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PLEASE NOTE

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

SCIENTIFIC INFORMATION REPORT

Table of Contents

NOTE: Items in this report are numbered consecutively.

USCOMM-DC-54748

I. BIOLOGY

1. X-Ray Induced Varieties of Yeast Yielding Increased Amounts of Ergosterol Obtained

"X-Ray Induced Hereditarily Changed Forms of Yeast Organisms Which Form Increased Amounts of Ergosterol," by Ye. N. Sokurova, Institute of Microbiology of the Academy of Sciences USSR, Moscow, Doklady Akademii Nauk SSSR, Vol 119, No 2, 11 Mar 58, pp 265-266

Cultures of saccharomyces carlsbergensis Frohberg which normally possess high ergesterol content, i.e., 2% of dry weight of 2-day old cultures, were subjected to radiation doses varying between 100 to 500 r, and the following observations were made:

1. By irradiating yeast organisms with sublethal doses of X-rays, and subsequently selecting appropriate yeast cultures, it was possible to obtain yeast cultures with hereditarily increased ergosterol content.

2. This hereditary characteristic is not sufficiently stable, since, after repeated cultivation without repeated irradiation, the high ergosterol content gradually decreases.

3. Radiostrain yeasts with increased ergosterol content do not differ essentially in their radiosensitivity from the original forms of yeast although there are indications of a possible protective role of ergosterol in radiation sickness.

2. Experimental Data Indicate Parallelism Between Disturbed Chromosome Apparatus and Radiation Dose and its Deleterious Effects on Different Stages of Embryogenesis

"Disturbances of Mitosis due to X-Irradiation of the Early Stages of Development of the Eggs of Groundling Fish," by V. N. Belyayeva, and G. L. Pokrovskaya, Institute of Biological Sciences of the Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 119, No 2, 11 Mar 58, pp 361-364

Tests were conducted on Misgurnus fossilis L. to determine the effect of ionizing radiation on the process of fertilization and on the various stages of cell division of fish eggs. The fertilized eggs were irradiated at various stages of embryogenesis (early and late blastula) and with various doses of radiation (100,250,500, 1,000, 10,000 and also 1,600, 3,200, 6,400, 12,800, and 19,200 r). Experimental details and photomicrographs accompany the article.

Results indicate that the greater the dose of irradiation, the greater is the decrease of the rate of mitosis, and even irradiation by 100 r noticeably decreases mitotic rate. No mitosis was noted following irradiation with 10,000 r. Rise in the percentage of disturbed mitosis was commensurate with the value of the dose. There was a parallelism between the degree of injury to the growing embryos and the injury to its chromosome apparatus.

These results, furthermore, indicate that the greatest radiosensitivity occurs during the earliest stages of mitosis (at the stage of one blastomere), and the later the stage of embryonic development, the greater is the dose required to cause 50% death of the embryos.

Parallelism was also noted following the irradiation of fish eggs during the late blastula stage between the degree of survival of the developing embryos, and the degree of injury to the nucleus with regard to dose of irradiation.

Such a clear manifestation of the laws of the disturbance of chromosome apparatus in relation to the does and the state of development of the eggs, and such a clearly expressed parallelism between the data of cytology and embryology make it possible for us to hope that further research along these lines may make it possible to explain a number of important problems connected with the effect of ionizing radiation on the processes of fertilization, cell division, and the development of fish.

3. Radiation Studies of the Early Development of Fish Eggs Indicate Importance of Radiation Injuries of a Cell Nucleus

"A Study of Ways in Which Injuries Caused by Radiation During the Early Development of Fish Occur," by A. A. Neyfakh, and N. N. Rott, Institute of Animal Morphology of the Academy of Sciences USSR, and the Institute of Biological Physics of the Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 119, No 2, 11 Mar 58, pp 261-264

X-ray effects of various strengths (3,000 and 10,000 r) on the germ cells and gametes of fish (Misgurnus fossilis and Acipenser stellatus) during various periods of development, especially middle, and late blastula and early gastrula stages are discussed. Differences in normal development at the stage of two blastomeres, morula, early blastula, late blastula, and early gastrula are sketched, and diagrams show changes in mitotic activity from the moment of irradiation up to 30 hours later.

The authors present two possible theories to explain changes and interruptions of development due to radiation:

1. That it is possible to assume that cell division is the intermediate link between the injury of the cell nucleus during irradiation and the appearance of functional deficiencies during the beginning of the gastrula stage.

