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I. ASTRONOMY

1. Byurakan Astrophysical Observatory

"Byurakan Astrophysical Observatory of the Academy of Sciences Armenian SSR," by V. A. Ambartsumyan and L. V. Mirzoyan, Tr. in-ta istorii yestestvozn, i tekhn. AN SSSR (Works of the Institute of the History of Natural Sciences and Engineering, Academy of Sciences USSR), 1957, 17, 485-492 (from Referativyy Zhurnal -- Astronomiya i Geodeziya, No 2, Feb 58, Abstract No 811)

"The Byurakan Observatory was founded in 1946 at a distance of 30 km from Yerevan on the south slope of Mt Aragats at an altitude of 1,500 meters above sea level. The observatory was equipped in 1946 with a 13-cm wide-angle double astrograph; in 1948 with a 30-cm Schmidt reflector; in 1949 with a 25-cm mirror telescope spectrograph designed by O. A. Melnikov and B. K. Ioannisiani; and with a 40-cm aberration-free reflector with Cassegrain and Schwarzschild focuses (constructed by D. D. Maksutov) and a 15-cm astrograph with an ultraviolet objective. In 1954, a 53-cm Schmidt telescope went into operation. Radioastronomical observations were started in 1951 using a parabolic radiotelescope 3 meters in diameter and three radio-interferometers with wavelengths of 0.5, 1.5, and 4.2 meters. The observatory has four laboratories -- stellar astronomy, astrophysics, radio astronomy, and mechanics. Research is concentrated on the structure and physical characteristics of interstellar absorbing matter; the physical nature of stars, nebulae, and discrete sources of radio emission; and the structure, origin, and development of stars and stellar systems pertaining to the Galaxy.

"Important achievements of the observatory are as follows:

"1. Theory of brightness fluctuations in the Milky Way and in the visible star distribution as well as extragalactic nebulae on the sky.

"2. Theory of stellar associations.

"3. Research on scattered stellar clusters which led to a new classification of clusters based on their morphological peculiarities and physical characteristics.

"4. Research of physics of stellar atmospheres; on the basis of studies of spectrophotometric gradients and magnitudes of the Balmer shift of hot giants and supergiants and photoelectric color excesses of stars, the law of interstellar light absorption is derived, as well as the effect of selective interstellar absorption.

"5. Research in physics of nebulae. It is shown that in the case of stars with a temperature exceeding 7,000° K the possibility of accretion is excluded due to radiative pressure. The application of methods of hydroaerodynamics to planetary nebulae facilitated the explanation of origin of double shells. The stability criterion of gaseous shells was obtained. A new classification of planetary nebulae was developed.

"6. Statistics of binaries. By means of derived formulas the probable number of binaries was obtained in the part of the Galaxy accessible to research. It is shown that the distribution in space of the directions of radii-vectors connecting the components of binaries appears to be uniform. It was established that Wolf-Rayet stars are in overwhelming majority binaries.

"7. The interstellar light absorption. From colorimetric observations of long period Cepheids in the photographic and photovisual parts of the spectrum the magnitudes of the selective and the general light absorption in various directions of the Galaxy are established.

"8. Radio astrophysics. The measuring of relative intensities of some sources of radio emission proved that the spectral energy distribution of radio emission of many sources appears to be equal. It was concluded that the mechanism of emission of these sources is also the same. In 1954, during the solar eclipse the radio diameter and the degree of radio eclipsing were determined for a wavelength of 1.5 and 4.2 meters. The method developed for observations of discrete sources by means of a phase inverter together with the method of signal accumulation facilitated the study of weak discrete sources of radio emission.

"9. Sources of stellar energy. Observations show that in atmospheres of nonstationary stars, members of T-associations, and in others processes of energy release differing from thermal emission occur. These processes are due to the formation of new nuclei. This concept holds the key to the explanation of the origin of cometlike nebulae.

"10. Clusters of galaxies. It was established that among clusters of galaxies dynamically nonstationary formations predominate of the Trapeze of Orion type. The inconsistency of the statement that the radio emission of some galaxies is the result of collision of two galaxies is shown.

"During the existence of the observatory 18 issues of Soobshcheniya Byurakanskoy observatorii (Communications of the Byurakan Observatory) were published."

2. Star Catalog of Right Ascensions in the FK3 System

"Catalog of Right Ascensions of Stars FKSZ in the FK3 System, Compiled From Observations on the Khar'kov Meridian Circle in 1953-1956" Uch. zap. Kharkovskogo un-ta, 1957, 86; Tr. Astron. observ., 13, 13-61 (from Referativnyy Zhurnal -- Astronomiya i Geodeziya, No 2, Feb 58, Abstract No 900)

The authors observed stars of the catalog by means of the meridian circle of the Khar'kov observatory (F = 192 cm, D = 16 cm) from 1953 to 1956. During 224 nights 5,759 observations of stars were obtained, among them 2,816 reference stars. The observations were made on wide 40° zones.

Investigation results of instrument errors are reported; variations of the value n; differences between observations made at circles east and west; personal errors among observers; accuracy of results; and comparison of the catalog obtained with GC and FK3.

The obtained right ascensions of 645 stars of the list FKSZ in the FK3 system are given, reduced to the equinox 1950.0, the mean time of observations of each star and the number of observations.

Also, separate positions of stars of the catalog are published for each date of observations.

3. Catalog of Declinations in FK3 System

"Catalog of Declinations of 585 Weak Stars in the FK3 System Observed by Means of the Meridian Circle of the Kiev Astronomical Observatory," by A. A. Gorynya, Tr. Kievsk. astron. observ., 1956, 1, 3-79 (from Referativnyy Zhurnal -- Astronomiya i Geodeziya, No 2, Feb 58, Abstract No 901)

The catalog is a part of the work on compilation of a catalog of weak stars. From January 1948 to April 1951, 5,300 observations were made, among them 2,657 observations of reference stars by means of the Repsold meridian circle. Data on the instrument are given (F = 148 cm. D = 12 cm, diameter of circles = 72 cm), on the meridian room of the observatory, on the constants of the instrument setting, and on the method of observations and their processing.

The final reduction of declinations to the FK3 system (for each degree) was processed according to the Zimmerman method and is different for a different position of the instrument (circle eastward and circle westward) which may be explained by a change of the bending action. The declinations of the processed stars are reduced to the equinox 1950.0. The mean error of one observation equaled ± 0".53. The comparison of the obtained catalog with GC was done by means of 439 general stars, with FK3, by means of the

differences FK3 - GC. The differences proved insignificant, but one sign predominates, indicating a not sufficiently accurate tie-in of the new catalog to FK3. After elimination of systematic differences K - GC, a satisfactory agreement of results of the comparison of the catalog being published with GC and FK3 was reached. In the appendix a catalog of declinations of 585 stars and the results of separate observations of declinations of stars are given.

II. BIOLOGY

Insect Control

4. Aerosol Generators

"Aerosol Generators," by G. I. Korotkikh; Moscow, Zashchita Rasteniy ot Vrediteley i Bolezney, No 5, Sep/Oct 57, pp 50-51

"During 1956, in the Czechoslovak Republic the first consignment of portable pulsating aerosol generators, RAG-1, was released. Klavik, Pokorny, and Koula, members of the Institute of Plant Growing, took part in the development of the construction. The apparatus is designed for destroying harmful insects found on various trees and small field and garden crops, as well as for the disinfestation of grain storage and animal buildings. A jet pulsating engine is the basis of the generator. It is started by a hand pump after being connected to an ignition battery. After several seconds, a pressure of 1.2 atmospheres is attained in the gasoline and insecticide tanks. After passing through a series of disk valves, the gasoline enters the combustion chamber through a nozzle where it is mixed with air and then ignited by a spark plug.

"The hot gases which are formed are directed through an exhaust pipe at the end of which is located a jet of insecticide solution. The insecticide is divided into drops by these gases, as a result of which a highly dispersed mist is forced out of the generator pipe.

"After the gasoline is ignited, the battery is disconnected and the combustion chamber continues to function automatically at the rate of 60-80 impulses per second. The empty generator weighs 5.5 kg, has a gasoline reserve for one hour's work (1.5 liters), an insecticide reserve for 20 minutes' work (4.5 liters), and a gross weight of 11.5 kg. The insecticide is consumed at the rate of 0.2 liter per minute.

"The dispersion of the mist can be altered by changing the level of the gasoline: slanting the nozzle downward increases the mist droplet size, and slanting the nozzle upward decreases the size of the droplets.

"Some of the portable pulsating aerosol generators have been received by the Moscow Plant Protection Station. Preliminary tests indicate it is simple to handle, but it is very sensitive to the purity of the insecticide and gasoline used, as well as to shock, and external air temperature.

"It is believed that the portable pulsating generators will find many uses in the fight against pests in gardens, orchards, and agricultural plantations (primarily for treating protective ditches with DDT) as well as for the disinfestation of grain storage bins, hothouses, and animal buildings.

"Due to the small capacity of the insecticide tank, it is expedient to use oil solutions of the pure gamma-isomer of hexachlorane.

"During 1957 in the Czechoslovak Republic the first model of a tractor-mounted pulsating aerosol generator was constructed.

"Electric light bulbs -- "Insekta" (patent 169836) -- containing an insecticide are being used in Austria, Sweden, France, and other countries in the fight against everyday parasites (flies, moths, bedbugs, and cockroaches). The bulb, which can be screwed into a normal socket, has two apertures through which pressed tablets of the gamma-isomer of hexachlorane may be inserted -- one tablet, weighing 0.6 gram, for each 50 m^3 of area to be treated. After the power is turned on, the heat from the filaments glowing in the bulb is passed on to the blackened lower portion of the bulb where the hexachlorane tablet is located. The hexachlorane is volatilized by the effect of heat and its crystals escape into the air, filling the room. The volatilization process is completed in 40 minutes. From 2 to 4 hours later the room is ventilated. The gamma-isomer tablets do not have the typical unpleasant smell of technical hexachlorane.

"Thirty-five-candlepower bulbs, 120-130 and 220-240 volts, are produced. After the bulb is washed with alcohol, it can be either reused or used for ordinary lighting. In addition to treating living quarters, these bulbs can be used to disinfest grain storage and animal buildings."

Radiobiology

5. Scientific Conference on Radiobiology Meets to Commemorate 250th Anniversary of Leningrad

"Scientific Conference on Radiobiology, Commemorating the 250th Anniversary of Leningrad," by Prof S. Ya. Arbuzov and Prof V. P. Mikhaylov, Division of Radiobiology, Institute of Experimental Medicine, Academy of Medical Sciences USSR; Moscow, Meditsinskaya Radiologiya, Vol 3, No 2, Mar/Apr 58, pp 88-92

The Institute of Experimental Medicine of the Academy of Medical Sciences USSR held its scientific meeting from 28 to 31 May 1957 to celebrate the 250th anniversary of Leningrad. The conference was devoted to the problem of radiobiology. More than 300 people representing 45 scientific institutions participated in the proceedings of this conference, and a total of 46 reports were heard. There were six sessions.

Prof D. A. Biryukov, director of the Institute of Experimental Medicine, opened the conference and talked briefly on the historical development of radiobiology which was introduced in 1897, and which has branched out so that now research on radiobiology is conducted by the scientific branch of nearly every institute. The reporter also mentioned that with the discovery of atomic energy a new branch of radiobiology has been organized since 1956 to use atomic energy for peaceful purposes.

The following are the important scientific reports of the six sessions of this conference.

1. Prof P. S. Kupalov reported on "The Influence of Penetrating Radiation on the Activity of the Central Nervous System." At first he elaborated on the effect of radium emanation on the brain of the frog. His data indicate that ionizing radiation exerts a direct effect on the central nervous system which leads to changes in the functional properties of nerve cells. The reporter said that as early as half an hour after the irradiation of dogs by X rays the latter disturb the normal course of complex higher nervous activity.

2. O. N. Voyevodina, an associate of P. S. Kupalov, demonstrated by motion pictures the effect of single and repeated general X-ray irradiation on situation-conditioned reflexes in dogs.

3. Prof P. G. Svetlov reported on "The Effect of Ionizing Radiation on Embryogenesis of Mammalia," and he dwelt on the most important problems, including the interrelationships between embryology and genetics. His data distinguish two periods of maximum radiosensitivity of the fetus to radiation, i.e., the preimplantation period and the period of transition to placental circulation. The author considers that it is possible to transfer the results of this research on rats to man and conclude that embryos may suffer severe consequences by doses that are harmless to their mothers. Furthermore, one may suppose that maximum harm from irradiation may occur during the first week after conception (preimplantation period) and during the second to the ninth weeks of pregnancy.

4. Z. F. Isachenko reported on his experimental results connected with the transfer of the zygote 3 days after mating, first, from irradiated rabbits to healthy ones, and, second, from healthy animals to irradiated ones.

5. L. A. Kachur reported on the physicochemical processes in the initial biological effect of ionizing radiations. He stated that the presence of water and of large organic molecules in living organisms makes one suppose the possibility of the combined effect of both the direct and the indirect influences of ionizing radiation. Furthermore, a number of factors lead one to suppose that the fundamental physicochemical reaction determining the development of radiation injuries is a chain-reaction mechanism.

6. Prof I. A. Piontkovskiy demonstrated by motion pictures the loss of maternal instinct of albino rats which were irradiated by X rays during their pregnancy.

7. Prof V. G. Yeliseyev stressed the necessity of studying the hyaluronic acid content of ova and of embryonic tissues after irradiation.

The following reports were heard at the second session of the conference which concentrated on the problems of vascular permeability and disturbances of cardiovascular functions and of the respiratory system.

1. Prof A. V. Lebedinskiy reported on the topic of "The Influence of Ionizing Radiation on Permeability," and presented new data obtained at his laboratory. He described a specially interesting method of quantitative calculation of the permeability of the walls of blood vessels based on changes in the fluorescence of the fluid of the anterior chamber of the eye after the introduction of fluorescein into the blood. After irradiation, two periods of increased permeability are noted. The first is a reversible increased permeability, while the second period of increased permeability immediately precedes the death of the animals. Before the onset of this second period, the grave outcome of irradiation is distinguished by the coloring of the anterior chamber of the eye.

2. N. I. Arinchin reported on the dynamics of blood pressure level in radiation sickness in dogs and rats. His data confirm the compensatory nature of the changes in the cardiovascular system to maintain blood pressure level during radiation sickness.

3. Two reports, one by Prof N. A. Shevchenko on the topic of "Delayed Changes Due to Radiation in the Endothelial Layer of the Large Blood Vessels" and the second report by A. D. Smirnov and Z. P. Kovtun on the topic of "Changes in the Walls of Intraorganic Blood Vessels at Various Stages of Acute Radiation Sickness," analyzed the morphological changes in the walls of blood vessels during radiation sickness.

4. L. G. Terekhova reported on her research devoted to the influence of ionizing radiation on the functional condition of the respiratory center. An analysis of her material proves that general X-ray irradiation changes the functional condition of the respiratory center and may be considered one of the methods of desensitizing animals.

5. G. I. Medvedeva reported on the effect of radiation sickness on the course of traumatic shock and the effectiveness of certain recommended means for its therapy during radiation sickness.

The third session of this conference concentrated on a number of problems connected with the role of neurohumoral mechanisms in the development of radiation sickness. The following reports were presented.

1. Prof D. A. Biryukov presented a second report on the effect of penetrating radiation on the central nervous system of birds. A number of new factors were revealed. Data proved that acute motor disturbances in pigeons after their irradiation are connected with the injury of the lower divisions of the brain. The reporter explained that the effect of penetrating radiation in any given case is connected not with the higher divisions of the central nervous system, but with the lower ones. Biryukov suggests that his experimental data make one able to conclude that the effects of ionizing radiations offer a new procedure for physiological research and at the same time present a basis for studying the mechanism and the subject of radiation effects.

2. V. V. Petelina reported on the "Influence of Radiation Sickness on Reflexes of Vestibular Analysors and cited facts which indicate that disturbances in the activity of vestibular analysors are connected with its cortical part which has a tendency toward quick compensation rather than the subcortical analysors which are distinguished by their great stability and constancy.

3. G. Z. Abdullin reported that the irradiation of the head of pigeons by X rays with adequate protection of higher nervous activity leads to disturbances in the lower forms of coordination, i.e., clumsiness, etc.

4. M. G. Durmish'yan reported on the "Types and Mechanisms of Reactions of an Organism to the Effect of Small Doses of Radiation" and presented a number of factors verifying pronounced changes in the function of various systems of an organism due to radiation by small doses.

5. P. I. Lomonos, in his report on changes of defense-conditioned reflexes in dogs following radiation sickness, explained the phasic nature and the fluctuation of the magnitude of conditioned reflexes. Parallel research on the peripheral blood of irradiated dogs indicates that changes in the blood precede disturbances of higher nervous activity.

A number of reports were heard at this session on disturbances of certain endocrine glands due to radiation sickness.

6. Prof Ye. A. Moiseyev reported on the results of his research on the morphological changes in the anterior lobe of the hypophysis of guinea pigs after their irradiation by gamma rays. Changes were evident in the chromophil cells, suggesting that changes occur in the cytoplasmic granules and consequently lead to changes in the hormones which are elaborated by these cells.

7. M. I. Yakovleva reported that research done on cats indicates changes in the excitability of the cortical part of adrenals following radiation sickness.

8. Ye. I. Komarov, in his report entitled "Concerning the Neurohumoral Mechanisms of Leukocyte Reaction Following Local Irradiation of the Gut by Radioactive Strontium," proved the possibility of reflex changes in the organism following the irradiation of the gut due to the participation of the humoral chain which in this case is the adrenal glands.

9. A. D. Smirnov presented preparations which demonstrated histological changes in the neurons of the spinal ganglia, in the sympathetic nuclei of the spinal cord, and in the ganglia along the spinal column (autonomic nervous system) at various stages of acute radiation sickness.

The fourth session concentrated on changes in the reactivity of tissues following irradiation, especially during the period of recovery and regenerative processes in radiation sickness and included the following reports.

1. A joint report by Prof N. A. Krayevskiy and V.V. Shikhodyrov on "The Condition of Porous Connective Tissue Following Radiation Sickness" demonstrated changes in the cells and in the intercellular substances arising in animals due both to external irradiation and to the introduction into organisms of various radioactive substances. A number of symptoms of radiation sickness were connected with these changes in the connective tissue, i.e., disturbances of vascular and connective tissue permeability, changes in the mechanical strength of blood vessels and of tissues, changes in the regenerative capacity of injured organs, distortion of the course of inflammatory reaction, decreased phagocytosis, and decreased immunity.

2. Prof L. N. Zhinkin reported on the morphological changes in skeletal musculature under the influence of radioactive phosphorus. He observed that changes of an atrophic nature in muscle fibers were caused by disturbed circulation.

3. Prof V. G. Yeliseyev, and N. V. Militsyna reported on "The Influence of General X-Ray Irradiation of Foci of Aseptic Inflammation."

4. Prof V. P. Mikhaylov, Ye. A. Cheredeyeva, and K. M. Yaroslavtseva presented material on regeneration of uterine tissue of young rats after traumatic injuries due to radiation sickness. Data indicate that regenerative processes in uterine tissue after irradiation by a dose of 550 r proceed quite well.

5. Prof B. P. Kalashnikov and Yu. S. Kaminskaya reported on the local and general irradiation effects on the retina of rabbits' eyes following radiation doses of 800 and 10,000 r.

The theme of the fifth session was metabolic changes and infectious processes due to radiation sickness. The following reports were heard.

1. Prof A. M. Kuzin, and Ye. A. Ivanitska presented new data on "The Effect of Ionizing Radiation on Sorption Properties of Cells." Changes in sorption properties were especially pronounced in the cells of the reticuloendothelial system.

2. V. S. Turovskiy reported on the effect of local X-ray irradiation on the content and metabolism of the acid-insoluble phosphorus fraction of bone marrow.

3. A joint report by B. P. Golovin and O. K. Dokusov explained the hormonal secretion function of the adrenal cortex during radiation sickness. Results based on the elaboration of 17-ketosteroid hormones prove the phasic nature of radiation sickness.

4. Changes in the blood sugar level due to reflex mechanism following local irradiation of small intestines by radioactive strontium were explained in the report by R. Ya. Keylina and Ye. I. Komarov. The blood sugar level in irradiated animals was 20-30% higher than in controls, but no increase in the blood sugar level was noted in animals with previously denervated intestines.

5. N. I. Likhnitskaya, doing research on the influence of ionizing radiation on the regulatory mechanism of water metabolism, explained that after radiation sickness there is a spontaneous decrease of the diuretic reaction after the ingestion of small amounts of water. Data reveal that radiation sickness causes retention of water in the extracellular and cellular phases.

6. Prof B. G. Avetikyan and A. G. Artemova, in a joint report, explained the influence of X-ray irradiation on "congealed" foci of autoinfection. It was established that the already established foci of experimental autoinfection (done by ligature of the caecum of albino mice) show no activation due to X-ray irradiation, contrary to foci of autoinfection that are in the process of formation.

7. Prof A. V. Ponomarev, in a report entitled "The Influence of Ionizing Radiation on the Immunological Condition of Organisms," proved that irradiation before the administration of antigens inhibits antibody formation. Therefore, for prophylactic and therapeutic purposes during radiation sickness, immune serum must be used, in addition to antibiotics.

8. B. N. Sofronov reported on the influence of X-ray irradiation on experimental pneumonia, proving that irradiation significantly aggravates the course of infection and that the use of biomycin is advisable but that streptomycin is much more effective.

The sixth and last session of the conference was devoted to the problem of prophylaxis and experimental therapy of radiation sickness. The following reports were given.

1. Prof N. A. Kharauzov, V. B. Isachenko, and Yu. I. Lisunkin reported on results of their experiments on the influence of cholinolytic and anticholinesterase substances used separately and in combination with thiourea on the course of radiation sickness. Results verify changes in the systems reactive to choline after irradiation and the distinct protective effect of certain cholinolytic substances. Combining cholinolytic substances with thiocompounds exerted an unfavorable effect on the protective properties of the latter. No decrease in the protective effects was noted by combining anticholinesterase preparations with thiourea.

