PB 131891—T6

CENTRAL INTELLIGENCE AGENCY

SCIENTIFIC INFORMATION REPORT

19 September 1958

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

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

Approved For Release 1999/09/08 : CIA-RDP82-00141R000100150001-7

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

Approved For Release 1999/09/08 : CIA-RDP82-00141R000100150001-7

PLEASE NOTE

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

SCIENTIFIC INFORMATION REPORT

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I. BIOLOGY

1. Experimental Installation With 200-Curie Po-Be Mixture for Experimental Irradiation of Animals

"An Experimental Installation for Irradiation of Animals by Neutron Fluxes (ENO-1), (Report 1)," by A. G. Istomina and I. B. Keirim-Markus; Moscow, Meditsinskaya Radiologiya, Vol 3, No 3, May/Jun 58, pp 51-61

Although reactors and accelerators can be used as powerful sources of fast neutron fluxes, they do not satisfy experimental conditions for animal irradiation due to the following: first, they cause unilateral irradiation; second, irradiation by fast neutrons is accompanied with intense gamma irradiation and, in reactors, by thermal and resonance neutrons; and third, because irradiation in accelerators takes place in short pulses and, as is known, pulsed irradiation can cause a different effect on an organism from that caused by a constant flux. Therefore, an installation, planned in 1954, was designed with a 200-curie Polonium-Beryllium mixture for the experimental irradiation of small animals by neutron fluxes. The following is the accompanying English abstract.

"Computations show that the dose rate of gamma irradiation from the sources equals only 2.5% of the dose rate of fast neutrons. Eighteen such sources made of Po+Be were located in two flat cassettes in such a way as to create a uniform field of fast neutrons in the central working chamber with a dose of one rep per hour. The installation is shielded by paraffin and borax blocks. The method of study of fast, resonance, and thermal neutrons by activation of sulfur, gold, and indium specimens and the absolute measurement of induced activity are described in detail. The dose rate of the gamma irradiation was measured by the photographic method."

Various formulas, graphs, and charts accompany the article.

2. Substances Adhering to Mitochondrial Surface Increase Cell Resistance to Ionizing Radiation

"The Influence of Blocking Intracellular Structures on Cell Radiosensitivity," by M. N. Meysel', N. A. Pomoshchnikova, and T. S. Sokolova, Institute of Microbiology of the Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 117, No 1, Nov/Dec 57, pp 142-145

The importance of the mitochondrial surface in its selective adsorption of substances which later are subjected to oxidation-reduction processes is reviewed. Reference is made to research conducted by the authors in 1950 on the topic of the blocking of mitochondria in yeast cells for studying the physiological significance of intracellular structures.

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The aim of this research was to study the influence of the blocking of mitochondria by berberine on the sensitivity of the cell and its various components toward irradiation. Yeast organisms were made fluorescent by an aqueous solution of berberine sulfate (1:10,000), and irradiated. Details of experimental procedure and charts showing the effect of blocking (staining) and irradiation (30, 60, and 250 kr) on the processes of respiration and viability are included. The authors make the following conclusions.

1. Substances which become tenaciously attached to mitochondria of cells, such as berberine, ethyl alcohol, and ether, distinctly increase cell radioresistance and decrease the injurious effects of ionizing radiation. This mechanism is connected, first of all, with changes in the physicochemical properties of the surface of mitochondria.

2. In vivo blocking of the nucleus also leads to increased radioresistance of the cell.

3. Blocking the vacuoles by neutral dyes has no effect on cell radioresistance.

4. The method of in vivo blocking of cell structures has definite future prospects for research on normal pathological cell physiology.

3. Different Sources of Nitrogen Nutrition Exert Different Influences on Viscosity, Elasticity, and Cold and Heat Resistance of Plant Protoplasm

"Changes of Plant Resistance to High and Low Temperature as Related to Quality of Nitrogen Nutrition," by K. A. Badanova, Institute of Plant Physiology imeni K. A. Timiryazev, Academy of Sciences USSR, Moscow; Moscow, Fiziologiya Rasteniy, Vol 5, No 4, Jul/Aug 58, pp 353-356.

The aim of the research was to study the effect of various forms of nitrogen nutrition on chemicocolloidal properties of the protoplasm of plant cells. Tests were conducted on the leaves of the makhorka [tobacco (Nicotiniana rusticana)] plant to determine the degree of resistance of plant cells to high and low temperature after cultivating them on different nitrogen nutrition sources (ammonium salts and nitrates).

A diagram and two tables show the effect of nitrates and ammonium salts on plant cell coagulation and the influence of the quality of nutrition on cell content of organic acids and on the viscosity, elasticity, and resistance of plant cell protoplasm to high and low temperatures.

Results indicate that the degree of plant cell resistance toward high and low temperatures changes, depending on its nutrition. For example, plant nutrition from ammonium sources leads to increased heat resistance of the protoplasm, simultaneously with decreased cold resistance. Both changes are accompanied by increased viscosity of the protoplasm. On the contrary, decreased heat resistance and increased cold resistance are accompanied by decreased viscosity of plant cell protoplasm.

The author also discusses the effect of natural and artificial methods of introducing various substances into the cell structure on cell viscosity and elasticity.

The author concludes that different sources of nitrogenous nutrition exert a substantial effect on plant metabolism which in turn determines certain differences in the reaction of the protoplasm to external environmental factors.

4. Fluctuations in Ascorbic Acid Content in Leaves of Plants Under Polar Conditions

"Seasonal Dynamics of Ascorbic Acid in Leaves of Plants Under Polar Conditions," by I. D. Shmatok, Polar-Alpine Botanical Garden, Kirovsk, USSR; Moscow, Fiziologiya Rasteniy, Vol 5, No 4, Jul/Aug 58, pp 345-349

Research was conducted on the seasonal fluctuations of ascorbic acid content of 18 plants (rhubarb, sorrel, lungwort, onions, lilies, primroses, roses, carrots, etc.). A diagram illustrates the increase and decrease of ascorbic acid with the phase of growth, i.e., during the vegetative period, period of budding, blooming, seeding, and the end of the vegetative period. A diagram presents detailed information on the influence of the developmental period on ascorbic acid content in leaves of plants, calculated on the basis of raw weight and of absolutely dry weight of plant material.

Results indicate the following.

1. Seasonal fluctuations of ascorbic acid content of plants depends essentially on the type of plant; i.e., some plants contain maximum ascorbic acid content during the early part of the vegetative period, and others attain maximum ascorbic acid content at a later period.

2. In all plants the amount of ascorbic acid in the leaves diminishes at the end of the vegetative period, but in some plants there is an increase of ascorbic acid after exposure to autumn frosts.

II. CHEMISTRY

Chemistry and Technology of Nuclear Fuels and Reactor Construction Materials

5. Crystallization of Uranium

"Recrystallization of Uranium Under the Effect of Thermal Cycling," by A. A. Bochvar, G. I. Tomson, and N. T. Chebotarev; Moscow, Atomnaya Energiya, Vol 4, No 6, Jun 58, pp 555-556

As a result of cyclic heat-treatment in the temperature range of 100-550° C with a cycle period of 50 sec in uranium hardened from the gamma-phase as well as annealed in the gamma-phase or cast uranium which did not undergo additional deformation, a recrystallization occurs resulting in refinement of the initial microstructure. The recrystallization starts at spots with the greatest crystal lattice distortion.

Crystal Chemistry

6. Current Work at Institute of Crystallography, Academy of Sciences USSR

"Investigators of Crystals", by A. Novikov; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Vol 3, No 74 (374), 22 Jun 58, p 3,

The Institute of Crystallography, Academy of Sciences USSR, is the only institution in the USSR which investigates in detail the structure and physical properties of crystals, does research on phenomena taking place in them, and conducts work pertaining to the industrial applications of results obtained in this field.

At the Laboratory of Electronography, work is being done on the structure of organic and inorganic crystals. Electronography is applied in investigations of semiconductor materials and heat-resistant alloys. Work in this particular field is being done under the direction of Prof Z. Pinsker. By using electronographic techniques, one can investigate the structure of the surface of germanium crystals and of the surfaces of other crystals, as well as processes of corrosion and oxidation. The novel methods employed in this field make it possible to solve some crystal-chemical problems, for instance, those concerning the magnitude of the force exerted between atoms and the nature of the interaction between atoms in crystals.

Work on the crystals used in scintillation counters is of importance from the standpoint of prospecting for ores containing radioactive elements. These counters are also used in nuclear investigations and in connection with work in which tracer atoms are employed. The crystals used in scintillation counters are artifically grown in laboratories. They consist of anthracene, naphthalene, or sodium iodide. The scintillator crystals are shaped in such a manner that the luminescence which arises inside them is focused and directed into the aperture of the photoelectric multiplier. This is achieved by giving to the crystals a definite shape depending on the index of refraction of the crystals. Special reflectors are also used.

Scintillation counters have acquired considerable importance in connection with core sampling in test wells sunk at petroleum fields. By using such counters, one may determine with a sufficient degree of precision the thickness of different strata including those bearing petroleum.

The principal advantages of scintillation counters are their high sensitivity to all forms of nuclear radiation and the rapid response which makes it possible to record individually particles which are emitted with intervals as small as one billionth of a second. Interesting work is being done at the institute on corundum and colored varieties of corundum, for instance, rubies. A method of producing crystals in the form of thin stems was developed at the institute. However, rubies having this shape exhibited a tendency to crack while they were cut and polished. N. Ikornikova and A. Popova, Candidates of Physicomathematical Sciences, succeeded in eliminating the internal stresses in stem rubies which are responsible for this cracking. Stem rubies will soon be used in the production of [jewel bearings for] watches.

Quartz is of considerable importance as a material for the production of spectrograph prisms or lenses which transmit ultraviolet and infrared rays, wedges for polarization microscopes, and piezoelectric crystals for different purposes. In work launched by N. Sheftel', Doctor of Geological Sciences, and continued by V. Butuzov, Candidate of Physicomathematical Sciences, it has been shown that quartz of the desired quality for these purposes and of the necessary dimensions can be produced artificially. Work on the mechanical properties of crystals which is being conducted at the Institute of Crystallography under the direction of M. Klassen-Neklyudova has yielded considerable information that has a bearing on the hardness, plasticity, and elasticity of various materials used in technology and construction.

7. Development of Electrochemistry in USSR

"Today and Tomorrow; Ways of Perfecting Electrochemical Technology," by Prof V. Stender, Corresponding Member, Academy of Sciences Kazakh SSR, and Prof M. Loshkarev, Doctor of Chemical Sciences; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Vol 3, No 71, (371), 13 Jun 58, p 2

Electrochemical processing is of advantage because its use makes it possible to transform electrical energy directly into the chemical energy of products obtained at the electrodes. Another advantage of electrochemical processing is the possibility of manufacturing products of high quality from the poorest crude materials.

Electrochemical processes have become the basis for the most important branches of present-day technology. For instance, the deuterium needed for thermonuclear reactions is concentrated almost exclusively by the electrolysis of water. The hydrogen that is obtained in this electrolysis is used for the synthesis of ammonia.

In view of the fact that the demand for chlorine will soon exceed that for caustic alkalis, it will be necessary to produce chlorine electrolytically without producing at the same time caustic alkalis. In some cases it will be advisable to subject to electrolysis chlorides of heavy metals and produce these metals as a cathodic deposit instead of caustic alkali.

Aluminum and copper are of fundamental importance to the electric power industry; aluminum, titanium, and magnesium for the construction of planes; nickel, carbon-free manganese, and chromium are the most important constituents of alloy steels and heat-resistant alloys. All these metals are produced by electrolysis.

Many rare metals which have become of the greatest importance in technology are also produced by electrolysis: for instance, the lithium which is converted into tritium, beryllium and cadmium for the nuclear energy industry, and the cesium and rubidium which are used in photocells employed in the automatic control of production processes.

Such rare elements as germanium, indium, gallium, thallium, rhenium, and tellurium are also products of the electrochemical industry.

Electrochemical sources of current, particularly those with an intensive effect such as galvanic cells and storage batteries, are necessary components of self-propelled appliances, including automobiles, planes, rocket missiles, and artificial earth satellites.

Development of the electrochemical industry is connected with the development of the power production of the country. To expedite developments in this field, the Presidium of the Academy of Sciences USSR has decided that three electrochemical research institutes will henceforth be active within the framework of the academy, namely, at Moscow, Sverdlovsk, and Irkutsk. Furthermore, the electrochemical divisions of a number of scientific research institutes will be reinforced and new electrochemical laboratories created.

In subsequent research in the field of electrochemistry, particular attention must be paid to the problems mentioned below.

Current density must be sharply increased and the rate of electrochemical processes augmented. Difficulties arise in connection with this, because the ions cannot be transported to the electrodes as fast as they are used up there. As far as the production of metals and solid products is concerned, the principal measure applied should be a substantial increase in the circulation of electrolytes and thorough purification of these electrolytes. The theory of the action of inhibitors of electrode processes should be developed and new, more effective regulators of the growth of cathodic deposits of metals found on the basis of this theory. The regulators of the growth of cathodic deposits must preserve their effectiveness at high velocities of electrolysis. This has not been achieved hitherto. The solution of the problem should be sought in reversing the current periodically, whereby uniformity of the growth of crystals will be ensured. Under the circumstances the application of much higher current densities will become possible.

The employment in electrochemical technology of so-called intermediate reagents functioning as charge carriers makes it possible not only to accelerate a number of processes, but also to expand considerably the field of the industrial application of electrolysis.

The development and introduction of this method of electrolysis must contribute to the development of the industrial electrosynthesis of organic compounds. The introduction of intermediate reagents will make it possible to use homogeneous catalysts to a greater extent than is possible with the application of direct electrode processes. Intermediate reagents can be applied not only in reactions taking place in solutions, but also for the oxidation or reduction of solid phases or emulsions, including those involved in processes for the production of metal powders, higher metal oxides, and other products.

It is important to develop new and stable anodes for the electrolysis of aqueous solutions and fusions. In this respect good results are to be expected when metal oxide anodes are applied. These anodes ought to be sufficiently stable, have an adequate electric conductivity, and be mechanically and thermally resistant. In the electrolysis of fusions, the applications of such anodes make it possible to increase considerably the current density and to get rid of the anodic effect. In the electrolysis of aqueous solutions, it will be possible to increase the length of operation of equipment between repairs and improve the purity of the cathodic products.

Research must be done with a view toward developing processes of electroorganic chemistry, with the use of which very precisely controlled syntheses of complex organic compounds including drugs, dyestuffs, and other substances can be carried out.

Further development of the electrochemistry and electrometallurgy of newly discovered and rare metals will make it possible to extract them from crude materials with high yields and to produce them in a purer state at a reduced cost.

Great attention must be paid to the improvement of methods for the production of carbon-free chromium and manganese. The methods of amalgam metallurgy should be developed. These methods are convenient for the stepwise isolation in a pure state of individual metals from raw materials containing a number of metals. They make it possible to concentrate the metals being recovered from large quantities of very dilute solutions.

Electrochemical processes should be developed which make it possible to obtain valuable products at both electrodes rather than only one. Chloride solutions should be used to an increased extent in electrometallurgy in preference to sulfate solutions.

At the new electrochemical institutes to be opened at Sverdlovsk and Irkutsk work pertaining to electrometallurgy and the electrosynthesis of organic compounds ought to play a prominent role, in the opinion of the authors of this article.

A special electrochemical journal ought to be published by the Academy of Sciences USSR or the Ministry of Higher Education USSR.

8. Trends in USSR Synthetic Rubber Industry

"Synthetic Elastomers," by Prof R. B. Dolgoplask, Doctor of Chemical Sciences, and K. Piotrovskiy, Candidate of Chemical Sciences; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Vol 3, No 73 (373) 18 Jun 58, p 3

Industrial production of sodium butadiene rubber according to the process devised by Academician S. V. Lebedev has been carried out in the USSR on a large scale since 1932. However, it was clear from the very beginning that sodium butadiene rubber is in many respects inferior to natural rubber as far as some characteristics are concerned and cannot completely replace natural rubber in the production of a number of articles. Under the circumstances new types of synthetic rubber had to be synthesized both with the aim of replacing natural rubber and for the purpose of developing synthetic products that possess novel properties required in special applications.

Synthesis of Elastomers for General Purposes

The principal aim of work done in this field was replacement of natural rubber with a synthetic product. In the present-day synthetic rubber industry production of synthetic elastomers obtained by polymerization of butadiene with styrene or alpha-methylstyrene (rubbers of the SKS-30 A type) plays the principal role. Although the application of synthetic rubber of this type contributed to the solution of the problem of manufacturing tires from synthetic rubber exclusively, without the use of natural rubber, tires made of this kind of rubber are much inferior to those made of natural rubber. To obtain high mechanical strength and other characteristics which are required of a good material for tires, synthetic rubber of the butadiene-styrene type and other types of synthetic rubber must contain a considerable quantity of filler (carbon black). As a result of the addition of filler, the elasticity of the rubber is reduced and there is a higher development of heat following repeated deformation.

The quality of butadiene-styrene rubbers depends to a considerable extent on the ratio between styrene and butadiene. When the content of styrene is reduced, the elasticity is increased, while an increase in the styrene content results in the formation of a product which resembles a plastic rather than an elastomer. By varying the styrene content, products suitable for different applications can be obtained.

Polychloroprene rubber (chloroprene), also produced by emulsion polymerization, is manufactured on an extensive industrial scale. Some of the advantageous characteristics of chloroprene are resistance to the action of solvents and ozone and stability as far as oxidative aging is concerned. Furthermore, chloroprene is produced from readily available raw materials (acetylene and hydrogene chloride) and is cheap for that reason. A filler does not have to be added to this type of rubber. The drawbacks of chloroprene as a material for the manufacture of tires consist in an inferior stability at low temperatures and a low elasticity caused by the presence of a large quantity of chlorine.

In recent years a method for the production of isoprene rubber has been developed on the basis of a catalytic polymerization procedure. The laboratory research and developmental work have already been completed and the synthesis of isoprene rubber (SKI rubber) will be carried out within a few years on an extensive industrial scale, with the result that the USSR will no longer have to import any natural rubber in the future.

A new approach to the production of elastomers of high strength is the synthesis of the so-called carboxylate rubbers which contain, in addition to butadiene or butadiene and styrene, small quantities of carboxyl groups in the polymer chain. The presence of carboxyl groups makes it possible to vulcanize the rubber by means of metal oxides rather than sulfur. As a result, elastomers with new characteristics are obtained. Unfilled rubber of this type is distinguished by a high mechanical strength not inferior to that of natural rubber as well as a very high resistance to cracking and to oxidative aging at elevated temperatures. Investigations that are being conducted at present will indicate whether or not carboxylate rubber can be used instead of natural rubber.

At present new ways can be discerned for solving the problem of the synthesis of an elastomer which is equivalent or superior to natural rubber. Among the possibilities envisaged is catalytic copolymerization of ethylene with propylene or with other analagous unsaturated compounds. Of definite interest from this standpoint is solution of the problem of obtaining butadiene polymers with a regular structure.

As far as the problem of the synthesis of elastomers for general purposes is concerned, a stage of scientific and technical knowledge has been reached which makes it certain that synthetic rubber will be produced which is analagous in its structure and properties to natural rubber.

Synthesis of Elastomers for Special Purposes

Vulcanized natural rubber for all practical purposes loses its elasticity (i.e., freezes) at a temperature of about minus 50°. The problem of the synthesis of rubber resistant to the effects of low temperatures has been solved on the basis of the polymerization of butadiene or the copolymerization of butadiene with small quantities of styrene (or methylstyrene). The use of crude materials of this type makes it possible to produce rubber which preserves its elasticity down to minus 70°. It has been proved in principle that it is possible, by employing the catalytic polymerization of butadiene, to produce elastomers which preserve their elasticity down to minus 100°.

The problem of the synthesis of elastomers resistant to the action of organic solvents has been solved by the introduction into the polymer chain of polar groups and atoms such as nitrile groups and atoms of halogens. One of the elastomers of this group is the SKN rubber, which is produced industrially at present and is obtained by the copolymerization of butadiene with acrylic acid nitrile. Other elastomers having similar properties belong to the thiokol type.

Introduction into the polymer of polar groups which assure increased stability at low temperature and increased resistance to the action of organic solvents can also be achieved by the synthesis of polymers of another type, for instance, polymers obtained by the copolymerization of butadiene with methylvinylpyridine, the polymerization of some organic compounds containing fluorine, etc.

Natural rubber and ordinary synthetic elastomers for general purposes begin to decompose at temperatures in the range of 150-200°. Rubber articles made of elastomers of these types do not stand a temperature higher than 150° in use. Present-day technology requires the development of elastomers which can stand temperatures of 250-300° and higher, which do not swell strongly in organic solvents, and which preserve their elasticity at temperatures down to minus 60°. A silicone rubber is being produced the principal chain of which consists of alternating atoms of silicon and oxygen. This chain is surrounded by organic groups (methyl groups) that are bound to the silicon atoms. Rubber of this type stands temperatures as high as 250-300°. By varying the nature of the organic radicals which enter into the composition of the molecule of this elastomer, one may improve the mechanical and thermal properties of the product. A characteristic property of some silicone elastomers is a combination of resistance to high temperatures with stability at low temperatures (the elasticity is preserved down to minus 100°). Introduction into silicone rubbers of appropriate polymer groups makes them resistant to the action of organic solvents.

The problem of the synthesis of elastomers which are resistant to temperatures higher than 300° will presumably be solved by the synthesis of heteroorganic polymers derived from organic compounds of boron, titanium, and silicon, and other elements. Rather promising are elastomers derived from unsaturated fluororganic compounds. Elastomers of this type swell only to a minor extent in organic solvents and stand exposure to a temperature of 300° for a relatively long time. However, elastomers of this type developed hitherto still exhibit an inferior resistance to low temperatures: they lose their elasticity at temperatures in the vicinity of minus 25°. A promising way of obtaining elastomers which are resistant to high temperatures and stable to the action of solvents and the effects of low temperatures is the synthesis of silicone rubbers in which a part of the hydrogen atoms of organic radicals is replaced by fluorine.

The problem of increasing the resistance of rubber to wear is becoming of considerable importance. The greatest degree of success in this field was achieved by the synthesis of the so-called polyurethane elastomers obtained as a result of a polycondensation reaction in which dicarboxylic acids, glucose, and some diisocyanates participate. Filled rubbers produced from these elastomers have a high elasticity in addition to a high degree of resistance to wear.

When rubber of this type is used as a material for the shoulders of tire treads, tires can be produced the treads of which will not wear out during the useful life of the car. Elastomers produced with the use of methylvinylpyridine are also distinguished by a high resistance to wear.

Very promising is the development of the production of butyl rubber, which is obtained by the copolymerization of isobutylene with small quantities of isoprene. Butyl rubber, in addition to having superior mechanical characteristics, exhibits a very low permeability to moisture and gases and has a high chemical stability.

The production of synthetic latices for various applications will be considerably increased during the next few years.

The decision of the May 1958 Plenary Session of the Central Committee CPSU has determined the ways along which the chemical industry of the USSR will develop and the rate at which developments in different fields will proceed. Particular emphasis will be placed on the chemistry of synthetic polymers, specifically synthetic elastomers. The principal initial materials required for the synthesis of elastomers manufactured in large quantities (butadiene, isoprene, isobutylene, styrene, and methyl styrene) will be produced from petroleum products at all synthetic rubber plants, so that further expansion of the production of elastomers is assured.

9. New Grade of Rubber for Use at Low Temperatures

"Cold-Resistant Rubber," by G. Rubtsov; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Vol 3, No 90 (390), 30 Jul 58, p 1

"The Yefremovsk Synthetic Rubber Plant imeni Academician S. Lebedev has initiated mass production of the cold-resistant SKVM rubber according to a method developed at the central plant laboratory. By using cheap transformer oil, the use of ethyl alcohol for the production of the new type of rubber could be reduced 15%. SKVM rubber, which is distinguished by a heightened plasticity and stability at low temperatures, has already been used in the production of 500 kilometers of electric cables of different types."

[SIR Note: SKVM rubber is apparently sodium-polymerized butadiene rubber extended with transformer oil.]

Organic Chemistry

10. Organophosphorus Research

"An Improved Method for the Synthesis of the Di-beta,beta'-chloroethyl Ester of beta-Chloroethylphosphonic Acid," by Ye. L. Gefter, Scientific Research Institute of Plastics; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 7, Jul 58, pp 1908-1909

A safe method for the isomerization of beta,beta',beta''-chloroethylphosphite was developed which permits preparation of the di-beta,beta'-chloroethyl ester of beta-chloroethylphosphonic acid with a yield of 63-67%.