2. That the nucleus, due to its own activity during the early stages, guarantees the development of the cells up to certain later stages. Higher doses of radiation curtail its activity, and development after irradiation can proceed only to the stage which was preserved by the function of the nucleus at the moment of irradiation.

II. CHEMISTRY

Analytical Chemistry

4. A Spectrographic Method For the Determination of Germanium in Coal Ash

"Spectrographic Determination of Germanium in Coal Ash," by N. V. Arnautov, West Siberian Affiliate of the Academy of Sciences USSR; Novosibirsk, Izvestiya Vostochnykh Filialov Akademii Nauk SSSR, No 1, Feb 57, pp 49-52

A method for the spectrographic determination of germanium in coal ash is described which was found to be sufficiently precise and to give reproducible results. By using this method, more than 400 determinations of germanium were made on coal samples from different deposits, primarily deposits in West and East Siberia.

[For additional information on analytical chemistry, see Item No 11.]

Biochemistry

5. Ascorbase Inhibition by Complex-Forming Reagents Studied

"The Inhibition of Ascorbase by Complex-Forming Reagents," by A. Jindra and V. Prochazka, Chem. Listy, 1957, 51, No 2, 362-366 (Czech) (Moscow; from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 8, 25 Apr 58, Abstract No 9743)

"Studies were conducted on the inhibition of ascorbase obtained from frozen cucumbers by complex-forming reagents which bind copper (tetraethylthiuram disulfide (antabuse), cupferron, kompleksen III [disodium salt of ethylenediaminetetraacetic acid], and CO). The effect of the inhibiting reagents was determined by decreased ascorbic acid content, with respect to time, in the presence of ascorbase both with inhibitors and without inhibitors. It was established that antabuse and cupferron are not rival inhibitors for ascorbic acid, for tetraethylthiuram disulfide exerts five times greater inhibition than cupferron (50% inhibition in a concentration of 8×10^{-6} moles). Komplexon III (disodium salt of ethylenediaminetetraacetic acid) and CO do not affect the activity of ascorbase."

Chemistry and Technology of Nuclear Fuels and Reactor Construction Materials

6. A Review of "Atomnaya Energiya" for 1956-1957

"On the Pages of the Periodical Atomnaya Energiya (1956-1957)," by M. B. Yegiazarov and A. G. Zelenkov; Moscow, Vestnik Akademii Nauk SSSR, Vol 28, No 6, Jun 58, pp 137-143

The authors of the article review the papers published during 1956-1957 in Atomnaya Energiya, mentioning the papers which they consider most interesting and subjecting the contents of the periodical to a critical review. They discuss as follows the papers dealing with nuclear fuels and reactor construction materials:

"An important subdivision of the nuclear energy industry is that concerned with the production of fissionable materials. The problems pertaining to this production are very diverse and relate to the forms in which uranium is found in nature, methods for the detection of uranium deposits, the chemical separation of uranium and plutonium, the separation of uranium isotopes, and other aspects of the production of fissionable materials.

"Problems of the geology of uranium are discussed in detail in Supplement No 6, 1957. Issue No 12, 1957, contains a review article by V. I. Gerasimovskiy entitled "Concerning the Forms in Which Uranium Occurs in Rocks." The subject of this article is of primary importance for the clarification of the conditions under which uranium deposits are formed. An article by A. A. Chernikov, O. V. Krutetskaya, and N. I. Organova (No 8, 1957) announces the discovery of sodium autunite (a new uranium mineral) and describes its properties.

"The radioactivity of uranium and thorium ores makes it possible to determine the content of uranium and thorium in them directly under natural conditions without taking samples or conducting chemical analyses. Methods of the radiometric assaying of radioactive ores on the basis of the gamma radiation emitted by them and a method for the quantitative interpretation of the results of gamma core testing of ore bore holes are discussed in articles by V. L. Shashkin published in No 1 and 2, 1957. Methods of analysis based on the gamma-radiation emitted by radioactive elements contained in ores are discussed in papers by G. R. Gol'bek, V. V. Matveyev, and R. S. Shlyapnikov (No 9, 1957); L. N. Posik and I. M. Tonenbaum (No 9, 1957); and others.