2. Prof S. Ya. Arbuzov presented a report entitled "The Protective Effect of Certain Pharmacological Agents in Radiation Injuries." This report included results of a number of scientists' experiments on the effect of a number of Soviet preparations, for example, the more active salts of mercamine, unithiol, sodium chlorophyllin, aminazine, and phosphorus-containing compounds, on the course and outcome of radiation injuries. Some sulfur-containing compounds also were discussed. It was established that mercamine exerts a pronounced effect on various segments of the reflex arc, on vegetative innervation, and on higher nervous activity. In animals deprived of superior cervical sympathetic ganglia, the protective effect of mercamine and its combination with stimulators of the nervous system was greatly decreased.

3. A report by Ye. A. Mukhin treated the prophylactic use of isothiouronic compounds in injuries by radiation sickness. Compounds of this series exert a pronounced effect which is not inferior to that by mercamine and are less toxic.

4. P. F. Ganzha presented the results of his experimental observations on the protective effect of certain thiodiazole products in radiation injuries. The author reported that it is possible to achieve a protective effect by using heterocyclic compounds. This view has provided a reason for searching for new compounds in this series.

5. L. I. Tank reported on his studies of the protective effect of mercamine derivatives on the external effect of penetrating radiation. It was established that lengthening the carbon chain to C_5 or changing its configuration does not deprive mercamine of its protective properties.

6. V. P. Korotkova reported on "The Influence of Mercamine and Its Combination With Certain Analeptics on the Course and Outcome of Radiation Injuries" and noted that a combination of caffeine with mercamine administered before irradiation boosts the protective effect of mercamine.

7. The pharmacological analysis of the protective effect of cysteineamine in radiation sickness was presented in a report by G. I. Smorodintseva. She established that cysteineamine increased cholinesterase activity in the brain, kidneys, and blood and changed the reflex reaction of blood pressure and of respiration and that it possesses gangliolytic properties.

8. I. Ya. Nekachalova reported on her observations on the effect of cysteineamine on the secretory and motor functions of the intestines in radiation sickness. The administration of cysteineamine to irradiated dogs aids in the normalization of the process of digestion and increases the secretory function of the intestines as compared with that of controls.

At the conclusion of this session, the following people participated in the discussions: L. F. Semenov, M. M. Lenkevich, Prof M. G. Durmysh'yan, Prof S. V. Anichkov, and Prof A. V. Lebedinskiy, all of whom stressed the special significance of cholinergic and adrenergic structures in the reactions of living organisms to the effect of ionizing radiations. It was mentioned that research, in this direction, on various pharmacological agents has great future prospects, and it was furthermore noted that the analysis of the protective effect of the preparations that are being studied in radiation sickness is connected with the explanation of the mechanism of their physiological effect.

Delegates to the conference participating in the discussions included the synthetic-organic chemists Prof F. Yu. Rachinskiy, Prof M. N. Shchukina, V. O. Kul'bakh, and F. T. Solodkiy, who stressed the urgent necessity of speeding research in the medical industry on preparations possessing protective and therapeutic effects in radiation injuries and of opening a wide front for research on the synthesis of new and more effective preparations. These projects will proceed under the combined direction of chemists, pharmacologists, and radiobiologists.

The conference adjourned after a word from Prof A. V. Lebedinskiy, who praised the great accomplishments of the conference, and said that the work reported in a number of papers not only clarified known information on the reactions of organisms to ionizing radiation, but also produced additional information on some missing links. The reporter said that the conference also proved the existence of certain shortcomings: for instance, there were few reports on the incorporation of radioactive substances and there was evidence of insufficient study of radiation effects due to small doses.

6. Correlated Changes in Plants Subjected to X-Ray Irradiation Studied

"On the Correlated Changes in Plants Under the Effect of X Rays," by I. M. Vasil'yev, Institute of Biological Physics of the Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 116, No 1, Sep/Oct 1957, pp 49-51

Since X rays cause numerous changes of a different nature in plants, and some of these changes are due to the direct effect of ionizing radiation while others are consequences of the indirect effects and in their turn cause changes of a third order, etc., two series of tests on wheat were conducted to study X ray effects on plants. The author concludes that many changes in plants subjected to X ray effects arise according to the principle of correlation. The most important change in irradiated plants which leads to other changes is the inhibition of growth in the meristematic zones. Decreased growth in the root hairs results in the accumulation in the cells of osmotically active substances unused for growth, and an increase in suctorial strength of the cells, leading to the formation of vacules, etc. A darker coloring of leaves of irradiated plants is noted and this is directly correlated with delayed leaf growth. The inhibited growth of plants irradiated by X rays in certain cases may be a positive factor, for example, in preserving the life of the plant for a longer period under conditions of insufficient nutrition.

III. CHEMISTRY

Chemistry and Technology of Fuels and Propellants

7. Chemical Inhibitors of Explosion of Hydrogen-Oxygen Mixtures

"Is It Possible to Make Nonexplosive Mixtures of Hydrogen With Oxygen?" by A. B. Taubman, Doctor of Chemical Sciences; Moscow, Priroda, Vol 47, No 5, May 58, p 128

"Hydrogen-oxygen mixtures which have been thoroughly dried explode at a considerably higher temperature than mixtures containing water. For a long time this effect was ascribed to the catalytic action of water vapor. However, it has been established that the inhibiting effect on the reaction and the increase in the ignition temperature are brought about by traces of phosphine derived from the phosphoric acid anhydride that is commonly used as a drying agent.

"The dependence of the explosive properties of hydrogen on its content in the mixture is determined by the existence of two concentration limits: the lower concentration limit, which is reached when the quantity of the combustible gas in the mixture becomes inadequate, and the upper concentration limit, which exists when there is a lack of oxygen in the mixture, i.e., when an excess of hydrogen is present. The upper limit is of particular interest from the practical standpoint. This limit corresponds to 72% of hydrogen and 28% of air for hydrogen-air mixtures (the lower limit for hydrogen-air mixtures corresponds to 5% of hydrogen and 95% of air).

"The existence of these limits is due to the fact that the flame cannot propagate when the rate of transmission of heat from the burning mixture to the surrounding atmosphere becomes so large that the temperature drops below a certain critical value and the rate of propagation is reduced to only a few centimeters per second. Inhibition of the explosion of mixtures of hydrogen with oxygen (as well as any other explosive gas mixtures) by the addition of various agents is based on this relationship. This inhibition is referred to as flegmatization of the explosive mixture.

"According to present-day ideas on the subject, chain reactions play the principal role in combustion processes. Molecules of the inhibitor also enter into chain reactions, bringing about termination of chains, and thus considerably reduce or bring to zero the rate of combustion.

"The most effective substances in this respect are halogens (chlorine or bromine) and their compounds, for instance, carbon tetrachloride, tin tetrachloride, ethyl bromide, etc.

"According to experiments carried out by Tanaka and Nagai in 1927, the addition of 1% of ethyl bromide to a hydrogen-air mixture lowers the upper limit of ignition of the hydrogen-air mixture from 72% to 49% and the addition of 3% of this inhibitor to 34%. When 6% of the inhibitor has been added, the upper limit of ignition is lowered to 12%.

"Thus, one may say that there is an effective method of inhibiting the tendency of hydrogen to explode. However, depending on the conditions of the combustion of gas mixtures (the content of hydrogen in them, the circumstance as to whether combustion takes place in an open or closed vessel, the type of the ignition source, etc.), one must select appropriate conditions under which the action of inhibitors will be most effective.

"The theory of the inhibition of the combustion and explosion of gases forms a part of the general theory of combustion and explosions, which has been developed primarily by Soviet scientists."

Chemistry and Technology of Nuclear Fuels and Reactor Construction Materials

8. Solubility of Uranyl Nitrate in Dibutyl Ether

"Investigation of the System Uranyl Nitrate-Water-Dibutyl Ether; Solubility Isotherm at 25°," by V. M. Vdovenko and I. G. Suglobova Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 6, Jun 58, pp 1403-1409

The solubility isotherm of the system uranyl nitrate-water-dibutyl ether at 25° has been investigated. It was established that water molecules which combine with anhydrous uranyl nitrate, forming coordination compounds (hydrates), increase the rather low solubility of the anhydrous salt in dibutyl ether and other ethers.

9. Carbonate Complexes of Plutonium

"Carbonate and Carbonate-Oxalate Complex Compounds of Plutonium (IV); Part 1 -- Plutoniumcarbonates of Potassium," by A. D. Gel'man and L. M. Zaytsev; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 6, Jun 58, pp 1304-1311

A method has been developed for the isolation of complex carbonate compounds of plutonium (IV) in the form of solid substances of a sufficiently high degree of purity. Four potassium-carbonate complex compounds of plutonium have been isolated: $K_4[Pu(CO_3)_4].nH_2O$; $K_6[Pu(CO_3)_5].(3\text{-}4).H_2O$; $K_8[Pu(CO_3)_6].nH_2O$; and $K_{12}[Pu(CO_3)_8].nH_2O$. It was established that the coordination number as far as the inclusion of $CO_3^{=}$ ions in the inner sphere of the complex compound is concerned may be as high as eight.

10. Migration of Radium and Thorium Isotopes Studied

"On the Mechanism of Migration of Radium and Thorium Isotopes," by V. I. Baranov, A. M. Babeshkin, K. B. Zaborenko, and S. V. Pirozhkov, Moscow State University imeni M. V. Lomonosov; Moscow Zhurnal Neorganicheskoy Khimii, Vol 3, No 4, Apr 58, pp 1054-1059

The authors were interested in studying the process of migration in simple systems for which the form in which radioactive isotopes occur would be known in advance and the number of radioactive "transformations" be small. For this purpose the leaching out of radium and thorium isotopes from compounds whose crystal lattice is isomorphous with radium and thorium compounds was investigated. Experiments were conducted using barium salts containing Ra-226 and Ra-228 and cerium salts containing Th-228. In these experiments, the degree of isotope transfer from the above compounds to the solution was studied. It was found that the degree of Ra-224 transfer into solution is greater than that of Ra-228 and Ra-226 which is in agreement with data obtained by using samples of naturally occurring compounds. The behavior of thorium isotopes is determined not so much by the crystalline form of the compounds in which they occur as by the chemistry and behavior of thorium. This should be taken into account when the migration of thorium isotopes in nature is estimated.

11. Luminescence Spectra of Uranyl Nitrate Coordination Compounds

"Luminescence Spectra of Uranyl Nitrate Coordination Compounds," by G. I. Kobyshev and D. N. Suglobov, Physics Institute and Chemistry Institute of the Leningrad State University imeni A. A. Zhdanov; Moscow, Doklady Akademii Nauk SSSR, Vol 120, No 2, May 58, pp 330-332

The luminescence spectra of both anhydrous uranyl nitrate and some of its coordination compounds with various additives was investigated to ascertain the effect of coordination and the properties of molecule-additives on the luminescence spectra. It was found that the structure of the luminescence spectra of uranyl compounds is conditioned by coordination of electron-donor molecules at the uranyl ion with the resultant formation of stable compounds. It was also observed that in the case of the coordination compounds there is a shifting in the maximum of luminescence intensity toward lower frequencies which is due to a strengthening of the donor properties of the molecules functioning as additives.

12. Prospects for Production of Uranium and Germanium From Coal in Hungary and Eastern Germany

"Uranium and Germanium From Coal" (unsigned article); Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Vol 3, No 36 (336), 23 Mar 58, p 4

"Workers at the Institute of Nuclear Research in Hungary found that coal mined in the Transdanubian region contains large quantities of uranium. The institute is conducting extensive research with the view of finding the cheapest method of recovering uranium from lignite.

"Investigations conducted in the GDR (German Democratic Republic) showed that lignite contains small quantities of germanium. Coal appears to be a better source of germanium than lignite.

"Germanium can be recovered relatively easily as a by-product from the crude material being treated. This is due to the chemical properties of germanium: first, the volatility of some of the compounds of this element, particularly of germanium chloride, and second, the capacity of germanium to form similarly to carbon and silicon diverse compounds of the same structure as the organic compounds of carbon or the silanes derived from silicon.

"Organization on a large scale of the recovery of volatile and organic by-products in connection with the conversion of coal (and of petroleum and peat) will make it possible to increase considerably the production of germanium."

Industrial Chemistry

13. Progress in Subterranean Gasification of Coal

"The Present State and Prospects of the Subterranean Gasification of Coal," by N. V. Lavrov, Doctor of Technical Sciences, and I. P. Kirichenko, Candidate of Technical Sciences; Moscow, Vestnik Akademii Nauk SSSR, Vol 28, No 6, Jun 58, pp 56-61

In a general review which outlines the specific characteristics of the process of subterranean gasification of coal and reports on progress in this field made in the USSR, the following information is given and the following opinions are expressed:

The technology of the subterranean gasification of lignite to generate gas for power production has been developed and experimental and developmental work is being done on the subterranean gasification of coal deposits. Progress in the subterranean gasification of coal has been less rapid than in the subterranean gasification of lignite. Exceptionally difficult conditions

were encountered as far as the gasification of coal at the Lisichansk Station is concerned. To generate power gas there, blowing with air that has been partly enriched with oxygen is used. This is not expedient from the economic standpoint. The principal object of the work being done at Lisichansk is development of a process for the generation of power gas with air blowing and of a process for the generation of technological gas (i.e., of a gas used in chemical syntheses) with the application of oxygen and steam.

The Yuzhno-Abinsk Experimental Station in the Kuznetsk Basin has been operating for 2 years. A steeply inclined coal layer about 7 meters thick is subjected to gasification there. The thermal energy release capacity of the gas produced at this station, averaged over a year, amounts to 1,270 kilocalories per normal cubic meter, while the chemical efficiency of the process is higher than 70%, i.e., approaches that achieved in surface gas generators.

The work in the field of subterranean gasification conducted in the USSR is considerably ahead of that done outside the USSR in regard to both scope and the technical methods used in it. However, a number of complex scientific and technological problems remains to be solved before large quantities of gas suitable for industrial applications can be produced.

A theoretical basis for the electric joining together and/or cross-cutting of wells (sboyka skvazhin) with an alternating current of 760-800 volts has been developed in work done at the Power Institute imeni G. M. Krzhizhanovskiy, Academy of Sciences USSR, and at the All-Union Design and Planning Scientific Research Institute of the Underground Gasification of Coal (Vniipodzemgaz). This method was found to be of advantage in trials conducted on lignite.

Semiconductor thermoelectrogenerators of the type developed by A. F. Ioffe and his collaborators ought to prove useful for the direct conversion into electric energy of the physical heat contained in gas produced by subterranean gasification.

Employment of tracer atoms is one of the best methods of studying the flow of gas in subterranean gasification installations.

Immediate prospects for the development of subterranean gasification of coal depend on the possibilities of the production of a technological gas suitable for the synthesis of valuable chemical products. The Institute of Combustible Minerals together with Vniipodzemgaz has completed work on the principal theoretical aspects of the production of a technological gas by subterranean gasification with the application of oxygen and steam blowing. However, work on this subject is not proceeding rapidly enough.

14. Solutions of Silicic Acid in Acetone as Substitute for Ethyl Silicate

"A Substitute for Ethyl Silicate," by Ye. Yegorova, Candidate of Chemical Sciences, senior scientific associate, Institute of Silicate Chemistry, Academy of Sciences USSR; and P. Sorokin, Candidate of Technical Sciences, docent of the Leningrad Electrotechnical Institute imeni V. I. Lenin; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Vol 3, No 76 (376), 27 Jun 58, p 3

Solutions of silicic acid in acetone have been found a satisfactory and cheap substitute in the treatment of molds for metal casting. By using such solutions the cost of cast metal can be considerably reduced. The Leningrad Sovnarkhoz (Council of National Economy) has decided to organize a centralized production of the new ethyl silicate substitute. A method for its production is described.

Isotopes

15. Statistical Method for Determination of Isotope Composition of Simple and Complex Substances

"The Quantity and Concentration of Isotopic Molecules of Simple and Complex Substances," by I. G. Petrenko; Moscow, Atomnaya Energiya, Vol 4, No 4, Apr 58, pp 377-380

A method has been developed for the statistical calculation of the number and concentration of isotopic molecules of simple and complex chemical compounds without considering the influence of the isotope effect. This method is described and illustrated by actual calculations for carbon monoxide carbon dioxide, and methane. It is pointed out that investigation of the molecular isotopic composition is of importance for mass-spectrometric measurements, molecular spectroscopy, and the separation of isotopes. Furthermore, enrichment with an isotope due to the isotope effect can be determined after the concentration of isotopic molecules based on the statistical distribution of isotopes has been calculated.

Organic Chemistry

16. Work on New Synthetic Fibers at Moscow Textile Institute

"Development of Methods for the Synthesis of New Types of Synthetic Fibers" by Z. A. Rogovin and Z. A. Zazulina, Chair of Synthetic Fibers, Moscow Textile Institute; Ivanovo, Izvestiya Vysshikh Uchebnykh Zavedeniy, Khimiya i Khimicheskaya Tekhnologiya, No 1, Feb 58, pp 137-146

During the past 5-6 years, research on new synthetic fibers of the carbon-carbon chain type has been conducted at the Chair of Synthetic Fibers of the Moscow Textile Institute. As a result of the research that has been done, several new types of synthetic fibers were developed. Two varieties of fibers that have been developed present considerable interest from the standpoint of technological applications. The industrial production of these fibers on an experimental scale will presumably begin soon.

Research at the Moscow Textile Institute was conducted along the following two lines:

1. Synthesis and fabrication of modified polyacrylonitrile fibers and acrylonitrile copolymer fibers, including (a) a copolymer of acrylonitrile with vinylidene chloride (the "saniv" or MTI-1 fiber) and (b) a polymethacrylonitrile (the MTI-3 fiber).

2. Development of fibers which are more resistant to chemical action than the known natural and synthetic fibers (this phase of the work consisted in the development of the "ftorlon" or MTI-2 fiber).

On the basis of the results that are reported, the following conclusions were made:

1. Replacement of hydrogen with a methyl group in the acrylonitrile group of polyacrylonitrile sharply lowers the quality of the fiber, so that it is not advisable to employ polymethacrylonitrile for the production of synthetic fibers.

2. Ftorlon is superior to all known natural and synthetic fibers as far as resistance to chemical action is concerned.

17. Synthetic Fibers With Higher Resistance to Heat and Chemical Action

"New Synthetic Fibers," by A. Bystrov; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Vol 3, No 81 (381), 9 Jul 58, p 2

"Extensive work on the development of a method for the synthesis of a fiber which is highly resistant to aggressive substances has been done at the Chair of Synthetic Fibers, Moscow Textile Institute (Prof Z. Rogovin; Z. Zazulina, Candidate of Technical Sciences; and Engr M. Martsinkovskaya). The initial material for the preparation of the new fiber was a fluorine-containing copolymer that is soluble in acetone. This substance was synthesized at the Leningrad Institute of Polymerized Plastics (head, L. Chereshkevich).

"The group of workers at the chair developed within a comparatively short period of time a method of fabricating the new fiber, which has been named ftorlon.

"Ftorlon is distinguished by a high mechanical strength and the capacity to stretch 350-400% at room temperature. A still better mechanical strength of the fiber is achieved by treating it in glycerine. After this treatment the tensile strength of the fiber amounts to 115 kilograms per square millimeter. The fiber surpasses in this respect all kinds of natural and synthetic fibers; glass fiber is the only exception. The new fiber is very resistant to heat. As distinguished from khlorin [perchlorovinyl], the physico-chemical properties of which change as low as at 80-90°, ftorlon can be safely used at a temperature of 120°. Ftorlon is only a little less fast to light than nitron [polyacrylonitrile] which has a fastness to light exceeding that of all other synthetic and natural fibers.

"Ftorlon is very stable to chemical action exerted by various substances. While khlorin resists the action of concentrated nitric acid for only 5-6 hours, after which it deteriorates completely, the new fiber, on being immersed in this acid, does not change its characteristics for 60 days.

"Nitron derived from polyacrylonitrile will find extensive application in the national economy. However, its production involves the use of the solvent dimethylformamide, which is in short supply. The scientists of many countries have done persistent work with the aim for finding a substitute for polyacrylonitrile.

"The group of workers at the Chair of Synthetic Fibers has successfully solved this problem as well. In cooperation with workers at other research organizations, they developed a method for the production of the new fiber saniv, which is a copolymer of acrylonitrile with vinylidene chloride.

"The new synthetic fiber has characteristics superior to those of khlorin. Saniv dissolves readily in acetone and is resistant to the action of acids and alkalis. To increase its strength it is stretched 100-120% at an elevated temperature."

18. Polyethylene Prepared by Using New Catalyst

"On the Possibility of Polymerizing Ethylene Into Polyethylene in the Presence of Lithium Hydride, Aluminum Halide, and Titanium Tetrachloride," by A. V. Topchiyev, I. V. Tolchinskiy, and B. A. Krentsel', Institute of Petroleum, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, Otd. Khim. Nauk, No 3, Mar 58, pp 375-376

In one of Ziegler's published works, it is stated that heating an ether solution of lithium aluminum hydride with ethylene at a temperature of 180-200° under pressure results in a mixture of alpha-olefins and that no formation of high-molecular polymers of ethylene takes place. However, it is known that triethylaluminum, complexed with titanium tetrachloride, polymerizes ethylene even at atmospheric pressure. The authors therefore undertook to prepare triethylaluminum and polymerize ethylene into polyethylene in one stage. Two typical experiments are described using n-octane and white spirit as solvents (carefully purified with all air removed). The catalyst consisted of LiH, $AlCl_3$, and $TiCl_4$ in a 1:6:4 ratio, and its concentration was about 5% by weight. In one experiment at 10 atm pressure and 85° temperature, the yield of the powdered polymer was 236 g/liter of solvent. The molecular weight was 87,000 and the melting point was 140°. Polymerization of propylene into polypropylene was also accomplished under analogous conditions. It is stated that the polyethylene prepared by these methods is a highly disperse product and samples of it have been successfully refined into high-quality foam polyethylene.

19. Synthesis of Alkylferrocenes

"The Synthesis of Alkylferrocenes by the Friedel-Krafts Reaction," by A. N. Nesmeyanov and N. S. Kochetkova; Moscow, Doklady Akademii Nauk SSR, Vol 114, No 4, Jun 57, pp 800-802

In 1956, the authors described the alkylation reaction of ferrocene with alkyl halides in the presence of anhydrous aluminum chloride. An excess of the alkyl halide was used as a solvent. In the present work, the authors succeeded in carrying out the same reaction by not using an excess of alkyl halide. An increase in the yield of the mono- and dialkyl derivatives of ferrocene was also achieved. n-heptane or absolute petroleum ether were used as solvents. Direct alkylation of ferrocene with alkyl halides (methyl chloride, isopropyl chloride) or unsaturated hydrocarbons (ethylene) resulted in the formation of the previously unknown alkylferrocenes: methylferrocene, dimethylferrocene, isopropylferrocene, diisopropylferrocene, and isomeric

diethylferrocenes in which both alkyl groups are located at the same cyclopentadiene ring. It was also established that introduction of the first alkyl group into the cyclopentadiene ring makes it easier for other alkyl groups to enter, as is the case with the aromatic series. When this occurs, a mixture is obtained with all substituents in one ring.