"Bis-triaroxyphosphazosulfones and Tetraaryl Esters of Sulfamidobisphosphoric Acid," by A. V. Kirsanov and L. L. Matveyenko, Dnepropetrovsk Metallurgical Institute; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 7, Jul 58, pp 1892-1901

The reaction between bis-trichlorophosphazosulfone and sodium arylates was investigated. Bis-triaroxyphosphazosulfones were prepared. The hydrolysis of bis-triaroxyphosphazosulfones was investigated, and the tetraaryl esters of sulfamidobis-phosphoric acid were prepared.

"Trichloroisophosphazoacyl Compounds of the Aromatic Series," by A. V. Kirsanov and G. I. Derkach, Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 7, Jul 58, pp 1887-1892

The reaction for preparing trichloroisophosphazoacyl compounds from acylamidophosphoric acid dichlorides and phosphorus pentachloride was found to be a general reaction of the aromatic series. Several trichloroisophosphazoacyl compounds of the aromatic series were prepared and their properties described.

Radiation Chemistry

11. Vulcanization of Elastomers by Irradiation

"The Structure and Properties of Rubbers Produced by Irradiation Vulcanization," by B. A. Dogadkin, Z. N. Tarasova, M. Ya. Kaplunov, V. L. Karpov, and N. A. Klauzen, Scientific Research Institute of the Tire Industry; Moscow, Kolloidnyy Zhurnal, Vol 20, No 3, May-Jun 58, pp 260-271

The structure and properties of irradiation vulcanizates derived from the technical and purified crude rubbers SKB [sodium butadiene rubber], NK [natural rubber], SKS-30A [butadiene-styrene polymer], SKS-30 AM [oil-extended butadiene-styrene rubber], and SKI [isoprene rubber] were investigated. Both the crude rubbers and their mixtures with fillers were subjected to irradiation in a nuclear reactor and by means of a cobalt-60 radiation source. The total dose of radiation applied amounted to 10^7-10^8 roentgens. It was established that the density of the vulcanization network formed by irradiation is determined by the energy dose absorbed, the type and composition of the rubber, the types of carbon black and antioxidant used, the conditions of the irradiation (medium in which the irradiation was carried out and temperature), and several other factors. The yield of cross-links per 100 ev for extracted butadiene-styrene rubber irradiated in air comprises approximately 12; for extracted NK, approximately 4; and for technical SKS-30A, 2.5. The degree of structure formation increases with the temperature and decreases when an oxidation inhibitor (phenylbeta-naphthylamine) is present.

The irradiation vulcanizates exhibit a higher thermal and mechanical stability than thiuram vulcanizates without sulfur. It has been found that the irradiation vulcanizates change their characteristics least during the process of chemical stress relaxation. In contradistinction to sulfur vulcanizates, a correlation exists in the case of irradiation vulcanizates between the rate of chemical stress relaxation and the density of the vulcanization network of cross-linkages. These data testify to

the formation during irradiation vulcanization of cross-linkages of the C-C type. Introduction of active carbon black brings an increase in the thermal and mechanical stability of irradiation vulcanizates.

With the aid of infrared spectra, the presence of carboxyl, hydroxyl, ester, and ether groups was established in the irradiation vulcanizates of natural, butadiene-styrene, and sodium-butadiene rubbers obtained by irradiation in air. Double bonds disappear almost completely when a dose of 60×10^6 roentgens is applied to extracted butadiene-styrene rubber. In technical rubber which contains the antioxidant phenyl-beta-naphthylamine, the decrease in unsaturation on exposure to this dose amounts to approximately 30%.

The tendency of radiation vulcanizates to crystallize on stretching has been investigated in the case of vulcanizates of natural rubber. It was found that irradiation vulcanizates obtained as a result of the action of relatively low doses of radiation not exceeding $20\text{-}30 \times 10^6$ roentgens exhibit a degree of crystallinity equal to that of sulfur vulcanizates with the same density of the cross-linkages network. As the dose of irradiation increases, the degree of crystallization decreases.

The conditions under which bulk multilayer samples are obtained as a result of irradiation vulcanization were investigated. It was established that it is possible to produce a homogeneous vulcanization network independently of the thickness of the sample (within the limits of 0.1-40mm).

The physicomechanical and technical characteristics of the rubbers obtained as a result of irradiation vulcanization were investigated. It was found that in comparison with the best grades of sulfur vulcanizates containing the same quantity of filler, radiation vulcanizates exhibit an increased resistance to temperature aging (a stability which is 4-5 times higher at 130°), low residual deformation, a low hysteresis, a high stability toward the effect of multiple deformations, and a high temperature resistance. The tearing strength of radiation vulcanizates in dependence on the dose of radiation proceeds through a maximum. The index of tearing strength exhibited by radiation vulcanizates is lower than that of the best grades of sulfur vulcanizates.

"News Items (USSR)" (unsigned item); Moscow, Atomnaya Energiya, Vol 4, No 5, May 58, p 495

"The Scientific Research Institute of the Tire Industry together with the Scientific Research Physicochemical Institute imeni Karpov carried out irradiation vulcanization of three types of tires for motor trucks. As material for the tires carbon black-filled natural rubber and capron cord were used. The vulcanization was done at an installation for radiation-chemical investigations equipped with a Co^{60} radiation source having an activity corresponding to 21,000 gram-equivalents of radium and in the gamma-radiation field of an experimental nuclear reactor.

"As compared with the best sulfur-vulcanized rubbers containing the same quantity of filler, the radiation vulcanizates exhibited resistance to aging (at the temperature of 130°) which was 4-5 times greater, a low residual deformation, a low hysteresis, high resistance to repeated deformations, and high thermal resistance."

12. Use of Radioisotopes in Metallurgical Research at Ural Affiliate of Academy of Sciences USSR

"Application of Radioactive Isotopes in Metallurgical Investigations," by N. A. Vatolin and Ye. A. Vetrenko; Moscow, Atomnaya Energiya, Vol 4, No 6, Jun 58, pp 603-604.

Radioactive isotopes are being used to an increasing extent in metallurgical investigations being conducted at the Ural Affiliate of the Academy of Sciences USSR.

One of the most extensively used isotopes is S^{35}. By using this isotope, workers at the Laboratory of Steelmaking Processes, Ural Affiliate of the Academy of Sciences USSR; the Ural Institute of Ferrous Metals; and the Central Laboratory of the Verkh-Isetsk Metallurgical Plant investigated the desulfurization of transformer steel in a 14-ton electric furnace.

S^{35} was also used for the investigation of the interaction of a number of sulfides with sulfates and sulfur dioxide. It was found that as a result of the interaction of CaS with SO_2 the sulfide sulfur is fully eliminated, while sulfur and oxygen from the sulfur dioxide are transferred to the sulfate that is formed. During the analogous interaction of cobalt sulfide with sulfur dioxide an intermediate reaction with the formation of metallic cobalt takes place. In the investigation of reactions of sulfides with sulfates the application of tracer sulfur made it possible to establish the stoichiometric relationships with a great degree of precision, which is very difficult to accomplish by ordinary means.

The mechanism of the desulfurization of cast irons was investigated with the application of Fe^{59}.

By using Zn^{65}, the sublimation of zinc sulfide in processes applied in the treatment of polymetallic ores was investigated. The volatilization of selenium in metallurgical processes was studied with the application of Se^{75}.

Gamma radiation emitted by Co^{60} was employed by workers at the Laboratory of Metal Casting, Ural Affiliate of the Academy of Sciences USSR, in procedures for the control of the melting of cast iron in cupola furnaces. Co^{60} was also used in investigating the distribution of metal between mattes and slags in nickel production.

13. Review of Progress in USSR Chemical Research

"Annual General Meeting of the Department of Chemical Sciences, Academy of Sciences USSR" (unsigned article); Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 7, Jul 58, pp 908-910

The general annual meeting of the Department of Chemical Sciences was held 24-25 March 1958 at the auditorium of the Institute of Physical Chemistry, Academy of Sciences USSR. N. N. Semenov, academician-secretary of the Department of Chemical Sciences, presented a progress report on the most important achievements of work done at scientific institutions of the Department of Chemical Sciences and affiliates of this department during 1957 as well as on the organizational activities of the bureau of the department during the period in question.

As a result of the successes achieved by the USSR in the year that marks the 40th anniversary of the October Revolution, the erroneous assumption in regard to the weakness of Soviet science, which was based on an impression created by propaganda spread outside the USSR, became entirely untenable. The world realized that the Soviet people were able to create during the years of socialism a science which has in many respects overtaken the science of the US and of other technically advanced capitalistic countries.

A major part of Semenov's report dealt with the most important results obtained in work done at the institutes of the Department of Chemical Sciences. Significant results were obtained in 1957 at the Institute of Physical Chemistry. Research on the reduction of the mechanical strength and plasticity of metals by adsorption of surface-active agents made it possible to formulate a theory of the action of surface-active lubricants during the process of treatment of metals by pressure and to develop a number of new lubricants. The formulation of a theory of the formation of a double layer at the boundary metal-semiconductor has been completed. An electrical potential theory of physical adsorption has been formulated for adsorbents with an inhomogeneous energy distribution over the surface.

By applying isotopes for the investigation of the mechanism of catalysis, the correctness of new concepts pertaining to catalysis could be confirmed in connection with work done at the Institutes of Physical Chemistry and Chemical Physics. Progress has been made in research in the field of electrochemical kinetics and as far as the application of electrochemistry to the solution of problems of the theory of structure is concerned. A theory has been developed explaining the passage of current

through boundaries between semiconductors and electrolytes. Interesting data have been obtained on the radiation-chemical oxidation of organic compounds by the oxygen of organic solvents. Weighable quantities of technetium have been isolated from molybdenum irradiated with neutrons. [SIR Note: In a previous report on the general meeting of the Department of Chemical Sciences (cf. Scientific Information Report, 8 August 1958, PB 131891-T3, p 32, the material from which weighable quantities of technetium were isolated was incorrectly given as neutron-irradiated lithium.] Some of the properties of technetium were investigated. Methods have been proposed for the dispersion of thermal clouds and fogs, the elimination of dust which may cause silicosis, and protection of various objects against corrosion. These methods are undergoing successful tests and will be introduced into practical application.

One of the shortcomings of work conducted by the Institute of Physical Chemistry is insufficient coordination between the activities of individual laboratories and divisions.

At the Institute of Chemical Physics, progress has been made in work on the theory of chain reactions. A theory of the propagation of shock waves of low amplitude has been developed for nonlinear conditions. The theory of thermal explosions which had been formulated earlier at this institute was expanded further and applied to the detonation of condensed explosives. A new method has been developed for the oxidation of the simplest hydrocarbons in the liquid phase at temperatures and pressures close to the critical.

Significant progress has been made in the development of new appliances. A new type of "time magnifying glass" has been designed for the investigation of rapid processes. With the use of this appliance, observations involving the recording of as many as 33 million frames per second can be made. A new type of mass spectrometer has been developed. The principle of the recharging of ions which underlies the operation of the new mass spectrometer makes it possible to obtain spectra with a small number of lines. Piezoelectric appliances for measuring pressure have been developed. An apparatus has been designed for measuring electronic paramagnetic resonance in work pertaining to the investigation of chemical kinetics. New results on glass plastics [plastics reinforced with glass fibers] have been obtained at the Laboratory of Anisotropic Structures.

At the Institute of High-Molecular Compounds progress has been made in the development of heat-resistant polymers, including transparent polymers of this type. New data have been obtained on the mechanism of catalytic polymerization. Possibilities have been found of synthesizing block polymers with different numbers and dimensions of the blocks. It has been established that there is a correlation between the rate of destruction of polymers and creep. A theory explaining the mechanical

strength and deformability of oriented polymers and a theory of intermolecular and intramolecular interactions have been developed. Work is continued on the stabilization of cellulose and of its derivatives and on the clarification of the mechanism of the oxidative decomposition of cellulose esters and/or ethers. New adsorbents have been synthesized which exhibit a high selectivity. New scintillator plastics and polyelectrolytes useful for modifying the structure of soil as well as flotation and coagulation agents have been developed. New appliances have been designed for the investigation of the photoelastic effect and of dynamic birefringence and forthe application of procedures employed in the investigation of reactions by the method of electronic magnetic resonance.

At the Institute of Organoelemental Compounds new methods for the synthesis of organoelemental compounds have been developed on the basis theoretical concepts formulated earlier. Alkylations of ferrocenes have been carried out for the first time and the effect of different substituents in ferrocenes on the orientation has been clarified. A new method for the synthesis of tropilium has been found. It has been demonstrated that extensive possibilities exist of obtaining organoelemental compounds by reacting trialkyl aluminum with the halides of different elements.

Interesting syntheses of peptides containing sulfur have been accomplished. New ylide systems with charges separated by an aromatic nucleus have been synthesized. The development of the theory of tautomeric equilibrium has been continued.

The tendency to use the results of theoretical research and theoretical concepts for the solution of important practical problems, specifically problems pertaining to the development of new monomers and polymers, is characteristic for the Institute of Organoelemental Compounds. The results of a considerable number of investigations are being applied in developmental work. This includes the synthesis of aminoenantic acid for the production of the fiber enant, the synthesis of thiodivaleric acid, and the production of highly fluorinated compounds to be used as plasticizers and lubricants.

Of great importance are materials with a high heat resistance based on polyorganometallosiloxanes and elastomers with a high heat resistance derived from organosilicon compounds. A large number of organoelemental compounds containing phosphorus, silicon, germanium, tin, and other elements has been synthesized. Work is being conducted on the synthesis of new organophosphorus insecticides.

Extensive investigations have been conducted at the Institute of Organic Chemistry. New data have been obtained which confirm the structural and energy relationships underlying the multiplet theory. Investigations of methods for the synthesis of and determination of the properties of various types of organoboron compounds have progressed and successful work has been done on organosilicon monomers and vinyl compounds. A new method has been developed for the synthesis of macrocyclic compounds which is based on the scission of thiophene rings. The employment of tracer atoms has made it possible to obtain interesting data which contributed to the clarification of the mechanism of a number of reactions such as azoxy couplings, isomerizations, and reactions leading to azoxy compounds.

Many of the results obtained are of great importance for the national economy. A two-stage method has been developed by which isoprene is obtained from isopentane with a high yield. A method has been proposed for the complete conversion of petroleum residues involving the production of gaseous olefins with simultaneous reduction of the ores of nonferrous metals. New efficient methods have been developed for the synthesis of a number of substances used in perfumery (nerol, geraniol, and farnesol). New luminophores have been synthesized. It was established that lignin that has been oxidized with nitric acid can be used to advantage in the drilling of petroleum and gas wells. An effective method for synthesizing the insecticide isodrene has been found. It was shown that, by hydrogenating in an acidic medium cheap raw materials containing pentosans, one may obtain valuable polyatomic alcohols with good yields.

At the Division of the Chemistry of Petroleum and Gas of the Petroleum Institute work has been successfully completed on the synthesis of propylene and polypropylene, the polymerization of ethylene into a high-melting polyethylene, the radiolysis of hydrocarbons under the action of nuclear radiation, and high-velocity cracking of paraffinic hydrocarbons.

At the Institute of General and Inorganic Chemistry imeni N. S. Kurnakov work has been continued on the investigation of physicochemical properties of compounds of rare elements. The effects produced by the temperature, concentration, pressure, and other factors governing equilibrium on the composition, structure, and reactivity of compounds of this class were investigated. New data have been obtained on the chemistry of complex compounds. The development of a new theory of the hydration of ions in aqueous solutions was completed. A new method for the production of anhydrous tin chloride and a method for refining tin in the form of its chloride were tried out on an industrial scale and found suitable. A new method has been developed for the group precipitation of platinum metals by means of which the total quantity of platinum metals present in dilute solutions can be precipitated.

At the Institute of Silicate Chemistry a new method has been proposed for the synthesis of methylsiloxane chlorides which contain in the principal chains alternating atoms of silicon and carbon. It proved possible to expand the application of the reaction of catalytic dehydrocondensation of trialkyl silanes with different oxy-, oxo-, and polyoxyorganic compounds. It was established that hexalkyldisiloxanes are capable of splitting under the action of alcohols; organosilicon compounds can be synthesized by this means. A series of investigations has been completed on the principal mineral used in ceramic production, namely, mullite, and on the nature of solid phases formed as a result of the heating of oxides of elements of the fourth group of the periodic system. The institute is conducting successful work on the introduction into industrial application of special types of protective coatings and impregnating agents.

At the Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy progress has been made in research on the geochemistry of niobium, tantalum, zirconium, hafnium, molybdenum, rare-earth elements, zinc, lead, uranium, and boron. Work has been continued on the determination of the absolute geological age by radioactivity methods. New biogeochemical subdivisions ("provinces") were found. A major deposit of boron minerals was found by means of neutron core sampling. In the field of analytical chemistry, work on the development of methods for the determination of many chemical elements by spectral, X-ray, oscillographic, chromatographic, and radioactivation procedures was done. Research in the field of nuclear chemistry was continued successfully.

At the Radium Institute imeni V. G. Khlopin the existence of the formerly discovered cis-effect in complex compounds of divalent platinum has been confirmed experimentally. Progress was made in the investigation of the properties of different compounds of uranium, thorium, plutonium, radiozirconium, radioniobium, and rare earths. Interesting data have been obtained on the behavior of substances in extremely dilute solutions. Work has been successfully continued on the investigation of the mechanism of the splitting of complex nuclei by fast particles. Work has also been done on cosmic radiation and the determination of absolute geological age. A method has been developed for producing photoemulsions with a very high degree of grain dispersion. These emulsions exhibit a high sensitivity.

At the Hydrochemical Institute, work was continued on the physicochemical conditions under which natural waters are formed and the changes in the hydrochemical conditions at water reservoirs in connection with hydrotechnical construction.

At the Kazan' Affiliate of the Academy of Sciences USSR organophosphorus and organoarsenic compounds were synthesized and investigated. A general method has been developed for the synthesis of various substituted amidophosphates. A method has been proposed for the synthesis of the free radical diphenylpicrylhydrazine. Extensive tests are being conducted on the insecticides octomethyl and dithiophos and on the drug phosorbin. Investigations of petroleum and natural gas occurrences in the Tatarskaya ASSR are being continued.

At the Ural Affiliate of the Academy of Sciences USSR a method has been developed for the complete utilization of dusts and distillates (and/or sublimates) with the extraction of rare elements. Research has been done on the electrolysis of rare metals and the development of a solid electrolyte for fuel cells. The quantitative characteristics of the reactivity of the benzene nucleus in reactions of alkylation with olefines in dependence on the nature of the catalysts, of the alkyl groups, and the temperature of the process were defined. Results of importance from the standpoint of practical applications were obtained in work on the development of high-quality reaction engine fuels and diesel fuels.

At the Bashkir Affiliate work is being successfully conducted on the development of new methods for the conversion of petroleum crudes containing sulfur.

In summarizing the information given in his report, Semenov remarked that during recent years, particularly in 1957, considerable progress has been made in the fields of organic synthesis, the theory of structure, and the reactivity of organic substances. The progress made in the fields mentioned is due primarily to work done at the Institute of Organoelemental Compounds, which has rapidly become one of the principal centers in the world at which research on organoelemental compounds is done. Significant progress has been achieved in petroleum chemistry and heavy organic synthesis, although the rate of development in this general field cannot be regarded as adequate. It is necessary to expand considerably research on the chemistry of polymers and on the synthesis of naturally occurring compounds and compounds of importance from the biological standpoint. In the field of inorganic chemistry, work on the chemistry of complex compounds, particularly those of platinum metals, in radiochemistry, and in goechemistry is on a sufficiently high level. Although some progress has been made in the chemistry of rare elements, it is necessary to expand work in this field to a considerable extent. Work on general problems of inorganic chemistry, the theory of valency, thermochemistry, and the chemistry of semiconductors is conducted on an inadequate scale.

In the field of physical chemistry, the work of the institutes of the Department of Chemical Sciences is at a sufficiently high level as far as problems in the field of surface phenomena, the chemistry of electrode processes, chemical kinetics and catalysis, and the kinetics of combustion and explosions are concerned. Quantum mechanics are still not being applied to an adequate extent in chemistry. The lag which exists as far as the development of new physical and physicochemical methods is concerned must be ascribed principally to the absence of adequate support from the standpoint of the design and development of new equipment.

14. Electrical Charges on Natural and Artificial Cloud Particles Investigated

"On the Electrical Charges of Cloud Particles," by A. P. Sergiyeva, Institute of Applied Geophysics; Moscow, Izvestiya Akademii Nauk SSSR Seriya Geofizicheskaya, No 3, Mar 58, pp 347-357

Method and apparatus are described for the measurement of charge on a large number of particles. Data were obtained on the distribution of charges of both artificial and natural clouds. It was shown that in the case of artificial clouds the number of charged particles depends on the age of the cloud. Data were also obtained on the distribution of charges in a unipolarly charged fog and in natural clouds. It was shown that in natural clouds, as the particle size increases, the dispersion of charge also increases.

This method has many advantages over existing methods. It has a high resolution and permits measuring the distribution of charges on a sample of 50,000-100,000 particles of unequal radii. The apparatus itself is of such design that the aerosol is maintained at its original temperature while being analyzed. The method permits measuring the distribution of charges on artificial and natural clouds, changes in this distribution, and the magnitude of charge on individual particles. The apparatus captures fine particles of 4-60 microns if the charges on them are such that the ratio e/r varies in the interval $0.4 \cdot 10^{-4}$ to $8.0 \cdot 10^{-4}$ electrostatic units/cm. It is stated that the method is useful for investigating solid or liquid aerosols.

IV. ELECTRONICS

Communications

15. New Method of Single-Sideband Signal Generation

"Certain Potentialities of Phase-Filter Method of Single-Sideband Signal Generation," by I. V. Lobanov; Moscow, Elektrosvyaz', No 8, Aug 58, pp 22-29

The article describes a two-channel variant of single-sideband signal generation utilizing a new phase-filter method.

"In the process of investigation of the new method, we have established the possibility of a two-channel operation which can be brought into effect by connecting to the output of the device an additional unit assembled with low-frequency transformers."

The filter calculation was carried out with the aid of a standard developed at the Chair of Long-Range Communication of the Military Engineering Academy of Communications imeni S. M. Budennyy. The experimental equipment was tested in the frequency range of 1-4 Mc.

The results obtained from the first series of tests of this single-sideband signal generation method proved very promising in application to HF and VHF signal modulation.

16. Recent Soviet Patents in Communication Field

"Authorship Certificates" (unsigned article); Moscow, Elektrosvyaz', No 7, Jul 58, pp 77

Class 21a, 32_{54}. No 108554. Ye. A. Nikitin, N. I. Svetlov, and V. P. Yurchenko. Method for Improving Raster Quality in a Facsimile System.

Class 21a, 1. No 110309. A. M. Pshenichnikov. Device for Conversion of DC Voltage Into Proportional Repetition-Rate AC Voltage Pulses.

Class $21a^1$, 7_{01}. No 111231. V. Ye. Bukh-Viner. Method for Noise Immunity Improvement in Repeating Multichannel Systems.

Class $21a^1$, 3_{13}^4. No 110718. N. L. Artem'yev and G. V. Braude. Photoconducting Target of Television Transmitting Tubes With Photoresistors.

Class $21a^1$, 9_{02}. No 109683. M. U. Polyak. Audio-Frequency Telegraphy Method With Manipulation of Sideband Modulation.

Class $21a^1$, 32_{11}. No 109961. I. I. Zhilevich. Device for Reception of Facsimile Images With Aid of Ferromagnetic Particles.

Class $21a^2$, 36. No 110268. V. I. Smirnov. Device for Obtaining Delayed Coincidences.

Class $21a^2$, 5_{07}. No 110568. A. D. Tkachenko. Telephone Noise-Immune Fittings.

Class $21a^3$, 3. No 109995. I. Ye. Finkler. Telephone Commutator for Central Battery System.

Class $21a^3$, 66. No 109992. V. A. Godlevskiy, S. A. Vasilyev, L. M. Gol'shteyn, M. F. Lutov, and O. A. Sobolev. Method of Identification of Calling Number and Device Accomplishing it.

Class $21a^3$, 67_{30}. No 110329. B. S. Livshits, M. M. Vitsnudel', and S. V. Levina. Device for Transmission of Inductive Signals.

Class $21a^4$, 8_{02}. No 109993. L. A. Korneyev. Quartz Oscillator.

Class $21a^4$, 71. No 107500. M. I. Syr'ev. Method of Measurement Electric Field Intensity.

Class $21d^2$, 12_{02}. No 110270. P. V. Terent'yev. Device for Protecting High-Voltage Rectifiers From Anode Overvoltage During Break in Heater Circuit.

Class 21e, 12. No 110228. V. A. Kadkin. Device for Measuring Magnetic Properties of Ferromagnetic Materials.

Class 21e, 37_{02}. No 109990. V. I. Itskhakin, G. F. Filippov, and P. P. Dmitriyev. Method of Testing High-Frequency Coaxial Cables With Current for Their Heating.

Class 21g, 10_{01}. No 110441. B. M. Vul. Nonlinear Semiconductor Capacitor.