"A number of papers describing work on the chemical and physical properties of uranium and plutonium compounds attracts attention. In an informative article by A. M. Rozen (No 5, 1957) problems of the thermodynamics of equilibria formed during the extraction of uranyl nitrate are discussed. An article by S. N. Karpacheva and others (no 6, 1957) describes novel designs of jet extraction columns. In the same general range of work is the subject matter of an article published by a large group of investigators, including L. A. Artsimovich, G. Ya. Shchepkin, and V. V. Zhukov. This article describes an electromagnetic installation with a high degree of resolution that has been used for the separation of heavy elements (No 12, 1957). Some results obtained in the separation of isotopes of lead, uranium, and plutonium are reported in the article.

"Technical materials used in the construction of nuclear reactors must satisfy special requirements. Materials of this type must have a low effective cross section of neutron capture, be very pure, and possess certain definite physical, mechanical, and chemical characteristics. The periodical contains a number of papers dealing with results obtained in the investigation of the properties of zirconium, niobium, tantalum, and alloys and compounds of these metals as well as of methods for their production. To give a few examples, an investigation of the properties of alloys of zirconium with niobium is reported in two papers by Yu. F. Bychkov, A. N. Rozanov, and D. M. Skorov (No 2, 1957) and a method for the production of ductile niobium is described in a paper by O. P. Kolchin, N. V. Sumarokova, and N. P. Chuveleva (No 12, 1957).

"Graphite is one of the best materials for use as a moderator in nuclear reactors. A review article by V. V. Goncharov entitled "Graphite in the Construction of Reactors" (No 12, 1957) discusses in detail problems pertaining to the technology of the production of graphite articles, the application of graphite in reactors, and the changes which occur in graphite under the action of nuclear radiation.

"A study of changes which take place under the action of irradiation and of cyclic temperature changes in different materials is of particular importance for present-day nuclear power technology. Results obtained in investigations on this subject are reported in papers by I. V. Batenin and B. V. Sharov (No 9, 1957) and A. A. Bochvar and G. I. Tomson (No 6, 1957)." (p 140)

In regard to novel uses of nuclear energy, the following information is given:

"Two articles which describe research on new methods for the utilization of the energy of nuclear particles are of great interest. A paper by B. M. Vul, V. S. Vavilov, and other (No 6, 1957) deals with problems of transformation of the energy of fast electrons into electric energy in germanium crystals with P-N transitions. It is demonstrated in the work described that the principal factor which lowers the efficiency of the transformation is an increase in the velocity of the recombination of electrons and holes which arises as a result of disturbances in the crystal structure produced by the action of the fast electrons. An article by S. Ya. Pshezhetskiy and N. T. Dmitriyev entitled "Fixation of Nitrogen Under the Action of Ionizing Radiation" (No 10, 1957) describes results obtained in the investigation of basic relationships pertaining to the reaction of the oxidation of nitrogen under the action of electrons and gamma-radiation. The direct oxidation of nitrogen under the action of radiation and high energy particles may become one of the ways in which nuclear energy will be utilized." (p 141)

7. Determination of Thorium With the Arsenazo Reagent

"Photometric Determination of Thorium With the Arsenazo Reagent in the Presence of Zirconium, Titanium, and Rare Earth Elements," by F. V. Zaykovskiy and L. I. Gerkhardt, All-Union Institute of Mineral Raw Materials; Moscow, Zhurnal Analiticheskoy Khimii, Vol 13, No 3, May-Jun 58, pp 274-279

It has been established that the interference of zirconium. titanium, and rare-earth elements during the photometric determination of thorium with the arsenazo reagent [uranon or benzene-2-arsonic acid (1-azo-7) dioxynaphthalene-3, 6-disulfonic acid] can be eliminated by means of tartaric acid. A method has been developed for determining thorium with the arsenazo reagent in the presence of the above-mentioned elements.

Industrial Chemistry

8. Siloxanes Containing Metals

"Metallosiloxanes," by S. B.; Moscow, Khimicheskaya Nauka i Promyshlennost', Vol 3, No 2, Mar-Apr 58, p 274

Metallosiloxanes are a new class of organosilicon compounds which contain alternating atoms of silicon, oxygen, and a metal. Similar compounds have been synthesized the principal chains of which consist of alternating atoms of silicon, oxygen, and a nonmetal. Polyorganometallosiloxanes occupy an intermediate position between silicates and organic polymers, combining the characteristics of both. They surpass organosilicon polymers as far as stability at high temperatures and chemical stability are concerned.