20. Organophosphorus Polymers

"Organophosphorus Polymers. Communication 3 -- Polycondensation of p-Chlorophenyldichlorophosphine With 1.2-Diphenylethane," by V. V. Korshak, G. S. Kolesnikov, and B. A. Zhubanov, Institute of Organoelemental Compounds, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 5, May 58, pp 618-625

The polycondensation of p-chlorophenyldichlorophosphine with 1,2-diphenylethane in the presence of aluminum chloride was investigated and the basic parameters of the process determined. It was established that the substitution of a hydrogen atom in the benzene ring by a radical containing phosphorus with the subsequent formation of a phosphorus-carbon bond leads to the deactivation of the other hydrogen atoms in the benzene ring. The polycondensation of p-chlorophenyldichlorophosphine with diphenylethane is complicated by processes which take place in a manner similar to that of rearylization reactions.

21. Organophosphorus Compounds

"On Amides of Phosphorus Acids. Dialklyphosphoryl-N-phenyltriazines and Their Salts," by M. I. Kabachnik and V. A. Gilyarov, Institute of Organoelemental Compounds, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 114, No 4, Jun 57, pp 781-784

It has been shown that complete esters of trivalent phosphorus acids react with phenylazide to form imidophosphates, and the reaction with phenylazide may be considered as typical. The authors further investigated this reaction using salts of dialkylphosphites in which the phosphorus is trivalent. It was found that free dialkylphosphites do not react with phenylazide, while dialkylphosphite salts (those of triethylammonium and sodium) react smoothly to form salts of dialkyl-N-phenylphosphoryltriazines from which the free dialkylphosphoryl-N-phenyltriazines may be separated. The latter are a new class of phosphorus-nitrogen compounds.

22. Decomposition of Nitroglycerine Studied

"On the Decomposition of Nitroglycerine at High Temperatures," by K. K. Andreyev, Moscow Chemicotechnological Institute imeni D. I. Mendeleyev; Moscow, Zhurnal Prikladnoy Khimii, Vol 31, No 3, Mar 58, pp 484-493

The decomposition of nitroglycerine at high temperatures in the absence of impurities is a complex homogeneous-heterogeneous reaction in the initial stage. When it takes place in the vapor phase, there is no acceleration in gas formation, while there is a slight acceleration in gas formation if the reaction takes place in the liquid phase. After a certain pressure of gaseous products if formed and a corresponding concentration of the gases dissolved in the liquid is achieved, there is a drastic acceleration of gas formation. A similar acceleration in gas formation takes place if water, especially water combined with acids, is added to the nitroglycerine. It can therefore be concluded that in both cases accelerated gas formation is conditioned by a hydrolytic reaction and subsequent reaction between the hydrolysis products. The decomposition of glycol dinitrate and nitrocellulose is similar to that of nitroglycerine.

23. Heat of Explosion of Hexogen Measured

"On the Explosive Decomposition of Hexogen," by A. Ya. Apin and Yu. A. Lebedev; Moscow, Doklady Akademii Nauk SSSR, Vol 114, No 4, Jun 57, pp 819-821

Changes in the heat of explosion and volume of gaseous explosion products have been established for trotyl, tetryl, picric acid, and a number of other explosives having a negative oxygen balance. However, until recently the heat of explosion of hexogen (cyclotrimethylenetrinitramine) [also known as RDX] was measured under the assumption that it was independent of the conditions of the explosion, expecially the density of the charge. Published data give different values for the heat of explosion of hexogen which apparently vary with the state of the explosive and experimental conditions, i.e., liquid or vapor, powdered or close packed, size of charge, etc. However, there is no point to determining the heat of explosion with great accuracy if conditions of the explosion are not held constant.

The authors feel that the most important factor in studying complete explosion lies in maintaining constant charge density. It was established that the heat of explosion increases rapidly with increasing charge density.

The heat of explosion of hexogene was measured in a 250-kg steel bomb calorimeter with the charge (30-50 g and 20-30 mm in diameter) placed in a copper shell suspended in the calorimeter. A table lists the heats of explosion in relation to the density of the charge. The relationship is linear in character.

It was established that the heat of explosion is not constant for an explosive. The most important conclusion of the present work is that in a narrow detonation wave equilibrium processes in the explosion products are established to a considerable degree, while over a longer period of time expansion of the explosion products that have reached a state of equilibrium does not have time to go in the opposite direction, i.e., there is an intense "freezing" of the equilibrium. Determination of the heat of explosion and the composition of the explosion products of the charge, the diameter of which is close to the critical, permits one to judge the degree of pressure drop in the detonation wave and the magnitude of pressure loss.

Radiation Chemistry

24. Effect of Ionizing Radiation on Atmospheric Corrosion of Metals

"The Atmospheric Corrosion of Metals Under the Effect of Radiation," by A. V. Byalobzheskiy, Institute of Physical Chemistry, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 119, No 3, May 58, pp 515-517.

While ionizing radiation does not produce any corrosion of metals in dry air, experiments conducted in this instance in air the relative humidity of which was 98% indicated that considerable corrosion of iron, copper, aluminum, and zinc takes place in humid air under the action of radiation. It was established that not only oxygen but also the nitrogen of the air has a corroding effect under the conditions studied. V. G. Khlopin established that ozone, hydrogen peroxide, and nitrous acid anhydride are formed in humid air as a result of the action of ultraviolet radiation. In the experiments conducted in this instance, in which a cathode ray tube, an X-ray tube, and Co^{60} were used as sources of radiation, it was found that ozone (0.4% in air and 0.5% in oxygen) and nitrogen oxides were formed, but no measurable quantity of hydrogen peroxide. While these long-lived products of irradiation of the atmosphere promote the corrosion of metals, the short-lived products (OH and OH_2 radicals, O atoms, compounds of the type of NO_3) have a still greater effect, according to the results obtained. It was furthermore established that corrosion in pure oxygen is not significantly greater than in a mixture consisting of 80% of argon + 20% of oxygen. The fact that a passivating effect is exerted by the strongly acidic products formed in oxygen is advanced as an explanation for this.

25. Radiolysis of Benzoyl Peroxide Solution Investigated

"Energy Transfer During the Radiolysis of Benzoyl Peroxide Solutions," by V. A. Krongauz and Kh. S. Bagdasar'yan, Scientific Research Physicochemical Institute imeni L. Ya. Karpova; Moscow, Doklady Akademii Nauk SSSR, Vol 114, No 4, Jun 57, pp 829-832

When solutions of organic compounds are subjected to ionizing radiation, the absorbed energy can be transferred from one component to another. To clarify the effect of the nature of the solvent on the transfer of energy, the authors investigated the radiolysis of benzoyl peroxide in benzene, cyclohexane, and ethyl acetate. The differential dose was equal to 1.74×10^{15} ev/ml·sec. The radiolysis was conducted with gamma rays from Co^{60} in a vacuum, and the initial rate of decomposition of the peroxide was measured iodimetrically. Comparison of data on the radiolysis of benzene peroxide in various solvents indicates that the transfer of energy from the solvent to the solute depends greatly on the nature of the solvent. The following processes occurring during the radiolysis of peroxide solutions in benzene were investigated: (a) the formation of excited benzene molecules during the absorption of radiation energy, (b) spontaneous deactivation of the excited benzene molecules, (c) the transfer of energy from the excited benzene molecules to the peroxide molecules and the decomposition of the latter, and (d) decomposition of the peroxide as a result of absorption of gamma radiation energy by the peroxide itself. A formula is given which describes the rate of radiolysis of benzene peroxide in benzene. This formula incorporates rate constants for the above four reactions.

Miscellaneous

26. USSR Progress in Chemistry During 1957

"The Principal Results of the Scientific Activity of the Academy of Sciences USSR During 1957," by Academician A. V. Topchiyev, chief scientific secretary, Presidium of the Academy of Sciences USSR; Moscow, Vestnik Akademii Nauk SSSR, Vol 28, No 5, May 58, pp 9-28

In the report on the work done by the Academy of Sciences USSR during 1957, A. V. Topchiyev outlined as follows the results of chemical research done during that year.

"The results of research in the most important theoretical subdivisions of chemistry demonstrate that in a number of fields the Soviet Union occupies a prominent place in world science. Among these fields are the theory of chain reactions, many subdivisions of electrochemical kinetics and of the theory of surface phenomena, the chemistry of complex compounds, and the theory of conjugated bonds, tautomerism, and the dual capacity of organic compounds to enter into reactions.

"Research in the field of organophosphorus compounds done by Academician A. Ye. Arbuzov's school at Kazan' is developing successfully. New and interesting results have been obtained in work on free radicals.

"Work on acetylene chemistry that has been conducted during recent years gave rise to original research on the chemistry of physiologically active substances, essential oils, and initial materials for the synthesis of elastomers.

"Some progress has been achieved in the chemistry and physics of high-molecular compounds. In work done at the Institute of High-Molecular Compounds, it has been shown that it is possible to produce glasslike polymers which possess a resistance to heat considerably exceeding that of plexiglass ("organic glass") produced continuously; a number of practical procedures for the production of such compounds has been proposed and the theoretical possibility of increasing further the heat resistance of materials of this type demonstrated.

"At the Institute of Organic Chemistry imeni N. D. Zelinskiy an industrial method for the synthesis of isoprene has been proposed. Isoprene is of importance as an initial material for the production of synthetic rubber which resembles natural rubber in its characteristics.

"At the Institute of Organoelemental Compounds directed by Academician A. N. Nesmeyanov, a great number of new high-molecular substances has been synthesized, including heteroatomic compounds the principal chains of which consist of alternating atoms of metal and oxygen, silicon and oxygen, or oxygen and phosphorus. Compounds with carbon-carbon chains which contain different elements such as phosphorus, boron, and germanium have also been synthesized. It was established that some of the newly synthesized polymers are stable up to 350-400°. Starting with dicarboxylic acids containing phosphorus and diamines, polyamides with high melting points have been obtained. New methods for the preparation of high polymers were found. Work has been successfully completed on telomerization processes for the preparation of amonoenanthic, aminopelagonic, and aminoundecanic acids to be used for the production of new and valuable types of synthetic fibers. New reactions have been developed for the

telomerization of ethylene with silicon compounds. The products of these reactions are organosilicon compounds which are capable of polymerization. In the course of the investigation of the chemical behavior of tetrachloroalkanes and their derivatives a new type of rearrangement was discovered, viz., the homolytic rearrangement.

"New polymerization catalysts have been discovered which exhibit a more universal type of action than those known abroad, and work has also been done in other fields. However, our work in the field of high-molecular compounds still lags to a considerable extent.

"The Communist Party and the government have set to Soviet science the task of advancing to a leading position in this field during the next few years. This task is particularly important in connection with the decision that has been made to create within the next few years a powerful industry producing plastics, synthetic fibers, synthetic elastomers, and other synthetic materials to satisfy the huge demand for products of this type to be employed in the production of textiles of high quality, footwear, synthetic fur, and an extensive range of building materials comprising boards for the construction of walls, floor-covering materials, and boards which are soundproof and have a heat-insulating effect. Many products to be used in different industries are also to be made from the new synthetic materials.

"In the performance of the tasks involved particular attention must be paid to basic scientific work, the development of research, and cooperation between science and industry so that the results of research done at the institutes of the Academy of Sciences USSR on the synthesis of new polymers and the development of new, more economical methods of utilizing available raw materials will be transferred without delay to the stage of technological development and introduced into industrial application through the efforts made at industrial specialized branch institutes and industrial enterprises.

"With the use of ion exchange resins produced in the USSR, an efficient chromatographic method for the separation of rare earth elements has been developed at the Radium Institute imeni V. G. Khlopin. This method has yielded substantial results in the investigation of nuclear reactions. Closely related is work done by the Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, the Institute of Metallurgy imeni A. A. Baykov, and other institutes on the production of rare elements in a state of high purity. These elements are required particularly in connection with the development of semiconductor technology, the production of heat-resistant alloys, and the production of structural materials for nuclear reactors.

"At the Institute of General and Inorganic Chemistry new complex compounds of plutonium, uranium, zirconium, cadmium, tuthenium, and other elements have been synthesized. The structure of these compounds was investigated.

"In the field of the theory of solutions the formulation of a new and original theory of the hydration of ions in aqueous solutions has been completed.

"In work done in the field of nuclear transformations and radiochemistry, more than 100 radioactive isotopes have been investigated. At the Institute of Geochemistry and Analytical Chemistry, new types of alpha-decay processes have been found in the cases of dysprosium and hafnium and also beta-decay processes in the case of thulium. It was established that the isotopes sodium-24 and phosphorus-32 are formed as a result of a strongly asymmetric splitting of the nuclei of lanthanum, gold, and other elements. The effect which the structure of the nucleus has on this process was clarified. At the Radium Institute, a method has been developed for the preparation of emulsions with an exceptionally fine grain size. These emulsions are sensitive to high-velocity particles and are of particular importance for research in nuclear physics conducted with the aid of photosensitive layers. Work done at the Institute of Physical Chemistry demonstrated that radiation-chemical oxidation may take place in organic systems in the absence of molecular oxygen, the organic solvent acting as the oxidizing agent.

"Substantial progress in work on the theory of chain reactions has been made at the Institute of Chemical Physics.

"Experimental work on the kinetics of the oxidation of hydrogen at low pressures made it possible to determine the constant of the reaction of branching and the energy of activation of the process. The theory of the interaction of chains could also be formulated quantitatively. It was established that inert radioactive gases are very effective as initiators of oxidation processes.

"At the Institute of Physical Chemistry, new electron types of catalysis by semiconductors have been discovered. The kinetics of catalysis of this type have been formulated. A number of theoretical problems in the field of electrochemical kinetics has been solved. Thus, a quantitative theory of hydrogen overvoltage have been developed for a complex set of conditions. In connection with this work, the criteria have been indicated which can be used in determining the mechanism of the reaction. It has been shown that a rotating disk-shaped electrode can be used in the investigation of the kinetics of reactions taking place in a volume. A general theory explaining the origin of fluctuations of potential and current in electrical systems has been proposed.

"A potential theory of the adsorption of gases and vapors on actual adsorbents with a surface inhomogenous in regard to energy distribution has been developed. This theory describes the adsorption equilibrium and the heat of adsorption in an extensive range of temperatures including the critical range.

"At the Institute of Geochemistry and Analytical Chemistry work was continued on the relationship underlying the distribution of chemical elements in the Earth's crust. Work has also been done on the geochemistry of isotopes and the isotopic composition of a number of elements contained in meteorites (e.g., sulfur, oxygen, carbon, lead, and the noble gases), as well as in different types of rocks and volcanic deposits. On the basis of the results obtained, conclusions were drawn in regard to the nature of processes which resulted in the formation of meteorites and of rocks composing the Earth's crust."

27. Current Trends in USSR Chemical Research

"At the Department of Chemical Sciences" (unsigned article); Moscow, Vestnik Akademii Nauk SSSR, Vol 28, No 5, May 58,
CPYRGHT pp 51-55

"A general meeting of the Department of Chemical Sciences was held under the chairmanship of Academician A. P. Vinogradov. At this meeting N. N. Semenov, academician-secretary of the department, presented a report which summarized the scientific work done at the department. In this report Semenov pointed out the most important work done by various institutes in their fields of activity.

"Surface phenomena, radiochemistry, and radiation chemistry were the principal fields in which research was done at the Institute of Physical Chemistry.

Investigation of changes in the properties of metals including their mechanical strength and ductility brought about by the action of lubricants coating these metals demonstrated that interactions which apparently take place on the surface actually penetrate deeply into the metal and exert an effect on the mechanical properties of the material as a whole. On the basis of the relationships that were discovered, new effective lubricants were developed which are used extensively in the industry.

"Interesting results were obtained in the fields of catalysis, electrochemistry, and corrosion. New lines of research are being pursued, particularly in regard to the application of electrochemistry to problems of the theory of structure and those pertaining to semiconductors. A theory has been developed which describes the passage of currents through the boundary between semiconductors and electrolytes.

"In the fields of electrochemistry and radiation chemistry, work was described on the isolation of weighable quantities of technetium from lithium irradiated with neutrons and the finding that radiation-chemical oxidation with the oxygen of the organic solvent is possible in organic systems. On the basis of general theoretical results, work that is of importance from the standpoint of practical applications was done. For instance, it has been found that it is possible to destroy and disperse warm clouds and fogs under natural conditions by using surface-active agents. Another instance is the development of a method for the separation of concentrated radiocesium compounds from waste products of the radiochemical industry.

"At the Institute of Chemical Physics, physical methods were applied in research on chemical kinetics and combustion and in work pertaining to the theory and development of a scientific basis for some technological work. A number of appliances has been developed for the observation of rapid processes. With the aid of these appliances, interesting research has been done on frozen free radicals and the formation of radicals from triphenyl lithium during the course of the reaction by which they are formed. The results of some research on processes which take a rapid course will be of importance from the standpoint of practical application in connection with explosions employed in mining and for the development of a theory of diverse phenomena occurring underground as a result of subterranean explosions. Progress has been made in the theory of chain reactions, shock waves, and thermal explosions.

"Among the new methods developed in 1957, Semenov mentioned as very promising that of the oxidation of simple hydrocarbons in the liquid phase at temperatures and pressures approaching the critical.

"The Laboratory of Anisotropic Structures has achieved good results in work on special plastics of the glass type. Pilot-plant installations for the production of such plastics have been erected.

"Work done at the Institute of High-Molecular Compounds was concerned to a significant extent with the synthesis of heat-resistant polymers. A number of new types of transparent high-polymer materials was developed. Some of the new polymers containing rings in the principal chain proved exceptionally stable at relatively high temperatures.

"Important results were obtained in the field of catalytic polymerization. The conditions were clarified under which amorphous and crystalline polymers of olefins and diolefins are obtained with the aid of complex compounds formed as a result of the interaction of titanium tetrachloride with alkylmagnesium halides and with organolithium compounds. It has been established that it is possible to obtain block polymers with different dimensions of the blocks and different numbers of these blocks in polymer molecules. This done by supplying the individual monomers separately and at definite intervals.

"In the field of the study of mechanical properties of polymers, new data were obtained on correlations between rates of deterioration and those of creeping and on the theory of mechanical strength and deformation of oriented polymers. By measuring the dielectric loss and the electric polarization, the role played by intramolecular and intermolecular interactions in polymers both in solution and in the elastic state was clarified.

"In the course of some theoretical investigations, ways were found for the practical utilization of the results obtained. Thus, research on ion exchange and on the chromatography of bipolar ions led to the synthesis of new adsorbents with a high selectivity toward a number of antibiotics (albomycin, streptomycin, and collimycin) and to a method for the isolation of insulin in the crystalline state. Other instances are the synthesis of heat-resistant transparent materials leading to the development of new grades of transparent plastics and research on the polymerization of methylmethacrylamide and its derivatives, which led to the development of polyelectrolytes the introduction of which into the soil in small quantities improves the structure of the soil and increases the yields of plants grown on it.

"New equipment was developed, including appliances for the investigation of the photoplastic effect, of reactions by the method of electromagnetic resonance, of changes in the angle of dielectric loss and of dielectric permeability in the range of decimeter waves, etc.

"At the Institute of Organoelemental Compounds, successful research was done on the theory of structure, reaction kinetics, and reactivity. New methods of synthesis were developed and new organoelemental compounds synthesized by these methods. Some of these compounds will possibly be of practical importance, particularly as catalysts.

"The tendency to employ results of general theoretical research for the solution of practical problems is typical for the Institute of Organoelemental Compounds, according to Semenov. For instance, the synthesis of aminoenanthic acid developed at this institute was applied in the production of the enant fiber and the synthesis of thiodivaleric acid developed there was employed in the synthesis of plasticizers, lubricants, and valuable by-products. New substances containing a high percentage of fluorine were synthesized which are of interest from the standpoint of the production of plasticizers and liquids that are heat-resistant and resistant to chemical action. A method for the synthesis of siloxanes containing different other elements was developed; on the basis of this method polyorganosiloxanes have already been synthesized the principal chains of which contain aluminum, titanium, tin, antimony, cobalt, iron, or other elements. Furthermore, high-molecular aluminophosphates have

been synthesized which contain alkyl silicon groups in the side chains. Liquid high-molecular compounds distinguished by a high thermal stability were synthesized. The systematic investigation of organoelemental high-molecular compounds was continued with the purpose of finding among them substances which have a high thermal stability and a high mechanical strength. A great number of new organoelemental high-molecular compounds were obtained which contain phosphorus, silicon, germanium, tin, and other elements. The properties of these compounds were investigated. It is intended to subject to extensive investigation the possibilities of synthesizing monomers and polymers including organoelemental compounds by applying basically new methods and reactions, including the telemerization reaction.

"At the Institute of Organic Chemistry imeni N. Z. Zelinskiy, research has been completed on the development of a dynamic method for the determination of the surface of catalysts and on the application of the method of ultrathin sections in the electron microscopy of catalysts. The latter method is used at present extensively not only at the Institute of Organic Chemistry, but also at a number of other scientific institutions. A number of oxide catalysts was investigated thoroughly with the aid of an ultramicrotome. The structure and formation of a number of typical binary oxide catalysts and of a number of catalysts used industrially were investigated in detail.

"Progress was made in research in heterocyclic compounds, the determination of the energy of bonds formed by elements of organic compounds with oxide and metal catalysts, and on methods of synthesis and properties of organoboron derivatives and functional organosilicon compounds.

"Many investigations dealt with the solution of technological problems: the results of these investigations are being introduced into practical application as far as the production of polymers of vinyl pyrrolidone, the synthesis under semiplant conditions of a monomer for synthetic rubber, the synthesis of "tsigerol" and "deksirol," a method for the continuous production of cyclopentadiene by the decomposition of its dimer, and other industrial methods are concerned.