Class $42g$, 10_{01}. No 110566. T. Ye. Zaytsev. Method of Estimating Sound Fidelity and Speech Intelligibility for Transmission Over a Telephone Channel.

17. Further Possibility of Narrowing Telephone Channel

"Possibility of Telephone Channel Spectrum Narrowing by Transmission of Instantaneous Speech Frequency or by Application of Frequency Dividers," by A. V. Kandinov and G. I. Tsemel'; Moscow, Elektrosvyaz', No 8, Jul 58, pp 3-8

The article describes experimental investigation of telephone-transmitted speech restored by its instantaneous frequency and amplitude. The basis for the suggested system of narrowing the frequency spectrum of a telephone signal is the assumption that the spectrum of instantaneous frequency of a speech signal is considerably narrower than the frequency spectrum of the speech on a whole. This system presumably can be realized by two methods: transmission of instantaneous speech signal frequency in the communication channel or division of frequency of the converted speech signal.

The evaluation of the quality of speech restoration was conducted with coherent speech as well as with separate syllables and was judged for speech articulation and naturalness of sound by four listeners. It was thus established that, in case of spectrum limitation of the modulating signal by a 0- to 2,000-cycle band-pass filter, the speech was fully restored with all the original peculiarities of the voice.

Electromagnetic Wave Propagation

18. Effect of Ground Conductivity on Radio Wave Propagation

"Radio Wave Propagation and Ground Conductivity," by V. Kashprovskiy, Moscow, Radio, No 7, Jul 58, pp 19-21

The article describes five methods for measurement of ground conductivity which has a pronounced effect on the propagation of ground radio waves. The article suggests a simple method of ground conductivity measurement based on measurement of electromagnetic wave attenuation in the ground. Investigations have shown that for the greater part of the USSR territory the radio wave attenuation (β) in the wavelength range from 200 to 2,000 m can be expressed by the formula

$$\beta = 2\pi\sqrt{\frac{30\sigma}{\lambda}}$$

where σ is ground conductivity expressed in mho per meter and wavelength λ in meters.

In the Moscow region, where ground consists mostly of clay formations with a high water table, the value of ground conductivity is about 10^{-2} mho per meter.

19. Efforts to Compile a Ground Conductivity Map of USSR

"Rules for Radio Amateur Competition in Compiling the Ground Conductivity Map of the USSR" (unsigned article); Moscow, Radio, No 7, Jul 58, p 18

The competition is organized for the purpose of mass engagement of radio amateurs in helping to collect data on ground conductivity of the USSR. All participants in the competition submitting valuable data on ground conductivity will be awarded diplomas from the periodical Radio.

All materials pertaining to ground conductivity should be submitted to the All-Union Scientific Research Institute of Terrestial Magnetism, Ionosphere, and Radio Wave Propagation. The final date for submission of the information collected will be 1 September 1959.

Aids to Navigation

20. MPK-1 Portable Direction Finder

"Portable Field Radio Direction Finder MPK-1 With Magnetic Antenna," by N. Korsakov; Moscow, Morskoy Flot, No 5, May 58, p 21-22

At the experimental shops of the Arctic Scientific Research Institute of the Main Administration of the North Sea Route, Ministry of Maritime Fleet USSR, a highly portable radio direction finder, the MPK-1, was developed. The device permits accurate determination of the direction of any operating radio station. This direction finder with its magnetic antenna is mounted in a 10 x 18 x 25 cm wooden box. Small power-supply batteries are placed in the pockets of the operator.

The MPK-1 is a superheterodyne, 3-d class radio receiver assembled with miniature tubes (1A2P, 1B2P, 1K2P). The wavelength reception band is 400-1,300 m.

The experimental MPK-1 unit was tested under field conditions on the Karelian Isthmus about 100 km from Leningrad.

21. Effect of Noise on Automatic Tracking Systems

"The Effect of Noise Fluctuations on the Accuracy of an Automatic Tracking System With a First Order Astaticism and a Passband Controlled by the Input Signal," by Yu. M. Kazarinov, Yu. A. Kolomenskiy, and R. I. Smirnov, Leningrad Electrical Engineering Institute imeni V. I. Ul'yanov [Lenin]; Leningrad, Izvestiya Vysshikh Uchebnykh Zavedeniy-Priborostroyeniye, No 2, 1958, pp 3-12

An attempt is made to determine the increase in accuracy of a system having a passband controlled in accordance with changes in the spectrum of the input signal in comparison with a system having constant parameters. The problem assumes that the input value of the tracking system changes with constant speed and white noise is present at the input of the receiving device.

A comparative evaluation is made experimentally of the root-mean-square error of a pulse-phase system of automatic frequency tuning with a constant and a controlled amplification factor.

As a result of the analysis an expression is obtained for the RMS error in relation to the basic parameters of the system, and conditions are found for the minimum RMS error for the presence of noise fluctuations and a constant rate of change of the pulse signal. The RMS error of the system may be significantly decreased by controlling the passband relative to variations in the speed of change of the pulse signal.

22. New Radar Station "Don"

"To Coordinate the Interests of Fleet Operation With the Safety Requirements of Navigation" (unsigned article); Moscow, Morskoy Flot, No 6, Jun 58, pp 1-2

The article contains the following passage: "In the second quarter of 1958 our ships will be receiving the new radar station "Don" which will be in no way inferior in their technical parameters to foreign models of similar class. A new small-size radar station is now in the process of design."

23. Speed Regulation in Magnetic Recording Systems

"On Speed Regulation of a Synchronous Reluctance Motor in Systems of Precision Magnetic Recording," by L. A. Pusset; Moscow, Avtomatika i Telemekhanika, No 6, Jun 58, pp 574-581

The stability of systems of automatic speed regulation of synchronous motors as used in tape transport mechanisms is examined and certain recommendations are given on the choice of parameters for such systems.

The advantages of electromechanical phase-detecting elements over simple phase discriminator circuits are pointed out. These include greater freedom in selection of parameters for achieving stability in the regulation process and less relative dependence on voltage fluctuations which would cause changes in frequency.

24. New Highly Sensitive Frequency Meter Developed

"On the Problem of Design of Frequency Meters for Commercial Frequencies," by M. L. Fish, Penza Industrial Institute; Leningrad, Izvestiya Vysshikh Uchebnykh Zavedeniy-Priborostroyeniye, No 2, 1958, pp 22-31

A commercial frequency meter based on a phase circuit developed by the author and V. N. Mil'shteyn (Izmeritel'naya Tekhnika, No 6, 1955) is described and compared with other meters of the same category. The meter uses a magnetoelectric ratiometer as the measuring device.

Specifications of the new instrument include the following: measuring range, 49-51 cycles; power consumption with filter, 2.5 w; error due to voltage change of 10%, 0.02%; weight, 8 kg; and dimensions, 180 x 200 x 230 mm.

The design of this new frequency meter is seen as the basis for the construction of a series of meters covering a band of 40-1,500 cycles.

25. Use of Electromechanical Feedback in Profilometers

"Correction of Measuring Force of a Contact-Type Profilometer by Means of Electromechanical Feedback," by N. G. Ignat'yev, Leningrad Institute of Precision Mechanics and Optics; Leningrad, Izvestiya Vysshikh Uchebnykh Zavedeniy-Priborostroyeniye, No 2, 1958, pp 83-92

The author proposes a method for correcting the dynamic and static forces of the feeler needle of a profilometer. The principle of operation relies on the application of a negative force of an electromechanical system to the acting force of the basic electromechanical feeler system; the resulting force of the needle on the surface of an object is the difference between these two.

A description of the profilometer feeler system and amplifier circuit is given and the amplitude-frequency characteristics of the feedback circuit are determined.

Electromechanical feedback coupling is found to be particularly effective in high-speed profilometers which have considerable inertial force.

26. Ultrasonic Cutting Device Developed

"Ultrasonic Semiautomatic Device," by A. P. Sviridov, Central Scientific Research Laboratory; Leningrad, Izvestiya Vysshikh Uchebnykh Zavedeniy-Priborostroyeniye, No 2, 1958, pp 159-163

The author examines the effect of magnetostriction in ultrasonic devices and its application in a number of production processes.

Magnetostrictive semiautomatic devices for cutting hard stones (having a hardness of 6-9 on a 10-unit scale) were developed in 1957 in the Central Scientific Research Laboratory of the Gem Stone Industry in Leningrad. The 200-watt oscillator used in the instrument operates in a frequency band of 15-25 kc, and the frequency of the vibrator is 18-18.5 kc.

The device is designed for cutting corundum, agate, quartz, porcelain, and similar materials to a diameter of 0.5-25 mm and a depth of 10-15 mm. The abrasive suspension used is boron carbide and water.

The efficiency of magnetostrictive vibrators at frequencies of 16-25 kc was found to be 40-50%.

27. Printed Circuit Development in USSR

"Potentiometer Electronic Amplifier With Printed Circuit," by Ye. V. Migushin; Moscow, Priborostroyeniye, No 6, Jun 58, pp 19-21

 The article contains the following passages:

"In our domestic radio-electronic industry the methods of pressing and electrochemical deposition of copper ('Start' TV set, 'Dorozhnyy' radio receiver, computers, etc.) are widely used in the manufacture of printed circuits.

"After centralized production of pertinax sheets is organized (at the Izolit plant), a considerable improvement in printed circuit technology and introduction of the foil etching method (radio receivers Kristall, Volna, and others) can be expected.

"We are manufacturing electronic UE-109 and UE-209 amplifiers in several models. Such amplifers are intended to magnify small dc signals from data-transmitting measuring units, etc.

"The electronic amplifiers are now assembled on two insulting printed sheets of laminated GF-1VV pertinax 1.0-1.5 mm thick with a 0.03- to 0.05-mm-thick copper printed circuit.

"The printed circuit is one-sided, i.e., all the radio components (capacitors, resistors, tubes, etc.) are mounted on the circuit-free side. This construction of the printed sheet is made for the purpose of automatic soldering of the electric contacts by means of immersion in molten solder.

"In developing the design and technology of printed circuits, the experience and achievements of design bureaus, scientific research institutes, and plants of various administrations, as well as the results of experimental work conducted by the All-Union Scientific Research Technological Institute for Instrument Building (VNITIpribor) in cooperation with the L'vov Plant, were exploited."

28. Examination of Periodic Conditions in Systems of Automatic Regulation

"On the Stability of Periodic Conditions in Systems of Automatic Regulation Found Approximately on the Basis of Filter Hypothesis," by V. A. Taft; Moscow, Avtomatika i Telemekhanika, No 6, Jun 58, pp 558-563

An approximate method is suggested for analyzing the stability of periodic conditions in nonlinear systems of automatic regulation. This method is based on the assumption that the system contains a linear filter. A comparison is made between the conditions of stability derived by this method and those suggested by L. S. Gol'dfarb (Avtomatika i Telemekhanika, No 5, 1947) based on the method of harmonic balance.

29. Analysis of Dynamics of Relay Servomechanism

"Dynamics of an Electric Relay Servomechanism With the Load Changing Proportionally to Motion," by N. S. Gorskaya; Moscow, Avtomatika i Telemekhanika, No 6, Jun 58, pp 540-557

The author examines the dynamics of an electric relay servomechanism, the load of which changes proportionally to movement. Movement of the servomechanism is described by a complete second order differential equation where the right side of the equation is a relay function representing a characteristic with a loop and a dead zone. A complete solution of the problem is given by the method of point conversion.

30. Reproduction of Functions of Variables Into Electrical Voltage

"One Method for the Reproduction of Functions of Two Independent Variables," by A. V. Paley and V. S. Pustyl'nikov, Penza Industrial Institute; Leningrad, Izvestiya Vysshikh Uchebnykh Zavedeniy-Priborostroyeniye, No 2, 1958, pp 36-43

A method is suggested for the reproduction in voltage form of any functions of two independent variables. Intersecting curves and families of intersecting curves may be reproduced by this method using electrical conoids with comparatively simple circuits.

Such conoids have been used in pilot training for determining the relationship between the true flight speed of an aircraft and the number of revolutions of the engine and pitch angle of the plane. An ordinary servosystem with an electronic amplifier and a Type RD-09 motor is used to convert the voltage taken from the conoid to an angle of rotation.

Materials

31. Solar Energy Converters

"Silicon Photocells as Solar Energy Converters," by V. S. Vavilov, G. N. Galkin, and V. M. Malovetskaya; Moscow, Atomnaya Energiya, Vol 4, No 6, Jun 58, pp 571-575

Results of investigation of properties of p-n junctions obtained by means of thermodiffusion of phosphorus into silicon of p-type are described. Data on charge and spectral characteristics of silicon photocells with p-n transitions and on the work performance of these photocells at strong intensities of illumination are presented.

V. ENGINEERING

32. Electromagnetic Mining Devices

"Radio Waves Disintegrate Rock," by V. Pospelov; Moscow Promyshlenno-Ekonomicheskaya Gazeta, 1 Jun 58, p 3

Presents some of the achievements of the All-Union Scientific Research Coal Institute in the field of non-mechanical rock crushing. The projects are under the supervision of Anatoliy Vasil'yevich Varzin.

The radiating device "Shakhta" was specifically developed for the secondary crushing of large pieces of ore and hard rock in the mines of Ust'-Kamenogorsk. It may also be applied in stoping when explosives are not admissible. Direct current is supplied to the radiator from a rectifier placed within or outside of the mine. The power in continuous radiations is about 2.5 kilowatts at a frequency of 3,000 megacycles. When directed at rocks the energy of the electromagnetic waves is transformed within the rocks into thermal energy. The resulting stresses cause crystal and layer displacements which end in disintegration of the mass.

A more powerful apparatus of the system "Gornyak" is being placed in series production and a new mining unit of the "radio combine" is being developed. The new unit will be equally effective with both the hardest and softest rocks and in the opinion of specialists may become the universal mining machine of the future.

33. Apparatus for Testing Metals at Superhigh Pressures

"Apparatus for Mechanical Tests of Metals at Pressures up to 30,000 Kilograms per Square Centimeter." by Yu.N. Ryabinin, L. F. Vereshchagin, D. B. Balashov, L. D. Livshits; Moscow, Pribory i Tekhnika Eksperimenta, No 2, Mar/Apr 58, pp 79-85

Gives a detailed description of the design and operation of an apparatus for testing the ductility and tensile strength of metals and alloys under hydrostatic pressures up to 30,000 kg/cm^2. The authors say the basic idea of the device was that of Bridgman (P. V. Bridzhmen, Issledovaniya bol'shikh plasticheskikh deformatsiy i razryva [Investigations of Large Plastic Deformations and Rupture], 1955, Publishing House of Foreign Literature, IIL). However, the lack of sufficient detailed data necessitated reconstruction of a similar apparatus from the beginning utilizing experience acquired in other experiments in the field of high pressures.

The device consists basically of a multiplier for generating the desired pressure and a medium (of either pentane or aviation gasoline as neither congeal at the high operating pressures) for transmitting this pressure to the test specimen. The test specimen is placed in a reverser which is located in the high-pressure chamber forming the so-called "laboratory under pressure." This high-pressure chamber is set in a thick-walled conical vessel made of steel 45KhNMFA heat treated to 48 to 50 R_c hardness. This vessel is in turn seated in a thick-walled retaining vessel made up of three rings of 45KhNMFA steel heat treated to 43 to 45 R_c. Pressures of 260 to 300 kg/cm^2 are supplied to the multiplier by an NZhR type high-pressure pump.

The plunger which delivers pressure to the high-pressure chamber is made of the superhard, powdered metal alloy VK8 (92 percent tungsten carbide and 8 percent cobalt) which was tested at pressures in excess of 30,000 kg/cm^2. Steel ShKh15 heat treated to 58 to 60 R_c hardness is used for a bushing component in the electric lead-in of the multiplier. A so-called "compressimeter" for measuring forces directly acting upon the specimen is tied in to a double Thomson Bridge circuit at the electric lead-in. Pressure within the working fluid (test chamber) is measured directly by a manganin manometer the resistance of which was tested by a Wheatstone Bridge type MVL-47 with a galvanometer type GZP-47. Resulting measurements of liquid pressure were accurate to within one percent.

The apparatus was developed at the Laboratory of the Physics of Super-High Pressures, Academy of Sciences USSR and tested at operating pressures of 30,000 kg/cm^2. Investigations were performed on the ductility of steel. A photograph is given of a test specimen of steel 45.

34. Power Production Planning in the USSR

"Factory Manufacturing Technique of Thermal Electric Stations as Important Factor in Reducing Time and Cost of Construction," by F. V. Sapozhnikov; Moscow, Elektricheskiye Stantsii, No 7, Jul 58, pp 8-12

The article includes the following passage:

"At present 80% of the total electric power generated comes from thermal electric stations. The ratio of electric power production is expected to remain approximately the same for the period 1959-1965. Therefore, power generation expansion as a whole will depend on the tempo of construction of new thermal electric stations.

"The planned increase in production of natural gas will further accentuate the significance of construction of thermal electric stations as the most economical form of capital investment."

35. Hysteresis Motors

"General Problems of the Theory of Hysteresis Electric Motors," by A. N. Larinov, N. Z. Mastyayev, and I. N. Orlov of Moscow Power Engineering Institute, and D. N. Panov of Taganrog Radio Engineering Institute; Moscow, Elektrichestvo, No 7, Jul 58, pp 1-6

Initial work on hysteresis motors began in the USSR in 1950 at the Chair of Electrical Equipment for Aircraft and Automobiles of the Moscow Power Engineering Institute, and later was extended to other scientific-research institutes and plants. Due to their valuable features, hysteresis motors, are now becoming more widely used. The hysteresis motor is a synchronous motor with a permanent magnet field. The stator is wound in a conventional manner and the rotor is made of magnetically hard material and has no winding. The article describes a method for calculation and design of hysteresis motors.

36. Effect of Power Supply From Kuybyshev Hydroelectric Plant on Moscow Network Performance

"Operation of Thermal Electric Station Systems Under Conditions of Variable Load," Ya M. Ostrovskiy, N. P. Kurkin, A. I. Kryukov and I. Z. Tsyrkin; Moscow, Teploenergetika, No 8, Aug 58, pp 3-8

The article describes the problems that arose at the thermal electric stations of Mosenergo (Moscow Regional Power System Administration) as a result of power supply from the Kuybyshev Hydroelectric Plant. Prior to connection (1956) of the Kuybyshev Hydroelectric Plant to the Moscow power network, the major portion of power was generated at thermal electric stations which comprised about 85% of the total installed capacity of the system. As a result of supplying power to the Moscow network from the Kuybyshev plant, the daily electric power generation at the thermal stations has become highly irregular and the utilization of installed capacity has decreased considerably. The number of hours of utilization of installed capacity at the thermal stations fell in 1957 to 4,507 hours as compared to 6,358 hours in 1956 and 6,981 hours in 1955. Power generation at the thermal stations in 1957 has dropped 23% compared to 1956.

"It should be noted that, although the power supply from the Kuybyshev Hydroelectric Plant has complicated the operating performance of a number of thermal stations, it has at the same time set up a precedent for radical improvement of power supply to consumers, as well as improvement of reliability and economy of operation of the system's electric stations.

"The new operating conditions of thermal electric stations, resulting from power reception from the Kuybyshev plant, required preparatory work in all steam-generating departments of the electric stations.

"In the boiler rooms, due to a sharp increase in the number of boiler firings, an acute problem arose of how to reduce the firing time in order to lower the fuel consumption and to effect the boiler firing in the shortest possible time during the morning load peaks of electric stations utilizing a minimum of on-duty personnel.

"Thus, in spite of greater operating difficulties at the thermal stations caused by sharply increased load fluctuations, measures were taken to assure reliable operation of electric stations, to improve technical-economical operation indexes of the system on the whole and to assure sufficient flexibility of the standby "hot" reserves in case of disruption of the Kuybyshev-Moscow electric transmission line."

37. Use of Helicopters for Laying Down Fireproof Zones During Forest Fires

"Laying Down Fireproof Barrier Zones From a Helicopter," by N. Kubatskiy, V. Molchanov and P. Bitkov; Moscow, Grazhdanskaya Aviyatsiya, No 4, Apr 58, p 31-32

After briefly reviewing US efforts to use helicopters to lay protective fireproof zones during a forest fire, the authors state that they have used a PS-8 compressor installed on a MI-4 helicopter and have been successful in 44 tests out of 56. The PS-8 compressor weighs approximately 180 kgs and has a 600 liter capacity which is capable of covering an area 100-300 meters long. Plans call for increasing this to 200-400 meters.

38. All-Union Society of Inventors and Rationalizers Organized

"At the Organization Committee of the All-Union Society of Inventors and Rationalizers," unsigned article, Moscow, Izobretatel' i Ratsionalizator, No 5, May 58, p 5

A passage from the article reads as follows:

"The workers, engineering-technical personnel and employees enthusiastically supported the resolution of the Presidium of the All-Union Central Council of Trade Unions concerning organization of the All-Union Society of Inventors and Rationalizers. Wide masses of workers were actively and in a business-like manner involved in the work of organizing the primary branches of the society."

The chairman of the Organization Committee of the new society is Viktor Pavlovich Karyakin.

VI. MEDICINE

Communicable Diseases

39. Brucellosis Control in Voronezhskaya Oblast

"Experimental Work on Brucellosis Control in Voronezhskaya Oblast," by T. G. Dzhuro, Voronezhskaya Oblast Sanitary-Epidemiological Station; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 29, No 7, Jul 58, pp 98-103

The purpose of publishing this article was to acquaint the journal's readers with the brucellosis control program organized by the author in Voronezhskaya Oblast, in which the presence of the disease among cattle was verified bacteriologically in 1931. Brucellosis was also detected among humans from 1947 to 1956 in all rayons of the oblast except two. Incidence data collected for cattle, sheep, goats, swine, and humans are presented and analyzed.

On the basis of data obtained in epidemiological and epizootological studies in the oblast, attempts were made to decrease the incidence of brucellosis among humans in disease foci. The first step of the eradication program was the distribution of special forms to all farms threatened with brucellosis and to rayon sanitary-epidemiological stations. Results of monthly examination of animals for brucellosis, date of placing the farm under prophylactic control, and date when healthy conditions had been re-established were noted on these forms, of which five types are illustrated. All antibrucellosis measures employed are discussed in the text. It is stated that new agents -- sulfanilamides and antibiotics -- were employed in treating brucellosis patients, but that intravenous vaccine therapy remained the basic method.

 The following conclusions are offered on the basis of data obtained:

"1. Complex measures which should be taken by medical, veterinary, and farm organizations have determinative significance in brucellosis control. Timely vaccine prophylaxis (vaccination and revaccination) has a large share in these measures.

"2. The success of measures for eliminating brucellosis from animal husbandry farms and protecting persons therein from becoming infected depends on the whole on active control by soviet and party organs and on the initiative and persistence of medical and veterinary workers.

"3. Timely performance of antibrucellosis measures and establishment of strict control for elimination of brucellosis foci in animal husbandry farms require the widespread acquaintance of medical and veterinary workers with the epizootic and epidemiologic conditions of the rayon.

"4. Documentation which is precise and singularly adapted to each kray and oblast with respect to its implementation is necessary for correct organization of brucellosis control work; the documentation should be established by special instructions of the Ministry of Health USSR."

The author states that, as a result of all the measures taken by medical workers in the antibrucellosis network of Voronezhskaya Oblast together with the public health organs of the rayons, including the participation of veterinary service workers, the incidence of brucellosis has been decreased 91.3% below 1950 statistics.

40. Differential Diagnosis of Q Fever in Leptospirosis Foci

"The Clinical Manifestations and Differential Diagnosis of Q—Rickettsiosis (Q-Rickettsiosis and Leptospirosis)", by Ya. S. Pupkevich-Diamant, Armavir; Moscow, Klinicheskaya Meditsina, No 6, Jun 58, pp 77-89

A detailed discussion of the similarities and differences between the clinical manifestations and diagnosis of Q fever and leptospirosis and an exhaustive chart for the differential diagnosis of the two diseases are given. Epidemiological, serological, and clinical data, including typical case histories, are presented in tabular form. Twenty-four Soviet and 17 non-Soviet references are listed in the bibliography.

CPYRGHT On the basis of the material presented, the following conclusions are drawn:

"1. In water-borne leptospirosis foci, clinically similar diseases are sometimes observed which yield negative results in laboratory tests for leptospirosis. In attempting to discern their etiology, the presence of Q fever cases was detected for the first time in a number of rayons.

"2. Cases were observed in which antibodies to both infections were present simultaneously in the blood serum of active and recovered patients. The same situation was encountered in examining the blood sera of animals in an effort to determine the sources of the infections. These facts testify to the parallel course of both diseases in individual natural foci, to the presence of common sources of infection of both diseases (cattle and horses), and to common routes of infection (bathing in water contaminated by the excretions of animals, consumption of food containing contaminated water or milk products, or caring for diseased animals).