Tris-(trialkylsilyl) borates of the formula $(R_3SiO)_3B$ are high-boiling oily liquids which are recommended for use as catalysts in the alkylation of silicon halides and as plasticizers (M. G. Voronkov and V. N. Zgonnik, Zhurnal Obshchey Khimii, Vol 27, 1957, p 1476).

By employing the reaction

$$R_3SiOH + Al \xrightarrow{HgCl_2} (R_3SiO)_3Al + H_2$$

crystalline tris-(triethylsiloxy)-aluminum was synthesized, the hydrolysis of which leads to the formation of heat-resistant polymers with the structure

$$R_3SiO\text{-}Al(\text{-}O\text{-}Al\text{-}OSiR_3)\text{-}O\text{-}Al\text{-}OSiR_3$$

(K. K. Andrianov and others, Doklady Akademii Nauk SSSR, Vol 112, 1957, p 1050). The reaction of the siloxanols $-HO(SiR_2O)_xH$ with Al results in the formation of highly polymerized alumosiloxanes. Addition of aluminum powder as a pigment to polysiloxane liquids made it possible to obtain coatings which protect ordinary steel up to 540° and stainless steel up to 760-870°.

When halogenated organosilanes are hydrolyzed together with $AlCl_3$ according to the equation

$$(CH_3)_2SiCl_2 + C_6H_5SiCl_3 + AlCl_3 \xrightarrow[H_2O]{NaOH} [-(CH_3)_2SiOSi(C_6H_5)O-]_4OAl-,$$

products with the consistency of a gel are obtained the thermal polymerization of which yields resins which have a very high resistance to heat (K. A. Andrianov and others, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, 1956, p 74). In an analogous manner polyorganometallosiloxanes can be obtained which contain both aluminum and cobalt or nickel.

By reacting trialkylsilanols (or their sodium salts) with $TiCl_4$, tetrakis-(trialkylsiloxy)-titanium compounds were obtained. In acidic media these compounds hydrolyze slowly, forming polymers which have the constitution

$$(R_3SiO)_2Ti(OTi(OSiR_3)_2)_2$$

By hydrolyzing alkylalkoxy(halogeno)silanes together with derivatives of orthotitanic acid, diverse polyorganotitanosiloxanes can be obtained (K. A. Andrianov and others, Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, 1956, p 798). Resins, varnish films, and enamels based on compounds of this class exhibit a high degree of heat resistance and great mechanical strength as well as favorable characteristics with respect to adhesion, suitability as insulating and waterproofing agents, and impermeability to ultraviolet radiation. Addition of aluminum as a pigment to this type of resins makes them heat-resistant at temperatures above 600°. Some titanosiloxanes are effective as adhesives for cementing polysiloxane rubber and teflon to metals, as materials for the impregnation of textiles and footwear, and as catalysts of the polycondensation of organic resins.

Alkyl titanates accelerate the hardening of polysiloxane resins, sharply lowering the temperature of solidification of films and increasing their strength. These effects are explained by the formation of Si-O-Ti links.

The methods for the synthesis of compounds with Si-O-P groupings are similar to those employed in the synthesis of borosiloxanes. The tris-(trialkylsilyl)-phosphates $(R_3SiO_3)_3$ (M. G. Voronkov and V. N. Zgonnik, Zhurnal Obshchey Khimii, Vol 25, 1955, p 469; Vol 27, 1957, p 1483) are viscous liquids which are stable up to 250-300°. These liquids are effective as antifoam agents and plasticizers. The introduction of derivatives of phosphoric acid into liquid polysiloxanes stabilizes the latter, lends to them compatibility with mineral oils and fire resistance, and also improves their lubricating properties. Polysiloxane resins and polysiloxane elastomers acquire a high degree of resistance to heat after phosphorus compounds have been added to them.

Monomers obtained by the Clayton-[L. A.] Soborovskiy reaction formulated below

$$Cl_{4-n}SiR_n + PCl_3 + O_2 \longrightarrow Cl_{4-n}\underset{R_{n-1}}{SiR'POCl_2}$$

form fire-resistant resins on hydrolysis and polycondensation.

The synthesis of monomeric and polymeric organosilicon compounds has been reported which contain Si-O-M or Si-C-M groupings with M = Zn, Cd, Hg, Ce, Fe, Pb, Zr, Sb, As, etc.