"Considerable attention was paid in Semonov's report to work done at the Division of Chemistry of Petroleum and Gas of the Petroleum Institute. At this institute extensive work was done on the processes of the production of polypropylene from the propylene fraction of natural gas and the pyrolysis of kerosene in the presence of Ziegler catalysts (triethyl aluminum and titanium tetrachloride). This work was done in cooperation with specialized branch institutes and chemical enterprises.

"Among investigations carried out at the Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, Semenov mentioned investigations of the physicochemical properties of compounds of rare elements and work that led to results being applied practically (for instance, the method of the group precipitation of platinum metals by means of thiourea, which makes it possible to separate almost completely all platinum metals from dilute solutions, a method for the production of anhydrous tin chloride, etc.)

"The Institute of Silicate Chemistry proposed a fundamentally new method for the synthesis of polymethylchlorosilanes which contain alternating atoms of silicon and carbon in the principal chain. Methods for the production of insulating coatings which are resistant to moisture and to high temperatures are being introduced on an extensive scale.

"At the Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, interesting results were obtained in research on nuclear chemistry and analytical chemistry. It was established that alpha-decay takes place in the cases of dysprosium and hafnium and beta-decay in the case of thulium. It was also established that as a result of the asymmetric splitting of lanthanum, gold, and several other complex nuclei the isotopes sodium-24 and phosphorus-32 are formed. The isotopic composition of a number of elements contained in meteorites of different types was investigated. The isotopic composition of volcanic rocks was also investigated. The production of pure compounds of all rare-earth elements was organized on an experimental basis, and measures were taken to assure the production of these compounds on a pilot-plant scale.

"Among results obtained at the Radium Institute imeni V. G. Khlopin, Semenov first of all mentioned the discovery of the cis-effect in the inner sphere of complex compounds. This effect is also apparent in isotope exchange reactions. It was established that a number of complex ions consisting of uranyl and organic bases are formed. The significance of the formation of these compounds for the distribution in liquid systems was clarified. A number of new peroxidic compounds of uranyl was obtained, and the equilibrium conditions pertaining to the solutions in question were investigated. Significant progress was made in work on gamma-spectroscopy, and beta-spectroscopy, investigations on interactions between nuclei and high-energy particles as well as slow neutrons, and the production of new isotopes, and in the fields of dosimetry and radiometry.

"Results obtained at the Hydrochemical Institute on hydrochemical conditions affecting bodies of water and conditions under which the chemical composition of natural waters is established are of practical interest from the standpoint of hydraulic construction.

"Chemical research conducted at affiliates of the Academy of Sciences USSR is progressing satisfactorily. This includes work done at the Kazan' Affiliate on new methods for the synthesis of organophosphorus compounds and organoarsenic compounds, as well as on the investigation of the physicochemical properties of petroleum crudes and natural gas found in the Tatarskaya ASSR; also work done at the Ural Affiliate on industrial methods for the electrolytic refining of rare metals and of metals present in small quantities, particularly titanium and zirconium.

"In completing the review of the activities at the institutes of the department, Semenov pointed out the raised level of experimental research at all institutes as far as methods are concerned. In fields such as organic synthesis, the theory of the structure and reactivity of organic compounds, the chemistry of petroleum, heavy organic synthesis, geochemistry, the chemistry of rare elements, surface phenomena, and chemical kinetics and catalysis, research done in the USSR is on a very high level, according to Semenov. On the other hand, in the fields of the chemistry of natural compounds, high polymers, inorganic synthesis, the theory of valency, and a number of other fields, it is definitely necessary to improve the work.

"The second part of Semenov's report dealt with organizational problems and was concerned mainly with prospects for the development of work along the principal directions envisaged. Among these directions are the development of a scientific basis for the synthesis of high-molecular compounds as well as of monomers and auxiliary substances, research on the chemistry of natural compounds and substances of importance in biology, the use of isotopes and of radiation in chemistry, and work in the fields of the chemistry of rare elements, the chemistry of semiconductor materials, electric [presumably electrochemical] sources of current, and the chemistry of organoelemental compounds. At academic research institutions, scientific branch institutes, and higher educational institutions, work will be conducted on the theory of structure, the theory of valency and of the chemical bond, reactivity, sterochemistry, the theory of catalysis and of the mechanisms of chemical reactions, chemical thermodynamics, the theory of combustion and explosions, problems of colloid chemistry and electrochemistry, adsorption, and several other subjects.

"At the same time scientific problems of technological importance must be solved which pertain, to give a few instances, to aerosols, physicochemical mechanics, the development of a scientific basis for chemical technology, petroleum chemistry, etc. Semenov pointed out that theoretical work on the most important problems will not be dissociated from problems of practical application. He showed what role is assigned to every institute of the department as far as the solution of problems which face the department as a whole is concerned. He also outlined a number of measures which will assure the completion of tasks with which the department is confronted in connection with these problems.

"Semenov reported on work relative to assistance that is to be extended to the Siberian Branch and its chemical institutes.

"The final part of the report dealt with scientific sessions, conferences, and meetings held in 1957 and with the participation of members of the Department of Chemical Sciences at international congresses. Semenov also discussed activities facilitating international scientific contacts and the publishing activity of the department. V. T. Bykov, S. I. Vol'fkovich, A. P. Vinogradov, K. M. Gorbunova, S. N. Danilov, B. V. Deryagin, I. A. Kazarnovskiy, I. L. Knunyants, N. A. Krotova, N. P. Luchnaya, I. Ye. Starik, N. A. Toropov, and A. N. Frumkin participated in the discussion of Semenov's report.

"A considerable proportion of the statements made by these persons during the discussion supplemented the report. Thus, N. P. Luchnaya told about developments in the field of semiconductor chemistry at the Institute of General and Inorganic Chemistry, I. Ye. Starik about some achievements at the Radium Institute in investigations pertaining to spectroscopy, and A. P. Vinogradov about progress made at the Institute of Geochemistry and Analytical Chemistry in work on relationships underlying the distribution of chemical elements in the Earth's crust, on the geochemistry of isotopes, on the determination of biogeochemical areas, the application of biogeochemical methods in prospecting for useful minerals, and the chemistry of nuclear transformations.

"A great amount of attention was given in the statements mentioned to future work on the principal chemical problems. The role to be played by individual institutes and laboratories in work on these problems was defined more precisely, the degree of importance of particular lines of investigation was evaluated, and the directions along which research must be pursued to an increasing extent were pointed out. Special attention was paid to the equipment of laboratories, wider use of new methods of investigation, improvement of the organization of conferences, and publication activities.

"The general meeting praised the work done by the Bureau of the Department of Chemical Sciences and recognized as correct the principal lines followed in the research that is being conducted. The Bureau of the department was urged to pay due attention in its future work to the suggestions made in connection with the discussion of the report."

IV. ELECTRONICS

Communications

28. Efforts of Soviet Amateurs to Master VHF Range

"Let's Mark the Sports Summer With New Records," by L. Lomonosov; Moscow, Radio, No 6, Jun 58, pp 1-2

CPYRGHT The article contains the following passages:

"If the world's achievements in the field of long-range radio communications on the frequency band of 144-146 Mc is equal to 4,087 km, our best results thus far do not exceed several hundreds of kilometers. Still worse is the situation in mastering the 420-425-Mc frequency range; only individual radio amateurs are engaged in this field.

"What is the cause of such backwardness? In the first place our radio clubs and Dosaaf committees do not give sufficient consideration to these frequency ranges. Besides, in the VHF competition rules insufficient stress was laid on VHF competitions.

"It is necessary to reconstruct radically all our operations in the VHF range, directing them toward further mastering of the 144-146 and 420-425 Mc ranges. This should be accomplished without further delay, considering the fact that summer is the best time for conducting experiments in long-range radio communications on these frequencies.

"In large cities with a variety of interferences it would be difficult to establish more-or-less distant radio contacts on 144-146 and 420-425 Mc. It would be considerably easier to accomplish such contacts if stations were located somewhere outside the towns. That is why our ultrashort-wave radio amateurs should conduct their experimental radio communication under field conditions."

29. Experiments With Waveguides for Long-Distance Communication

"Some Problems of Long-Distance Waveguide Communication," by Yu. I. Kaznacheyev; Moscow, Radiotekhnika i Elektronika, No 6, Jun 58, pp 731-743

Results of experiments conducted by the Institute of Radio Engineering and Electronics of the Academy of Sciences USSR on the propagation of H-mode waves in circular waveguides are presented. Basic attention is

devoted to the measurement of losses in waveguides and the study of the relationship of these losses to the nature of the current-carrying surface of the waveguide.

A description is given of experiments with "self-filtering" waveguides, that is, waveguides having dielectric or absorptive films on their inner surfaces, and with periodic or variable-section waveguides. Waveguides with absorptive films on all-metal walls have less filtration than those with variable sections. It was found possible to make variable-section waveguides having losses only 20-30% greater than the thermal losses of all-metal waveguides with ideal geometry.

A comparison is made between frequency modulation and pulse-code modulation for multiplex telephony transmission in waveguides. Pulse-code modulation with the use of line repeater points proved to be the most advantagous type of modulation, providing a high quality of telephone and television signal transmission which was practically independent of the length of the waveguide line.

Electromagnetic Wave Propagation

30. Improved Method of Pulse Demodulation

"Method of Increasing the Accuracy of Pulse Demodulation," by B. N. Mityashev; Moscow, Radiotekhnika, No 5, May 58, pp 55-63

The article describes a new method of pulse demodulation developed by the author, which is claimed to be more accurate than the conventional method of demodulation. In this demodulation method, for each incoming signal pulse a response in the shape of an isosceles triangle is formed. The amplitude of these triangular pulses is proportional to the amplitude of signal pulses, and their duration is equal to two repetition periods. As a result of superposition of such responses, a signal is obtained in which the voltage from one amplitude value to another is changing along a straight (continuous) line. The output signal is delayed with respect to the modulating function by one repetition period.

The accuracy of demodulation is thus increased; the improvement of accuracy is especially noticeable where the envelope curvature is small. Further improvement of accuracy of demodulation is obtained by introduction of low-frequency filters.

The new-type demodulator consists of a conventional (step) demodulator with two identical circuits, each having selecting, shaping, and summating stages and an integrator.

Such a demodulator can find application for exact reproduction of fast oscillations in modulating processes and for other processes having pulsing characteristics.

31. Computation of Noise Factor in Two-Beam Tube

"Noise in a Two-Beam Tube Caused by Short Fluctuations in Current Flow," by V. I. Kanavets, G. A. Kuz'mina, and V. M. Lonukhin; Moscow, Radiotekhnika i Elektronika, No 6, Jun 58, pp 800-805

A study is made of the relationship between the noise factor of a two-beam tube and a number of its parameters. It is assumed that the tube has a resonant input and that the noise is caused by uncorrelated fluctuations in current density and velocity in the absence of a minimum potential.

32. Energy Propagation in Filled Waveguide

"On the Mean Propagation Velocity of Electromagnetic Energy in Waveguides," by D. V. Sivukhin; Moscow; Radiotekhnika i Elektro-

nika, No 6, Jun 58, pp 744-749

"The author examines the propagation of electromagnetic waves in rectilinear waveguides with arbitrary cross section, assuming that the walls of the waveguide are ideal conductors and that the waveguide is filled with a dispersive medium with a specific inductive capacitance $\varepsilon(\omega)$ and magnetic inductivity $\mu(\omega)$. It is shown that the mean propagation velocity of electromagnetic energy in the waveguide coincides with the group velocity."

Instruments and Equipment

33. Small Time Interval Measuring Device

"Differential Time Analyzer for Measuring 10^{-8} to 10^{-10} Sec Time Intervals," by E. Ye. Berlovich, Physicotechnical Institute, Academy of Sciences USSR; Moscow, Pribory i Tekhnika Eksperimenta, No 1, Jan-Feb 58, pp 68-72

The article describes a device for measuring small time intervals by the method of delayed coincidence, which permits selection of pulses according to their amplitude and exclusion of the effect of the difference in the pulse edge. The time resolving capability of the circuit utilizing a FEU-1V photomultiplier can be raised to such a value as to permit the measurement of time intervals of the order of 10^{-10} sec. The device is intended for measurement of the lifetime of excited states of nuclei and neutron velocity spectra.

The circuit of the device consists of three amplifiers, electron trap, two photomultipliers, two limiters, variable-delay line, three triggering devices, two amplitude analyzers, and a scaler.

34. Investigation of Photomultiplier Characteristics by Coincidence Method

"Investigation of Time Characteristics of Photomultipliers by the Method of Delayed Coincidences," by E. Ye. Berlovich and B. A. Shilyayev, Physicotechnical Institute, Academy of Sciences USSR; Moscow, Pribory i Tekhnika Eksperimenta, No 1, Jan-Feb 58, pp 62-68

The article describes the application of the delayed coincidence method for evaluating the natural build-up time of photomultipliers. In investigating the build-up characteristics of the Soviet photomultipliers FEU-1V and FEU-19, the following values were obtained correspondingly -- $(1 \text{ to } 2)\cdot 10^{-9}$ sec and $4.5\cdot 10^{-9}$ sec. The test circuit consisted of two limiting tubes, a variable time-delay line, a germanium diode, an amplifier, a discriminator, a scaler, and a recording device. It was shown that the build-up time of a photomultiplier depends on its construction, as well as on the voltage applied.

35. Superhigh-Speed Camera

"At the Leningrad Institute of Precision Mechanics and Optics" (unsigned article); Moscow, Tekhnika Kino i Televideniya, No 5, May 58, p 96

Docent I. I. Kryzhanovskiy has developed a new superhigh-speed motion-picture camera SSKS-1 capable of taking 1,000-200,000 frames per second. The camera is intended for registering high-speed processes of 0.0005 to 0.5 sec duration. The camera can be loaded in direct light. It can take pictures of luminescent objects, as well as artifically illuminated objects. It is provided with three objective lenses of 73 mm, 150 mm, and 300 mm focal length having power of 1:1.9.

The camera is provided with a device for synchronizing the beginning of process with the beginning of photographing; a device for reprinting of recorded process from a wide negative to a standard 35-mm positive film; a remote control panel which permits taking pictures from a distance of 0.8 m up to infinity; and a time recorder. The camera is mounted on a stand and can be rotated 360°.

The over-all dimensions and the weight of the camera are such that it can be used in mobile equipment.

At present, a camera capable of taking up to 500,000 frames a second is in process of development at the Leningrad Institute of Precision Mechanics and Optics.

Components

36. High-Frequency Oscillator With Feedback Delay

"Theory of High-Frequency Self-Oscillator With Feedback Delay," by I. S. Gonorovskiy, Moscow, Radiotekhnika, No 5, May 58, pp 19-30

The article discusses stable generation of equally spaced frequency spectrum, which depends on the nature of the oscillatory system frequency response and on the relation between transmission band and delay magnitude.

The self-oscillator is presented as a combination of resonance amplifier with amplitude clipper in its feedback circuit. The main feature of the described delay-feedback self-oscillator is its ability to generate various frequencies, and under certain favorable conditions even to generate several frequencies simultaneously. In starting such an oscillator without external excitation, the generated frequency assumes a value in accordance with the conditions of phase balance, i.e., nearest to the resonance frequency of the system.

37. Range of Existence of Electrodeless Ring Discharge

"Investigations on the Existence Range of the Electrodeless Ring Discharge," by H. J. Strauss, Institute of Gas-Discharge Physics, Greifswald; Leipzig, Annalen der Physik, Vol 1, No 4/5, 1958, pp 281-295

The dependence of the existence range of an electrodeless ring discharge on pressure and excitation frequency is indicated for the inert gases and mercury, nitrogen, oxygen, bromine, and iodine in the frequency range of 4-8 megacycles. The fields which produce the ignition of the discharge and which cause the transition into the ring discharge are determined in respect to their dependence on the coil potential. A description of the apparatus is also given.

If the electrical field of the coil in the discharge vessel exceeds a certain value (ignition field intensity) which is determined by the type of gas, inflation pressure, and frequency of the applied field, the gaseous path will ignite. With suitable inflation pressure, a slightly luminous discharge takes place, which has scarcely any influence on the resonant circuit and which is called a "predischarge," and is identical with what is described in the literature as a discharge "of the electrostatic type." An increase of excitation, and the increase of the magnetic flux (and thus of the induced electrical field strength) associated with it, causes a transition at a certain value (transition field strength) which is characteristic for gas, pressure, and frequency. After this transition, the discharge has the same character as the ring discharge described in the literature.

This transition is observed only within a certain pressure range, outside of which the ring discharge builds up very rapidly, and the predischarge, on ignition, cannot be kept stationary.

The transition from a diffuse discharge directly into the form with a clearly recognizable ring shape takes place continuously. It thus seems justified to use the expression "electrodeless ring discharge" also for the diffuse form.

The ignition field strength depends on the radius of the discharge vessel, the type of gas, and the frequency of the excitation field. In the frequency range investigated, the ignition field strength drops as the frequency increases. The existence ranges shift with increasing frequency toward lower field strengths and lower pressures. The transition field strength, on the other hand, is almost independent of frequency in the case of inert gases, but exhibits a clear frequency response in the case of the halides.

When, for the inert gases, the pressures were plotted against the frequencies at which they appeared, five parallel curve segments were obtained for the five inert gases investigated; these curve segments could be approximated by five straight lines in the frequency range 4-8 megacycles. The diagram illustrates the regularity. If the ionization voltage is taken as a measure in the setup, it is evident that the individual gases follow one another just as the ionization voltages do, disregarding the transpositioning of helium and neon. There is no such regularity in the case of molecular gases.

Materials

38. Synthesis and Characteristics of Europium Hexaboride

"Europium Hexaboride," by G. V. Samsonov, V. P. Dzeganovskiy, and I. A. Semashko, Institute of Cermets and Special Alloys, Academy of Sciences Ukrainian SSR; Moscow, Doklady Akademii Nauk SSSR, Vol 119, No 3, 21 Mar 58, pp 506-507

Europium hexaboride, which has not been previously synthesized, was prepared by reducing pure europium oxide with boron carbide according to the following formula:

$$Eu_2O_3 + 3\,B_4C = 2\,EuB_6 + 3CO$$

The lattice constants of europium hexaboride were determined and compared with those of other rare-earth metal hexaborides (DyB_6, HoB_6, and LuB_6). It is pointed out that rare-earth metal hexaborides, because of their high thermal emissivity, are employed in electronics and have been investigated for that reason.

39. Susceptibility of Lithium Ferrite

"Dispersion of the Complex Transverse Susceptibility of Lithium Ferrite in the Frequency Range 10-10,000 Megacycles," by F. Voigt, Institute of Magnetic Materials, Jena; Leipzig, Annalen der Physik, Vol 1, No 3/4, 1958, pp 86-101

To interpret the two areas of dispersion which occur in the case of lithium ferrite, measurements were made in a transverse magnetic field in the frequency range 10-8,645 megacycles. The first dispersion area decreases with increasing magnetic field and is forced into the dispersion area at 2,500 megacycles. Shortly before the disappearance of the first dispersion area there is a noticeable shift of the second absorption position toward shorter wavelengths. The process of magnetization and the experimentally determined demagnetization factors for lithium ferrite specimens are considered in the discussion of the measurements.

The dispersion area at 50 megacycles is explained by means of rotational processes. The course of the reconstructed curve and the behavior of the transverse susceptibility at the lowest measured frequencies are cited as evidence of this.

40. Conductivity Studies on Lead Monoxide

"On the Electrical Conductivity of Lead Monoxide With Additions of Neodymium Oxide," by H. Grunewald and W. Neumann, Institute of Experimental Physics, Advanced Pedagogical School, Potsdam; Leipzig, Annalen der Physik, Vol 1, No 4/5, 1958, pp 198-200

The article deals with the dependence of the electrical conductivity of lead monoxide on the content of neodymium oxide in the temperature range of 200-500 deg C. The neodymium oxide content varied between 0 and 2.5 mol percent. It was found that, at a temperature of 200 deg C, the dependence of the electrical conductivity of the PbO on the Nd_2O_3-content very slight tendency to increase, whereas it decreases steadily at 300, 400, and 500 deg C.

The work is being continued.

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

V. ENGINEERING

41. Ivanovo Power Engineering Institute imeni V. I. Lenin

"In the Power Engineering Institute imeni V. I. Lenin," by S. Rozanov; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, No 49, 23 Apr 58, p 3

The Ivanovo Power Engineering Institute imeni V. I. Lenin (Ivanovskiy Energeticheskiy Institut imeni V. I. Lenina) was founded in August 1918 as the Ivanovo-Voznesenskiy Polytechnic Institute. Its present name was adopted several years later.

The institute specializes in the training of engineers and scientific workers; during its existence the institute has graduated more than 6,000 engineers and scientific workers. The deputy director of the institute is Prof A. Sorokin, Doctor of Technical Sciences.

The institute contains a number of fully equipped laboratories where research is conducted on various aspects of electrical power for the textile industry and other industrial enterprises. Among the new equipment for the laboratories are oscillographs, calculating-computing machines, and other instruments.

42. Automation Program in USSR

"Automation -- a Path to Rapid Increase of Labor Productivity" (unsigned article); Moscow, Priborostroyeniye, No 5, May 58, pp 1-2

The article contains the following passages:

"The rate of increase of our labor productivity, at present, considerably trails the rate of growth of our industrial production in general. As a consequence of this, the Seven-Year Plan of 1958-1965 has to contemplate a considerable increase in number of workers and experts for the basic industries.

"It is evident that in the very near future proper measures should be taken to increase labor productivity sharply.

"When we talk about the increase of labor productivity, we do not mean an increase of several percent or several tens of percent, we mean an increase of several hundred percent; this will require an introduction of radically new forms of manufacturing processes and new methods of controlling them.

"However, on the basis of general indexes of labor productivity, the USSR still lags considerably behind the level of labor productivity in the US.

"Considerable hindrance to the realization of complex mechanization and automation is the absence of a sufficient amount of new means of mechanization."

43. High-Voltage Current Transformer

"500,000-Volt Current Transformer" (unsigned article): Moscow, Tekhnika-Molodezhi, No 5, May 58, p 17

A short article accompanying a photograph reads as follows:

"At the Zaporozhye Transformer Plant a successful test was completed of a 500-kv experimental transformer. The new transformer has better electrical characteristics than the previously manufactured 400-kv transformers, and it weighs 3.5 tons less and is one meter shorter. Testing of the new 500-kv transformer was done under conditions of simulated rain at the High-Voltage Laboratory of the Zaporozhye Transformer Plant."