"3. The similarity of the clinical symptomology in the initial period of both infections results in the possibility of their erroneous diagnosis, which makes it mandatory that special importance be attached to their timely and complete laboratory investigation and to striving in every suspected case for hemocultures of the pathogen or repeated positive serological reactions (agglutination and complement fixation reactions), which, in fresh cases, always reveal accumulating titers.

"4. A clinicoepidemiological working differential diagnosis table for Q fever and the leptospiroses which refines the differential diagnosis details has been proposed.

"5. The examples of Q fever cases which have been presented distinguish the peculiarities of the clinical course: the presence of exanthema, hemorrhagic phenomena, enlargement of the regional lymph nodes and complications (pericarditis, exudative pleuritis, inflammation of the endocardium, and enduring nonresolving focal pulmonary lesions), which also bespeaks the significantly more polymorphic clinical manifestations of these cases within the territory of the USSR."

41. Neurological Phenomena in Q Fever

"The Neurological Characteristics of Q Fever," by D. N. Vaysfel'd, Magnitogorsk Southern-Ural Railroad Hospital; Moscow, Klinicheskaya Meditsina, No 6, Jun 58, pp 89-94

Neurological phenomena occurring in 51 Q fever patients observed by the author and others described in the literature (15 Soviet references in the bibliography) are tabulated and discussed.

On the basis of the data presented, the following conclusions are given:

"1. In the overwhelming majority of Q fever patients we observed the so called 'vegetative reaction syndrome.'

"2. Investigation of vegetative algesic points is a valuable diagnostic device which broadens the semeiotic concept of the disease and makes it possible to judge its dynamic development.

"3. In addition to functional disorders of the central nervous system and its higher vegetative formation, we noted affection pre-eminently of the left sympathetic column (especially its cervical portion) and of the solar plexus in our patients.

"4. Changes in the nervous system, especially in its vegetative apparatus, play an important role in the pathogenesis of Q fever."

42. Immunogenic Properties of Antiplague Serum

"The Problem of the Comparative Immunogenic Effectiveness of Antiplague Serum and Its Globulin Fractions," by L. Ye. Khundanov, V. S. Kolesnik, and G. P. Pletnikova, Irkutsk Scientific Research Institute; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 29, No 7, Jul 58, p 110 (author's abstract).

"The objective of this research was to clarify the comparative resistance of guinea pigs to experimental infection with B. pestis following passive immunization with these preparations: specific serum or protein products of its fractionation -- whole globulins and gamma globulins.

"The work was done on 80 guinea pigs separated into four groups: (1) 22 pigs infected after preliminary introduction of serum, (2) 22 pigs infected after preliminary introduction of whole globulins, (3) 22 pigs infected after preliminary introduction of gamma globulins, and (4) 14 pigs infected without any preliminary preparation (controls). The aforementioned preparations were administered in a single subcutaneous 5 ml injection 20 hours before infection. Infection was produced with a subcutaneous dose of 1,000 microorganisms (10 Dlm) of a virulent plague strain (No 143). The animals were chloroformed at different periods after infection (two pigs out of each experimental group and one control) and were dissected immediately.

"Animals which died during the experiments were also dissected. During dissection of the animals, pathological-anatomical changes were recorded, seedings from organs were done, and material was taken for pathological examination.

"The pathomorphological and bacteriological data obtained showed that the course of plague infection was relatively less virulent in guinea pigs infected after preliminary subcutaneous introduction of antiplague serum or products of its fractionation (globulins and gamma globulins). A tendency to limitation of the process to the region of the portal of entry was observed and substantiated by the predominant localization of the pathogen at the site of its introduction and in the surrounding lymph nodes where, as a rule, limited, almost encapsulated abcesses, but not the diffused, exudative-alterative inflammation observed in control animals were observed. The comparatively infrequent observation of septic foci in the organs was a characteristic of plague infection, which corresponded with the marked tendency of the infection to be limited to the portal of entry region.

"Together with this, our attention was directed to the almost continual presence of secondary pneumonic plague foci, the more distinctly developed, the longer the time elapsed from infection. This pneumonia usually consisted of significant manifestations in the pathomorphological picture of the disease, especially in killed animals, which could not be said of controls (animals which had died and animals which had been killed), in which, as a rule, sharply pronounced septic phenomena predominated in the pathomorphological picture of the disease.

"Pathomorphological manifestations of plague in different groups of previously immunized animals differed somewhat (although the results of bacteriological investigation showed nothing definite in this respect): In animals which had received gamma globulin before infection, cellular proliferation in inflammatory foci was considerably more sharply pronounced, septic foci were most infrequently observed in the organs, pneumonic foci were relatively larger in diad animals, necrosis of elements of alveolar exudate was less extensive, and plague microorganisms were less abundant. In animals which had been given whole globulins before infection, inflammatory foci were less sharply delineated, and contained more plague pathogens; septic foci were encountered in the lungs more frequently than in animals which had received gamma globulin, and similar septic foci were most often observed in the spleen and liver of all three groups of animals. In animals which had received serum before infection, regional inflammatory foci were most numerous and least sharply delineated, septic foci in the spleen were observed more often than in animals which had received gamma globulin and small septic foci were encountered in the lungs more often than in animals which had received whole globulin; granular-adipose dystrophy of the hepatic parenchyma was most sharply pronounced, and inflammatory foci devoid of visible plague microorganisms were encountered in this organ more frequently than in the other groups of animals.

"The data presented make it possible to conclude that comparative resistance to plague infection is present in animals which have received antiplague serum and its fractions. Thus, judging by pathomorphological data, gamma globulin was found to exert a more pronounced effect than whole globulins and natural serum."

43. Attenuated B. pestis Strains Studied in Mice Under the Effect of Cortisone

"The Use of Mice Under the Effect of Cortisone as an Experimental Model for the Study of B. pestis Strains With Decreased Virulence," by S. L. Blyakher, State Control Institute of Vaccines and Sera imeni Tarasevich; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 29, No 7, Jul 58, pp 65-72

In general, this article discusses artificially increasing the sensitivity of animals to infection with a particular pathogen in order to create an experimental model of the disease. A number of methods for establishing these conditions are referenced; the role of cortisone in the development of the infection process and the formation of immune reactions in the organism is pointed out. It is stated that in massive doses cortisone sharply decreases resistance to infection in a number of animals and in the human, which phenomenon is substantiated by the fact that pathogenic, conditionally pathogenic, and even saprophytic microorganisms are capable at times of proliferating intensively in the organism and causing severe disease of a septic nature.

In his own experiments, the author used male white mice weighing 16-18 g. He mentions that cortisone obtained from the English firm of Biddle Sawyer and from the French firm of Roussel differed somewhat in their activity. Different vaccine strains of B. pestis, EV-76, No 1, AMP 3270, the EV strain selected, were used in the experiments. The method of preparing cultures is described in detail. Final suspensions contained one billion microorganisms per ml according to optic standards. These suspensions were then diluted with physiological solution so that the doses contained 0.5 ml for subcutaneous and 0.1 ml for intravenous administration. Material from various organs of mice which died during the course of the experiments was seeded on dishes containing Martenovskiy agar and 5% "manifestator," a filtrate of a bouillon culture of B. mesentericus fuscus or B. mesentericus vulgatus 66; according to Pokrovskaya, Pryadkina, Gutorova, Blyakher, and Suslova (1957), this preparation can stimulate the growth of B. pestis.

Two series of experiments were performed in which the cultures were introduced via the subcutaneous and intravenous routes, respectively. The results of these experiments are discussed in detail in the text and are summarized in two tables and three illustrations. Conclusions presented on the basis of the results are as follows.

"1. Single introduction of 3.5 mg of cortisone to mice sharply increased their sensitivity to B. pestis with attenuated virulence. Subcutaneous introduction of 500,000 B. pestis microorganisms, strain EV-76,

to mice which had received cortisone caused the death of 80-90% of the animals following the appearance of acute plague septicemia, which was never observed in normal animals. After the intravenous introduction of plague pathogens, mice which had received cortisone were found to be still more sensitive -- even 1,000 microbial cells of B. pestis strain EV-76 brought about the death of all animals following the appearance of plague septicemia.

"2. Mice subjected to the action of cortisone are a highly sensitive experimental model for studying B. pestis strains with attenuated virulence.

"3. Mice which have received cortisone can be used for performing biological tests in investigating various objects for the presence of plague infection, especially in those cases in which the plague pathogens are contained in small quantity in the material examined or have decreased virulence."

44. Vitamin B_{12} Therapy Expands Therapeutic Possibilities of Treating Inflammatory and Toxic Diseases of the Optic Nerve

"The Use of Vitamin B_{12} in Treating Diseases of the Optic Nerve," by S. Rzhegak, V. Bartoushek, and B. Dubanskiy, Clinic of Eye Diseases, Military-Medical Academy imeni Ya. Ye. Purkine (head of the chair, Prof M. Klima, Doctor of Medicine), Gradets Kralove, Czechoslovakia; Moscow, Vestnik Oftal'mologii, No 4, Jul/Aug 58, pp 28-31

The authors review various methods of treating diseases of the optic nerve. Therapeutic means used include stimulating therapy, use of ACTH, vasodilating, ganglioplegic, and neuroplegic drugs, and the use of vitamin B_1 and other components of the vitamin B group.

Results indicate a favorable effect of vitamin B_{12}. This is attributed to its selective affinity for the optic nerve, its specific favorable influence on the metabolism of substances in the nervous tissue to preserve normal function and structure of nervous tissue (especially the myelin), and the detoxifying effects of vitamin B_{12}. Tests have also proved that the absence of vitamin B_{12} causes injuries to the central nervous system.

The authors review the results of treating 24 patients suffering from injuries to the optic nerve tract with vitamin B_{12}. Results indicate that both medium and large doses of vitamin B_{12} are effective. Medium doses ranged from 100 to 250 milligrams per day, with a total of 2,000-3,000 milligrams, depending on the course of the diseases and the signs of remission.

The authors conclude that the use of vitamin B_{12} significantly expands therapeutic possibilities in inflammatory and toxic diseases of the optic nerve, in both their acute and chronic forms.

Pharmacology and Toxicology

45. Use of Unithiol in Cobalt Intoxication

"Unithiol -- An Antidote for Cobalt," by A. I. Cherkes and B. S. Braver-Chernobulskaya, Department of Experimental Therapy, Ukrainian Scientific Research Sanitary Chemical Institute; Moscow, Farmakologiya i Toksikologiya, No 3, May/Jun 58, p 59-63

It is well known that sulfhydryl groups in proteins are important to many biological processes; metabolism, growth and development of cells, neuroreflex regulatory functions, and transmission of neuromuscular impulses, as well as chemoreception (Kh. S. Koshtoyants, V. N. Chernigovskiy, and others).

It has been determined that the blocking of the sulhydryl groups in proteins leads to the destruction of the normal activity of many enzymes and consequently to the disruption of the activity of organs and tissues. In agreement with numerous data, the mechanism of the action of certain pharmaceuticals (antibiotics and phytoncides) is also related to the reactivity of the sulfhydryl groups.

Therefore, among the great number of enzymatic poisons, (substances which inactivate enzymes) those which have the capacity of combining with the tissue thiol (sulfhydryl) groups are especially interesting.

Notions concerning the mechanism of the toxic action of such a series of poisons provided the theoretical prerequisites for research on corresponding antidotes from among those compounds which contain free sulhydryl groups (thiols) which, after being introduced into the body, would possess the capacity to inhibit the poison or reactivate the blocked sulfhydryl groups in the tissue enzymes.

On the basis of this, research conducted at the Ukrainian Scientific Research Sanitary Chemical Institute resulted in the synthesis (by V. Ye. Petrukhin and others of many thiols of which the most active was sodium dithiol-2,3-dimercaptopropansulfonate -- $CH_2SH-CHSH-CH_2SO_3Na.H_2O$ -- called unithiol (A. I. Cherkes and others, and N. I. Luganskiy).

Many experimental investigations and clinical observations indicated the feasibility of utilizing unithiol as an antidote which would be therapeutically effective in cases involving mercury, arsenic, nickel, and chromium intoxication.

In the light of this it was decided to study the antidotal activity of unithiol in relation to other heavy metals as well as cobalt which is widely utilized (in the production of hard, heat-resistant, magnetic, oxidation-resistant alloys, as well as in the production of catalysts and paints, and in the treatment of malignant tumors in the form of radioactive cobalt).

In experiments on dogs and cats it was demonstrated that unithiol prevents a decrease in blood pressure due to cobalt intoxication and prevents the development of polycythemia. A pronounced therapeutic affect was accomplished with unithiol in experiments on rabbits after the rabbits were injected with 60 mg/kg of cobalt chloride (LD_{80}). Unithiol therapy was begun on the third day and continued for 6 days with a total administration of 450 mg/kg.

Unithiol forms a cyclic complex with cobalt and thereby averts or displaces the blocking of sulhydryl groups found in the enzymatic systems.

With the action of cobalt chloride solutions, in concentrations of 2.10^{-3} and 4.10^{-3}, on the isolated heart of a frog, various disruptions in cardiac activity were observed (decrease in amplitude, and rhythm and a stoppage of the heart in the diastole). Washing the isolated heart with a 1.10^{-3} solution led to a prompt restoration of cardiac activity (within 2-3 minutes).

Therefore, on the basis of the data presented, it is suggested that unithiol be utilized as an antidote in cobalt intoxication.

46. Toxicity of Beryllium Oxides

"The Problem Concerning the Toxicity of Beryllium Oxides," by V. V. Mel'nikov; Moscow, Farmakologiya i Toksikologiya, No 3, May/Jun 58, pp 73-77

This article reviews the work of various Russian scientists (B. I. Martsinkovskiy, Ye. Ye. Syroyechkovskiy, Ye. M. Zamakhovskaya, I. G. Gelman, A. N. Magnitskiy, T. N. Ablina, and S. V. Volter) and foreign scientists concerning their work on the toxic action of beryllium. On the basis of his review the author concludes the following:

"1. The toxicity of insoluble beryllium salts, including oxides, is not increased with an increase in dispersion.

"2. The most toxic compounds of beryllium appear after internal administration.

"3. The animals most sensitive to the action of beryllium oxides after internal administration appear to be rabbits, then dogs, and finally rats.

"4. In view of the fact that identical experimental data by various investigators do not exist, further experiments are required concerning toxicological data on beryllium compounds."

47. Effect of Atropine and Estrogen on Carbohydrate Metabolism

"The Effect of Atropine and Estrogen on Carbohydrate Metabolism in Rabbits," by A. P. Voloskova, Tr. Vses. In-ta. Eksperim. Veterinarii (Works of the All-Union Institute of Experimental Veterinary Medicine), 1957, No 20, pp 310-311, (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 15, 10 Aug 58, Abstract No 20155, by N. Shvarsalon)

"It was determined that atropine increases the glycogen concentration in rabbits blood, while folliculin and microbial cultures of paratyphoid and brucellosis decrease its content. The same results -- abortion -- as those obtained with the administration of folliculin and the bacteria cultures were obtained by the administration of synestriol to four heifers. The author concludes that atropine prevents abortion in rabbits as a result of facilitating carbohydrate metabolism."

48. Method for Determining Residual Metaphos in Food Products

"A Method for Determining Residual Metaphos in Food Products," Inform. Byul. Mosk. In-ta. Sanitarii i Gigiyenii (Information Bulletin of the Moscow Institute of Sanitation and Hygiene) No 10-11, 1957, pp 11-13 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 15, 10 Aug 58, Abstract No 18961, by V. Sabov)

"From 150- to 200 g of material is extracted with ether for 2 hours. The extract is condensed, 50 ml of water is added, and the remainder of the ether evaporated. Then 1-2 ml of H_2O_2 (30%) and one ml of NaOH (15%) is added and the solution alternately brought to a boil and cooled for the next hour. After cooling, 4.5-5 ml of $ZnSO_4$ is added together with enough water to bring the volume up to 100 ml. After 15 minutes it is filtered and the residue washed with water. Water is then added up to 100 ml, and the yellow solution is measured colorimetrically in a 'Gener' cylinder with a standard solution (one mg% solution of paranitrophenol)."

49. Synthetic Drug Substitutes in Medicine

"Synthetic Substitutes," by A. Mndzhoyan, Academician, Academy of Sciences Armenian SSR; Moscow, Meditsinskiy Rabotnik, 1 Aug 58, p 2

"Progress in medicine has always been related to progress in many contiguous disciplines. Organic chemistry, which not only permitted the synthesis of many existing natural substances but also opened avenues for producing new active preparations for treating and preventing diseases, occupies a prominent position in the development of therapeutics and prophylaxis. Native chemical science has directed a great deal of work in this direction, filling the pharmaceutical arsenal with new active preparations.

"A definite portion of the work in this area was conducted by the scientists and workers of the Institute of Fine Organic Chemistry of the Academy of Sciences Armenian SSR. For more than 10 years the scientists of this institute have concerned themselves with solving important problems in contemporary natural science -- the relationship between the chemical structure of organic compounds and their biological action in the body.

This is important not only in relation to the ultimate goal, research, concerning a general theory of 'structure and action,' but also in relation to the development of highly reactive and highly selective therapeutic substances.

"The Institute of Fine Organic Chemistry has developed a series of original domestic preparations which have been successfully introduced into medical practice. These include ditiline, gangleron, and many others. The former is a synthetic substitute for natural curare. Possessing selective action on the myoneural endings, it produces temporary weakness in the voluntary musculature. It provides an opportunity, together with small doses of ether or chloroform, for conducting complicated procedures on the heart, lungs, internal organs, etc. The temporary action of the preparation and its slight toxicity provide not only an opportunity for its utilization in contemporary anesthesiology but also an opportunity for utilizing it in psychiatry as a muscle relaxant during electroshock therapy. For the satisfaction of the practical requirements of the therapeutic organizations in our country, the technological department of the Institute of Fine Organic Chemistry organized the mass production of this preparation.

"Another medicine developed by the institute, gangleron, possesses effective and selective action. Possessing gangleo-blocking action, it has been used with success in treating stenocarditis. The results of the work of many therapeutic organizations in Moscow, Leningrad, Yerevan, and other cities indicates that gangleron not only alleviates the disease syndrome preceding stenocarditis, but also forestalls the appearance of the attack itself. Clinical observations have indicated that in specific cases the preparation displays a positive action during the treatment of ulcerous diseases.

"Extensive research for selecting preparations of high hypotensive action is also being conducted at the institute.

"The experimental results make it possible to assume that certain of these and other preparations will be placed in clinics soon as therapeutic agents for treating hypertonic diseases.

"Recognizing the necessity for obtaining higher and more powerful stimulatants for these and other functions of the body, the scientific collective of the institute is conducting broad investigations in this area of endeavor."

Public Health, Hygiene, and Sanitation

50. Problem of Urban Sewage Contamination With Radioactive Potassium

"Concerning the Problem of the Content of Radioactive Potassium in Urban Sewage," by L. B. Dolivo-Dobrovol'skiy and F. S. Zavel'skiy, Moscow Scientific Research Institute of Sanitation and Hygiene imeni Erisman; Moscow, Meditsinskaya Radiologiya, Vol 3, No 3, May/Jun 58, pp 65-67

During the last few years thousands of researchers have been engaged in conducting mass determinations of external contamination of water, air, and food products with radioactive sources, especially K-40. The authors present a table showing the balance between K-40 radioactivity in suburban sewage, mixed urban and suburban sewage, and sewage from industrial areas.

Results indicate that the approximate potassium radioactivity in the mixed city sewage was 2.3×10^{-11} curies per liter, sewage from purely suburban areas contained 6×10^{-12} curies per liter, and sewage from industrial areas contained 1.7×10^{-11} curies per liter.

The authors conclude that by analyzing these data it is possible to say that each city dweller eliminates into the city sewage about 300 micrograms of K-40 which has an activity equal to about 2×10^{-9} curies per day. The natural specific radioactivity of city sewage (with reference to K-40) is in the range of 6×10^{-12} curies per liter.

Radiology

51. Protective Effect of Chondroitin Sulfate Against Lethal X-Ray Doses

"Protective Effect of Chondroitin Sulfate Against Lethal Doses of X Rays," by N. D. Petrova, L. I. Polikarpova, M. F. Sbitneva, L. T. Tutochkina, and V. V. Shikhodyrov; Moscow, Meditsinskaya Radiologiya, Vol 3, No 4, Jul/Aug 58, pp 34-41

The aim of this research was to study the protective effect of chondroitin sulfate, as a representative of the group of mucopolysaccharides, against ionizing radiation. Tests were conducted on three groups of mice irradiated with a dose rate of 23-30 r/minute and a total dose of 600 r. Experiments were set up to prove the effect of chondroitin against ionizing radiation when applied intraperitoneally and intravenously, as evidenced by animal survival, changes in animal body weight, and changes in the weight of the spleen.

Results indicate the following

1. Chondroitin sulfate administered peritoneally to mice 5-10 minutes before irradiation, at the rate of 25 mg per g of body weight, showed no significant protective effect (11% survival in experimental animals, as compared with 5% survival in controls).

2. Chondroitin sulfate administered under the above-mentioned conditions but intravenously proved effective against ionizing radiation, effecting 53% survival in experimental animals, as compared with 7% in the controls. The life span of nonsurviving animals was prolonged from 12 days in the controls to 14 days in the experimental animals. Chondroitin sulfate also caused a faster rate of restoration of body weight in the surviving animals.

3. Additional protective effect of chondroitin sulfate was evidenced clinically by the following: A faster restoration rate of the number of leukocytes and the leukocyte formula during the restoration period, a more intense regeneration rate of the cells of the fibroblast series and of the loose connective tissue series, and a favorable effect on the metabolism of procollagen in the skin during the early stages of radiation sickness.

4. The authors present two hypotheses on the mechanism of the protective effect of chondroitin sulfate, or its transformation products: (a) the effects on the primary processes caused by ionizing radiation are due to competition for free radicals; by preventing changes from occurring in the loose connective tissue, it obstructs the onset of injuries to the collagenous structure in the intercellular substance; and (b) the favorable effects on the early biological reactions caused by irradiation are due to the possibility that chondroitin sulfate can block enzymes which cause the destruction of intercellular substance.

52. Etiology of Acute Radiation Sickness Distinguished From That of Most Acute Radiation Sickness

"Concerning the Development of the Most Acute Form of Radiation Sickness," by L. F. Semenov, Central Scientific Research Roentgenoradiological Institute (Leningrad) of the Ministry of Health USSR; Moscow, Meditsinskaya Radiologiya, Vol 3, No 3, May/Jun 58, pp 70-77

The author presents a comprehensive discussion of the type of acute radiation sickness developed after the irradiation of the whole animal, the trunk only, and the head only, of experimental animals (mice, rats, rabbits, dogs, guinea pigs, and cats).

Five charts present the rate of death of animals due to various doses of irradiation under the above conditions. Changes in the blood picture under these conditions are reviewed. The author makes the following con-

clusions.

"1. The development of the most acute form of radiation sickness is determined by irradiation of the head.

"2. The most acute form of radiation sickness results from smaller doses of ionizing radiation following irradiation of only the head than following general irradiation.

"3. The use of narcosis at the moment of irradiation prevents the development of the most acute form of radiation sickness, and in this case the pathological process takes the form of the acute type of radiation sickness. Cysteineamine and thiourea used as prophylactic agents do not affect the development or the course of the most acute form of radiation sickness.

"4. The most acute form of radiation sickness differs pathologically from the acute form of radiation sickness. The mechanism in the development of the most acute form of radiation sickness is due to the direct effect of ionizing radiation on the activity of the nerve centers, while the mechanism of the acute form of radiation sickness is mostly reflex in nature."

53. Disturbed Regulatory Role of Central Nervous System Intensifies Sensitivity to Insulin During Acute Radiation Sickness

"Concerning Hormonal Regulation of Carbohydrate Metabolism in Acute Radiation Sickness," by D. A. Golubentsev; Moscow, Meditsinskaya Radiologiya, Vol 3, No 3, May/Jun 58, pp 35-37

The aim of this research, which was conducted between 1952 and 1956, was to study the role of the endocrine glands in carbohydrate metabolism during acute radiation sickness resulting from general X-irradiation of dogs (400 r), rats (750 r), and rabbits (1,000-1,500 r). Results indicated the following.

1. The experimental animals showed decreased hypoglycemic reaction to insulin during the first few days, but the hypoglycemic effect of insulin increased sharply starting with the 7th and continuing to the 25th day, at which level it remained during the entire second month in the surviving animals. This increased sensitivity to insulin administration led to the development of a severe hypoglycemic condition which was accompanied with periodic convulsions and prostration.

2. No changes were observed in irradiated animals toward the hyperglycemic effect of adrenalin administration during the first day, but during the peak of radiation sickness the administration of adrenalin speeded the Cori cycle, caused increased dissociation of glycogen reserves in the skeletal muscles of irradiated animals, and increased the glycogen level in the liver and in the myocardium.

