Academy of Sciences, Berlin; Leipzig, Annalen der Physik, Vol 2, No 5/6, 11 Nov 58, pp 225-235

The article provides a new method of deriving the local properties and the laws of propagation of shock waves of the gravitational field from the properties of the Riemann tensor of Einstein spaces. For 20 years, these properties have been derived on the basis of the theory of characteristics and bicharacteristics of the Einstein field equations. It is shown here that both scalar theorems of conservation, arrived at in the

classical computation as propagation conditions, result from the tensor analysis properties (freedom of divergence) of the Riemann tensor of Einstein spaces. The first of these theorems of conservation also follows from the Einstein energy momentum theorem. The computations here are shown to be considerably shorter than those of the classical procedure.

Finally, the methods developed here are generalized for the case where, in addition to the gravitational field, an electromagnetic field is also present.

#### X. MISCELLANEOUS

##### 165. West Siberian Affiliate of Academy of Sciences USSR To Be Abolished

"On the West Siberian Affiliated, Academy of Sciences USSR"  
(unsigned article); Moscow, Vestnik Akademii Nauk SSSR, No 1,  
Jan 59, p 124

The Presidium of the Academy of Sciences USSR has decreed that the West Siberian Affiliate of the Academy of Sciences USSR is to be abolished, since the Siberian Branch of the Academy of Sciences USSR has been organized sufficiently to take over the work of the West Siberian Affiliate. All institutions under the affiliate have been made subordinate to the Presidium of the Siberian Branch of the Academy.

##### 166. New Directors and Head of Soviet Institutions Announced

"Appointments and Transfers" (unsigned article); Moscow, Vestnik Akademii Nauk SSSR, No 1, Jan 59, p 124

The following Soviet scientists have been appointed directors and heads of scientific institutes and periodicals:

Alikhanov, A. I., academician, appointed director of Institute of Theoretical and Experimental Physics, Academy of Sciences USSR.

Shumskiy, P. A., Doctor of Geographical Sciences, appointed director of Institute of Permafrost Studies imeni V. A. Obruchev, Academy of Sciences USSR.

Troshin, A. S., Doctor of Biological Sciences, appointed director of Institute of Cytology, Academy of Sciences USSR.

Bruk, I. S., Corresponding Member, Academy of Sciences USSR, appointed director of Institute of Electronically Controlled Machines, Academy of Sciences USSR.

Amirkhanov, Kh. I., Doctor of Physicomathematical Sciences, appointed director of Institute of Physics, Dagestan Affiliate of Academy of Sciences USSR.

Smirnov, M. V., Doctor of Chemical Sciences, appointed director of Institute of Electrochemistry, Ural Affiliate of Academy of Sciences USSR.

Orlov, Yu. A., Corresponding Member, Academy of Sciences USSR, appointed chief editor of the periodical Paleontologicheskii Zhurnal.

Troshin, A. S., Doctor of Biological Sciences, appointed chief editor of the periodical Tsitologiya.

Nayda, S. F., Doctor of Historical Sciences, appointed chief editor of the periodical, Voprosy Istorii.

All of the above appointments are contingent on approval by the General Assembly of the Academy of Sciences USSR.

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