44. Extra-High-Capacity Thermal Electric Stations

"Superhigh-Capacity Thermal Electric Stations," by A. Kh. Levkopulo; Moscow, Teployenergetika, No 7, Jul 58, pp 48-55

The All-Union Heat Engineering Institute after studying the problem of largest practical turbogenerator unit, has arrived at the conclusion that single 600,000-kw units are very adaptable to the modern technology of electric power generation. The Soviet turbine building industry believes that the construction of two-shaft turbines of the indicated capacity can be accomplished very soon.

On the basis of the above considerations, the Moscow Branch of the "Teploelektroproyekt" Institute has drawn up plans for an extra-high-capacity electric station. This station will have a capacity of 2,400,000 kw and will be able to supply the basic electric power needs of the rayon; thus it is planned to utilize it as the main electric station of the system. The limiting capacity of 2,400,000 kw was dictated by the limitations of water supply. All the electric power generated will be fed to the 220-, 400-, and 500-kv network. This superhigh-capacity station will operate on brown coal having a calorific value of 3,000 kcal/kg, moisture content of 35%, and ash content of 16%.

The planned station will have four 600,000-kw steam turbogenerators (SKK-600, 300 atm, 650/565/565°C) and four uniflow boilers (1,690 ton/hr, 320 atm, 655/570/570°C). Other variants for the equipment arrangement of the superhigh-capacity power plant are suggested.

[For information on engineering materials, see Items No 76 and 77.]

45. Differential Equations

"Generalization of Ordinary Differential Equations Having Discontinuous Solutions," by J. Kurzweil, Prague, Moscow, Prikladnaya Matematika i Mekhanika, Vol 22, No 1, Jan/Feb 58, pp 27-45

The generalized differential equation $\frac{dx}{dt} = DF(x,t)$ is analyzed. This equation is reduced to the ordinary equation $dx/dt = f(x,t)$ if the derivative $\partial F/\partial t = f(x,t)$ is continuous. The existence of solutions for the general equation above and the continuous dependence of solutions on a parameter is proved, provided the function $F(x,t)$ has a limited variation of t at a fixed x and it satisfies a certain continuity condition in x.

46. Special Solution of Differential Equations

"A Certain Method of Investigation of Stability of the Zero Solution in Dubious Cases," by V. I. Zubov, Leningrad, Prikladnaya Matematika i Mekhanika, Vol 22, No 1, Jan/Feb 58, pp 46-49

A certain method of investigation concerning the stability of the zero solution of a system of $(n+k)$ ordinary differential equations applicable in dubious cases is analyzed. The method consists of the separate investigation of stability of the zero solution for k and for n equations, obtained from the initial system of equations

$$\frac{dy_s}{dt} = f_s(x_1, \ldots x_n, y_1 \ldots y_k, t) \qquad s = 1, \ldots, k$$

$$\frac{dx_j}{dt} = g_j(x_1, \ldots x_n, y_1, \ldots, y_k, t) \qquad j = 1, \ldots, n$$

This method was first applied by A. M. Lyapunov (Obshchaya zadacha ob ustoychivosti dvizheniya [General Problem of Stability of Motion], 1950) and later developed by I. G. Malkin (Prikladnaya Matematika i Mekhanika, Vol 6, No 6, 1942). Some of the latter's proofs were used in this article.

47. Differential Difference Equations

"Solution of Linear Differential Difference Equations Having Polynomial Coefficients," by A. A. Mirolyubov (Gor'kiy); Moscow, Matematicheskiy Sbornik, Vol 42 (84), No 1, Jan-Mar 58, pp 65-78

This work borders closely on a former work of the author which appeared in Matematicheskiy Sbornik, Vol 34 (76), 1954, pp 357-385. The problem considered in the present work is the finding of the general analytical solution of the equation

$$M[f(x)] = \sum_{i=0}^{n} \sum_{k=0}^{m} P_{ik}(x)\, f^{(i)}(x + h_k) = F(x). \qquad (1)$$

Here $F(x)$ is a function regular in a certain region G;

$$P_{ik}(x) = \sum_{j=0}^{p} a^{j}_{ik} x^{j},$$

where the polynomials $P_{no}(x)$ $(a^{0}_{n0} \neq 0)$ of degree p and $P_{nm}(x)$ have only prime zeros; h_k $(k = 0, 1, \ldots, m)$ are differences satisfying the condition

$$0 = h_0 < h_1 < \ldots < h_m,$$ and h_m is not a root of the equation

$$a^{0}_{nm} - a^{1}_{nm}\lambda + \ldots + (-1)^{p} a^{p}_{nm} \lambda^{n} = 0.$$

Particular properties of the solution found are then discussed.

48. Approximations in the Mean for Complex-Valued Functions

"An Approximation in the Mean of a Function on Rectifiable Curves," by G. Ts. Tumarkin (Moscow); Moscow, Matematicheskiy Sbornik, Vol 42 (84), No 1, Jan-Mar 58, pp 79-127

The work is devoted to an approximation in the mean of complex-valued functions. In the first section an approximation in the mean is considered for a complex-valued weighting function f(t) defined on the interval [0, 2π] of the real axis by linear combinations of function of the system $\{e^{int}\}$ (n 0, 1, 2, . . .). In the second section an approximation

in the mean is considered for weighting functions defined on a closed rectifiable curve by polynomials $\Pi(z^p)$, and in the third section an approximation in the mean is considered for a weighting function f(x) defined on the real axis by linear combinations of functions of the system $\{e^{iax}\}$ where $a \geq 0$ is any real number.

These problems were the object of investigation by a series of scholars. In this region the investigations of the Soviet mathematicians A. N. Kolmogorov, V. I. Smirnov, M. V. Keldysh, M. A. Lavrent'yev, M. G. Kreyn, N. I. Akhiyezer, A. L. Shaginyan, M. M. Dzhpbashyan, S. N. Mergelyan, P. P. Korovkin, and Ya. L. Geronimus have fundamental importance.

49. Estimates for the Derivatives of Harmonic Polynomials

"Estimates for the Derivatives of Harmonic Polynomials of Several Variables," by Ye. G. Gol'steyn, Doklady Akademii Nauk Armyanskoy SSR, Vol 26, No 4, 1958, pp 193-200

In this work estimates similar to the known estimates of Markov and Bernstein are given for the derivatives of harmonic polynomials in various kinds of regions. Converse theorems subsequently resulting from these estimates are formulated in the theory of best approximations by harmonic polynomials. Similarly, for polynomials in the complex space, the estimates obtained for the derivatives of harmonic polynomials lead to the investigation of the growth of polynomials outside the investigated set under the condition of their boundedness over the same set.

50. Differentiation of the Eigenfunction Expansion of the Operator $-\Delta + q(x,y)$

"Concerning Differentiation of the Expansion According to Eigenfunctions of the Operator $-\Delta + q(x,y)$," by I. S. Sargsyan, Doklady Akademii Nauk Armyanskoy SSR, Vol 26, No 4, 1958, pp 201-205

A real continuous function defined in a simply connected finite region D of a two-dimensional Euclidean space E_2 is denoted by $q(x, y)$. The boundary of the region D is denoted by Γ.

The eigenvalues are considered for the following system:

$$\Delta u + \{\lambda - q(x,y)\} u = 0, \tag{1}$$

$$\partial u/\partial n \Big|_{\Gamma} = 0. \tag{2}$$

By hypothesis the function q (x, y) is continuous in the region $D + \Gamma$; hence it is bounded, and for that reason it may be assumed that the spectrum of system (1) — (2) is nonnegative without violating the generality of the argument. In fact, as is known, if the function q (x, y) is bounded, then the negative spectrum of the system (1) — (2) is bounded from below. For that reason, as it is easy to see, a number η may be selected such that the spectrum of the system

$$\Delta u + \{(\lambda + \eta) - q(x,y)\} u = 0$$
$$\partial u / \partial n \Big|_{\Gamma} = 0$$

turns out to be nonnegative.

The eigenvalues of the system (1) — (2) are denoted by $\mu_1^2, \mu_2^2, \ldots, \mu_n^2$ and the corresponding orthonormalized eigenfunctions of the system (1) — (2) by $\varphi_1(x,y), \varphi_2(x,y), \ldots \varphi_n(x,y)$

Let $f(x,y) \subset L_2(D)$. We set

$$c_n = \iint_{(D)} f(x,y)\, \varphi_n(x,y)\, dx\, dy$$ and consider the series

(3)
$$f(x,y) \sim \sum_{n=1}^{\infty} c_n \varphi_n(x,y),$$ the differentiation of which is considered in the present paper.

The analogous question for equation (1) in the one-dimensional case was investigated in the work of the author which appeared in Izvestiya Akademii Nauk SSSR, Seriya Matematicheskaya, Vol 21, 263 (1957). The three-dimensional case was investigated in the work by B. M. Levitan which will appear in Matematicheskiy Sbornik (in printing). He also investigated the analogous question for the Laplace operator in spaces of arbitrary dimension in his work which appeared in Matematicheskiy Sbornik, Vol 39 (81): 1, 3-7 (1956). The fundamental result in all the enumerated cases was one and the same and hinges on the fact that each differentiation raises the order of summation according to M. Ries by unity. Nevertheless, on increasing the dimensionality of the space by one, the order of summing according to M. Ries of the corresponding derivatives of the series (3) increases by one half. Hence, if the derivative of the series (3) in the one-dimensional case is summed according to the derivative of

the expanded function according to M. Ries of the first order, then in the three-dimensional case it is necessary to sum the mean of the second order, in the two-dimensional case. As is proved in the work the order of summing turned out to equal 3/2.

51. Simple Method of Obtaining Eigenvalues of the Schroedinger Equation

"On a Simplification of the Sommerfeld Polynomial Method," by W. Nowak and T. Tietz, Institute of Theoretical Physics, University of Lodz; Leipzig, Annalen der Physik, Vol 1, No 4/5, 1958, pp 296-298

The article presents a simple method of determining the eigenvalues of the Schroedinger equation. First, a function f_1 is sought, which satisfies the boundary condition R (∞) and the boundary conditions R (∞); R(0) = 0 in the solution of the Schroedinger equation R = y . f_1. The function y in many cases satisfies a differential equation from which the eigenvalues can be obtained. It is further shown that this method is very easy to apply in practice and also can be used to obtain the corresponding eigenfunctions.

VII. MEDICINE

Contagious Diseases

52. Topical Administration of Antirabies Gamma Globulin

"Topical Use of Antirabies Gamma Globulin for Prevention of Rabies," by V. D. Solov'yev, M. A. Selimov, and G. D. Kobrinskiy, Virus Division, Moscow Institute of Vaccines and Sera imeni I. I. Mechnikov; Moscow, Voprosy Virusologii, No 2, Mar/Apr 58, pp 115-116

On the basis of experimental and practical work, the authors of this article suggest that the best method for topical therapy of rabies is direct application on the wound of a powdered form of antirabies gamma globulin containing specific antibodies, in conjunction with antiseptics or antibiotics ordinarily employed in surgical practice. It is recommended that this procedure be followed prior to inoculation with antirabies vaccine.

Results of the use of powder-form gamma globulin for topical therapy of wounds infected with rabies street virus are reported and are summarized in two tables; the experimental method is described in detail. The action of four preparations was compared: powder-form antirabies gamma globulin; the same, in suspension with norsulfazol, penicillin, and streptomycin; concentrated carbolic acid; and antitetanus gamma globulin. Data presented in the tables demonstrate the specific action of antirabies gamma globulin. In the author's opinion, it is possible to augment the effectiveness of this preparation by increasing the concentration of antibodies contained therein; further experimental work along these lines is recommended.

Local application of antirabies gamma globulin no later that 15 minutes after infection of guinea pigs with rabies street virus prevented the development of rabies in most of the animals. The effectiveness of the treatment was diminished when the preparation was applied later than 15 minutes following infection.

Pharmacology

53. Pharmacology of Piperidone Derivatives

"The Action of Piperidone Derivatives on the Organism of Animals," by A. G. Trotsenko, M. A. Rozenberg, and A. N. Borisenko, V Sb. Nekotoryye Voprosy Farmatsii (Certain Problems of Pharmacy), Kiev, Gosmedizdat, 1956, 289-294; (from Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 6, 25 Mar 58, Abstract No 8153, by R. Il'yuchenko

"On frogs, white mice and rabbits, the pharmacological activity of triphenylpiperidone (1), $\alpha\alpha'$-diphenyl- β-carboxyethyl-N-phenyl- γ-piperidone (2), and $\alpha\alpha'$-diphenyl-N-p-carboxyphenylene- γ-piperidone (3) was investigated. Intoxication and fatal results against a background of strychnine-like convulsions were noted in frogs (after 2-3 days and later) with the administration of (1) in 0.001--0.01 g doses; (2) and (3) did not produce convulsions, however, the animals began to die with a dosage of 0.015--0.06 g. The use of (2) (0.025 g) after the administration of chloralhydrate (0.006 g) prolongs the time for the onset of sleep and decreases its duration; and vice versa, the preliminary administration of (2) removes the inhibiting effect on the central nervous system, blood pressure, and respiration subsequent to the administration of chloral hydrate. During the first 3-5 days after administration, it was noted that piperidone derivatives increase the number of leucocytes.

54. Ganglioblockers and Coronary Circulation

"The Effect of Certain Ganglioblocking Substances on Coronary Blood Circulation," by N. V. Kaverina, Institute of Pharmacology and Chemotherapy, Academy of Medical Sciences; Moscow, Byulleten' Eksperimental'noy Biologii i Meditsiny, No 10, Oct 57, pp 68-71

The purpose of the tests was to study the effect of ganglioblocking substances -- tetamon, hexonium, pentamine, and mecamine -- on coronary circulation. The tests were conducted on cats.

As a result of the data collected it was determined that:

Tetamon in doses of 2-3 mg/kg increases the blood flow from the coronary sinus by 8-10%.

In cases of low and average initial values of blood flow volume, 7-8 ml/min, 2-3 mg/kg of hexonium increases the blood flow by 25-40%, however, the same dose given to animals with high initial blood flow volume, 10-15 ml/min, decreases the blood flow 20-40%.

Pentamine in doses of 2-5 mg/kg and mecamine in doses of 0.5-2.0 mg/kg decreased the blood flow from the coronary sinuses.

55. Pharmacology of Colchamine

"The Pharmacology of Colchamine (Omaine)," by I. M. Sharapov, Khimiya i Meditsina (Chemistry and Medicine), Moscow, Medgiz, No 7, 1956, 32-40; (from Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 6, 25 Mar 58, Abstract No 8150, by T. A. Braytseva)

"In experiments on white mice, rats, rabbits, and cats, the toxicity and general action on omaine were studied. It was determined that the action of omaine on an organism is similar to colchicine; however, it is less toxic. Leukopenia and anemia were observed in rats receiving doses of 5, 10, and 20 mg/kg. Seven to 10 days after the administration of omaine, the blood picture is restored."

Physiology

56. Variation of Latent Period of Motor Reaction to Auditory Stimuli

"Variation in the Latent Period of a Motor Reaction to Auditory Stimuli," by O. A. Konopkin; Moscow, Voprosy Psikhologii, No 2, Mar/Apr 58, pp 8-16

"A series of experiments was conducted by the Chair of Psychology of the Moscow State University to determine what changes take place during the latent period of a simple motor response to sound stimuli presented in pairs at different time intervals. The experiments were conducted under the supervision of K. M. Gurevich. It was postulated that the simplest act of voluntary motion is a product of the function of the cortex of the brain as a whole and not of separate, isolated points or connections among points alone. On the basis of information obtained, it appears that the negative aftereffect, observed by A. I. Bronsteyn in his experiments, is neither general nor inevitable. It disappears somewhat rapidly, depending on the time interval elapsing between presentation of paired stimuli, on preliminary instructions given by the person conducting the experiments, and on self-instruction of the person experimented with."

57. Data on Reduction of the Latent Period of a Motor Reaction

"Some Data on the Reduction of the Latent Period of a Motor Reaction," by M. P. Ivanova, Department of Physiology of the Central Scientific-Research Institute of Physical Culture; Moscow, Voprosy Psikhologii, No 2, Mar/ Apr 58, pp 17-22

"Decrease in the motor reaction latent period is considered to be an indication of increase in the level of excitation. In examining changes in neurodynamics, it must be taken into account that in quite a large number of cases a decrease in the latent period of motor reaction is accompained by an increase in faulty reactions in the differentiation of stimuli in some cases and a decrease in others. This affords a basis for assuming that the physiological mechanisms underlying the decrease in the motor reaction latent period is different in different cases. Students 12-15 years of age, who were taking part in sports that require physical exertion, were used in this survey."

58. Eidetic Anomalies of Perception Investigated

"Some Peculiar Anomalies of Perception," by I. M. Feygenberg, Electrophysiological Laboratory of the Central Scientific Research Institute (TsNII) of Legal Psychiatry imeni Professor Serbskiy; Moscow, Voprosy Psikhologii, No 2, Mar/Apr 58, pp 38-46

"Results of experiments on people revealed that intensification of interaction between analysors takes place in patients in whom sound stimuli are apt to produce visual images. Intensification of interaction between analysors also takes place in patients in whom visualized thoughts, auditory thoughts, or both types of hallucinations appear simultaneously. Stimulation of the olfactory analysor by thymol vapors caused an increase in optical chronaxy of 0.3-1.1 microfarads in such patients; in healthy people the increase in optical chronaxy was 0.05-0.15 microfarads. As far as the physiological mechanism is concerned, these anomalies resemble synesthesia. However, the intensification of analysor interaction in these cases takes place at a higher level so that the second signal system is more active than in synesthesias. The formation of visual images in response to sound sensations or visualized thoughts is different from eidetism in cases like these. No intensification of analysor interaction is observed in eidetism; it can be assumed, however, that a pathological inertia occurs in the sphere of the corresponding analysor."

59. Oxyhemometric Studies of Hypothermia Show No Appreciable Decrease in Blood Saturation With Oxygen

"Oxyhemometry in Hypothermia," by O. V. Aleksandrov, Hospital of Surgical Clinic of the First Leningrad Medical Institute imeni I. P. Pavlov (director, Prof F. G. Uglov); Moscow, Eksperimental'naya Khirurgiya, No 3, May/Jun 57, pp 51-55

The purpose of the present research was to study the effect of surgical intervention under hypothermia on the oxygen saturation of the blood and the effect of hypothermia itself on blood saturation by oxygen. The following is an English abstract:

"Oxyhemometry readings were made on 36 patients subjected to hypothermia....

"Cooling did not appreciably affect oxygen saturation of blood. In four cases with congenital heart lesions, blood saturation at the end of cooling was 4-5% lower than the initial figure.

"During the cooling phase, increase of muscular tonus, shivering, and clonus at times were observed. They were accompanied by oxyhemoglobin drop of 2-3%; in congenital heart patients the drop reached 4-6%. The decrease in oxygen saturation was brief and proportional to the duration of the above complications. An increase in the ether and oxygen dosage and the administration of ganglioplegics restored the original saturation level.

"Operations under hypothermia without controlled respiration were accompanied by low blood oxygen figures. Controlled respiration in operations on the open thorax improves blood oxygen saturation and prevents abrupt changes in it."

60. Evolutionary Basis of Epileptiform Seizures Due to Hyperoxia

Otrazheniye Evolyutsionnykh Zakonomernostey v Epileptiformnoy Reaktsii Zhivotnykh na Deystviye Vysokogo Partsialinogo Davleniya Kisloroda (Reflection of Evolutionary Regularities in Epileptiform Reactions of Animals to Effects of a High Partial Oxygen Pressure), by A. V. Voyno-Yasenetskiy, Academy of Sciences USSR, Institute of Evolutionary Physiology imeni I. M. Sechenov; Academician L. A. Orbeli, responsible editor; foreword by Academician L. A. Orbeli, Publication of the Academy of Sciences USSR, Moscow-Leningrad, 1958, 168 pages, illustrated, 9 rubles 30 kopeks

The following is a review of the book.

A. V. Voyno-Yasenetskiy has undertaken to deal with an important problem concerning the mechanism of disturbances in the motor functions caused by breathing oxygen under high partial pressure, i.e., during

oxygen poisoning of a living organism. A biologist by training, but who worked for a long time with physicians, he made a great effort to clarify both the theoretical and practical significance of his undertaking. Proceeding from theoretical premises of evolutionary theory and from accounts of integrated clinical experiences of physicians who have specialized in neuropathology, he thoroughly examined the question of the outward resemblance between the picture of motor disturbances caused by oxygen and the picture of epileptic seizures. He tried to ascertain to what extent both of these motor phenomena are reflections of evolutionary regularities. He has also tried to trace the development of functions of the nervous system in the animal world.

A. V. Voyno-Yasenetskiy's research was extensive and multiform. He chose for subjects of his experiments specific animal organisms, guided by the character of their motor activity. This comparative physiological method, based on a comparison of given functional data, made it possible for him to discover disturbances that are similar despite seemingly outward differences that may exist between them.

Proof, collected as a result of laboratory tests and clinical experience, leaves no doubt that the cortex is involved in the manifestations of the epileptic symptom complex.

But the problem is not yet completely solved even if it is recognized that the cortex is involved in epileptic seizures in highly organized, warm-blooded adult animals and humans. There are still discussions on the subject of the role and form of participation of the cortex in the manifestation of the entire epileptic symptom complex. However, there still exists uncertainty in the minds of many whether an epileptic seizure is due to excitation or to inhibition of the cortex. Both possibilites have a large number of adherents; in other words, there exist two diametrically contradictory opinions. It would seem that the question concerning the condition of the cortex during an epileptic seizure may be resolved successfully with the aid of a greatly perfected method of conditioned reflexes. But even here the conclusions reached by researchers differ.

From a diagrammatic explanation concerning the physiological mechanisms of epileptic convulsions, it may be concluded that at present there exists no unanimity of opinion and, consequently, no clear-cut picture can be drawn here. In the words of A. D. Speranskiy, "the reason for such a situation is the absence of guiding principles for evaluating the results of laboratory tests and clinical observations of convulsive seizures."

The experimental material, accumulated by A. V. Voyno-Yasenetskiy, does not attempt to support either of the existing theories on epilepsy. Facts collected by A. V. Voyno-Yasenetskiy forced him to seek an explanation for epileptiform seizures, caused by a high partial oxygen pressure, not in the existing theories on epilepsy, but in the theory of the evolution of functions.