Increased sensitivity toward insulin is explained as due to the disturbed regulatory role of the central nervous system and the weakened functional activity of the hypophysis-adrenalin system and of the adrenal cortex.

The author concludes that his data agree with the well-known fact of decreased glycogen reserves of the liver during the peak of radiation sickness and that adrenalin normalizes the disturbed relationship between glycogen reserves of the liver and of the skeletal muscles.

54. Decreased Glycine Absorption by Intestinal Epithelial Cells in Radiation Sickness Is Improved by Adding Inorganic Phosphate and ATP

"Concerning the Problem of the Mechanism of Disturbed Intestinal Absorption of Glycine After X-Ray Irradiation," by V. A. Shaternikov; Moscow, Meditsinskaya Radiologiya, Vol 3, No 3, May/Jun 58, pp 37-42

The aim of this research was to study the effect of irradiation on the absorption of certain amino acids. This was done by studying the effect of X-irradiation on oxidative phosphorylation since glycine absorption in the small intestines depends on oxidative phosphorylation in the intestinal epithelium.

Simultaneous observations were made of glycine absorption by the walls of the isolated intestinal loop of Tiery and of oxidative phosphorylation of intestinal epithelium. Sharp wavelike or periodic disturbances in the processes of glycine absorption following X-irradiation were observed simultaneously with the inhibition of oxidative phosphorylation in the epithelial cells of small intestines.

The addition of inorganic phosphate and adenosine triphosphate to glycine administered into the intestine increased the absorption of this amino acid.

Thus the author concludes that disturbed processes of absorption of glycine in irradiated animals depends on the inhibition of oxidative phosphorylation in the epithelial cells of the intestines.

55. X-Ray Effects on Enzymatic Secretions of Small Intestines in Acute Radiation Sickness

"Secretory Function of the Intestines During Radiation Sickness," by M. F. Nesterin, Radiobiological Laboratory (head, G. P. Yeremin) Institute of Nutrition of the Academy of Medical Sciences USSR; Moscow, Meditsinskaya Radiologiya, Vol 3, No 3, May/Jun 58, pp 42-46; and "Secretory Function of Small Intestines During Acute Radiation Sickness," by K. V. Smirnov, ibid; pp 46-51

The aim of both investigations was to study the secretory and enzymatic function of the small intestines during radiation sickness. Tests were conducted on dogs irradiated with 400 r of X rays.

Results are as follows

1. As developed in the first report, X-ray effects on various enzyme secretion processes differ. The secretion of enterokinase, saccharase, and phosphatase may be disturbed while no change occur, or changes may last for only definite periods in lipase and peptidase. Changes in enterokinase and phosphatase excretion do not always coincide with changes in the enteric juice composition, which indicates that other biochemical factors also contribute to changes in enzyme excretion. Changes in water and enzyme elimination with feces during radiation injuries are independent of each other.

2. The second research report proves that periods of increased enzyme activity alternate with periods of normalization and depression. "Milk-egg" and "liver" diets do not normalize the secretory function of small intestines in dogs. The author concludes that these disturbances in secretory processes in the small intestines are connected with pathological shifts in the central nervous system and in metabolic processes.

56. Changes in Physical Thermoregulation After Single General Irradiation of Rabbits by 1,000 r of X Rays Studied

"Changes in Physical Thermoregulation After Single General Irradiation of Rabbits by X Rays With 1,000-r Doses," by I. N. Kondrat'yeva; Moscow, Meditsinskaya Radiologiya, Vol 3, No 4, Jul/Aug 58, pp 8-15

The aim of this work was to study physical thermoregulation of animals after a single general irradiation, because it is known that physical thermoregulation is an important index of the functional condition of the vegetative nervous system. Tests were conducted on rabbits because they have a well-developed physical thermoregulation system.

Five composite tracings illustrate changes in temperature readings and respiration frequency with time as a factor after irradiation. Another composite diagram presents changes in certain vegetative reactions and clinical symptoms, such as strength of vascular reaction, latent period of vascular reaction, strength of respiratory reaction, frequency of respiration, rectal temperature, and body weight.

Results indicate the following.

1. Change in physical thermoregulation after a single general X-irradiation are of a phasic nature: There is an immediate burst of stimulation with increased temperature, and speeded respiration; then during the first through the second day after irradiation, significant disturbances of physical thermoregulation become evident; these are followed by absent or weakened vascular reactions and by significant inhibition of respiratory reactions. Then, starting with the 2d to the 3d and through the 7th to the 9th day, there is an unstable restoration of physical thermoregulation, but as a rule the respiratory component does not attain its original value.

2. From 2 to 6 days preceding the death of the animals acute inhibition of physical thermoregulation is again evident.

3. Inhibition of vascular and respiratory reactions soon after irradiation are most probably conditioned by inhibition from centers in the spinal cord which are connected with the stimulation of the brain.

4. Further changes in physical thermoregulation are dependent on the condition of the compensatory capacity of the central nervous system.

57. Charging Device for Individual Pocket Dosimeters Manufactured

"Charging Device for Pocket Dosimeters," by Ye. V. Utekhin, Central Scientific Research Roentgenoradiological Institute of the Ministry of Health USSR; Moscow, Meditsinskaya Radiologiya, Vol 3, No 3, May/Jun 58, pp 68-69

Pocket dosimeters designed for individual monitoring by people working with X rays and gamma rays are finding increasingly more extensive and varied use in the USSR. These pocket dosimeters have a charging unit equal to 200 volts. Details of the construction and charging and an external view of the dosimeter and its charging unit accompany the article. One photograph illustrates the act of charging the cylindrical dosimeter by its charging unit (also cylindrical) which has a wider diameter than the dosimeter and slips over the latter to establish contact.

The advantages of this dosimeter and its charging device include the fact that every person working with penetrating radiation always has his own individual charging appliance which requires no galvanic batteries. In addition, this appliance is simple and cheap to manufacture.

58. Distribution of Radioactive Phosphorus P 32 in Central Nervous System

"The Dynamics of the Distribution of Radioactive Phosphorus P^{32} in Various Portions of the Central Nervous System Under Normal Conditions and During the Action of Caffeine and Bromine," by A. I. Karayev and A. A. Khudazarov, Dokl. AN Azerb. SSR, 1957, 13, No 5, 559-564 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 15, 10 Aug 58, Abstract No 20148, by V. Korzhov)

"P^{32} was administered subcutaneously to rabbits under normal conditions or 20 minutes after the injection of caffeine or NaBr, at the rate of one ml of 10% solution per kg of weight. After 1.3 and 24 hours, the radioactivity of portions of raw brain tissue, up to 200 mg from various parts of the brain, was measured. Under normal conditions, the various portions displayed various degrees of P^{32} fixation. During the first hour, the concentration of P^{32}, in decreasing order, is distributed in the following manner: spinal cord, medulla oblongata, white matter of the large hemisphere Varolius bridge, cerebellum, cerebral cortex, and the midbrain. These relationships are altered with the passage of time; after 3 hours the P^{32} content is lowered in many portions while after 24 hours the content increases above the content after the first hour. After the preliminary administration of caffeine and NaBr, changes in the distribution of P^{32}, in relation to the norm, are observed; however, these changes are not strictly uniform or regular in character either with regard to the various areas, or with regard to time."

59. Special Apparatus for External Irradiation With Beta Radiation Indicates 65 r Approximate Tolerance Dose for Mice

"Concerning the Problem of the Biological Effect of External Irradiation With Beta Radiation," by S. N. Aleksandrov, K. F. Glakovskaya, O. G. Matveyev, and V. A. Petrov, Central Scientific Research Roentgenoradiological Institute of the Ministry of Health USSR; Moscow, Meditsinskaya Radiologiya, Vol 3, No 4, Jul/Aug 58, pp 6-8

The aim of this research was to investigate certain changes due to the external effects of beta radiation. Albino mice (437) were irradiated in a specially designed apparatus (a cylindrical glass jar with a 0.5-liter capacity and with an active layer of $Sr^{90}(NO_3)_2$, and $Sr^{90}Cl_2.6H_2O$, containing 460 millicuries Sr^{90}). The dose rate was 25 r per minute. The experiment

animals received surface doses of 65, 125, 250, and 500 r. The article describes changes in the blood picture, and healing of skin wounds, and compares percentage survival of experimental and control animals.

Results indicate that after irradiation with a dose of only 65 r no discrepancies in wound healing, etc, were evident between experimental and control animals.

Therefore, the authors conclude that this dose of 65 r is close to the tolerance dose for mice subject to external irradiation with beta radiation.

Surgery

60. Universal Apparatus for Suturing Blood Vessels and Nerves

"Universal Apparatus for Suturing [Blood] Vessels and Nerves" (unsigned article); Moscow, Meditsinskiy Rabotnik, 27 Jun 58,

 p 4

"A universal apparatus for suturing [blood] vessels and nerves has been produced at the Scientific Research Institute of Experimental Surgical Apparatus and Instruments. By means of this instrument, circular end-to-end sutures can be applied to arteries and veins; end-to-side sutures, to veins; and epineural sutures, to nerves. The apparatus is designed for use in traumatic injuries, aneurisms, plastic surgery, restorative operations, suture of bile ducts and ureters, and other cases where the vessels or nerves are not appreciably altered pathologically."

Tantalum staples are used. The apparatus has removable inserts which can be changed, depending on the type of suture desired and the diameter of the vessel or nerve. In an end-to-end vascular suture, the vessels are sutured intima-to-intima.

The apparatus has passed clinical tests at the Moscow Scientific Research Institute of First Aid (Skoroy Pomoshchi) imeni Sklifosovskiy, at the Hospital imeni S. P. Botkin, and at the Military-Medical Academy imeni S. M. Kirov. The Leningrad Order of Lenin Plant "Krasnogvardeyets" is starting to produce it.

Veterinary Medicine

61. Potel Reviews Experimental Pathology of Foot-and-Mouth Disease

"Recent Results in the Area of the Experimental Pathology of Foot-and-Mouth Disease," by K. Potel, Friedrich Loeffler Institute, Riems; Leipzig, Monatshefte fuer Veterinaer Medizin, No 13, 1 Jul 1958, pp 401-405

 The following is the text of an address delivered by Dr Potel in Erfurt on 26 October 1957 before the Thueringen Section of the Scientific Society for Veterinary Medicine in East Germany.

"In our studies for the purpose of explaining the pathogenesis of foot-and-mouth disease, certain observations in practice gave rise to producing, even in experiments, various types of physical manifestations of the disease for the purpose of investigating, along with the etiological connections between the pathogen and the actual tissue processes, the factors which also have a determinative effect in the origin of the disease.

"Thus we know that, in the course of serious foot-and-mouth-disease characteristics, more or less extensive muscle changes can occur in the infected cattle and calves, the pathological-anatomical and histological pattern of which is well known (Zschr. Inf. krkh. Haustiere, 57, 1941, p 37; Tieraerztl. Rdsch., 47, 1941, p 103; ibid, 46, 165, 177, 189, 202, 1940). Until this time, however, no explanation had been forthcoming on the theoretically and practically important question of what role is played by the foot-and-mouth-disease virus in these tissue lesions. In view of the importance of this complex question, we at our institute have, in the past several years, turned toward this problem by, first of all, concerning ourselves with a systematic testing of the skeletal musculature of the guinea pig according to virological, bacteriological, and histological points of view. Special attention was devoted to any possible participation by secondary bacteria in the occurrence of the disease. On the basis of comprehensive experimental data, we established (Arch. exp. Veterinaermed., 8, 1, 1954) the fact that a great number of the guinea pigs infected with the three types of virus exhibited, during the generalized disease process, changes in Zenker degeneration in certain skeletal musculature groups which were clearly evident macroscopically; this indicates a surprisingly high virus concentration in comparison with unchanged parts of the tissue and the lower virus titer of the blood.

"In further experiments we were successful (Arch. exp. Veterinaermed, 8, 1954, p 606) in producing experimentally in calves and young cattle the skeletal muscle changes which are observed in the course of the epizootics caused by type A and later also by type C in spontaneously susceptible hoofed animals. After an originally unsuccessful attempt to use types O and C, we

were able to determine, with a virus strain of type A_5, more or less extensive degenerative processes of the musculature in generalized form in 12 out of 40 cattle. Especially involved were the biceps femoris, masseter, quadriceps, pectoralis, longissimus dorsi, infraspinatus, supraspinatus, extensor digitorum, and flexor digitorum, and occasionally also large groups of the muscles of the trunk and of the extremities. In addition, changes could occasionally also be discerned in muscles which appeared macroscopically to be unchanged, for example, the diaphragm. The predilection for the most active musculature is striking. Our virological tests showed in the changed musculature from the 5th to the 7th day post infectionem, i.e., 4-6 days after the appearance of aphthous symptoms in the oral cavity, a virus titer between 10^{-3} and 10^{-7} as compared with a virus content of, at most, 10^{-2} in the macroscopically unchanged muscles.

"Corresponding examinations of the damaged myocardial tissue led likewise to demonstration of the virus up to 7 days p.i. and with a maximum virus titer of 10^{-6}. From this point on, there was a clearly discernible drop in virus concentration in the changed parts of the transversely striated musculature. Only after 14 days p.i. did the tested parts of the muscles prove to be free of the virus. These discoveries are not without significance also from the practical and hygienic point of view; they point out the fact that the foot-and-mouth disease virus can remain in the living organism inside the damaged muscles in a high concentration for about a week, in weaker concentrations even up to almost 2 weeks, after the appearance of aphthae in the mouth. Since the titer in areas of macroscopically changed muscles was always higher (10^{-4}), in most cases considerably higher (10^{-6}), than in the neighboring unchanged muscles, it is to be assumed that a multiplication of the virus took place before the appearance of visible lesions. Analogous results were obtained in corresponding investigations of the musculature of artifically infected suckling mice, and later also of adult white mice (Arch. exp. Veterinaermed., 8, 1954, p 424; ibid, 9, 1955, p 844). It is perhaps not uninteresting to learn that the presence of the virus could still be detected in a concentration of 10^{-2} in the changed muscles after 72 hours storage at room temperature after the animals were killed. We attribute the long survival to the lack of acidification of these muscular regions, which we were able to confirm in subsequent pH measurements.

"As far as the bacteriological findings are concerned, we were able, as early as from the 5th day on, to cultivate secondary bacteria from individual damaged muscles, thus at a time when a high concentration of the virus was still present. These findings seem to us to be of particular interest for the scientific-practical side of foot-and-mouth-disease therapy. Along with the fact that the virus prepares the tissue base for localization of the secondary bacteria, we must emphasize that the early appearance of these bacteria in the lesions caused by the virus gives these bacteria the opportunity of causing serious and destructive tissue processes. Thus, expecially when proteolytic bacteria are involved, muscle changes (purulent-phlegmonous, supperative, or ichorous) can take place which, according to Wagener (Berliner Muenchener

tieraerztl. Wschr., 1, 1941), are to be excluded from delitescence (Entschaedigung). To what extent the occasional hematoma formations in the thick muscular areas of the hinter extremities, observed by Studer (Schweiz. Arch. Tierhk., 63, 1921, p 253) and Wagener (in Kolle-Kraus-Uhlenhuth, Handbuch der pathogenen Mikroorganismen, 3d edition, 1929, p 227), are to be considered liable for indemnification cannot be determined on the basis of our experimental data. It must, however, be expected that, after the debility of a great deal of functional tissue as a result of virus damage, as we have observed particularly in the biceps femoris, quadriceps, and the gluteal muscles, the rupturing of muscles can occur as a result of an overstressing of the still unchanged parts of the muscles. These points of view should be considered in a new regulation for indemnification resulting from foot-and-mouth disease.

"After clearing up the causal connections between the virus and the muscle lesions, we were interested in the question of the type of origin, especially in the factors which play a role in their development. We were faced with the problem of whether the virus multiplies only after the tissue has been damaged, or whether it leads to an alteration of the muscle tissue after first multiplying in undamaged areas. We were able to obtain certain indications regarding the mechanism of origin through experiments on guinea pigs and cattle (Arch. exp. Veterinaermed., 8, 1954, p 606) with local damage of muscles produced by injections of lactic acid. In this case we chose muscle sections in the area of the thigh which, to our experience, were not wont to be affected in the case of foot-and-mouth disease infection. In several cases, virus in increased concentration could be found in the muscular areas damaged by this previous treatment. Otherwise, the entire body of the animal was without changes.

"These results strengthened our point of view that a multiplication of the virus in the skeletal musculature is preceded, or at least facilitated, by damage to the tissue -- apparently of a hypoxemic nature via the circulatory system during the course of the disease. As comparative investigations have shown, tissue lesions are often to be observed in the case of slaughtered healthy animals in the form of degenerative changes in individual fiber elements in the most varied skeletal muscles, which can be verified only by histological means and which could create favorable conditions for a subsequent multiplication of the virus.

"Even though no final solution has been forthcoming from our many-sided experiments directed toward the explanation of the mechanism of origin of the skeletal muscle changes, such as the exclusion of the motor nerve paths and their end plates by means of Curare preparations, the influencing of the vegetative nervous system through stimulating and inhibiting drugs, temperature and vitamin experiments, etc., we might nevertheless assume that a complex of factors is involved in the tissue processes.

"Above and beyond this, the virus itself, according to our observations, plays a not insignificant role in the appearance of these muscle lesions insofar as there are certain strains which are characterized by a pronounced myotropic component. This myophilia can appear especially after a series of passages. Our investigations have thus brought forth the unequivocal proof that the virus of foot-and-mouth disease, in addition to quite pronounced epitheliotropic properties, also has, within certain limits, a myotropic component. There is no doubt that the tenacity and reproductive property of the virus are particularly strong against the infantile organism, whereas for the effect of the myotropic properties of the virus in the case of the adult animal certain other preliminary conditions are required, which have thus far escaped our knowledge.

"Along with the skeletal musculature, the myocardium, which in the course of generalization is often affected also, can be considered a focus of temporary virus multiplication accompanied by tissue damage. This applies especially to the virulent form of foot-and-mouth disease, in which we are wont to meet with the well-known picture of the so-called 'tiger heart.' Changes in the heart as well as in the skeletal muscles are also found, however, in cases of foot-and-mouth disease which prove to be mild. To be sure, these cases involve only very slight changes which, in most cases, are completely healed. In regard to the question of termination of the origination of the myocardium processes, Holz (Virch. Arch. path. Anat., 310, 1943, p 257), in earlier experiments on cattle, was able to determine, 24 hours after successful artificial infection, localized adiposis zones in fine droplets and adventitial proliferations as initial phenomena in the myocardium. Not until 5 days post infectionem, a time when the first deaths occurred among the infected cattle, did typical multiple localizations of necrosis accompanied by reactive inflammatory processes take place. Corresponding investigations on pigs have recently been carried out (Arch. exp. Veterinaermed, 11, 1957, p 115). A special occasion was provided for these experiments insofar as we observed in suckling pigs and in pigs in heat, within 24 hours after intravenous virus inoculation, consequently after immediate hematogenic provocation of the pathogen, apoplectic deaths, which were based on anatomically extensive myocardial changes in the absence of dermal reactions. The occurrence of the myocardial processes in these animals would, therefore, have to be traced back to a time which was considerably earlier than when they first appeared in the case of the cattle material tested by Holz.

"The results of our systematic investigations, which moreover were carried out with a simulaneous control through electrocardiogram, confirm this assumption. The initial symptoms of a proliferative-degenerative process were found as early as the 4th hour after intravenous administration of type A5 foot-and-mouth-disease virus. In the period of 5-9 hours post infectionem there were no morphologically discernible tissue changes in a part of our material, but there was a noticeable lengthening of the QT-time in the electrocardiogram which can be interpreted as a sign of a histologically undemonstrable disturbance in the metabolism of the myocardium (hypoxemia?),

consequently of homogeneous damage of the heart musculature on an infectious-toxic basis. At 12 hours p.i. the time of the first appearance of macroscopic changes, the tissue picture was characterized by a rapid progression of the inflammatory-degenerative process with an inclination toward multiple localizations. As the period of infection lengthened, the electrocardiogram showed signs of a retardation of homogenous damage; the variations indicating a multiple localization became more and more pronounced.

"As a particular finding let us mention the fact that a not insignificant part of our experimental animal material during the observation period did not show the specific tissue processes at the cutaneous focal points up to 96 hours p.i., although the anatomic and electrocardiographic findings for the myocardium unequivocally indicated the presence of foot-and-mouth disease. This is all the more striking, since it would have to be assumed, in view of the method (intravenous) chosen for the inoculation, that the virus was brought very quickly to the elective epidermis tissue where it was able to produce local changes analogous to aphthous processes. In several cases, in the above-mentioned time span the described myocardial processes developed, even though in less pronounced form, indeed even without any sort of general clinical symptoms, particularly without febrile reactions. This discovery is not without importance in regard to epidemiology and veterinary police; the findings indicate, however, that in endangered areas one must count on the presence of clinically unsuspected pigs which can harbor, and naturally also excrete, the virus of foot-and-mouth disease over a period of time longer than usual, before the appearance of any typical, diagnostically utilizable symptoms. The fact that aphthous vesicular exanthem can appear in pigs as late as 4-5 days p.i. has been confirmed by occasional observations in practice and by experimental cases in our institute.

"Special epidemiological conditions during the 1951-52 epidemic directed our attention to another problem, which we likewise tackled by means of animal experiments. When the foot-and-mouth disease epidemic spreading at the time in West Germany reached the line of demarcation, the pathogen was able to establish itself particularly in goat herds, where, in some areas, there were often many deaths among the uninoculated goats.

"According to the reports of the Kreis veterinarians, individual goats or groups of goats in the areas and herds infected or threatened with foot-and-mouth disease became infected in most cases without any previous indication or under coliclike conditions with diarrhea and considerable decrepitude all at once and died within a very short time. On dissection the otherwise well-known changes in the case of foot-and-mouth disease were in most cases not found in any of the organs, but rather a hemorrhagic enteritis with strong bleeding in the intestinal lumen (sometimes sausagelike and stopped up with blood coagulum), splenic tumor, hemorrhages of the epicardium and endocardium, blood in the free intestinal cavity and in the gall bladder, and occasionally hemorrhages of the diaphragm and of the gums. In the further course of the disease, the deaths allegedly decreased with the symptoms of

hemorrhagic septicemia. Frequently, a considerable lameness of one leg was observed, on which aphthous changes at the fimbria of the foot were detected only after a long search. Even in these cases, specific changes in the oral cavity are said to have been not always present.

"According to Roehrer (personal talks), similar phenomena were observed during World War II in certain herds in Schleswig-Holstein, wherein the pronounced enteritic picture more or less dominated the course of the foot-and-mouth disease infection.

"In view of the fact that the quite uncharacteristic disease symptoms frequently observed in goats during the last large epidemic deviated more or less sharply from the usual picture of foot-and-mouth disease in cattle, pigs, and calves, practicing colleagues quite often asked our institute whether or not the pronounced hemorrhagic-septicemic symptoms represent a new form of foot-and-mouth disease or are to be considered secondary affections or mixed infections. We might also mention here that, on the basis of results of previous bacteriological tests of these questionable cases reported to us, the presence of pathogenic bacteria, with very few exceptions, could be ruled out. Another interesting thing in this connection is the report of a Kreis veterinarian, according to which several red deer (stags and does) in a zoological garden in the area of a foot-and-mouth disease epidemic died with the same symptoms of a hemorrhagic gastroenteritis.

"With the use of the epizootic type variant A_5 we were successful (Arch. exp. Veterinaermed., 7, 1953, p 407) in reproducing in artificially infected goats the condition observed in practice and to explain the fact that the above-mentioned changes of the stomach and intestine are not of inflammatory nature, but signs of a previous acute circulatory collapse. They have nothing to do with the direct effect of the virus.

"We were finally able to produce the same tissue processes even in guinea pigs which we infected with the various types of virus. Here too, in the case of the symptoms established in the various organs, expecially in the digestive apparatus, it was a matter of secondary circulatory changes as a result of the failure of circulation in the vascular periphery, thus a state of collapse like those observed in the case of other infectious diseases.

"What role, then, does the foot-and-mouth disease virus play in the development of this peripheral circulatory debility? On the one hand, the inclination is to consider that the distrubed dynamics of circulation, for the most part, are to be traced back to direct virugenic irritation of the vegetative nervous system, which was incipient at the vasomotor center or at the peripheral vascular nerves. On the other hand, endocrinous influences during the occurrence of the disease might be of some importance for the manner in which the disturbances to the blood circulation occur. Thus, in an experimental hog cholera, Matthias (Arch. exp. Veterinaermed., 8, 1954, p 226; ibid, 11, 1957, p 43) was able to detect changes of the adrenal gland in the form of an internal progressive transformation of the cortex and atrophy of the

chromaffin substance of the medulla, which he shows to be connected with the circulatory disturbances which occur in the case of this disease. Even though the histomorphology of the adrenal glands of our foot-and-mouth disease material does not immediately give a clear indication of the presence of similar tissue processes -- additional special investigations are necessary for this -- it seems, nevertheless, justificable, in view of the striking congruence of the pathological effect in the various other organ systems in the case of the two virus diseases, to assume that, with the foot-and-mouth disease too, a stress effect can be produced, whereby the effect of the infectious agents can produce in the hypophysis-adrenal cortex system a state of increased function and output. By analogy with the conditions in the case of hog cholera, it appears that, with the foot-and-mouth disease also, a simultaneous functional disturbance of the adrenal cortex and adrenal medulla would lead to circulatory disturbances with symptoms of collapse and thereby cause sudden and frequent deaths -- in the absence of morphologically detectable myocardium damage -- in the case of the latter disease.