The theory of evolution of functions was developed and substantiated by L. A. Orbeli. This theory can be summarized in the following manner: In the process of development of functions, the primary period is characterized by automatic activity of tissues and organs. This activity is defined exclusively by environmental influences. Establishment of bonds with the nervous system takes place during the next period. The first result of this is regulation of the interrelation between the organ and the environment due to which automatism acquires initial signs of conformance by the nervous system. Subsequently, the bond between the organ and the nervous system acquires new characteristics. The innervational apparatus completely inhibits the automatic activity of the organ and displays the function of an actuating apparatus. Now the organ enters the state of being active only under the influence of nerve impluses. Then comes the period of complete subordination of the organ to the nervous system with loss of automatism. But what is important in the given case is that during experimental dissociation of the organ and the nervous system regression takes place which results in return of the organ to its original independent automatic activity.

Denervation of the organ produces a process of functional return to more primitive levels which correspond to early stages of development.

In the higher vertebrates and in humans, reconstruction of coordination of the preceding stage of ontogenetic development is accomplised by activity of the cerebral cortex. Data accumulated by the Orbeli school of thought show that a great role is also played by another part of the central nervous system -- the cerebellum. The cerebellum assists the cortex in the reconstruction of the old coordinating relationships and in providing a possibility for creating new coordinations.

Orbeli constantly stressed that establishment of new coordinating relationships takes place not by means of complete eradication and complete elimination of the old coordinations, but by means of inhibition and reconstruction.

Summing up the results of Voyno-Yasenetskiy's observations and analysis of the process of oxygen poisoning, it is possible to lay down the following six hypotheses.

1. The symptom complex of oxygen poisoning occurs in worms, insects, Cyclostomatae, fishes, amphibians, reptiles, and mammals. Despite great differences in morphological and functional relationships in various representatives of the animal world, the manner of reacting to action of oxygen under pressure appears to be the same.

2. The complications that develop in the symptom complex of epileptiform motor disturbances are connected with the phylogenetic development of mechanisms of locomotor and adaptation reactions. Evolutionary development of functions introduces into the reactionary process only those complications which take the form of external manifestations, without changing the process itself.

3. The entire symptom complex of oxygen epilepsy is the result of a regressive change in the activity of the central nervous system. Under the influence of compressed oxygen, in the first place, the functions of higher levels of the central nervous system break down, resulting in liberation of the subordinate functions.

4. Dissolution of functions of the central nervous system follow a course of regressive ontogenesis. Integration takes place at each level of regression and is typical thereby of the corresponding stage of ontogenesis.

5. All forms of motor disturbances, including tonic spasms and clonic spasms, are forms of movements performed by certain animals at a definite stage of ontogenesis and are subordinate to coordinated mechanisms that are typical of corresponding stages of ontogenesis.

All five hypotheses together afford the possibility of determining whether the general regularities in the manifestation of symptoms of oxygen poisoning are based on regularities of the evolutionary process. Each symptom of an epileptiform reaction reflects the stages of history in the life of an organism. Therefore, it is possible to confirm that the physiological mechanisms which are responsible for any symptoms of disturbance in the motor functions during oxygen poisoning are the mechanisms of activity of the central nervous system of definite, earlier stages of evolution of functions during ontogenesis.

The evolutionary theory also makes it possible to understand the reason for the periodicity of convulsive seizures which is the characteristic feature of every epileptic symptom complex. It is the periodicity that makes it possible to ascribe the reactions to the central nervous system of animals and the liberation of epileptic reactions to the destructive action of high partial oxygen pressure.

The opinions and facts expressed above make it possible to supplement the five hypotheses stated above, concerning evolutionary regularity of development of epileptiform reactions to compressed oxygen, with a sixth.

6. Paroxysm-like epileptiform seizures, expressing themselves in a recurrence of symptoms, periods of immobility, and symptoms of remission, are reflections of a "struggle" that takes place in the process of ontogenic development. Ontogenically, a new form of coordination wins out in the process of progressive evolution and, in the case of epileptic dissolution of functions, the nearest, older one wins out.

In this way, analysis of the principal symptoms of oxygen poisoning indicates that the entire process of epileptic remission in the function of the central nervous system can be explained in the theory of evolution.

Returning to the questions of involvement of the cortex in the symptom complex of oxygen poisoning and its role in the formation of convulsions, Voyno-Yasenetskiy states that facts motivate him to a viewpoint which differs from the one now prevalent.

It is likewise inadmissible to affirm that epileptic symptom complex is a result of diffused inhibition.

In cases of oxygen "epilepsy," as in all other cases of epilepsy, one of the early symptoms that precede clonic spasms is excitation of the sympathetic nervous system.

Consequently, it is proper to think that the significance of the entire survey conducted by Voyno-Yasenetskiy goes beyond the limits of the study of physiological mechanisms of oxygen poisoning. It is possible to consider, with sufficient basis, that the pathological symptom complex of oxygen poisoning in animals and humans appears to be concealed in the main mechanism of epileptic spasms.

It is our understanding that "epileptic seizure" is a nonspecific method of reaction of the central nervous system to injuries, finding its expression in subsequent dissolution of its functions and in alternating liberation and restoration of those coordinating relationships which existed in the process of ontogenic evolution. Clinical examinations are necessary, of course to formulate a complete basis for such a conception of epileptic seizures.

On the basis of what has been said above, it can be concluded that the potential value of established facts are unlimited. These facts may be analyzed with the aid of the evolutionary theory only. Furthermore, these facts confirm the theory itself and make it possible to supplement its content.

The above statements show that "rocking and shaking" of complicated functional relationships are necessary for the dissolution of functions of the central nervous system in adult animals. Consequently, certain changes take place during the life span of an individual organism. These changes strengthen the ability of coordinating mechanisms to direct the activity of lower, ontogenically earlier functional systems. This strengthening is attained by every organism, although not to the same extent. In some cases the subordination is strong and difficult to destroy; in others, it is weak and is easily canceled. From the viewpoint of well-being of an individual organism, evidently, this is not quite enough. If ontogenically the latest coordinating mechanisms are to be perfected, as far as their adaptive reactions are concerned, it is also necessary that they be firm against any adverse influences. Furthermore, the higher coordinating mechanisms must be able "to cement" and strengthen the subordination to such an extent that even when higher mechanisms are weakened temporarily (which is possible when certain unfavorable or directly damaging factors are present), no immediate release would take place. The problem before evolutionary physiology is to find methods to aid this strengthening of subordination of coordinating mechanisms. Particular attention is called to that point because many preventive measures depend on it. When will those methods be found? Will it be possible to surmount individual defects in the nervous system which depend on fluctuations in subordination? Further study of this subordination and its mechanisms may result, no doubt, in substantial contribution to neuropathology and psychology.

It must be considered that the strength of subordination is one of the principal properties of the nervous system. If that is true, new perspectives are open for further development of I. P. Pavlov's theory concerning types of nervous systems (1926). In the meantime, a hypothesis can be drawn that the above-stated properties are inherent in the nervous system irrespective of what type that nervous system may be. Special research must be conducted to prove this.

The words "dissolution", "concealment," "disguise," and others presently used do not fully reflect the symptoms; but words are of secondary interest. More important is that more profound experimental research must be launched to probe into the essence of the process of reconstruction of functions. When a sufficient amount of factual material is accumulated, then proper words will be found; they, no doubt, will more correctly reflect the situation before us.

Another question is, does oxygen poisoning actually revive the same, previously existing, functions of the nervous system which remained intact throughout all stages of ontogenesis, or is it that in the process of oxygen poisoning, the old, completely canceled functions are recreated? Both possibilities, of course, exist. The work in the future must consist of making clear in what cases reconstruction of lost functions take place and in what cases those same functions, that existed during the early stages of ontogenesis, manifest themselves.

Whatever the answer is to those questions, we must adhere steadfastly to our hypothesis that in the reactions of an organism to effects of high partial oxygen pressure we can ordinarily find reflections. These reflections are the principal stages of evolution of functions in the course of ontogenesis.

All the facts discussed above, in the author's opinion, show that the mechanism of a paroxysm, manifesting itself as a result of oxygen poisoning, cannot be understood if we do not consider the comprehensive interaction of various branches of the central nervous system. But it is perfectly evident that phylogenetically, the latest associations of the central nervous system are particularly sensitive to oxygen poisoning. All experiments conducted point to that.

This book is considered useful to physiologists, biologists, and physicians.

Table of Contents of the book follows:

Psychiatry

61. Relation of Phasic Excitability States of Cerebral Cortex to Individual Psychological Traits

"Phasic Conditions of Excitability of the Cerebral Cortex as Related to Certain Individual Psychological Features of Students," by P. P. Raspopov, Chair of Pedagogy and Psychology of the Kirov State Pedagogical Institute imeni V. I. Lenin; Moscow, Voprosy Psikhologii, No 2, Mar/Apr 58, pp 23-37

"The author made a thorough study of personal histories of 120 upperclassmen of a secondary school and kept them under observation for a long time. He found that every inhibitory and excitatory phase was characterized by a peculiar psychological complex. Some temporary mental conditions are the result of certain educational influences and are brought about by phasic changes in the excitability of the cerebral cortex. Those temporary mental conditions can be fixed and transformed into relatively stable psychological features that are typical of the particular individual. Data dealing with phasic conditions are important in the study of special psychological traits of individuals."

Public Health and Sanitation

62. Electroprecipitator Designed to Trap Air-Borne Microorganisms

"Electroprecipitator for Trapping Microorganisms From the Air," by A. Ye. Vershilova, Chair of Microbiology, Kiev Institute for the Advanced Training of Physicians; Moscow, Gigiyena i Sanitariya, Vol 23, No 5, May 58, pp 79-80

"We attempted to construct an electroprecipitator for separating microorganisms from the air.

"The apparatus consists of two parts: a high-voltage power unit (designed by radiotechnologist N. Ye. Plotskiy), which is the modified rectifier of an 'Avangard' televisor, and an ionization-precipitation chamber. The rectifier is supplied from an alternating current source of 127 and 220 V and is connected with the electric circuit through an autotransformer.

"The rectified direct current at 12,000 V is supplied to the electrodes of the ionization-precipitation chamber. The strength of the current at the electrodes is 5 mA, which makes the apparatus harmless during use.

"The ionization-precipitation chamber is a hermetic cabinet made of organic glass with dimensions of 250 x 150 x 150 mm; the walls are 12 mm thick.

"Brass electrodes fastened on adjustable metal supports pass through the lateral walls inside the chamber. There are terminals on the supports for connection to the supply unit. The electrodes are fixed on the supports in such a manner that their ends can be adjusted at different distances from each other. One of the electrodes is a corona, and the other, a precipitator.

"The corona electrode is a brass rod to which a polished metal (brass) pointed cone is attached.

"The inside part of the corona electrode and the cone are enclosed in a cylindrical tube of organic glass, the end of which is cone-shaped. It is attached to the interior surface of the lateral wall of the chamber. At the tip of it there is an opening with a diameter of 2 mm, through which the rod of the brass cone enters into the chamber.

"The precipitating electrode is a brass rod 30 cm long. On its end outside the chamber there is a rubber insulator which regulates the distance between the electrodes when experiments are performed with the apparatus turned on. An aluminum dish with a culture medium is attached to the interior end of the precipitating electrode. The diameter of the dish is 80 mm. An intake pipe is soldered into the adjustable support of the precipitating electrode to allow air to enter the chamber. Its interior opening is inside a cone-shaped tube made of organic glass. The outlet tube for exhausting air to the outside is in the opposite wall beside the support of the precipitating electrode.

"There is a circular opening with a diameter of 90 mm, sealed with a hermetic, threaded plug, on the anterior wall. The culture dish is inserted into the chamber through this opening.

"The air being tested enters the chamber through the intake tube, goes in the opening at the point of the cone-shaped tube (which has the rod electrode in the center), and is drawn to the opposite surface of the culture medium in the dish and passes out through the outlet tube (see figure).

"Air is drawn through the chamber by means of an aspirator (a surgical electric pump). The quantity of air aspirated is measured with gas meters.

"A number of experiments with a bacterial aerosol created synthetically in the hermetic chamber were performed to determine precisely the optimum conditions for trapping microorganisms.

"On the basis of the experiments performed, it was established that on aspiration of air through the apparatus without previous ionization, a certain number of bacterial droplets and dust particles are caught in the apparatus as a result of the stream of air striking the culture medium.

"In addition, the length of the free end of the ionizing electrode (the part of the point that protrudes into the chamber from the cone-shaped tube) affects the trapping capacity of the apparatus. When the point of the rod is introduced 5 mm, 2.0-2.5 times more microorganisms are separated than when the end of the point is flush with the edge of the cone-shaped tube.

"The trapping capacity of the apparatus also depends on the distance between the electrodes. The greatest number of microorganisms are trapped when the distance between the electrodes is 25 mm. The optimum rate for aspiration of air is in the range of 8-15 liters per minute.

"The effectiveness of separation in the apparatus is equal with respect to both dust and droplet phases of a bacterial aerosol.

"A series of experiments devoted to comparative evaluation of the trapping capacity of the electroprecipitator we designed with that of the Yu. A. Krotov apparatus established that 30-40% more microorganisms are trapped from the air with the electroprecipitator than with the Krotov apparatus."

Radiology

63. Analysis of Radiation Injuries to the Cornea Indicate Correlation Between Radiosensitivity and Rate of Metabolic Processes of Tissues

"An Analysis of the Radiation Injuries to the Cornea of the Eye," by T. V. Krestinskaya, First Leningrad Medical Institute imeni I. P. Pavlov; Moscow, Doklady Akademii Nauk SSSR, Vol 116, No 1, Sep/Oct 57, pp 52-55

The aim of this research was to study the effect of various doses (3,600, 1,800, and 750 r) of X rays on the epithelial and underlying connective tissues of the cornea of the eye after varying periods (one to 90 days) of irradiation. A total of 85 albino rats were used. Photomicrographs illustrating histological changes due to X rays at 5, 10, and 15 days after irradiation accompany the article.

Changes in staining characteristics, in size, and in structure (both in the peripheral and in the central zones of the epithelium and in the underlying connective tissue of the cornea) are described with respect to varying periods.

Results indicate that the deleterious effects due to large doses were analogous to injuries caused by smaller doses, but the latter were less pronounced and reparative changes started sooner. Changes in the peripheral zone of the cornea were much more acute than in the central zone, both in the epithelium and in the underlying connective tissue. This greater radiosensitivity of the peripheral zone is because this zone is physiologically more active due greater mitotic activity than the central zone, and the peripheral zone is where a large portion of nerve endings and blood vessels are located.

The author presents a theory which points to the existence of a definite correlation between radiosensitivity and the level of metabolic processes in a tissue which, in turn, are dependent on its blood supply.

64. Importance of Primary Suturing of Wounds in Combined Radiation Injuries

"Primary Suturing of Wounds in Combined Radiation Injuries" (Review of Experimental Data), by S. A. Rusanov; Moscow, Eksperimental'naya Khirurgiya, No 3, May/Jun 57, pp 55-59

One of the major disturbances caused by penetrating radiation is the disturbance of the reactivity of an organism to infections, for ionizing radiation leaves an organism defenseless against small amounts of pathogenic microorganisms, and any small wound combined with radiation injuries may become very dangerous. This fact is of major interest to surgeons, who must decide the most appropriate time for surgical intervention to suture wounds. It is also known that this lack of resistance to pathogenic microorganisms is maximum at the time of the appearance of clear clinical symptoms of the acute radiation syndrome at the peak of radiation sickness. During the latent period of radiation sickness, the resistance of an organism with combined injuries remains practically sufficient, and the wound process runs without any noticeable deviation from its normal course. It is evident, therefore, that the latent period of radiation sickness before the onset of the peak of radiation sickness should be used for maximum active and radical surgical measures to get the maximum amount of therapeutic effect, i.e., to arrive at complete healing of wounds during the latent period.

The author's personal observations have shown that the final outcome of combined injuries due to wounds accompanied by the effect of penetrating radiation is determined by the primary suturing of wounds.

In the author's opinion, an important research problem would be the establishment of a simple, speedy and reliable test for determining the immunological state of an organism. Such a test would materially aid the surgeon in solving the problem of wound suture in delayed treatment.

65. Measures Proposed to Expand and Speed Publication of Material Pertinent to Medical Radiology

"Editorial Report on the Journal Meditsinskaya Radiologiya at the Meeting of the Scientific Medical Council of the Ministry of Health USSR"; Moscow, Meditsinskaya Radiologiya, Vol 3, No 2, Mar/Apr 58, pp 86-88

On 25 March 1958, a report by the editorial board of Meditsinskaya Radiologiya, presented at a meeting of the Scientific Medical Council of the Ministry of Health USSR, stated that of the enormous amount of research on radiobiology submitted in 1956 and 1957, less than a third of the material was published.

It was suggested that a Scientific Society of Medical Radiologists be organized, and measures were proposed for expanding the publication of material in this field.

Surgery

66. Equal Rate of Protein Synthesis in Transplanted Frozen and Vacuum-Dried Vascular Grafts Determines Normal Taking

"Protein Synthesis in Transplanted Frozen and Vacuum-Dried Vascular Grafts," by K. I. Gavrilova (deceased), E. M. Khodiyev, and A. S. Konikova, Institute of Surgery imeni A. V. Vishnevskiy (director, Prof A. A. Vishnevskiy, Active Member of Academy of Medical Sciences USSR) of the Academy of Medical Sciences USSR; Moscow, Eksperimental'naya Khirurgiya, No 3, May/Jun 57, pp 40-44

The authors describe various factors and problems in tissue and organ transplantation, and present the following English abstract:

"The authors investigated protein synthesis in transplanted frozen and vacuum-dried blood vessels with the aid of a tagged amino acid containing radioactive sulfur. The authors presume that protein synthesis may serve as an index of viability of transplanted vascular segments and in a certain measure reflect the influence of low temperature and drying on metabolic processes.

"As shown by the data published, protein synthesis does take place in transplanted segments of vessels which were previously subjected to low temperatures ranging from -70 to -196°, and vacuum-drying and its activity could be recorded every time the grafts were examined between 3 days to 7 months after grafting.

"By comparing the quantities of tagged amino acids in the proteins of the grafts and those of the blood vessels of the dog itself, it was found that often the intensity of protein synthesis in the grafted tissue was equal to the synthesis in the homologous blood vessels of the experimental animal. Such similarity in the synthesis rate obtained only in those cases where the transplanted vessels were patent and free from inflammatory and thrombic phenomena.

"When transplanted segments developed an inflammatory reaction, their protein synthesis rate exceeded that of the vessels of the experimental animal.

"In one experiment where partial necrosis of the graft occurred, the rate of protein synthesis decreased markedly.

"The presence of protein synthesis in transplanted homografts of blood vessels subjected to previous freezing at -70 to -196° C and vacuum-drying proves that dogs' blood vessels preserve their viability and, after transplantation, behave like living tissue, taking part in metabolic processes on a par with the tissues of the experimental animal.

"The fact that the difference in the protein synthesis rate in transplanted vessels was correlated to their condition after transplantation suggests that normal taking of the transplanted sector occurs when the protein synthesis rates in the graft and in the vessel of the experimental animal are equal."

67. Characteristics of Surgical Methods for Treating Burns Accompanied by Open Fractures Discussed

"Certain Characteristics of Surgical Methods for Treating Burns Which Are Accompanied by Open Fractures," by V. V. Vlasov, Lt Col Med Serv; Ya. I. Lipskiy, Lt Col Med Serv; and A. A. Shafranov, Lt Col Med Serv; Moscow, Voyenno-Meditsinskiy Zhurnal, No 8, Aug 57, pp 20-25

The authors emphasize the seriousness of combined burns and open fractures by the fact that the Hiroshima and Nagasaki bombings caused 60% of the injured to suffer from injuri combining burns and open fractures.

The present research was conducted on rabbits which were subjected to third degree burns on 10-12% of their bodies and also to open fractures.

The authors discuss the course of the injuries, histological, bacteriological, hematological, and roentgenological studies, shock symptoms, effects of antibiotics, and the effects of surgical intervention by suturing, wound drainage, removal of burned tissue, etc. on speeding tissue and bone healing, and on the prevention of infectious complications.

68. Modern Ultrasonic Impulse Techniques Enable One to Create and Accurately Locate Lesions, Foreign Bodies, and Pathological Foci in Tissues and Organs

"Ultrasonic Waves in Experimental Surgery," by I. Ye. El'piner, Institute of Biological Physics (director, Prof A. M. Kuzin) of the Academy of Sciences USSR; Moscow, Eksperimental'naya Khirurgiya, No 3, May/Jun 57, pp 3-8

The author discusses the method, purpose, and advantages of using ultrasonic waves in surgery. The following is an English abstract:

"It is possible to concentrate ultrasonic energy in any animal tissue and at any depth, in particular in the cerebral tissue. It was found that different elements of the tissues differ in their sensitivity to ultrasound. Hence it is possible to create selected lesions of given cells in a particular area of the given tissue in conformity with the object pursued. The modern ultrasonic impulse technique extended likewise the possibilities of studying the macrostructure of tissues. It enables location of foreign bodies and pathological foci in tissues and organs even in those cases where X-ray study proved ineffective."

Miscellaneous

69. Planning and Coordination of Soviet Medical Research

"Planning and Coordinating Research," by Prof D. Zhdanov, Corresponding Member of Academy of Medical Sciences USSR, and M. Zhukovskiy, Candidate of Medical Sciences; Moscow, Meditsinskiy Rabotnik, No 40, 20 May 58, p 2

The planning and coordination of scientific research on major problems of medical science are the responsibility of the Academy of Medical Sciences USSR. The presidium of the academy has formed a special Scientific-Planning Commission, which makes possible the preparation of

collated perspective and annual problem-thematical plans. The commission, together with the bureaus of the departments of the academy, guarantees the coordination of scientific work both within the academy and within the scientific institutions of the ministries of health of the union republics. The commission is also responsible for the organization of the scientific-creative ties with medical institutions of the Bloc countries.

The scientific medical council of each of the union republics compiles the prospective plan for medical research and directives for the annual plans. On these bases the scientific institutions and vuzes (higher educational institutions), of the republics develop their own annual and thematic plans. All of these plans are functionally related to the work of the Academy of Medical Sciences USSR and the principal direction of scientific research necessary for the USSR.

In coordinating scientific research, contact between scientific research institutions on the republic level, the problem commissions, and major research institutes must be direct. This direct contact will tend to avoid bureaucratic delays. This will not, however, decrease the role of the scientific councils of the republic ministries of health. The planning, directing, and control of scientific work; the distribution of cadres; and the determination of the structure of institutes are the responsibilities of the councils. The Presidium of the Academy of Medical Sciences USSR does not administer the scientific medical councils of the ministries of health and their subordinate institutes and vuzes. The presidium only acts as a consultative body, assists in the determination of the most important research, and facilitates the concentration of efforts and material resources, and the elimination of duplication.

70. Meeting of the Presidium, Academy of Medical Sciences USSR

"Medical Science and Practice," by M. Zhukovskiy, Candidate of Medical Sciences; Moscow, Meditsinskiy Rabotnik, No 51, 27 Jun 58, p 3

The Presidium of the Academy of Medical Sciences USSR recently held a meeting to decide problems of medical science in the light of the decision of the May Plenum of the Central Committee CPSU.

Prof V. N. Orekhovich reported that the institutes within the Department of Medical and Biological Sciences of the academy will test the various chemical compounds important in medical research. They will also give assistance in this field to the various chemical plants of the USSR.

Prof B. G. Yegorov spoke on the use of plastics in surgery, neurosurgery, obstetrics, gynecology, and orthopedics. Since 1957, the Institute of Surgery imeni A. V. Vishnevskiy has conducted experimental and clinical research on the possibility of substituting prosthetics made of "alloplastics" (a plastic nonirritating for tissues) for a part of the esophagus. Synthetic prosthesis are also being proposed as a substitute for defective blood vessels during the surgical treatment of aneurism, thrombosis, and endarteritis. In addition, it was decided to utilize ion-exchange resins for quantitative determination of the mineral content of tissues and fluids in the human organism.

Prof V. L. Troitskiy reported that the development of the chemical industry presents new problems for the institutes of the academy's Department of Hygiene, Microbiology, and Epidemiology. He pointed out that it is imperative, at present, to solve the problem of preventing the pollution of air by the chemical industry's waste products. It is also necessary to study the hygienic aspects of soil pollution and to develop measures for its sanitary protection.

The Institute of Nutrition will include in its project plan the study of prophylactic nutrition for workers of the chemical industry and will give a hygienic account of those synthetic substances which are to be utilized by the food industry.

Prof D. A. Zhdanov reported that the chairmen of the Problem Commissions of the academy have analyzed the plan of scientific work for 1959 and the 7-year plan and have indicated a series of themes which must be investigated in the light of the decisions of the May Plenum of the Central Committee CPSU.

71. Sukhumi Medical and Biological Station Reorganized Into Institute

"Brief News," by Ye. Vcinov; Moscow, Meditsinskiy Rabotnik, No 47, 13 Jun 58, p 2

The Sukhumi Medical and Biological Station, Academy of Medical Sciences USSR, has been reorganized into the Institute of Experimental Pathology and Therapy (Institut Eksperimental'noy Patologii i Terapii). No further information is given.

72. Conference on Problems of Proteins

"Conference on the Problems of Proteins," by L. A. Lokshina; Moscow, Vestnik Akademii Meditsinskikh Nauk SSSR, No 5, May 58, pp 73-76

A conference on the problems of proteins, organized by the Institute of Biological and Medical Chemistry, Academy of Medical Sciences USSR, was held in Moscow from 20 to 24 January 1958. Over 500 persons, representing 82 various institutes of Moscow, Leningrad, Kiev, Khar'kov, and other cities, as well as the Bloc countries, participated. Twenty-six reports on the problem of protein chemistry were presented. A number of reports concerned the isolation of proteins and the study of their chemical and physicochemical properties. Considerable attention was given to reports concerning the study of the microstructure of proteins, and the study of the proteins of various organs and tissues.

The following gave reports: K. F. Firfarova, Ye. V. Goryachenkova, V. O. Shpikhter, Prof V. A. Belitser, L. A. Lokshina, O. V. Troitskaya, D. N. Shigorin, Prof S. Ya. Kaplanskiy, Academician V. A. Palladin, Prof G. Ye. Vladimirov, Prof V. A. Portugalov, Prof I. I. Ivanov, V. M. Rodionov, V. V. Uspenskaya, R. V. Khesin, A. Ye. Gurvich, Prof I. B. Zbarskiy, T. S. Paskhina, and V. Tomavsek.

73. Conference on Problems of Regeneration and Cell Reproduction

"Conference on Problems of Regeneration and Cell Reproduction," by L. D. Liozner and V. N. Dobrokhotov; Moscow, Vestnik Akademii Meditsinskikh Nauk SSSR, No 5, May 58, pp 66-73

The first All-Union Conference on Problems of Regeneration and Cell Reproduction was held in Moscow at the Institute of Experimental Biology, Academy of Medical Sciences USSR, 28-31 January 1958. The conference was convened by the presidium, Academy of Medical Sciences USSR; over 50 reports were given. The conference was attended by representatives of the Kharkov University; the Khabarovsk, Riga, Voronezh, Crimean, Kursk, Stalinsk, Smolensk, and Kalinin Medical institutes; the Sukhumi Institute of Experimental Pathology and Therapy; and Moscow and Leningrad vuzes.

Most of the conference was devoted to the study of regeneration in mammals. Considerable attention was given to the study of conditions influencing the progress of the regeneration process in mammals. Numerous reports concerned regeneration process in the nervous system, the endocrine glands, and contralateral organs.

The following gave reports: Prof V. N. Orekhovich, L. V. Liozner, Ye. Ya. Korytnyy, T. A. Grigor'yeva, Yu. N. Kopayev, L. N. Moralev, L. N. Kuleshova, L. N. Zhinkin, I. V. Markelova, Yu. K. Tonkonogova, G. S. Strelin, G. V. Khomullo, A. I. Bukhonova, I. A. Alov, B. P. Solopayev, Ye. F. Kotovskiy, V. F. Sidorova, L. V. Polezhayev, Ye. I. Pil'shchik, Ya. G. Erenpreis, I. K. Yesipova, V. P. Kudokotsev, V. N. Zamarayev, A. A. Voytkevich, G. V. Kharlova, N. S. Artem'yeva, D. G. Malkina, I. P. Shlykov, Ye. N. Voinova, N. P. Bochkov, N. M. Shestopalova, A. I. Alov, V. I. Sorokin, K. A. Ryzhikova, V. V. Kozlov, I. A. Utkin, S. Ya. Zalkind, L. P. Kosichenko, O. T. Movchan, Ye. M. Veger, G. S. Uspenskaya, A. B. Kaleneniek, V. N. Dobrokhotov, N. V. Bogoyavlenskaya, A. K. Ryabukhi, V. G. Kryukova, Kh. Ya. Puzhak, L. I. Sazonov, A. N. Kulagin, Yu. I. Afanas'yev, Ye. F. Kotovskiy, I. I. Rampan, G. I. Gintsburg, P. P. Rumyantsev, V. I. Pilipenko, T. N. Radostina, Ye. B. Khaysman, and I. F. Ivanov.

74. Tenth All-Union Scientific Conference of Therapists

"Yesterday in Moscow" (unsigned article); Moscow, Meditsinskiy Rabotnik, No 52, 1 Jul 58, p 1

The Tenth All-Union Scientific Conference of Therapists was opened in Moscow on 30 June 1958. The conference was convened by the All-Union Scientific Society of Therapists and more than 300 physicians and scholars are attending.

Delegates to the conference will participate in the discussion of problems concerned with vitamins and the clinical manifestation of internal diseases. Reports will be given on the work of such periodicals as Klinicheskaya Meditsina (Clinical Medicine), Terapevticheskiy Arkhiv (Therapeutic Archive), and Sovetskaya Meditsina (Soviet Medicine). Reports will also be made on the past activity of the Board of the All-Union Scientific Society of Therapists. The conference will end on 2 July 1958.

75. Maj Gen Med Serv A. V. Mel'nikov, Soviet Surgeon, Dies

"In Memory of A. V. Mel'nikov," by A. Bakulev, V. Parin, B. Yegorov, Ye. Smirnov, A. Vishnevskiy, N. Petrov, P. Kupriyanov, B. Petrovskiy, A. Serebrov, V. Shamov, A. Smirnov, S. Kholdin, A. Rakov, and Ye. Prazdnikova; Moscow, Meditsinskiy Rabotnik, No 46, 10 Jun 58, p 4

After a long and serious illness, Maj Gen Med Serv Aleksandr Vasil'yevich Mel'nikov, Active Member of the Academy of Medical Sciences USSR, Honored Worker of Science, and chief of the Chair of Faculty

Surgery of the Military Medical Academy imeni S. M. Kirov, died. Mel'nikov graduated from the St Petersburg Military Medical Academy in 1914 and in 1920 received his Doctor of Medical Sciences degree.

From 1940 to 1956 Mel'nikov was chief of the Chair of Faculty Surgery, Naval Medical Academy. From 1956 to his death he was chief of the Chair of Faculty Surgery, Military Medical Academy imeni S. M. Kirov. He was the author of numerous articles and monographs and the founder of the study of pathological conditions preceding cancer.

VIII. METALLURGY

76. Review of Progress in Development of Methods for Treatment of Heat-Resistant Alloys

"Problems of the Treatment of Heat-Resistant Alloys," by A. A. Bat' and L. I. Gladshteyn; Moscow, Vestnik Akademii Nauk SSSR, Vol 28, No 3, Mar 58, pp 113-115

In a report on a special meeting held 18-21 December 1957 at the Institute of Machine Science and organized by the institute jointly with the Commission on the Technology of Machine Building, Academy of Science USSR it is pointed out that the application of heat-resistant alloys is increasing at a fast rate; such alloys are used in steam and gas turbines of electric power stations, in the construction of planes, in rocket technology, and in high-power generation technology. The conference discussed different aspects of problems pertaining to the treatment of heat-resistant alloys. Four plenary meetings were held and four sectional meetings, viz., on casting, treatment by the application of pressure, cutting, and welding.

It was brought out in papers presented in the sectional meeting on casting (conducted by L. I. Fantalov, Doctor of Technical Sciences) that a number of heat-resistant alloys which have high melting temperatures are distinguished by the chemical reactivity of their components when the alloys are in the liquid state. Under the circumstances, the alloys must be melted in high vacuum, using the latest methods to assure the required degree of heating.

The formation of an extensive zone of columnar crystallization accompanied by the generation of considerable internal strains is the cause of a heightened tendency toward the formation of hot cracks exhibited by ingots of heat-resistant alloys. In connection with this, methods for breaking down the structure of cast machine parts (for instance, by subjecting the molten metal to elastic vibrations), which have been developed in the USSR, have acquired considerable importance. Information on techniques of this type was given at the conference.

In reports presented at the sectional meeting on treatment by the application of pressure (conducted by A. I. Tselikov, Corresponding Member of the Academy of Sciences USSR), it was pointed out that one of the specific characteristic of heat-resistant alloys, namely, increased strength at high temperatures, requires a precise knowledge and control of the thermomechanical conditions under which treatment by the application of pressure is given. Successful work on the subject is being done by USSR scientists. Furthermore, the strength of the alloys is being increased by the application of mechanical methods. Work is being done on the development of the newest type of equipment by means of which high specific pressures can be achieved.

At the sectional meeting on welding (conducted by G. A. Nikolayev, Corresponding Member of the Academy of Sciences USSR), the specific characteristics of the welding of heat-resistant alloys were discussed. Among the new methods described were automatic welding in a carbon-dioxide atmosphere and electric slag welding with the aid of plate electrodes rather than wire electrodes. The method of electric slag welding has been simplified recently as a result of the development of fluxes which exhibit a high electrical conductivity at room temperature. When such fluxes are used it is not necessary to stimulate the formation of the electric arc in the initial stage of the process. In addition to the methods mentioned above, welding with a nonmelting electrode in an aragon atmosphere, point and roller contact welding, and welding under a layer of flux are still being applied.

In papers presented at the sectional meeting on cutting (conducted by A. I. Isayev), it was emphasized that the lowered heat conductivity of heat resistant alloys and their high mechanical strength require cutting under special conditions as well as the development of special tools for cutting. It was brought out in papers given at the meeting that this problem has been successfully solved by USSR scientists. Liquid carbon dioxide has been used lately as a cooling medium during cutting.

In the treatment of heat-resistant alloys, problems pertaining to the saving of the metal acquired exceptional importance because the chemical elements which enter into the composition of heat-resistant alloys (nickel, chromium, niobium, titanium, cobalt, molybdenum, tungsten, boron, etc.) are expensive and in short supply. Methods aimed at the saving of metal in connection with welding and other processes for the treatment of heat-resistant alloys were discussed.

The conference recommended that work be done on the following subjects: improvement of methods for obtaining clean surfaces, development of new vacuum installations, the design of mechanized high-temperature furnaces, development of grades of steel suitable for die punching, the creation of new types of electrodes, the development of methods of welding which would not result in cracking, and the improvement of cutting techniques. The conference pointed out that it is necessary to create at the Institute of Machine Science, Academy of Sciences USSR, a center which would coordinate research on the treatment of heat-resistant alloys.

An exhibition of literature arranged in connection with the conference gave to the participants an opportunity to examine not only USSR publications, but also foreign periodical publications on the subject discussed at the conference, which were carefully selected for that purpose.

77. Powder Metallurgy

"Powder Metallurgy," by Engineers V. Kuz'min and V. Myuyr; Moscow Promyshlenno-Ekonomicheskaya Gazeta, No 40 (340), 2 Apr 58, p 4

"The production of machine parts from metal powders opens up entirely new possibilities as far as technological processes and construction are concerned. By using powder metallurgy methods, materials are obtained which exhibit properties that older materials obtained by any other methods did not possess.

"For these reasons the increasing interest in problems of powder metallurgy outside the USSR is understandable. At a conference conducted in the GDR (German Democratic Republic) which dealt with problems pertaining to further development of powder metallurgy, many interesting considerations were presented. This conference was attended by representatives of the USSR, GDR, the German Federal Republic, England, France, Poland, Czechoslovakia, Bulgaria, Finland, Sweden, and Austria. Some of the papers presented dealt with problems which have a bearing on the sintering of metal powders and methods for improving this initial process of powder metallurgy.

"Research was discussed at the conference which is conducted with the aim of developing and producing cermet alloys with special physical characteristics, i.e., cermets which have the desired magnetic, contact, and other properties, and furthermore are heat-resistant and resistant to scaling.

"The production of cermet magnetic material was discussed at the conference in detail. Possibilities of inducing the formation of desired structures during the process of production were broached. To give an instance, it was established that by selecting the appropriate composition of the metal powder mixture one may produce cores with positive, negative, or zero temperature coefficients of magnetic permeability.

"Much that is new was reported as far as the production of articles from iron powders is concerned. Processes involving a double pressing and double sintering have acquired importance. In treatment of this type, the article is pressed at a low pressure (no higher than 1.5 tons per square centimeter) and then, after a preliminary sintering at 850-900°, pressed again by applying 5-6 tons of pressure per square centimeter. Finally, the article is subjected to a second sintering at 1,050-1,100°.

"In the GDR and a number of other countries, copper-iron materials are now used extensively which are distinguished by a high mechanical strength that is no lower than the strength of many alloy steels.

"As a result of the application of vacuum sintering and high pressure, it has become possible to develop technological processes for the production of iron-graphite materials containing 12.5% graphite or 20% graphite. Porous bearing materials and friction materials (brake linings) are prepared from these materials.

"Great importance is being attached at present in many countries to the development of powder metallurgy. Thus, two powder metallurgy enterprises have been created in the GDR.

In accordance with a decision made by the government of the GDR, the Institute of Special Materials has been organized at Dresden. Problems of powder metallurgy play a considerable part in the work of this institute, which has at its disposal the latest type of equipment. Work on as many as 30 subjects, each representing an independent scientific problem, is being conducted at the Dresden institute.

"Powder metallurgy is developing rapidly in Poland, where a combine for the production of cermet articles has been created recently. This combine is equipped with automatic presses manufactured by the Zimetag Co [a Western German concern], furnaces with automatic heating of the articles being manufactured and automatic control of the temperature, vibrating screens, mills of different types, and vacuum equipment.

"A special institute of powder metallurgy has been created in Czechoslovakia. Furthermore, large laboratories at which work is done in the field of powder metallurgy exist at eight other research institutes.

"The production of cermet articles in Czechoslovakia is done at special departments of six machine-building plants. At these departments porous bearings, contacts, magnets, filters, articles made of heavy alloys, friction materials [brake linings], machine parts, and instruments are produced.

"Powder metallurgy has developed rapidly during recent years in the US and in Western Europe. The development of powder metallurgy in the US is based primarily on extensive research in which, in addition to metallurgists, crystallographers, physicists, and physical chemists participate actively.

"The non-USSR press announced recently the development of a material with a fiber structure. The fiber structure of the initial material enhances the possibilities of improving the characteristics of the machine parts produced from it as far as mechanical strength and other physicomechanical qualitative properties are concerned. It has been pointed out, for instance, that it is possible to manufacture machine parts with oriented metal fibers. This can be done by rolling the material.

"Such machine parts are distinguished by a high impact viscosity. The interrelationship between the porosity of the metal and its mechanical strength is more advantageous in the case of machine parts made of metal fibers than for those made of metal powder.

"It is also pointed out that, in addition to a high mechanical strength, machine parts made of metal fibers possess a high degree of resistance to heat.

"The production of powders of different metals is of importance for the development of powder metallurgy. Definite progress has been made as far as this is concerned. One may point out, for instance, that a sintered aluminum powder has been developed which is designated in the USSR as SAP. Heating to a temperature as high as 500° of articles made of this powder does not lower their mechanical strength.

"Investigators working outside the USSR are at present paying considerable attention to problems pertaining to the production of cermet articles for special applications. This includes heat-resistant complex mixtures containing carbides, borides, silicides, and oxides as well as materials possessing novel magnetic properties, etc."

[SIR Note: Part of the article which deals with progress of powder metallurgy in the US, West Germany, and Austria has been omitted.]

IX. PHYSICS

Nuclear Physics

78. Conversion Spectra of Tb Isotopes Determined

"Conversion Spectra of Certain Neutron Deficient Tb Isotopes," by N. M. Anton'yeva; B. S. Dzhelepov, Corresponding Member of the Academy of Sciences USSR; A. A. Vashilov; and B. K. Preobrazhenskiy, Leningrad State University imeni A. A. Zhdanov; Moscow Doklady Akademii Nauk SSSR, Vol 119, No 2, 11 Mar 58, pp 241-243

A study of the conversion spectra of neutron deficient Tb isotopes is made in this work. The preparation of samples and the experimental setup were described in earlier works (Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, 22 No 2, 1958). The decay curves were constructed on the basis of change in the height of the conversion peaks with time. They show that the Tb samples contain several isotopes.

The conversion spectra of Tb for half lives of 8 ± 1 hour, 18 ± 1 hours 2.3 ± 0 days, 5 ± 1 days, 10 days, 120 days, and 200 days are analyzed.

79. Statistical Method for Modeling Electron-Photon Cascade Proposed

"Calculation of an Electron-Photon Cascade in Lead by the Monte Carlo Method," by V. V. Chavchanidze, R. S. Shaduri, and V. A. Kumsishvili, Institute of Physics, Academy of Sciences Georgian SSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 34, No 4, Apr 58, pp 912-915

A statistical probability method for modeling an electron-photon cascade initiated by a gamma quantum in lead is proposed. It is based on the method of random tests, a modification of the Monte Carlo method. Some typical curves obtained from the calculation are given. Two methods of applying existing computers to solve a problem of this type are indicated.

80. Theory of Bubble Chamber Discussed

"Contribution to the Theory of the Bubble Chamber," by Yu. Kagin; Moscow, Doklady Akademii Nauk SSSR, Vol 119, No 2, 11 Mar 58, pp 247-250

A theoretical explanation of the observed relationship between particle velocity and bubble density in bubble chambers is attempted. It is noted that, while recent works have presented the first quantitative data on the relationship between the number of bubbles per unit track length g and $\beta = v/c$ and the parameters of the liquid p and T, there is as yet no satisfactory theory explaining the bubbling phenomenon itself and the relationships observed.

It is assumed that the formation of visible bubbles along the track is the result of the hitting of subcritical nuclei in a region of substantial localization of energy given up by the charged particles. A consequence of this is the growth of the radius of the nucleus to a dimension exceeding the critical radius/R_{crit}. The region of localization is determined for the case of fast, heavy particles and a liquid whose molecules are composed of light atoms.

An expression is derived for the energy localized in a unit volume at a distance R from the track. It is concluded from this expression that the dimensions of the region of localization are inversely proportional to β. It is noted that consequently all processes will occur within a cylinder around the track whose radius changes as $1/\beta$.

An expression is also given for the number of particles per unit track length.

81. Reactions on Be^9

"An Investigation of (n, α) and (n,t) Reactions on Be^9," by S. S. Vasilyev, V. V. Komarov, and A. M. Popova, Scientific Research Institute of Nuclear Physics, Moscow State University imeni Lomonosov; Moscow, Doklady Akademii Nauk SSSR, Vol 119, No 5, 11 Apr 58, pp 914-917

Reactions $Be^9(n, \alpha)He^6$ and $Be^9(n,t)Li^7$ under action of fast neutrons of 1 to 19 Mev energy were observed on specially prepared nuclear emulsion layers in which finely dispersed, spectrally pure beryllium was contained (same authors, ZhETF, 33, 527, 1957). The neutron source was a lithium target irradiated with deuterons accelerated to 4 Mev on the 72-cm cyclotron of the Scientific Research Institute of Nuclear Physics. The developed photoplates were studied under a microscope. Special attention was paid to the reaction (n,t) on which no data are available. The correlations between

path and energy, taken from the book by E. Segre (Experimental Nuclear Physics) and from W. H. Barkas (Phys. Rev. 89, 1019, 1953) were used for computation. The dependence of the cross section on the energy of the incident neutrons was plotted for the reaction $Be^9(n, \alpha)He^6$. The values obtained for the cross section are in good agreement with those found by P. H. Stelsen and E. C. Campbell (Phys. Rev., 106, 1252, 1957). The reaction $Be^9(n,t)Li^7$ is considered as a "pickup" reaction and the absence of a peak at 0^o in the angular distribution may be explained on the basis of the conservation law of angular momenta in reactions of direct interaction (S. T. Butler, Phys. Rev. 106, 272, 1957).