"Most recent research done at Riems on the experimental pathology of foot-and-mouth disease deserves special mention insofar as it is of fundamental importance for the pathogenesis of this disease. According to the traditional conception of the biphase course of the infection, the upper portion of the alimentary canal where individual or several aphthea are formed is considered the primary site of virus multiplication. From these primary blisters, the virus then penetrates into the blood stream, and a short time later the hairless parts of the skin and of the cutaneous mucus membranes, the so-called predilection sites, break out in secondary or generalized aphthae, accompanied by general feverish reactions. Certain observations and deliberations led to the surmise that the propagation site of the virus of foot-and-mouth disease is not only the mucus membrane of the mouth, but might also be sought in other regions of the cranial cavity, possibly in the upper air passages which are rather inaccessible to inspection. Various authors report a detection of the virus in the milk or saliva before the appearance of typical clinical symptoms, such as temperature rise and formation of aphthae in the mouth. Moehlmann (Arch. exp. Veterinaermed., 8, 1954, p 316) mentions the discovery of aphthae on the crura of the rumen of cattle, which, after a 'cloth infection' (Tuchinfektion), displayed fever and anorexia,) but no exanthema in the mouth or on the feet.

"By means of detailed virological and histological tests on the various areas of the mucus membrane of the cranial cavity, including the regional lymph nodes, of artificially infected cattle, our institute has proved (Arch. exp. Veterinaermed., 11, 1957, p 637) that the primary site of the multiplication of the virus of foot-and-mouth disease is the upper air passages, chiefly in the mucus membrane of the nose. Corresponding investigations showed that in this previremic state no primary aphthae or aphthea-like changes in the mucus membrane of the oral cavity and tongue were to be detected either macroscopically or histologically. The subsequent blood infection probably

takes place via the lymphatic route and takes place during the incubation time before the fever reaction. An additional multiplication of the virus with the formation of aphthous processes which occurs along with a rise of temperature takes place at the well-known predilection sites, in addition to which, as mentioned already, the skeletal musculature, under certain conditions, can also be included. According to Korn, there is no such thing as a primary aphtha in the traditional sense; it is not to be excluded, however, in the case of freshly wounded epithelium in the region of the cutaneous mucus membrane.

"According to these results, therefore, the infection of susceptible hoofed animals seems to take place essentially via the mucus membrance of the nose, whereby virus can be secreted with the nasal secretion and the breath a short time after natural infection. This assumption is also supported by the experience that, in the case of epidemiological measures in stalls, a second disinfection, carried out after certain periods of time have elapsed, proved in our institute to be particularly effective; the second disinfection is for the purpose of rendering harmless the particles or droplets, containing the virus, which hover in the air and settle to the ground very slowly."

62. Proposals for New Soviet Medical Organizations and Activities

"Summary of Discussions of the Report of Prof I. V. Davidovskiy, Vice-President, Academy of Medical Sciences USSR" (unsigned article); Moscow, Vestnik Akademii Meditsinskikh Nauk SSSR, No 7, Jul 58, pp 55-61

The following proposals were offered by Soviet medical scholars for establishing new organizations and activities in conjunction with the report of Prof I. V. Davidovskiy, "On the Prospective Plan of the More Important Problems of Medical Science for 1959-1965:"

Prof L. S. Persianinov, chairman, Scientific Medical Society, Ministry of Health Belorussian SSR, proposed that the Academy of Medical Sciences USSR not only organize scientific research for its institutes but also for the institutes under the Ministry of Health of all Soviet republics. He also proposed that the Academy of Medical Sciences USSR organize an affiliate in the Belorussian SSR.

Prof A. A. Bagdasarov, Active Member, Academy of Medical Sciences USSR, discussed the necessity for developing new native preparations for the treatment of leukosis. He also proposed that a series of specialized experimental laboratories for the study of diseases of the circulatory system be formed, and that in 1958 new hematological clinics and departments be organized in a series of medical establishments. In addition, Bagdasarov proposed that the Scientific Research Institute of Blood Transfusion in Minsk be reorganized into the Institute of Hematology and Blood Transfusion.

Prof B. G. Yegorov, Active Member, Academy of Medical Sciences USSR, proposed that more physicists be employed in medical and scientific research institutes; he also proposed that a more fully developed program on scientific medical statistics be inaugurated.

Prof E. I. Atakhanov, chairman, Scientific Medical Council, Ministry of Health Uzbek SSR, proposed that the Academy of Medical Sciences USSR conduct research on regional medical problems such as the course of various pathological processes under conditions of a hot climate, etc. Atakhanov further proposed that the medical institutions of each individual republic conduct research on these regional problems. He also proposed that the principal institutes of the Academy of Medical Sciences USSR be transferred in the future to the union republics where they could conduct research on problems pertaining to the health and welfare of the individual republics.

Prof A. D. Adenskiy, Minsk, proposed that more research be conducted on metabolic disturbances.

Prof S. A. Kosilov proposed that greater emphasis be given to the study of the physiology of labor.

Prof N. N. Blokhin, Corresponding Member, Academy of Medical Sciences USSR, proposed that a major laboratory for the cultivation of tumors be organized within the Academy of Medical Sciences USSR. He further proposed that it was necessary to organize research on problems of tumor statistics and on regional peculiarities in the spread of tumors.

Prof N. D. Strashun, Active Member, Academy of Medical Sciences USSR, proposed that efforts be made for the study of the history of medicine in the USSR by all institutes.

Prof S. Ye. Severin, Active Member, Academy of Medical Sciences USSR, proposed that the development of biochemistry be advanced and that biochemists be trained in medical institutions. He also proposed to establish well-equipped biochemical laboratories in order to carry out the proposed studies on the analysis of morphogenesis.

Prof D. A. Zhdanov, deputy chairman, Scientific Plans Commission of the Presidium of the Academy of Medical Sciences USSR, proposed that research work be completely free of bureaucratism which could stall its progress. He also proposed that the problem commissions of the principal institutes perfect their methods so that they could develop their own plans for scientific research during 1959.

Prof B. A. Dolgo-Saburov, Corresponding Member, Academy of Medical Sciences USSR, proposed that, in order to fulfill the prospective plan, all cadres must be highly trained and the whole material basis, i.e., laboratories, chairs, institutes, etc., be greatly improved.

Prof V. V. Zakusov, Active Member, Academy Medical Sciences USSR, proposed that a laboratory for process research on new medicines be established in the Institute of Pharmacology and Chemical Therapy with the aim of conducting chemical testing. This laboratory would be comparable to a testing laboratory for new medical preparations.

Prof L. A. Zil'ber, Active Member, Academy Medical Sciences USSR, proposed that greater coordination among working groups be established in order that the scientific research problems in medical science be completed.

Prof Sh. D. Moshkovskiy, Corresponding Member, Academy of Medical Sciences USSR, proposed that greater emphasis be placed on the prospective plan on problems in chemical therapy.

Prof A. I. Yevdokimov, Corresponding Member, Academy of Medical Sciences USSR, proposed that more research be conducted on diseases of the teeth and that more research be conducted at the Moscow Medical Stomatology Institute.

Prof V. I. Ioffe, Corresponding Member, Academy of Medical Sciences USSR, proposed that the subject of immuno chemistry be taken up more seriously in the prospective plan and that future cadres receive better training in the field of microbiology and immunology.

Prof I. I. Speranskiy, Corresponding Member, Academy of Medical Sciences USSR, proposed that greater attention be given to study of the processes of the higher nervous activities.

Prof P. I. Yegorov, Corresponding Member, Academy of Medical Sciences USSR, proposed that greater efforts be devoted to developing new chemical therapeutic preparations. He also proposed that the Academy of Medical Sciences USSR exact a greater control over the publication of Meditsinskiy Rabotnik, which has allowed the publication of doubtful information on medical science.

Prof A. I. Savitskiy, Corresponding Member, Academy of Medical Sciences USSR, proposed that greater attention be given to the problem of the early diagnosis of cancer. He also proposed that the method for examining individuals believed to have cancer be more exacting.

Prof N. N. Priorov, Active Member, Academy of Medical Sciences USSR, proposed that a special establishment be formed whose function will be the restoration of the functions of injuries caused by specific trauma.

Prof L. A. Koreysha, Moscow, proposed that studies on general pathology and biochemistry be included in the prospective plan for the following 7 years.

L. I. Medved', Kiev, proposed that problems on hygiene in rural communities and the problems of rural public health be included in the prospective plan.

Prof V. N. Moshkov, Corresponding Member, Academy of Medical Sciences USSR, proposed that a special institute for the study of restorative functions be established, and that the Academy of Medical Sciences USSR include in its plan the medical problems of physical culture and sport.

Prof N. A. Kurshakov, Corresponding Member, Academy of Medical Sciences USSR, proposed that the training of physicians specializing in radiation pathology be accelerated.

Prof A. F. Tur, Active Member, Academy of Medical Sciences USSR, proposed that more studies be set up on the problem of children's diseases and development.

Prof Belen'kiy, Scientific Medical Council, Ministry of Health Latvian SSR, proposed that greater emphasis be given to the study of chemical therapy in the following 7 years.

Prof N. G. Olsuf'yev, Corresponding Member, Academy of Medical Sciences USSR, proposed that the problem commissions should strengthen and expand the organizational-methological divisions of the principal scientific research institutes.

63. Scientific and Organizational Measures Adopted for Soviet Medical Institutions

"Basic Scientific and Organizational Measures Adopted by the 12th Session of Academy of Medical Sciences USSR" (unsigned article); Moscow, Vestnik Akademii Meditsinskikh Nauk SSSR, No 7, Jul 58, pp 61-65

The following scientific and organizational measures were recommended at the 12th Session of Academy of Medical Sciences USSR in conjunction with the adoption of the Prospective Plan on the More Important Problems of Medical Science for 1959-1965:

"The network of scientific research institutes of the Academy of Medical Sciences USSR, the Ministry of Health USSR, and the Ministries of Health of the union republics are to be re-examined with the aim of achieving a more rational utilization of the scientific cadre and a more effective geographic distribution of scientific research institutions.

"Young scholars are to be induced to participate in the work of the sessions of Academy of Medical Sciences USSR and the all-union and republic scientific conferences and congresses in order to improve their qualifications.

"The training of cadre is to be expanded in the following scientific fields: morphology, histochemistry, immunochemistry, heredity and evolutionary changes, immunomorphology, general epidemiology, the scientific basis of vaccines and sera, microflora of humans and dysbacteriosis, the physiology and chemistry of viruses, sanitary virology, radiobiology, cardiology, gastroenterology, endocrinology, hormone synthesis, gerontology,

oncology (theoretical), traumatology (theoretical), plastic surgery, orthopedics, heart and lung surgery, general neurology, micropediatrics, medical psychiatry and psychology, the pharmacology of antibiotics, labor hygiene, physiology of labor, occupational diseases, climatology, school hygiene, anesthesiology, health resort studies, meteorology, physical culture, general physiology, general pathology, medical statistics, and the history of medicine.

"The organizational and methodological divisions of all principal scientific research institutes are to be expanded and strengthened.

"A book on achievements in the development of each problem of medical science in the USSR and abroad should be published every 3-5 years. This book must be prepared in cooperation with the problem commission under the editorship of its chairman.

"The production of electron microscopes of more modern design, ultra-microscopes, high-speed ultracentrifuges, refrigerated centrifuges, refrigerators -70 degrees, automatic syringe pipettes, and other contemporary equipment for scientific work should be developed.

"To guarantee the scientific work of institutes of the Academy of Medical Sciences USSR, it would be imperative to organize vivariums which will be able to keep experimental primates for long periods in Moscow and Leningrad; also to organize a central 'nursery' under the Academy of Medical Sciences USSR for breeding experimental animals of a pure line. It would also be necessary to produce, on a mass scale, a standard briquette type of feed for laboratory animals.

"To conduct research on established problems it has been decided to organize a Clinicoexperimental Physiology Laboratory (Klinikoeksperimental'naya Fiziologicheskaya Laboratoriya) in the following clinical institutes: Scientific Research Institute of Neurosurgery imeni Polenov; Scientific Research Institute of Neurosurgery imeni Burdenko, Academy of Medical Sciences USSR; Institute of Psychoneurology imeni Bekhterev; and Scientific Research Institute of Neurology, Academy of Medical Sciences USSR.

"It has been decided that a Laboratory of Gas Metabolism, a Laboratory of Electrophysiology, and a Neuromorphological Laboratory be established in the Division of General Physiology, Institute of Experimental Medicine, Academy of Sciences USSR, for the complex development of the problem of the physiology of the central nervous system.

"To conduct research on morphology it is necessary that an Institute of Normal and Pathological Morphology (Institut Normal'noy i Patologicheskoy Morfologii) be organized within the system of the Academy of Medical Sciences USSR and that groups of scientific workers and laboratory assistants, furnished with necessary equipment, be established in vuzes (higher educational institutions).

"A laboratory or a group for the study of metabolic processes and functional changes during regeneration should be established in the Institute of Experimental Biology, Academy of Medical Sciences USSR, in order to do research on regeneration.

"A statistical bureau for the study of the role of population factors in pathology and for working out the methodological indices for the study of hereditary diseases should be established in the Institute of the Organization of Public Health. A Laboratory of the Heredity of Man and a Laboratory of Radiobiology should be organized within the Institute of Experimental Biology, Academy of Medical Sciences USSR, and the Institute of Experimental Medicine, Academy of Medical Sciences USSR.

"The study of the mechanism of the action of medicinal substances and the search for and synthesis of new pharmocological and chemotherapeutical drugs require the organization in the East of a scientific research institute with chemical synthesis as its base and scientific research laboratories attached to major chemicopharmaceutical plants, in order to strengthen the Scientific Research Institute of Medicinal and Aromatic Plants, the Ural Branch of the All-Union Chemicopharmaceutical Institute, and individual laboratories. All the above establishments must have the latest equipment, the newest technology, and experimental animals. It is also imperative that experimental pilot plants be organized and attached to major medical industry plants.

"A second Technological Institute of Antibiotics must be organized in the East, in the region where new antibiotic production plants have been established. Work on the chemistry of antibiotics must be expanded in the All-Union Scientific Research Institute of Antibiotics; the Institute for the Search for New Antibiotics, Academy of Medical Sciences USSR; the Leningrad Institute of Antibiotics; the Institute of Biological and Medical Chemistry, Academy of Sciences USSR; and the Institute of Pharmacology, Academy of Medical Sciences USSR.

"Laboratories for the Study of Antibiotics must be organized within the chairs of microbiology of the Kiev, Khar'kov, Rostov, Minsk, Kazan', and Alma-Ata medical institutes.

"Study of the problem 'The Physiological Basis and the Hygiene of Nutrition of Both the Sick and the Well' will be more successful if institutes of nutrition are established in Novosibirsk, Tashkent, and Leningrad, and nutrition laboratories in the Dnepropetrovsk, Novosibirsk, Sverdlovsk, Rotov-na-Donu, Gor'kiy, Kazan', Baku, and Yerevan sanitation institutes are properly equipped.

"It is also necessary to strengthen the material base of the State Institute of Vitaminology; the All-Union Scientific Research Vitamin Institute; and the chairs of physiology, biochemistry, and pathophysiology of vuzes which are conducting research on vitamins.

"The research on such problems as the variability of microorganisms, immunity, and the scientific basis of vaccines and sera have brought forth a series of scientific organizational measures. It becomes necessary therefore, to form within the system of the Acadery of Medical Sciences USSR a scientific research base for the study of immunity and allergy in the form of a major division in one of the institutes of the academy which could be reorganized within 3 or 4 years into an independent institute. It is also necessary to radically improve the technical and material security of epidemiological and microbiological institutes and to improve the supply of new high-speed centrifuges, 'subzero' (-90 to -70 degrees) refrigerators and other modern equipment to institutes, and to organize the study of polyvaccines and their preparation.

It has been decided to establish well-equipped laboratories in children's infectious clinics; to supply all rayon laboratories attached to polyclinics with modern methods capable of early diagnosis of whooping cough; and to organize in infectious children's clinics a sanitation department for convalescence after certain acute infections, with the aim of studying the processes of recuperation and guarantee them a supply of modern apparatus for the study of the functional status of various organs and systems in an infectious process.

"To organize the study of virus diseases it is necessary to establish experimental-technical laboratories within the virology institutes.

"It is necessary to establish several production institutes in the USSR which will be capable of producing vaccines against polio-myelitis and to organize a wide network of virology laboratories equipped with necessary diagnostic apparatus. To successfully develop the study of parasitic diseases, a new building must be erected for the Institute of Malaria, Medical Parasitology, and Helminthology in Moscow and in the East.

"The Institute of Therapy, Academy of Medical Sciences USSR, is to be expanded in order to guarantee the research on the problems of hypertonic diseases, arteriosclerosis, and coronary insufficiencies. The institute is to increase its scientific workers, equipment, and number of hospital beds. In addition, it has been decided to increase the work of the chemicopharmaceutical institutes on the study and synthesis of new means of treating hypertonic diseases, arterosclerosis, and coronary insufficiencies, and to improve the work in the pharmaceutical industry.

"The organization of research on the problem 'The Physiology and Pathology of the Organs of Digestion, Ulcers, and Diseases of the Liver' requires the formation, within the system of the Academy of Medical Sciences USSR, of gastroenterological clinics with experimental divisions for the study of the pathology of the digestive system organs, and dispensary cabinets for treating ulcer patients.

"A Scientific Research Institute of Rheumatism and Joint Diseases is to be organized in Moscow to work on problems of rheumatism and joint diseases.

"Research on the problem of 'Physiology and Pathology of the Endocrine System' requires the organization, within the all-union and Ukrainian institutes of endocrinology, of chemistry and hormone laboratories, equipped with scientific apparatus and highly qualified specialists plus experimental production laboratories and experimental plants.

"To guarantee the resolution of the problem 'The Diseases of the Blood, Blood Transfusion, and Blood Substitutes' it is necessary to expand scientific research on the subject of normal hematopoiesis, and to utilize the latest morphological, histochemical, biochemical, and related methods of research; to organize, within the institutes of hematology and blood transfusion in Moscow, Leningrad, Khar'kov, and Tbilisi, special studies on experimental models of the diseases of the blood system (leukosis); to form hematological clinics in all institutes of blood transfusion, and to organize a Hematological Department in the Institute of Pediatrics, Academy of Medical Sciences USSR.

"It is recommended that the problems concerning blood diseases be worked out in other institutes such as the Institute of Experimental Pathology and Cancer Therapy, Academy of Medical Sciences USSR; the Institute of Microbiology and Epidemiology imeni N. F. Gamaleya, Academy of Medical Sciences USSR; the Institute of Pediatrics, Academy of Medical Sciences USSR; and other laboratories and clinics in medical institutes.

"It has been decided to create specially equipped recuperative establishments for paralytic patients and those suffering from speech impediments. These establishments are to be formed in the RSFSR, the Ukrainian SSR, the Central Asiatic republics, and the Baltic Region.

"It was proposed that a special scientific research center for the study of epilepsy and epileptic statistics be established, and that a Scientific Research Institute of Psychiatry be organized within the system of the Academy of Medical Sciences USSR.

"To expand research on the problem 'Hygiene of Labor and Occupational Diseases' a number of institutes of labor hygiene and occupational diseases must be established in the industrial centers of Siberia and the Far East, Belorussia, and Kazakstan.

"It is necessary to expand and strengthen the divisions of special hygiene in the institutes of hygiene of labor and occupational diseases, to expand and strengthen laboratories of physiology of labor in the same institutes; to increase scientific research on the physiology of labor in existing laboratories; and to organize in these institutes laboratories for the study of noise, vibration, and industrial lighting.

"The Institute of General and Municipal Hygiene imeni A. N. Sysin, Academy of Medical Sciences USSR, is to expand its research on the problem 'The Hygiene of Populated Areas and the Problems of Human Acclimatization.'

"To expand scientific work on tuberculosis with the aim of liquidating it, the existing network of institutes must be strengthened by creating branches of the Institute of Tuberculosis, Academy of Medical Sciences USSR, in Siberia, Khabarovsk, Kiev, and other places.

"It is necessary to increase the production of basic antitubercular drugs, i.e., phthivazid, streptomycin, and PAS, and increase the search for new stable preparations against the tuberculosis pathogens.

"To increase research on malignant tumors, it is necessary to establish a number of scientific research oncological irstitutes in addition to the two existing institutes, and to organize special cytomorphological laboratories in each republic, oblast, and kray for the early diagnosis of cancer.

"To expand research on the surgery of the nervous system and psychoneurology, it has been decided to establish neurosurgical institutes in Siberia and Central Asia; to organize neurosurgical divisions within the system of medical institutes which would be subordinate to neural disease clinics; to organize departments for the restoration of functions under the institutes of neurosurgery; to establish under the Institute of General and Municipal Hygiene, Academy of Medical Sciences, laboratories of radiology, acoustics, aerodynamics, and toxicology, and a division of personal hygiene and rest, plus an experimental workshop for developing new instruments and preparations. It is also necessary to expand and strengthen the divisions of hygiene within the institutes of epidemiology, microbiology, and hygiene.

"To organize research on the problems of anesthesiology, it is necessary to develop new types of apparatus for artificial breathing and universal apparatus for the inhalation of narcotic gases. It is also necessary to develop practical apparatus for use in artificial blood circulation and hemotherapy.

"The research on medical problems of physical culture and sport requires the establishment, within the system of the Ministry of Health RSFSR of a Scientific Research Institute of Physical Culture and special medical schools for training medical personnel specializing in therapeutic physical culture."

64. All-Union Scientific Society of Specialists in Pathological Anatomy to Meet in July 1959, at Khar'kov

"Chronicle," by Prof I. K. Yesipova, scientific secretary, All-Union Scientific Society of Specialists in Pathological Anatomy; Moscow, Arkhiv Patologii, Vol 20, No 7, July 1958, pp 94-95

The Board of Directors of the All-Union Scientific Society of Specialists in Pathological Anatomy held a plenary session in Moscow, 19-20 May 1958. Participating were about 30 members of the board from Moscow, Leningrad, Kiev, Khar'kov, Tomsk, Novosibirsk, Minsk, Ufa, Ivanovo, Smolensk, Kuibyshev, Tashkent, and Penza. The following problems were discussed.

1. The training of specialists in pathological anatomy.

2. The introduction into practice of research methods of pathological anatomy and histochemistry.

3. A report by R. D. Shtern, executive secretary of the journal Arkhiv Patologii, entitled "A Report of the Editorial Board of the Journal for 1957."

4. A joint report by I. V. Davydovskiy, president of the society, and T. P. Vinogradova entitled "On the Condition of Pathological Anatomy Service in the Public Health System of the USSR."

The Editorial Board passed a resolution setting the first few days of July 1959, for the meeting of the All-Union Congress of Specialists in Pathological Anatomy at Khar'kov. The following subjects are scheduled to be discussed.

1. Pathological anatomy, pathogenesis, and classification and prevalence of tumors.

2. Radiation pathology.

3. The effects of antibiotics on an organism.

Subjects for the reports must be sent in by 1 October 1958, to I. K. Yesipova, scientific secretary of the society, at the following address: Moscow, D-57, Leningradskiy Prospect (Ave), 75a, kv. [suite] 108. All reporters must submit the text of their reports not later than 1 March 1959.

It was also decided to have a commission composed of A. P. Avtsyn, A. I. Strukov, V. V. Portugalov, T. P. Vinogradova, and S. M. Shibayeva report quickly to the Ministry of Health USSR and to the Moscow Institute of Chemical Reagents concerning the introduction of histochemical methods of research into medical practice and to arrange a symposium on histochemistry, histology, and biochemistry.

After discussion of the report by the executive secretary, various resolutions were passed on the size, content, and frequency of the journal Arkhiv Patologii.