82. Activities at Dubna Joint Institute for Nuclear Research

"Nuclear Affairs" (unsigned news item); Frankfurt/Oder, Neuer Tag, 11 May 58

In the Dubna Joint Institute for Nuclear Research, assembly work on a large, propane-filled bubble chamber (Blasenkammer) is nearing completion in the building housing the synchrophasotron. This new installation, which constitutes a further development of the Wilson chamber, is used for the tracing of elementary particles. Chinese scientist Wang Kang-chang was in charge of the assembly work on this installation.

At present, a group of Czechoslovak physicists and engineers headed by Professor Petukhov is developing a novel electron accelerator. Bogolyubov, Lenin Prize winner and director of the Laboratory for Theoretical Physics in Dubna, is directing work of young scientists the purpose of which is discovery of laws by which new elementary particles can be predicted. So far, about 30 elementary particles are known. The research work is aimed at finding a principle for classifying these elementary particles, similar to the periodic system of the elements by Mendeleyev.

Spectroscopy

83. CdS at 20°K

"The Structure of the Absorption and Photoelectric Conductance Spectra of CdS Crystals at 20°K," by V. L. Broude, V. V. Yeremenko, and N. N. Chikovani. Physics Institute, Academy of Sciences Ukrainian SSR; Moscow, Doklady Akademii Nauk SSSR, Vol 119, No 5, 11 Apr 58, pp 911-913

The coefficient of light absorption by CdS crystals in the short-wave range were measured and the variations of line intensity connected with lattice distortions were quantitatively evaluated. The measurements were made at 20°K using a metallic cryostat with flat windows (V. L. Broude, V. S. Medbedev, and A. F. Prikhotko. Optika i Spektroskopiya, 2, 317, 1957) in which the sample was cooled by the vapor of boiling hydrogen. A Leitz glass monochromator was used for measuring photoconductance. The photocurrent was read on a mirror galvanometer with a response to $2 \cdot 10^{-9}$ amp. The absorption coefficient was evaluated on the basis of determinations made with a MF-2 microphotometer. No unique correlation between the stationary photocurrent and the absorption coefficient was found. This points to complicating factors affecting the dependence of the photocurrent on the wavelength of the absorbed light, which should be taken under consideration in establishing the mechanism of photoconductance in CdS single crystals.

Theoretical Physics

84. New Approximation Method in Many-Body Problem Formulated

"Concerning a Variation Principle in the Many-Body Problem." by Academician N. N. Bogolyubov; Moscow, Doklady Akademii Nauk SSSR, Vol 119, No 2, 11 Mar 58, pp 244-246

A new approximation method in the many-body problem is formulated. A dynamic system of Fermi particles is considered with Hamiltonian of the form

$$H = \sum \left\{ T(f, f') - \lambda \delta_{f,f'} \right\} a_f^+ a_{f'} + 1/2 \sum J(f_1, f_2, f_2', f_1') a_{f_1}^+ a_{f_2}^+ a_{f_2} a_{f_1} \quad (1)$$

where λ is the chemical potential; a, a^+ are Fermi amplitudes; f is the set of indices characterizing the state of a single particle.

We will make the following linear transformation of the Fermi amplitudes

$$a_f = \sum_\nu \left(u_{f_\nu} \alpha_\nu + v_{f_\nu} \alpha_\nu^+ \right). \qquad (2)$$

In order that the transformation be canonical and not destroy the commutative properties of the Fermi amplitudes the c — functions u, v must satisfy orthogonality conditions.

By substituting (2) in (1) and finding an average value of H for a vacuum state C_0 :

$$\alpha_\nu C_0 = 0$$

for new Fermi amplitudes, we obtain

$$\bar{H} = \sum \left\{ T(f,f') - \lambda \delta_{f,f'} \right\} F_1(f,f') +$$
$$\frac{1}{2} \sum J(f_1,f_2,f_2',f_1') \left\{ \Phi^*(f_1,f_2)\, \Phi(f_1',f_2') + \right.$$
$$\left. + F_1(f_1,f_1') F_1(f_2,f_2') - F_1(f_2,f_1') F_1(f_1,f_2') \right\} = \mathcal{E}(u,v),$$

where

$$F_1(f,f') = \sum_\nu v_{f_\nu}^*\, v_{f_\nu}, \quad \Phi(f,f') = \sum_\nu v_{f_\nu}\, u_{f_\nu'}.$$

We determine u and v from the condition for the minimum of the form $\mathcal{E}$ (u,v) under the additional conditions of orthogonality. The corresponding steady-state equation will be

$$\delta \tilde{\mathcal{E}}(u,v) = 0$$

$$\tilde{\mathcal{E}}(u,v) = \mathcal{E}(u,v) + \sum_{f,f_1} \left\{ \lambda(f,f')\, \xi(f,f') + \mu(f,f')\, \eta(f,f') + \mu^*(f,f')\, \eta(f,f') \right\} \qquad (5)$$

where λ, μ are the Euler factors. The variations δu, δv and δu^*, δv^* are here assumed to be independent.

We come now to the formulation of a new approximation method in the many-body problem. In this method we will take those u,v which satisfy the steady-state equations and which give a minimum value to the form $\mathcal{E}$ (u,v).

We will assume the respective C_0 to be the wave function of the ground state and $\mathcal{E}$ (u,v), the energy of the ground state. The question of the method's foundation and its limits of applicability are rather complex. We will limit ourselves here, therefore, to a number of remarks.

We can state on the basis of the results of the previous work (N. N. Boglyubov, Doklady Akademii Nauk, 119, No 1, 1958) that the method proposed here gives an exact solution of the problem for the case when only the interaction of pairs of particles with opposite momentum are considered in the Hamiltonian. We shall show, on the other hand, that there is always a solution among the solutions of the steady-state equation which exactly corresponds to the well-known Fok (Fock) method.

We will take the system of functions $\varphi_{f\nu}$, which have been normalized in the usual sense

$$\zeta(f,f') \equiv \sum_{\nu} \varphi^{*}_{f\nu} \varphi_{f'\nu} = \delta_{f,f'} \qquad (6)$$

and will divide the whole set of indices ν into two parts, F and G. We will take as F ("the Fermi sphere") the finite set of indices ν, consisting of N elements, where N is the number of particles. The remaining ν we shall put into the other set G.

We obtain

$$u_{f\nu} = 0, \quad v_{f\nu} = 0, \quad \nu \in F; \qquad (7)$$

$$u_{f\nu} = \varphi_{f\nu}, \quad v_{f\nu} = 0 \quad \nu \in G.$$

Obviously, then, all the orthogonality conditions will be satisfied. If these u,v are put into the form $\mathcal{E}$, the Φ in this form disappears and it will depend only on F_1, or in other words only on $\varphi_{f\nu}$ for $\nu \in F$.

We will designate $\nu \in F$ by the letter ω. We will determine from the condition for the minimum of the form $\mathcal{E}(\ldots \varphi_{f\omega} \ldots)$ under the additional conditions (6). The corresponding steady-state equation will be

$$\delta \tilde{\mathcal{E}}_F = 0 \qquad \tilde{\mathcal{E}}_F = \mathcal{E}(\ldots \varphi_{f\omega} \ldots) + \sum_{f,f'} \lambda(f,f') \zeta(f,f') \qquad (8)$$

It is easy to see that we have formulated none other than the ordinary Fok method. The wave function of the system is valid under the assumption that the individual particles occupy all the states $\varphi_{f\omega}$; the remaining states, $\varphi_{f\nu}$, are empty. On the other hand, we see from equation (5) that they always have a solution of the type (7), in which the $\varphi_{f\omega}$ are chosen according to the Fok method as solutions of equation (8). Thus our method can be considered a generalization of the Fok method and consequently its limits of applicability will not be narrower in any event.

The author suggests that this method can be used to obtain criteria for superconductivity in metallic crystals.

85. Gravitational and Electromagnetic Fields Independent of Time

"On Periodic Gravitational and Electromagnetic Fields in the General Theory of Relativity," by A. Papapetrou, Berlin, Research Institute for Mathematics, German Academy of Sciences; Leipzig, Annalen der Physik, Vol 1, No 4/5, 1958, pp 186-197

A gravitational field $g^{\mu\nu}$ is considered with the properties: (a) It depends periodically on time; (b) it satisfies the usual boundary condition in infinity, $g^{\mu\nu} \longrightarrow \eta^{\mu\nu}$ for $r \longrightarrow \infty$, and thus, within the region $r \geq r_0$, permits the series development $g^{\mu\nu} = \eta^{\mu\nu} + {}_1g^{\mu\nu} + \ldots$; and (c) in the region $r \geq r_0$ the field equations $R_{\mu\nu} = 0$ of the general theory of relativity apply. It is shown that, within the range $r \geq r_0$, such a field can be converted into a form which is independent of time.

In a further instance, it is assumed that, along with the gravitational field $g^{\mu\nu}$ with the above properties (a) and (b), an electromagnetic field is present which, likewise, is periodic (with the same period as $g^{\mu\nu}$). The vacuum field equations of the Einstein-Maxwell theory are considered to be satisfied in the range $r \geq r_0$. It is shown that, in this case, both fields can be converted into a form which is independent of time.

86. Use of Canonical Tensor as Energy-Impulse Tensor

"On the Energy-Impulse Tensor of Dirac-Like Fields," by H. G. Schoepf, Institute of Theoretical Physics, University of Greifswald; Leipzig, Annalen der Physik, Vol 1, No 3/4, 1958, pp 16-22

Model analyses are made, which show that in the case of fields similar to Dirac fields the use of the canonical tensor as energy-impulse tensor is justified.

87. More on Variation Principle for Classical Field Theories

"Addendum to the Variation Principle for Classical Field Theories," by J. Pachner, Prague, Physics Institute of the Advanced Technical School; Leipzig, Annalen der Physik, Vol 1, No 4/5, 1958, pp 201-202

In an earlier work (Annalen der Physik, Vol 19, 1957, p 353) the author explained the physical foundations and the mathematical formalism of a variation principle. He left open, however, the question of the exact functional dependence of the individual particle effects on their parameters. The problem is explained in this article as follows:

"As shown in the previous work, the new variation principle gives us not only the field equations, but an additional relationship for the determination of the integration constants of the field equations from the effects of the individual particles. On the left side of equation 17 is an expression made up exclusively of field values, and on the right side is the variation of the particle effect. It is clear that we cannot enter into this equation any arbitrary expression for the particle effect, but only one which will satisfy this equation. According to the type of problem to be solved, let us make a certain statement on the form of the solution of the field equations. If, for example, we assume a static spherosymmetric unitary field, we obtain two integration constants for each particle, and equation 11 for the particle effect proved to be adequate here. In the case of a more complex field (rotating bodies or particles with spin), the solution of the field equations, to be sure, contains several integration constants (brought to the author's attention by Prof A. Papapetrou), and the variation on the left side of equation 17 now relates (along with the vector field Γ_μ) to each of them. Expression 11 must then be altered correspondingly.

"Equation 17 is thus to be considered as defining the particle effect. It says: There exist certain areas in space-time where the surface integral has a value different from zero, and within these areas is found that which we call a particle. The parameters of the particles are nothing other than certain constant values which occur in the surface integral. (See E. Schroedinger, Space-Time Structure, Cambridge, 1950, p 99.)

"In the earlier work the physical foundations of the variation principle were compiled under three points. We supplement them here with the following fourth point:

"4. The functional dependence of the individual particle effects on the parameters of the particles is determined by the solution of the field equations.

"We thus approach the Einstein idea of a pure field theory. To be sure, we separate certain areas of space-time from the field by means of three-dimensional hyperplanes, but the primary agent, which also determines the form of the particle effect, is the field itself."

38. Thomas-Fermi Phase Shifts by Integration

"On the Asymptotic Phase Shifts in the Method of Partial Waves in the Case of the Scattering of Electrons in the Thomas-Fermi Atom," by T. Gajewski, Institute of Theoretical Physics, University of Lodz; Leipzig, Annalen der Physik, Vol 1, No 4/5, 1958, pp 232-237

Heretofore, in the case of the potentials of the statistical Thomas-Fermi model, the phase shifts, which are important for the effective cross sections, have always been computed by numerical methods only. In this article a potential given by Buchdahl (Annalen der Physik, Vol 15, 1955, p 238) is considered, and it is shown that, with the use of this potential, the Henneberg asymptotic formula (Z. Physik, Vol 83, 1933, p 555) for the phase shifts leads to expressions which can be integrated.

Tables are given to show the agreement between the results obtained from an evaluation of these expressions and corresponding numerical values.

"On the Relativistic Phase Shifts of the Partial Waves in the Statistical Thomas-Fermi Scatter Field," by T. Gajewski, Institute of Theoretical Physics, University of Lodz; Leipzig, Annalen der Physik, Vol 1, No 4/5, 1958, pp 299-304

In this second article in the same journal, the author develops, for the phase shifts of the partial waves in the case of scattering of electrons in the Thomas-Fermi atom, a relativistic method which is analogous to the nonrelativistic method explained in the previous article.

On the basis of a comparison of the two methods, it is shown that the formulas given in the previous article can, with corresponding corrections, be applied also from the relativistic point of view. The phase shifts computed with these modified relativistic formulas are compared with the values obtained with the nonrelativistic formulas and with values obtained with a numerical method. The use of the relativistic formulas for the phase shifts leads to closer agreement with the numerically computed values than was possible to obtain with the nonrelativistic formulas.

89. Economic Prospects for Atomic Energy in USSR

"Concerning the Structure of the Fuel Balance in the USSR," by Ye. Sokolova; Moscow, Voprosy Ekonomiki, No 5, May 58

After reviewing the economic growth of the fuel extracting industry in the USSR and outlining future trends and comparing similar economies in the US and England, the author briefly discusses the projected growth of atomic energy in the USSR.

According to the author, nuclear energy is the newest and most progressive type of energy. One of its main advantages over other types of fuels is the fact that a vast amount of energy is stored in a small amount of raw material. At the 20th Congress of the CPSU it was pointed out that, with nuclear fission, the fission of one ton of uranium 235 produces as much energy as the burning of 2 million tons of coal. The meaning of this is especially great in relation to the large increased requirements for fuel in the USSR during the next 15-20 years. According to preliminary data presented in a report by Comrade N. S. Khrushchev at the jubilee session of the Supreme Soviet USSR, the production of fuel energy resources will triple during the next 15 years. The structure of the extraction of fuel energy resources in the USSR during this period will change sharply with emphasis on increased amounts of more economical types of fuel (oil and gas). During the next 15 years roughly the following structure in the extraction of fuel will be attained (in % of the total: in terms of standard fuel).

	1957	1972
Coal	60.8	32.2
Oil	23.4	34.4
Natural gas	4.0	23.3
Peat	3.8	2.4
Hydroelectric energy	2.9	2.6
Atomic energy	--	3.2
Wood	4.4	1.3
Shale	0.7	0.6

"This structure of fuel energy balance, which is characterized by a high technical plane of development in the domestic economy, is more efficient than that which exists. Because of an efficient fuel balance, the cost of one ton of standard fuel produced in the USSR will decrease 35%. At present the cost of electric energy and specific capital investments in the operating fuel and hydraulic electric stations is lower, certainly, than that projected for the construction of atomic electric stations. However, technical progress in the construction of atomic electric stations can make the construction of these stations economically feasible on a wider scale.

"In the plan for the development of the domestic economy, provision should be made for works which would favor a wider inclusion of atomic energy in electric stations and transportation, both sea and rail...."

90. Election of Members to Siberian Branch, Academy of Sciences USSR

"Election of Members of Academy of Sciences USSR of the Siberian Branch" (unsigned article); Moscow, Vestnik Akademii Nauk SSSR, No 5, May 58, pp 45-46

On 28 March 1958, the General Assembly of the Academy of Sciences USSR met at the Conference Hall of the Presidium of the academy to elect members of the Siberian Branch of the academy.

Academician A. N. Nesmeyanov disclosed that 8 candidates for active membership and 27 candidates for corresponding membership in the academy have been selected for election. The following persons were elected Active Members of the academy by secret ballot:

In the field of mathematics, Il'ya Nestorovich Vekua and Anatoliy Ivanovich Mal'tsev.

In the field of physics, Vladimir Dmitriyevich Kuznetsov.

In the field of geology and geography, Andrey Alekseyevich Trofimuk, Vladimr Stepanovich Sobolev, and Aleksandr Leonidovich Yanshin.

In the field of mechanics, Pelageya Yakovlevna Kochina and Yuriy Nikolayevich Rabotnov.

The following persons were elected Corresponding Members of the academy by open balloting:

In the field of mathematics, Andrey Vasil'yevich Bitsadze.

In the field of physics, Gersh Itskovich Budker and Georgiy Borisovich Bekiy.

In the field of chemistry, Georgiy Konstantinovich Boreskov, Vladislav Vladislavovich Voyevodskiy, Nikolay Nikolayevich Vorozhtsov, Aleksandr Alekseyevich Koval'skiy, and Anatoliy Vasil'yevich Nikolayev.

In the field of geology and geography, Yuriy Alekseyevich Kuznetsov, Valeriy Alekseyevich Kuznetsov, Yuriy Aleksandrovich Kosygin, Boris Ivanovich Piyp, Boris Sergeyevich Sokolov, Epaminond Epaminondovich Fotiadi, German Avgustovich Khel'kvist, Feliks Nikolayevich Shakhov, Vladimir Nikolayevich Saks, and Viktor Borisovich Sochova.

In the field of mechanics, Eduard Ivanovich Grigolyuk.

In the field of automatics and electrical engineering, Valentin Nikolayevich Avdeyev and Konstantin Borisovich Karandeyev.

In the field of heat engineering, Ivan Ivanovich Novikov.

In the field of mining and metallurgy, Nikolay Andreyevich Chinakal and Timofey Fedorovich Gorbachev.

In the field of economics and statistics, Leonid Vital'yevich Kantorovich, Nikolay Nikolayevich Nekrasov, and German Aleksandrovich Prudenskiy.

91. Organization of Novocherkassk Polytechnic Institute

"Novocherkassk Polytechnical Institute Is 50 Years Old," by Prof D. P. Semchenko, Novocherkassk Polytechnical Institute imeni S. Ordzhonikidze; Moscow, Vestnik Vysshey Shkoly, No 1, Jan 58, pp 54-57

The Novocherkassk Polytechnic Institute imeni S. Ordzhonikidze was opened in October 1907. During its first 20 years the institute underwent numerous reorganizations. Seven institutes were formed on the base of its faculties and departments, i.e., the Institute of Geological Prospecting, Institute of Aviation (Khar'kov), Chemicotechnological Institute, Institute of Power Engineering, Metallurgical Institute (Ordzhonikidze and Dnepropetrovsk), Institute of Engineers of Municipal Construction, and Institute of Agricultural Machine Building (Rostov-na-Donu).

By 1933 the institute, which had ceased to be classified as a polytechnical vuz (higher educational institution), was called the Novocherkassk Industrial Institute. In 1948, however, the institute was again expanded and renamed the Novocherkassk Polytechnical Institute.

At present the institute has ten faculties: the Mining Faculty, Mining-Mechanical Faculty, Mining-Geological Faculty, Mechanical Faculty, Electromechanical Faculty, Power Engineering Faculty, Construction Faculty, Chemicotechnological Faculty, Evening Faculty, and Corresponding Faculty.

The institute also has higher engineering courses. The institute annually graduates 1,200 engineers in 36 specialties. During the Sixth Five-Year Plan the institute is scheduled to graduate 7,000 engineers. During its 50 years the institute has graduated 16,654 specialists.

At present the institute employs 542 instructors who teach in the institute's 50 chairs. Research is also conducted at the institute especially on problems concerned with improving the technology of production for over 200 enterprises of the USSR.

Scholars associated with the institute publish some 200 scientific works annually, and the institute grants 20-25 candidate of sciences degrees annually.

92. Mordovo State University Opened in Saransk, Mordovskaya ASSR

"In the Ministry of Higher Education" (unsigned article); Moscow, Vestnik Vysshey Shkoly, No 1, Jan 58, p 67

Toward the end of 1957 there was opened in the city of Saransk, Mordovskaya ASSR, the Mordovo State University (Mordovskiy Gosudarstvennyy Universitet), which is the 38th university in the USSR. The new university was formed on the basis of the Mordovo Pedagogical Institute. All day and evening students of the institute have become registered students of the new university.

The university is divided into two principal departments. The first, the department for regular students, consists of the following six faculties: Historical-Philological (with specialties in history, the Russian language and literature, and the Mordovian and Russian language and literature), Physicomathematical (with specialties in physics and mathematics), Natural Sciences (with specialties in biology and chemistry), Foreign Languages (with specialties in English and German), Engineering and Technical (with specialties in industrial and civilian construction and electrification of industrial enterprises), and Agriculture (with specialties in agronomy, zootechnics, and the mechanization of the processes of agricultural production). The second department, that for corresponding students, offers courses in history, Russian language and literature, biology, and mathematics. At present the university has 175 students in the first-year courses, of whom 75 are enrolled in the Engineering and Technical Faculty, 75 in the Agricultural Faculty, and 25 in the Foreign Languages Faculty.

93. Dagestan State University Opened in Makhachkala, Dagestanskaya ASSR

"In the Ministry of Higher Education" (unsigned article); Moscow, Vestnik Vysshey Shkoly, No 1, Jan 58, p 67

In December 1957 the 39th Soviet university was opened in Makhachkala, Dagestanskaya ASSR, and is to be known as the Dagestan State University (Dagestanskiy Gosudarstvennyy Universitet).

The new university was formed on the basis of the Makhachkala Pedagogical Institute. All regular and corresponding students of the institute have been transfered to similar courses and specialties in the university.

The university consists of five faculties: Historical-Philological Faculty (with specialties in history, Russian language and literature, and the native language and literature), Physicomathematical Faculty (with specialties in physics and mathematics), Natural Sciences Faculty (with specialties in chemistry and biology), Foreign Languages Faculty (with specialties in English and German), and Engineering-Technical Faculty (with specialties in industrial and civilian construction and conservation technology.

Corresponding students will be offered courses in the Russian language and literature, biology, and mathematics.

One hundred students were admitted for the first-year course in the Engineering-Technical Faculty; 50 of them in the specialty of industrial and civilian construction and 50 in the specialty of the technology of conservation.

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