65. Soviets to Publish New Medical Periodicals

"Basic Scientific and Organizational Measures Adopted by the 12th Session of Academy of Medical Sciences USSR" (unsigned article); Moscow, Vestnik Akademii Meditsinskikh Nauk SSSR, No 7, Jul 58, p 62

It was proposed at the 12th Session of the Academy of Medical Sciences USSR that the following new medical periodicals be published during 1959-1965:

Experimental'naya Morfologiya (Experimental Morphology)

Sovetskaya Vitaminologiya (Soviet Vitaminology)

Voprosy Kardiologii (Problems of Cardiology)

Gastroenterologiya (Gastroenterology)

Voprosy Revmatizma (Problems of Rheumatism)

Voprosy Grudnoy Khirurgii (Problems of Thoracic Surgery)

Gerontologiya (Gerontology)

Voprosy Istorii Meditsiny (Problems of the History of Medicine)

Anesteziologiya (Anesthesiology)

Voprosy Immunologii (Problems of Immunology).

It was also proposed at the session to increase the size and periodicity of the following existing medical periodicals i.e., they are to become monthly publications: Voprosy Meditsinskoy Khimii (Problems of Medical Chemistry), Problemy Endokrinologii i Gormonoterapii (Problems of Endocrinology and Hormone Therapy), Meditsinskaya Radiologiya (Medical Radiology), Vestnik Rentgenologii i Radiologii (News of Roentgenology and Radiology), Arkhiv Anatomii, Gistologii i Embriologii (Archive of Anatomy, Histology, and Embryology), Problemy Tuberkuleza (Problems of Tuberculosis), Voprosy Virusologii (Problems of Virology) and Voprosy Kurortologii, Fizioterapii i Lechebnoy Fizkul'tury (Problems of Resort Studies, Physical Therapy, and Therapeutic Physical Culture).

66. A USSR Conference on Pure Metals

"First Inter-Vuz Conference on Pure Metals", by V. V. Krapukhin; Ordzhonikidze, Izvestiya Vysshikh Uchebnykh Zavedeniy-Tsvetnaya Metallurgiya, No 2, Jun 58, pp 173-174

The first Inter-Vuz Conference on Pure Metals, Intermetallic Compounds, and Semiconductors was held at the Moscow Institute of Nonferrous Metals and Gold 15-18 October 1957. More than 360 delegates from 18 vuzes (higher educational institutions), 5 institutes of the Academy of Sciences USSR and academies of sciences of union republics, 13 scientific research specialized branch institutes and designing bureaus of various ministries and institutions, 8 industrial enterprises, and other organizations participated in the conference. Altogether, 32 reports were given at the conference, of which 21 originated at higher educational institutions and 12 at scientific research institutes.

The conference was opened by T. P. Glek, director of the Institute of Nonferrous Metals and Gold, who outlined its purposes and tasks.

Prof M. N. Murach (Moscow Institute of Nonferrous Metals and Gold) Doctor of Technical Sciences, and chairman of the Organizational Committee of the Conference, presented a paper reviewing the problem of obtaining pure metals and the economic significance of the production of such metals. Murach pointed out that the production of pure metals as well as research in this field involve simultaneously the solution of problems pertaining to the evaluation of the degree of purity of metals and those connected with the determination of the content of impurities in them. This, in turn, requires establishment of a production of the purest reagents and auxiliary materials as well as organization of laboratories and semiplant and full-scale industrial aggregates in addition to the development of precise chemical and physical methods of analysis.

The solution of the problems involved encounters difficulties as great as those which must be overcome in connection with the principal technological task that has to be accomplished, namely, the production of pure metals and semiconductors.

In the course of a discussion of the most important technological processes applied for the production of pure metals and their compounds, Professor Murach discussed results achieved in the purification of a number of metals and semiconductors. He pointed out that even when the content of an impurity amounts to one part per million parts of the principal metal, one cubic centimeter of the metal still contains 10^{16} atoms of the impurity per 10^{22} atoms of the principal metal. For that reason, it

is necessary to find new methods for the more thorough purification of metals and semiconductors. The author of the report stated that hitherto no uniform method has been accepted for indicating the purity of metals and the content of impurities in them. In touching upon economic implications of the problem, he pointed out that with increased purity, the cost of metals and semiconductors rises sharply, so that the consumers must indicate precisely the required degree of purity.

N. N. Sirota, Active Member of the Academy of Sciences Byelorussian SSR, presented a report entitled "The Physical Properties of Semiconductor Elements and Compounds in Relation to the Position of the Components in the Periodic System." He brought out on the examples of calcium [presumably carbon rather than calcium is meant], silicon, germanium, and tin that the width of the forbidden zone decreases with increasing atomic weight. In the series in question, the melting temperature and the characteristic temperature drop. All values which depend on the characteristic temperature, i.e., the entropy, the free energy, the inner energy, and also such values as the modulus of elasticity, the coefficient of linear expansion, hardness, etc., change according to definite relationships.

A number of important characteristics of semiconductors, such as the mobility of current carriers, the half-life, and the diffusion path depend on the position of the elements in the periodic system. Consideration on the basis of the position of elements in the periodic system of changes in the physical properties of their compounds from the standpoint of the structure of these compounds and the energy of inter-atomic interaction leads to the conclusion that there are extensive possibilities of finding new semiconductor materials with the most diverse properties.

A number of papers dealt with the physicochemical principles of methods for the production of pure metals. V. L. Kheyfits and A. L. Fotinyan of Gipronikel' (State Design and Planning Institute of Nickel Metallurgy Enterprises) discussed electrochemical procedures for the separation of the principal metal and impurities which accompany it as well as separations based on different solubilities of metal compounds and different vapor tensions of metals or their compounds. Yu. V. Baymakov (Leningrad Polytechnic Institute) cited results obtained in research on the electrolytic separation of metals both in aqueous solutions and fusions. The simultaneous discharge of cations of the principal metal and cations of impurities was investigated with the application of isotopes, so that very small quantities of impurities (e.g., a content of cobalt in copper amounting to $1 \times 10^{-11}\%$) could be determined.

E. V. Nikolayev (Moscow Institute of Nonferrous Metals and Gold), in discussing the theory of extraction, pointed out the important part played by this method in the production of pure and ultrapure substances. Results of research on the thermochemistry of chlorine compounds of tungsten and molybdenum were reported by members of a group working under the

direction of S. A. Shchukarev (Leningrad State University). A. G. Spasskiy and B. A. Fomin (Moscow Institute of Nonferrous Metals and Gold) reported on results of the investigation of diffusion processes in liquid metals. A. N. Krestovnikov and V. N. Vigdorovich of the same institute presented data obtained in thermodynamic investigations of the possible types of phase equilibria at the ordinates of individual chemical entities.

A large number of reports dealt with the investigation on methods for the production of different metals of high purity. V. S. Yemel'yanov, A. I. Yevsyakhin, and others (Moscow Engineering — Physical Institute) reported on the refining of chromium and hafnium with the application of the iodide method; A. I. Belyaev and L. A. Firsanova (Moscow Institute of Nonferrous Metals and Gold) on the production of pure aluminum by the distillation of aluminum subfluoride; and G. N. Nikolayenko on the production of ultrapure antimony, bismuth, and gallium by the methods of vacuum distillation and zone refining.

The following reports were given on work done at Gipronikel' in connection with the production of pure metals: by E. Sh. Ioffe on tin, by N. P. Kolonina on niobium oxide, by O. D. Krichevskaya on molybdenum and tungsten, by S. N. Chernobrov on cobalt, and by L. I. Sverchkova on zinc.

A paper describing a chemical method for the production of pure rhodium was presented by Ye. V. Shenderskaya and A. G. Mayorova (Institute of General and Inorganic Chemistry, Academy of Sciences USSR) and one on the production of pure tellurium by L. A. Soshnikova (State Institute of Nonferrous Metals). The possibilities of extracting the chlorides of some nonferrous metals with the application of kerosene and isoamyl alcohol were investigated with the purpose of devising methods for the production of pure antimony, cobalt, and gold by F. S. Kulikov, R. P. Dulyapina, and G. A. Smirnova (Moscow Institute of Nonferrous Metals and Gold). L. A. Nisel'son (Moscow Institute of Nonferrous Metals and Gold) presented a paper on the application of the rectification processes for the separation of alkali metals, zirconium and hafnium, and tantalum and niobium. Information on the best equipment to be used in these separations was included in the paper. A paper on the electrochemical refining of zinc from amalgams was presented by B. N. Lapshin (Ivanovo Chemico-Technological Institute).

The conference passed a resolution in which it recommended planning of research in the field of pure metals, coordination of research work and of the application of industrial methods with the state plan of economic development for the next 6-7 years, and increased standardization of methods for the analysis and evaluation of pure metals, their compounds, and semiconductor materials in accordance with the demands made by consumers.

It was decided to increase the volume of the published translations on problems pertaining to the production and investigation of pure metals, their compounds, and semiconductor materials.

The conference regarded as desirable the creation under Gosplan or the Scientific-Technical Committee of the Council of Ministers USSR of a coordination center (commission) for work in this particular field. The calling of annual conferences on the subject and the publication of the transactions of these conferences was also regarded as desirable.

The complete text of reports presented at the conference held in 1957 is being prepared for publication and will be published in Metallurgizdat in 1958 as a separate volume.

67. Hydrogen Embrittlement of Titanium

"Effect of Hydrogen on the Structure and Properties of Titanium and Its Alloys," by S. G. Glazunov, I. I. Kornilov, and A. M. Yakimova, Moscow, Izvestiya Akademii Nauk, Otdeleniye Tekhnicheskikh Nauk, No 6, Jun 58, pp 30-36

This article briefly reviews works published in recent years in Soviet and non-Soviet technical literature on the effect of hydrogen on titanium and its alloys. The low-temperature portion of transformation in the phase diagram of titanium-hydrogen is considerably refined as a result of numerous published investigations by various authors. It was established that the mechanism in hydrogen embrittlement is determined by the type of alloy structure, namely:

1. The principle of embrittlement in industrial titanium and α-type structure alloys is displayed by a separation of the hydride phase in eutectoid decomposition. Hydrogen embrittlement of α alloys basically leads to increased notch sensitivity.

2. Separation of the hydride phase in alloys with $\alpha+\beta$ and β-type structure has not been detected so that the mechanism of embrittlement in this type of alloy is not clear. The effect of hydrogen in $\alpha+\beta$-type alloys is displayed by decreased ductility during low-speed tension tests and also by premature brittle failure during long duration strength tests at room temperature.

Alloys with a β-type structure are practically insensitive to admixtures of hydrogen in quantities which show noticeable effect on the properties of alloys of the first two groups.

The harmful effect of hydrogen on titanium alloys can be removed by vacuum annealing.

68. Weldability of Titanium Alloys Containing Copper

"On the Problem of the Weldability of Titanium Alloys Containing Copper," by S. M. Gurevich; Kiev, Avtomaticheskaya Svarka, No 4, Apr 58, pp 32-36

Submerged butt-welded joints of seven alloys of the Ti-Al-Cu system containing approximately 5% Al and 0.5 to 4.7% Cu were investigated for structure and mechanical properties at the Institute of Electric Welding imeni Ye. O. Paton, Academy of Sciences Ukrainian SSR. The alloys welded were in sheets of 2 to 2.5 mm thickness which had been prepared by forging and rolling of ingots smelted by the double smelting method in vacuum arc furnaces. The specimens were presented by the All-Union Institute of Aviation Materials. Flux AN-T1 and titanium welding wire VT1 of 2 mm thickness were used in the welding operations.

The investigations proved that in automatic submerged welding of a titanium alloy containing 5% Al and an admixture of Cu with an unalloyed titanium electrode it is possible to obtain joints with satisfactory mechanical properties with Cu content up to 2%. One of the main principles in the lowering of ductility and strength of welded joints with a large concentration of copper in the basic metal is the coarse acicular martensite microstructure of the joint metal and the near-joint zone. Welded joints of a titanium alloy containing approximately 5% Al and 2% Cu have a tensile strength of approximately 85 kg/mm^2, a relative elongation of about 15% at rupture and an impact strength of about 4 kgm/cm^2.

69. Electrodes for Welding Thin EI417 (Kh23N18) Steel

"Selection of Electrodes for Welding of Steel EI417 (Kh23N18) of Small Thickness," by Docent G. L. Petrov, Candidate of Technical Sciences and Engineer L. A. Yefimov; Leningrad, Energo-Mashinostroyeniye, No 6, Jun 58, pp 25-27

Tests were conducted for the selection of electrodes for welding of steam turbine component made of 25-20 type steel (scale and heat-resistant). Electrodes KTI-5, TsT-15 and TsT-13, for which structural diagrams are given, were used in weld joints of steel EI417 (Kh23N18) of 6 mm thickness.

Analysis of results favored recommendation of welding limited thicknesses (up to approximately 8 mm) of steel EI417 (Kh23N18) with electrodes KTI-5. Such weld joints have a yield strength 94 to 99 percent that of the rolled steel Kh23N18 and are free of hot cracks when the metal deposited from electrode KTI-5 contains no less than 3 percent ferrite and the industrially produced steel EI417 has a normal composition of elements ($\leqslant$ 18.5 percent nickel and up to 0.2 percent carbon or 18.5 to 20 percent nickel and $\leqslant$ 0.16 percent carbon).

Practical application of electrodes KTI-5 in welding a number of components of a gas turbine confirmed the results of the conducted investigations and showed the possibility of obtaining welded joints with properties corresponding to those obtained under laboratory conditions.

70. Proposed Development of Nickel-Cobalt Industry for 1959-1965

"The Nickel-Cobalt Industry in 1959-1965," by I. G. Torubarov; Moscow, Tsvetnyye Metally, No 7, 1958, pp 7-11

This article contains proposals, general plans, and goals for development of the nickel-cobalt industry in the 1959-1965 period. Special attention was directed to this subject by the 20th Congress of the CPSU.

Increased demand for nickel and cobalt for special steels and alloys and by numerous other branches of industry requires increased development of all fields of the nickel-cobalt industry. Enterprises now in operation will be redesigned and expanded and new ones are to be constructed and activated. It is noted that special attention must be given to the solution of the important problem of developing effective methods for concentrating poor oxidized nickel ores.

A graph is given showing: (1) ore dressing; (2) nickel extraction, and (3) nickel content of ore for the period 1956 to 1965. According to this graph, ore dressing will be increased approximately 75 percent in 1965 in comparison with 1956, nickel extraction 8 percent; nickel content of ore will drop 4 percent. A sharp decrease of nickel content is shown from 1964 to 1965.

Extraction of cobalt in 1965 will be 1.6 times that of extraction in 1956.

71. Veksler Address on Acceleration Status

"The Present State of the Problem of Acceleration of Atomic Particles", (From the Annual Meeting of the Academy of Sciences USSR), by N. F.; Moscow, Atomnaya Energiya, Vol 4, No 6, Jun 58, p 587

"During the annual meeting of the Academy of Sciences USSR in March 1958 a speech was given by V. I. Veksler Corresponding Member of the Academy of Sciences USSR, on the present state of the problem concerning atomic particle acceleration. He reviewed the history of development of acceleration techniques and the difficulties involved in further increasing the energy and intensity of charged particle beams.

"The method of strong beam focusing, suggested by the US scientists Courant, Snider, and Livingston will make it possible to increase the maximum energy of the accelerated particles only by several times. To obtain intensive beams of particles at energies of hundreds and thousands billions electron-volts, new acceleration methods are required. The process of interaction, for example, in the case of a collision of two protons at an energy of 10 Bev moving head-on is similar to the bombardment of an immobile proton by a proton at 200 Bev energy. To increase the probability of collision of particles of meeting beams, instantaneous values of the current in accelerators should be increased by 500-1,000 times.

"As is known, in 1953 in the Soviet Union, A. A. Kolomenskiy, V. A. Petukhov, and M. S. Rabinovich proposed magnetic systems with a magnetic field constant in time which will allow a considerable increase in the intensity of beams in accelerators with high particle energy. A similar suggestion was made somewhat later in the US (Kirst, Simon, and others).

"V. I. Veksler drew attention to the fact that the further evolution of accelerators toward stronger currents and higher energies of particles will be impossible without taking into account the collective interaction of particles and results of the study of processes in plasma.

"In 1956, the Soviet scientist Ya. B. Faynberg indicated the possibility of using in accelerators plasma placed into a magnetic field. In a linear accelerator with a plasma wave guide, it is possible to combine the usually incompatible conditions of phase and space stability of the particle beam.

"An interesting method of using plasma for obtaining very strong magnetic fields (hundreds of kilooersteds) was proposed by the Soviet scientist G. I. Budker. By means of this method, it will be possible considerably to decrease the dimensions and the weight of accelerators.

"In conclusion V. I. Veksler dwelt on his suggestion of a coherent method of acceleration of atomic particles. This method uses for the acceleration of particles the interaction of small bunches of charged particles with a stream of fast electrons or the interaction of a bunch ["sgnstok"] at rest with a relativistic particle bunch of large mass. Use may also be made of the interaction of charged or even quasineutral bunches with electromagnetic waves. The magnitude of the accelerating field in the coherent method is proportional to the number of accelerated particles. V. I. Veksler thinks that by means of the coherent method, it will be possible to approach the construction of accelerators with very strong currents and superhigh energies of the order of 10^{12} ev and higher."

72. Spontaneous Uranium Fission

"Study of the Statistical Distribution of Spontaneous U-238 Fission Events Over Energies of two Fragments," by B. S. Kovrigin and K. A. Petrzhak; Moscow, Atomnaya Energiya, Vol 4, No 6, Jun 58, pp 547-554

Equipment consisting of a double pulse ionization chamber, two amplifying channels, a coincidence schematic, and a double-ray pulse oscillograph was used for measuring the kinetic energy of each of two fragments formed during the fission of the nucleus. Seven hundred and eighty cases of spontaneous U-238 fission were recorded, and about 4,500 cases of U-235 fission by slow neutrons. These data were used for plotting the statistical distribution of spontaneous fission events and of fission by slow neutrons over the energies of two fragments. The following curves were obtained: (a) the energy spectrum of all fragments, as well as separately, of light and heavy fragments; (b) distribution of events according to the total kinetic energy of both nuclear fragments; (c) fission fragment distribution according to masses; (d) the relationship of the mean total kinetic energy of two fragments to the ratio of fragment masses; and (e) relationship of the mean kinetic energy of light and heavy fragments to their total kinetic energy. The results obtained by both fission methods reveal much similarity. It was found that the total kinetic energy of two fragments at spontaneous fission of U-238 is on the average, 4 Mev lower than the energy of U-235 fission by slow neutrons.

73. Secondary Nuclear Reactions

"Secondary Nuclear Reactions During Bombarding of Tin With Fast Protons," by M. Ya. Kuznetsova, V. N. Mekhedov, V. A. Khalkin; Moscow, Atomnaya Energiya, Vol 4, No 5, May 58, pp 455-460

A radiochemical method was used for studying the reactions of capture of the products of splitting by the nuclei of the target.

By using the measurement results of yields of radioactive isotopes of tellurium (Z = 52) and iodine (Z = 53) from tin (Z = 50) irradiated with protons at an energy of 170-660 Mev, the excitation functions of secondary reactions are plotted. These reactions lead to the formation of products with a charge two or three units higher than the initial nuclear charge. The cross sections of these reactions increase with the rising energy of incident protons: $\sigma(\alpha, xn)$ and $\sigma(Li, xn)$ are equal respectively to 18.5 ± 5 and 0.17 ± 0.1 microbarns at $E_p = 170$ Mev and to 50 ± 6.5 and 1.6 ± 0.5 microbarns at $E_p = 660$ Mev. The found cross sections of capture of lithium nuclei by tin in the comparable proton energy range agree well with the investigation results of similar reactions in copper, tin, and lead but appear to be 50 times smaller than the cross sections obtained by Marquez and Perlman (Phys. Rev. 81, 953 (1951)).

The observed cross sections of secondary reactions of capture of lithium nuclei may be explained only by assuming that their energy is higher than that which the lithium nuclei may receive in processes of evaporation or fission of the target nuclei.

The secondary reactions of the type (α, xn) may be satisfactorily explained by the evaporation mechanism of helium nuclei formation.

74. Dosimetric Characteristics of Uranium Fission Fragments

"Dosimetric Characteristics of a Mixture of Fragments of Uranium Fission," by K. K. Aglintsev, A. N. Gorobets, V. P. Kasatkin, and E. S. Kondakova; Moscow, Atomnaya Energiya, Vol 4, No 5, May 58, pp 461-464

Results of the compution of various dosimetric characteristics of fragment elements are presented including the percentual composition of the mixture for the time of uranium irradiation $t_o = 100$ days and a cooling period $\tau = 15$ to 540 days; and variations in time of the activity of the mixture for t_o equal 60, 100, and 150 days. The computed data agree satisfactorily with the results of radiochemical analyses.

The gamma-constant of the mixture is practically independent of t_o (within a range of 60 to 150 days) and remains nearly constant in a τ range of 15 to 180 days.

75. Linear Electron Accelerators

"Fundamental Aspects of the Selection of Basic Parameters of Linear Electron Accelerators of High Energy," by G. A. Zeytlenok, V. V. Rumyantsev, V. L. Smirnov, L. P. Fomin, V. K. Khokhlov, I. A. Grishayev and P. M. Zeydlits; Moscow, Atomnaya Energiya, Vol 4, No 5, May 58, pp 448-454

The selection of basic parameters of linear accelerators of electrons to high energies is discussed. The relationships of accelerator length, number of sections, power supply, price of the equipment, and the operation of the accelerator to the magnitude of voltage of the electric field along the wave guide axis, the sections of which are independently fed by high frequency generators, are determined. The minimum of the price of the equipment and of the operation of the accelerator are independent of the final electron energy. It is shown that for feeding the sections of the accelerator, it is most convenient to use high-frequency generators of highest attainable power (over 20 Mw). The problem of increasing the duration of the efficient part of the high frequency pulse is analyzed.

76. The Transitional Mode in a Synchrotron

"The Transitional Mode in a Synchrotron Using Initial Betatron Acceleration," I. S. Danilkin and V. Ye. Pisarev; Moscow, Atomnay Energiya, Vol 4, No 6, Jun 58, pp 503-509

The article is devoted to the concrete application of the transitional mode theory (transition process from betatron to synchrotron acceleration) in the case of adiabatic slow stabilization of the accelerating field to the synchrotron field of 250 Mev at the synchrotron of the Physics Institute, Academy of Sciences USSR. The experiments and computations carried out facilitated evaluation of the correctness of the theory of this type of accelerators. On the basis of experimental data, some characteristics of the electron beam in the betatron mode were obtained, e.g., the electron distribution according to energy.

The possibility of using the relationship of the intensity of the beam of accelerated particles to the amplitude of the accelerating voltage for determining the amplitude of the endovibrator voltage was indicated.

77. Neutron Diffusion Theory

"The Effective Boundary Conditions in Neutron Diffusion Theory," by G. A. Bat' and D. F. Zaretskiy; Moscow, Atomnaya Energiya, Vol 4, No 6, Jun 58, pp 510-519

This survey describes a method of determining the (effective EBC boundary conditions), assuring in the asymptotic region the coincidence of the solution of the equation of neutron diffusion with the solution of the corresponding kinetic equation. In the case of monoenergetic neutrons, the EBC is analyzed for the cases of plane and cylindrical surfaces of "black" and "grey" bodies. The results are given for the case of cylinders of arbitrary cross section.

The simplest problem of determining the EBC for decelerating neutrons in a medium with heavy atoms and a cross section of scattering independent of energy is analyzed. The survey also presents results obtained by various authors in the USSR and abroad.

78. Resonance Neutron Capture

"Resonance Neutron Capture in an Infinite Uniform Medium," by G. I. Marchuk and F. F. Mikhaylus; Moscow, Atomnaya Energiya, Vol 4, No 6, Jun 58, pp 520-530

The problem of the slowing down of neutrons in an infinite uniform medium with a strong resonance capture and uniformly distributed neutron sources is analyzed.

The solution of the ajoint equation expresses the probability that a neutron of E energy will avoid resonance capture during the slowing down process up to some asymptotic energy. The solution of the basic and adjoint problems makes it possible to apply the perturbation functional for computing the effect on the resonances integral of the Doppler broadening of the resonance level.

The devised methods are applied to the computation of collision density and of resonance integrals of the first level of U-238 (E_0 = 6.7 ev) in pure uranium and in uranium oxide UO_2.

79. Mutual Screening of Elements

"Mutual Screening of the Elements in a Close-Packed Lattice Due to Resonance Absorption," by V. V. Orlov; Moscow, Atomnaya Energiya, Vol 4, No 6, Jun 58, pp 531-538

The effect of mutual screening of elements and layers of a resonance absorber is computed for the case when the width of the moderator separating the absorbing elements is comparable to or smaller than the free path of a neutron in the moderator. It is assumed in the computation that the elements are small and that the absorption cross section may be expressed by the formula of Breit-Wigner.

Computations carried out for a system of parallel plates make it possible to evaluate the results of work described by I. I. Gurevich and I. Ya. Pomeranchuk in their report at the International Conference of Peaceful Use of Atomic Energy at Geneva (Switzerland) in 1955 on reactor construction and theory, as well as to obtain a formula for systems close to the homogeneous. It is shown that the approximative exchange of the real cell by an equivalent spherical cell in the lattice of the cylindrical elements, usually justified in this type of problem, leads to important errors. Furthermore, a formula of resonance absorption is derived for a ring geometry of the absorber.

80. Nuclear Energy Spectrum

"The Energy Spectrum of Neutrons From a Pulsed Source in a Heavy Moderator With Constant Path Length," by M. V. Kawarnovskiy; Moscow, Atomnaya Energiya, Vol 4, No 6, Jun 58, pp 539-546

The present state of experimental techniques makes it possible to investigate nonstationary processes of neutron moderation and diffusion and therefore attracts attention to theoretical analyses of these effects. An expression is found for the energy distribution of neutrons from a pulse source in a heavy (mass number $M \gg 1$) moderator with a constant length of free path in an energy range small in comparison with the initial energy:

$$\text{const} \exp \left\{ \left[\frac{(1+M)}{2} f_{-1}(z) + f_0(z) + \frac{2}{M+1} f_1(z) + \ldots \right] \right\}$$

where $z = \frac{M+1}{vt} \ell$ (v - neutron velocity, t - deceleration time).

For the functions $f_{-1}(z)$, $f_0(z)$ and $f_1(z)$ the integral representations are given and also analytical expressions near the maximum, asymptotic expansion and detailed tables. Numerical evaluations show that these functions are sufficient to describe the neutron spectrum even in such a weak moderator as deuterium. The case when the moderator consists of a mixture of various nuclei is discussed. For the solution of this problem, a method is developed of solving integral and differential-integral equations, the nucleus of which K(x,y) differs from zero only for very small values of the magnitudes $(x - y)/(x + y)$.

81. Study of Conversion Electrons

"Coincidences of Conversion Electrons at the Decay of $Tb^{155} \rightarrow Gd^{155}$," by B. S. Dzhelepov, B. K. Preobrazhenskiy and V. A. Sergiyenko, Scientific Research Institute of Physics, Leningrad State University imeni Zhdanov, Moscow, Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 22, No 7, Jul 58, pp 791-794

Coincidences between conversion electrons produced by the decay of $Tb^{155} \rightarrow Cd^{155}$ are studied. Tb^{155} was obtained by irradiating for several hours a tantalum target with 660 Mev protons. The sample was separated 20 to 30 hours after the irradiation. The coincidences were observed on a doubled magnetic lens beta-spectrometer designed at Leningrad State University (LGU) (V. A. Sergiyenko, ibid. 198 (1958)). A quantitative comparison of velocities of the count of coincidences in various combinations may serve as a strong criteron for the verification of the decay scheme (see the next article by the authors). However, decay scheme balanced with regard to intensities is not yet available for Tb^{155}.

82. Study of Conversion Electrons

"Coincidences Between Conversion Electrons During the Decay of Lu^{173}," by B. S. Dzhelepov, B. K. Preobrazhenskiy and V. A. Sergiyenko, Scientific Research Institute of Physics, Leningrad State University imeni Zhdanov; Moscow, Izvestiya Akademii Nauk SSSR, ser. fiz. Vol 22, No 7, Jul 58, pp 795-807

A doubled magnetic lens LGU beta-spectrometer (V. A. Sergiyenko, ibid. 198 (1958)) was used for the study of coincidences between some conversion transitions in Yb^{173} occurring during the decay of Lu^{173} (T - 170 days). The data obtained makes it possible to improve the accuracy of the

decay scheme of Lu^{173} -> Yb^{173}. Available data on the decay of Lu^{173} -> Yb^{173} are summarized by D. Bobrov, K. Gromov, B. Dzhelepov, and B. Preobrazhenskiy (ibid. 21, 940 (1957)) and G. Gorodinskiy, A. Murin, V. Pokrovskiy and B. Preobrazhenskiy (ibid. 21, 1004 (1957)). A fact important for the identification of the isotope was recently established. G. Gorodinskiy, A. Murin, V. Pokrovskiy, and B. Preobrazhenskiy found that the gamma-spectra of the 170-day old Lu from the Lu fraction and of the 170-day-old Lu accumulated from Hf are identical. Because Hf^{174} is stable, the activity can be ascribed to Lu^{173} or Lu^{174} and it is proved therefore that the observed lines belong to Lu^{173}.

83. Neutron-Deficient Isotopes

"Mass Numbers of Neutron-Deficient Isotopes of Dysprosium," by A. N. Dobronravova, L. M. Krizhanskiy, A. N. Murin and V. N. Pokrovskiy, Radium Institute imeni Khlopin, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, ser. fiz. Vol 22, No 7, Jul 58, pp 815-816

Previous studies of Dy-fractions and of the genetic connections of Dy-isotopes with the daughter products Tb and Gd (G. M. Gorodinskiy, A. N. Murin, V. N. Pokrovskiy, B. K. Preobrazhenskiy, Izv. AN SSSR, Ser. Fiz. Vol 21, 1004 (1957)) led to conclusions that the Dy fraction contains isotopes with A = 159, 157, 155, 153. For the confirmation of this assumption, the direct determination of masses of Dy-isotopes produced during deep-fission reaction of Ta was attempted. The existence of radioactive Dy isotopes with A = 159, 157, 155, 153, and possibly 151, was established. The half-lives and the gamma spectra of Dy 157, 155, and 153 were determined.

84. More on Neutron Deficient Isotopes

"New Neutron-Deficient Rare Earth Isotopes; Lutecium Isotope With the Mass Number 167," by P. M. Aron, A. V. Kalyamin, A. N. Murin and V. A. Yakovlev, Radium Institute imeni Khlopin, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR. Ser. Fiz. Vol 22, No 7, Jul 58, p 817

Neutron-deficient isotopes of rare earth were produced on the 660 Mev synchrotron of the Joint Institute of Nuclear Research. In the chromographically deposited Lu fraction, a radioactive nuclide with a half-life of 55 $\pm$ 3 minutes was observed. Its energy of gamma-quanta and half-life corresponds to Yb 167. The Lu fraction separated from Lu emitted the characteristic gamma-spectrum of Tu-167. This demonstrates the existence of the conversion Lu-167 -> Yb-167 -> Tu-167 -> Er-167 (stable).

85. New Lutecium Isotope

"Lutecium Isotope With the Mass Number 173," by G. M. Gorodinskiy, A. N. Murin, V. N. Pokrovskiy, and B. K. Preobrazhenskiy, Radium Institute imeni Khlopin, Academy of Sciences USSR Moscow, Izvestiya Akademii Nauk SSSR, Ser. Fiz. Vol 22, No 7, Jul 58, pp 818-820.

The long-lived Lu-173 isotope with $T_{1/2} \sim 200$ days was revealed by the writers as a product of deep splitting of Ta (IZv. AN SSSR. Ser. Fiz. Vol 21, 1004 (1957)). To confirm the identification of the studied isotope by the mass number, separation of Lu from Hf was attempted. The comparative study of gamma-spectra made it possible to establish that the activity of the long-lived Lu isotope must be ascribed to the same isotope with $T_{1/2} = 200$ days, while the isotope table (G. Seaborg et al, Isotope Table, 1956) proved that the only Lu isotope remaining in the precipitate from Hf is Lu-173. Thus, the identification of Lu-173 by the mass number is confirmed.

86. Data on Hungarian Reactor and Notes on Planned Experiments

"Scientific Preparatory Work for the Use of the First Hungarian Experimental Nuclear reactor," by Lenard Pal, Dezso Kiss, and Istvan Kiss; Budapest, Magyar Tudomany, May 58, pp 183-187.

"The reactor costs 6 million rubles and we are getting, for this price, nearly all essential parts. The body of the reactor is now being equipped and test operation is expected to begin in the fall of 1958.

"The reactor's fuel is uranium enriched to 10 percent U-235. The fuel is contained in aluminum cylinders 500 millimeters long and 10 millimeters in outside diameter. The fuel rods, combined in a "basket," form the core of the reactor. The diameter of the core is 645 millimeters and it is 500 millimeters high; 4.5 kilograms of U-235 are placed in the reactor.

"The moderator and cooling medium for the reactor is doubly-distilled water. The system has two water cycles. In the first closed cycle the cooling water circulates directly about the heating elements and then transfers the heat to the second water cycle through a heat exchanger. At the time of operation, the water in the first cycle becomes highly radioactive but the second cycle is practically radiation-free.

"Regulation of the reactor is provided by eight boron-carbide rods and one stainless steel rod; the latter is the automatic output regulator. Three special safety rods serve to protect the system. In case of malfunction, the safety rods terminate the operation of the reactor.

"Seven ionization chambers serve to monitor the output of the reactor. One ionization chamber monitors the starting operation, one provides automatic registration of output, two provide automatic regulation, and the remaining three serve protection purposes.

"A water reflector and a cast iron and a heavy concrete wall provide radiation protection. There is a 3.5-meter deep-water layer above the active zone.

"The maximum value of the neutron flux in the center of the core is 2×10^{13} neutrons per square centimeter per second. Nine horizontally placed experimental channels lead out beams of neutrons from the central part of the core to the experimental equipment. The thermal neutron flux in these channels is $0.2 - 0.5 \times 10^{9}$ neutrons per square centimeter per second. The experimental channels are provided with locks driven by special servomotors. In addition to the channels, a movable graphite prism connects to the active zone; this is the thermal column with which we can do experiments with very slow (thermal) neutrons.

"The reactor is in a 15,000-cubic-meter hall. The entire building is 35,000 cubic meters.

"A group which does not deal with research, the Reactor Plant (Reaktor Uzem), operates the reactor. The leaders of the Reactor Plant received 3 months training in the Soviet Union in 1956.

"We want to do research on the solid state using neutron physics as a tool by studying the structural changes in solid bodies caused by neutrons, performing neutron diffraction experiments, and examining the scattering of slow neutrons in magnetic materials.

"Another group of studies will deal with the fissioning of atomic nuclei. A large device is now being designed with which one can obtain neutrons of various energies from the reactor. Construction of this device involves solving complicated mechanical and vacuum technology problems. The complex, 100-channel electronic time measuring appliance attached to this device contains about 1,200 electronic tubes.

"Plans for a neutron diffractograph and a neutron spectrometer recently arrived from Poland, where they were prepared on the basis of studies of neutron diffractometers used with US, English, and Swedish reactors. The Polish Atomic Energy Office made available all documentation.

"We solved the problem of absolute measurement of neutron flux and have a well-proven device available for this purpose. We had to work out a technology for making counter tubes filled with boron trifluoride gas. We measured the diffusion path of neutrons in difyl [sic], which seems as if it would be a good moderator for reactors.

"We built a 20-channel time analyzer for these measurements, and a 200-kilovolt pulse-operating neutron generator is being assembled.

"We consider it desirable to build a subcritical, and later a zero output, homogeneous reactor, first with a water moderator and later with an organic moderator.

"In the area of nuclear chemistry, there has already been work on the processing of uranium ores found around Pecs. Work on recovering plutonium and isotopes from exhausted fuel elements will begin after the reactor is in operation. Hot cells in which such work can be done, by remote manipulation, are being built.

"A laboratory for ultramicro methods will be applied in chemical experiments is also being built.

"Preparatory experiments for the study of radiation effects on metals are under way."

87. China's First Atomic Reactor and Cyclotron

"Our Country Enters Atomic Age: Atomic Reactor in Operation; Cyclotron Completed," (unsigned article), Peiping, Ta-kung Pao, 1 Jul 58, p 1

This article reports the inauguration of China's first experimental reactor and the completion of her first cyclotron, both of which were built by Chinese scientists and technicians and are housed in the Academia Sinica's Institute of Atomic Energy, formerly called the Institute of Physics.

[SIR Note: The reactor and particle accelerator are described in "China's First Atomic Reactor in Operation," an unsigned article in the English-language Peking Review, No 19, 1958. The weekly magazine is published in Peiping. The article follows:

"China's first experimental reactor, of heavy-water type, has gone into operation, it was announced on July 1, the 37th anniversary of the birth of the Chinese Communist Party. A cyclotron has also been completed and is ready for research work. With their completion, China has entered the age of atomic energy.

"These two items of equipment have been built, with assistance from the Soviet Union, to promote China's scientific and technological development in the sphere of atomic energy.

"The reactor, built to the world's latest designs, is the biggest in Asia. It has thermal power ranging from 7,000 to 10,000 kilowatts. A chain reaction took place in the reactor at 1600 hours on 13 June. The reactor is now gradually increasing its power for scientific research work.

"The cyclotron can accelerate alpha particles whose energy can reach 25 million electron-volts. Adjustment of the cyclotron started early in March. The particle beam has now been drawn out of the vacuum chamber.

"At the same time, a pressurized electrostatic accelerator built by Chinese scientists and engineers and technicians has also been completed. It can accelerate protons whose energy can reach 2.5 million electron-volts. Scientists are now using it for experiments."]

[For additional information on nuclear physics see item No 1]

Spectroscopy

88. Description of USSR Equipment for Spectral Analysis

"Latest USSR Equipment for Spectral Analysis," by V. K. Prokof'yev, Moscow, Izvestiya Akademii Nauk SSSR. Seriya Fizicheskaya, Vol 22, No 6, pp 737-741

A brief description is given of spectral analysis equipment developed in the USSR during the period from 1955 to 1957.

The use of diffraction gratings and replicas is emphasized, as well as photoelectric cells for the recording of spectra.

A new model of styloscope (SL - 12) is equipped with a photometric wedge transmitting 3 to 100% light. The spectra are excited by a low voltage alternating arc of 2 to 4 amp and a generator of a high-voltage spark under control.

A photoelectrc stylometer (I. S. Abramson, Zavodsk. Laboratoriya, 20, 168 (1954)) (FES-1) contains three glass prisms with a constant deviation and a collimator of 300-mm focal distance from the camera. The assembly furthermore comprises a generator of an ac current arc and of a low-voltage spark with electronic control (GEU-1) as well as two antimony-cesium photocells (SPV-9) with a low dark current (up to 10^{-15} Amp) of which one receives the unscattered light reflected from the first surface of the first dispersing prism and the second responds to the light energy of any spectral line projected the output slit of the equipment with visual control by means of a microscope.

A new diffraction spectrograph (DFS-8) is intended for photographing spectral bands 1,000 A wide in the range of 2,000 to 10,000 A at a dispersion of 6 A mm^{-1}. This spectrograph is provided with a grating of 120 x 60 mm in size and grooved with 600 lines mm^{-1}.

Another type of grating is concave, with a 2-meter radius of curvature and is inserted in a photoelectric spectrometer (DFS-10). Its dimensions are 70 X 50 mm. It has 1,200 grooves mm^{-1} and is mounted according to the Paschen-Runge design. The operating range is 2,300 to 5,400 A with a dispersion of 4 A mm^{-1}.

Assemblies for vacuum spectroscopes are provided with double prism monochromators (SP - 41) with photoelectric recording and optics of crystalline LiF.

A large vacuum diffraction spectrograph (DFS-5) is intended for photographic work in the range of 500-2,000 A. It has a concave diffraction grating with a 3-m radius of curvature, 1,200 lines mm^{-1}, dimensions of 100 x 60 mm, and a Paschen-Runge design.

Special photorecording equipment is devised for weak source spectra such as luminiscence, Raman spectra, etc. One of the instruments consists of a three-glass-prism spectrograph ISP-51 with an output collimator (FEP-1) of 300-mm focal length and an 1:5 aperture ratio. Behind the output slit of the collimator a photomultiplier with an antimony-cesium cathode amplifies the light beam, which is recorded on a EPP-09 automatic recorder. There are also spectrographs for particulary weak sources such as night sky, polar lights, etc., with plane diffraction grids SP-48. 49, and 50 (N. G. Gerasimova and A. V. Yakovleva, Pribory i Tekhnika Eksperimenta, 1, 83 (1956)).

Spectra of transient phenomena are obtained by specially designed spectroscopes of high light power, allowing the recording of spectra of very short duration and in various phases of luminiscence.

For this purpose, the fast photoelectric spectrometer (SP-61) is used. It has a plane diffraction grating with 600 lines mm^{-1}, is 150 x 140 mm in size; it scans the spectrum and records it on 36 mm film in the visible or near infrared region. Some of these spectrometers allow resolution in time of $1 \cdot 10^{-6}$ sec.

Spectrophotometers for absorption spectra have also been improved. A spectrophotometer for infrared (IKS-14) is assembled according to a double-ray arrangement. The source of light is a silite resistor. The receiver is a semiconductor colometer or metal bolometer. It has a tube amplifier, an automatic recorder, and operates in the range of 0.75 to 20 μ .

Mechanics

89. Drop Formation in a Liquid Jet Studied

"On the Question of the Decay of a Liquid Jet Into Drops," by P. I. Kuznetsov and L. Ya. Tslaf; Leningrad, Zhurnal Tekhicheskoy Fiziki, Vol 28, No 6, Jun 58, pp 1220-1223

The process of drop formation in the disintegration of a liquid jet is studied. The mean dimensionless diameter of the drops is obtained as a function of two variables. The parameters for this expression are obtained empirically from a study of the mean diameter of drops from a water jet at normal atmospheric pressure and at varying nozzle diameters.

IX. MISCELLANEOUS

90. Fortieth Anniversary of the State Scientific Library

"In the Service of Technical Progress," by Ye. Morozova, Director, State Scientific Library; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, No 87, 23 Jul 58, p 4

The State Scientific Library, located in Moscow and now celebrating its 40th anniversary, is the largest library for scientific-technical literature in the USSR. The library has nearly 6 million books of foreign and Soviet technical literature, contained in the main library and its 13 branches located in the major economic regions of the USSR. In 1957, the Library received 352,000 technical and economic books of which over 63,000 were non-Russian publications from 44 foreign countries.

The library offers considerable assistance in research to scientific, educational, planning and design organizations and numerous enterprises, and is the source for much technical information. Over 67,000 readers use the facilities of the library and its 13 branches. The library also mails literature to 3,500 enterprises, organizations, and major industrial plants. The facilities of the library are also available to individuals in foreign countries.

The library has a complete service for microfilming and photoreproducing books and monographs which are readily available to all borrowers.

The State Scientific Library publishes five series of bibliographic indexes: Gornaya Promyshlennost (Mining Industry), Metallurgiya (Metallurgy), Mashinostroyeniye (Machine Building), Energetika i Energopromyshlennost' (Power Engineering and Power Engineering Industry), Stroitel'naya Promyshlennost' (Construction Industry).

The library also has an abstract service which it furnishes to Soviet engineers and technologists. The library publishes technical abstracts on all new Soviet and foreign literature concerned with problems of technology and economics and the organization of production. Over 13,000 abstracts are compiled by highly qualified specialists, and nearly 3 1/2 million information leaflets are published by the library. At the request of industry or scientific institutions, the library will compile bibliographic lists and indexes of literature on any technical subject of interest to the requestor.

The library has also prepared a series of bibliographic indexes of Soviet and foreign literature dealing with the production and use of polyethylene, "The Preparation, Processing, and Utilization of Machine Parts From Capron (Nylon)," plastics, and others. The library has also compiled indexes of literature concerning problems of automation.

The State Scientific Library renders methodological assistance to a large network of scientific and technical libraries of the USSR, and offers courses and seminars for the training of over 6,000 librarians for work on technical books. The library has published 70 methodological texts on various problems of library work and bibliography.

91. Notes on Activities of the Hungarian Academy of Sciences

"From the Life of the Hungarian Academy of Sciences," (unsigned article); Budapest, Magyar Tudomany, Mar 58, p 83

The institute network of the Hungarian Academy of Sciences has been expanded by the establishment of the Stereochemical Research Group (Sztereokemiai Kutato Csoport). A new trend of world-wide significance in the development of organic chemistry is stereochemistry or spatial-chemical research. Heretofore, activities in this area were confined to university faculties and, in the absence of a separate research group for this research, direction and coordination were not unified. The Hungarian Academy of Sciences has entrusted Academician Gabor Fodor with the leadership of this group.

On 20 January 1958, the Solar Physics Research Group (Napfizikai Kutato Csoport), formerly the solar physics department of the Astronomical Institute (Csillagvizsgalo Intezet), started its independent work in Debrecen. The Louis Kossuth Science University in Debrecen greatly helped the establishment of the group by making available its observation dome. Similarly, the Nuclear Research Institute (Atommag Kutato Intezet) of the academy undertook to do considerable shop work.

"From the life of the Hungarian Academy of Sciences," (unsigned article); Budapest, Magyar Tudomany, Jun 58, p 233

At the 25 April 1958 meeting of the Department of Mathematical and Physical Sciences (Matematikai es Fizikai Tudomanyok Osztalya, Corresponding Member Sandor Szalay read a paper titled "The Role of Humus in the Geochemical Concentration of Uranium in Coal and Other Biolites."

Academician Pal Gombas introduced a study by Istvan Naray-Szabo titled "The Interconnection Between the Structure of Glass and Its Physical Properties". Academician Pal Turan introduced the following works: "Concerning Power Sums of Complex Numbers" by S. Uchiyama (Sapporo, Japan), "Concerning Asymptomatics of Orthogonal Polynoms" and "Concerning Interpolation Series Which Are Based on Normal Point Groups" by Tamas Frey, and "Concerning a New Task in the Theory of Diophantic Approximation" by Endre Makai. Finally, Corresponding Member Gyorgy Szigeti introduced a study by Zalan Bodo titled "Solution of the Boltzman Type Equation With Attention to the Permanent Relaxation Time."

92. The 1958 Kossuth Prize Winners in Hungarian Science

"The 1958 Kossuth Prize Winners in Hungarian Science," (unsigned article); Budapest, Magyar Tudomany, Apr 58, pp 140-141

First class, 50,000 forint awards were bestowed on Pal Erdos, Corresponding Member, Hungarian Academy of Sciences, and on F. Bruno Straub, Academician and university instructor.

Second class, 35,000 forint awards were bestowed on Sandor Arany, Doctor of Agricultural Sciences; Otto Benedikt, Corresponding Member, Hungarian Academy of Sciences and university instructor; Laszlo Erdey, Academican and university instructor; Pal Greguss, university instructor; Mor Korach, Corresponding Member, Hungarian Academy of Sciences and university instructor; Bela Molnar, Candidate of Medical Sciences; Jozsef Turoczi-Trostler, university instructor; and Jozsef Vero, Academican and university instructor.

A third class, 20,000 forint award was bestowed on Boldizsar Vasarhelyi, university instructor.

Pal Erdos received the Kossuth Prize for his achievements in the field of the theory of numbers, theory of functions, theory of sets, and probability calculations. He was the first to solve the arithmetic proof of the large prime theorem; before him, others were able to solve this only with complex theory of function tools. He has published nearly 300 works in almost every area of mathematics.

F. Bruno Straub received the Kossuth Prize for his valuable work in biological protein synthesis. He has shown, by years of protein research, that the amylase forming system can be broken into three fractions which by themselves and by pairs are inactive, being active together. He developed methods for the micro-isolation of amylase on the principle of starch adsorption.

Sandor Arany received the Kossuth Prize for his scientific work in soil study and soil improvement. He systematized the operational soil mapping methods, thus aiding agricultural practice. Soil study exploration of irrigation possibilities in the Great Plain, continuous examination and correction of water used for irrigation, and improvement methods for alkali soils were developed under his direction.

Otto Benedikt received the Kossuth Prize for his entire life's work. He is the inventor of the current transformer called the autodyne. The autodyne combines in one machine all the advantages of motor, dynamo, and regulator, and it can be used for automatic regulatory purposes.

Laszlo Erdey received the Kossuth Prize for his achievements in indicator research in the field of analytical chemistry. By clarifying the mechanism of redox processes going on in alkaline mediums, in analytic chemistry, and thus clarifying the mechanism of H_2O_2 decomposition, and by seeking suitable indicators he significantly contributed to the further development of modern analytical chemistry.

Pal Greguss received the Kossuth Prize for nearly four decades of work in higher education and for his work, "Xylotomische Bestimmung der heute lebenden Gymnospermen" (Xylotomic Determination of Living Gymnosperms). In this work, which has received world wide recognition, he publishes the results of 10 years work in tree anatomy.

Mor Korach received the Kossuth Prize for his entire life's work and for developing the title manufacturing process called Kervit. His process makes possible the production of tile which is theoretically new and which has great economic and technical advantages. With his invention, forming, drying, firing, and glazing of tiles are almost completely automaticized in one continuous process.

Bela Molnar received the Kossuth Prize for his several decades of activity in the area of surgery, especially in the interests of educating and training surgeons. His most significant works concern carcinoma of the large intestine and its diagnosis, gall-stone disorders, and abdominal wounds.

Jozsef Vero received the Kossuth Prize for his book, Altalanos metallografia (General Metallography) and for his achievements in the area of research on the crystallization of metals. His book is one of the most modern and valuable summaries on metallography in world literature. His work on the crystallization of metals has contributed to the clarification of crystal germination.

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