9. Organosilicon Compounds as Heat-Resistant Dielectrics

Teplostoykiye Kremniyorganicheskiye Dielektriki (Heat-Resistant Organosilicon Dielectrics), by K. A. Andrianov, Gosenergoizdat (State Power Engineering Publishing House), Moscow-Leningrad, 1957, 296 pp.

This book reviews in detail the characteristics of organosilicon polymers and of electrical insulation materials containing compounds of this class. The general principles pertaining to the synthesis of polyorganosiloxanes are outlined. Furthermore, the properties of organosilicon resins, varnishes, elastomers, and other materials produced by the USSR industry are outlined. Their technical uses are discussed.

According to the publisher's note on the back of the title page, the book is intended as a manual for engineers and industrial technologists, workers at laboratories and specialized branch institutes, and also specialists in the field of electrical insulation technology in general.

The subject matter of the book is arranged in the following manner: preface (p 3); carbon, silicon, and oxygen -- the basic elements of the polymer molecules composing organosilicon dielectrics (chapter 1, p 6); general principles of the formation of polyorganosiloxanes (chapter 2, p 19); the structure of linear polyorganosiloxanes and their properties (chapter 3, p 47); the structure of cross-linked and 3-dimensional polymers and the properties of these polymers (chapter 4, p 74); the deterioration of polyorganosiloxane resins under the effect of heat (chapter 5, p 86); liquid organosilicon dielectrics (chapter 6, p 110); organosilicon elastomers and dielectrics based on these elastomers (chapter 7, p 145); organosilicon resins, varnishes, and enamels (chapter 8, p 171); electrical insulating materials based on organosilicon resins and varnishes (chapter 9, page 208); applications of organosilicon polymers (chapter 10, p 252); subject index (p 292).

The scope of the subject and the significance of organosilicon compounds from the standpoint of technological developments, particularly developments in the electrical industry, are reviewed by the author as follows in the preface:

"The development of the production of electrical insulation materials and of the theory of dielectrics are closely connected with the development of electrical engineering as a whole. During the initial period of the development of electrical engineering and technology, the demands put to electrical insulation materials were not very exacting and could be satisfied readily by multipurpose materials which were not designed for any specific application: e.g., natural resins, rubber, vegetable oils, cellulose, and some inorganic materials, as for instance porcelain, glass, and mica.

"As electrical engineering developed, the demands put to electrical insulation materials became more stringent and diversified; types of insulating materials became necessary which could stand increased thermal, electrical, and mechanical stresses and furthermore be water proof and possess a sufficient mechanical flexibility. For the reason stated, the use of synthetic high-molecular organic compounds such as phenolformaldehyde, polyvinylacetal, and polyester resins was introduced on a large scale. High-voltage techniques and particularly high-frequency techniques require the application of dielectrics with a small dielectric loss. To satisfy the requirements imposed by high-frequency applications, the following polymers were synthesized: polystyrene, polydichlorostyrene, polyisobutylene, polyethylene, and polytetrafluorethylene. Insulation materials for electrical equipment designed for a long period of service must retain to a high extent their original properties even under very severe operational conditions. Of particular importance is stability of characteristics when the material is exposed to the prolonged action of high temperatures. The insufficient heat resistance of organic fiber dielectrics and of compounds used for impregnation hampered for a long time designers of electrical equipment, because the operating temperatures could not be raised for this reason. The development of electrical insulating materials containing glass fibers solved this problem only to a limited extent, because the use of organic compounds used for impregnation and cementing of the fibers reduced the heat resistance of glass-fiber insulating materials. Only the creation of a new type of material, i.e., organosilicon polymers (polyorganosiloxanes), which possess a high resistance to heat and to moisture, made it possible to produce electrical insulating materials that would stand working temperatures as high as 180-200° for prolonged periods of time. The first investigations dealing with methods for the production of organosilicon polymers (polyorganosiloxanes) and their characteristics were begun in the USSR in 1935. The first description of a method for the production of technically applicable products of the hydrolysis with water of organosilicon monomers of the alkyl (aryl) halogenosilane type or the alkyl (aryl) alkoxysilane type followed by the condensation of these monomers into resins appeared in 1937. In 1939, different polyorganosiloxane resins were synthesized and their properties as heat-resistant dielectrics investigated.

"Polyorganosiloxanes contain both organic and inorganic structural elements: their unusual properties are the result of a combination of the high heat resistance of quartz and the elasticity which is characteristic for organic polymers. For instance, laminated materials consisting of polyorganosiloxanes and glass fibers can be exposed for a long time to an operating temperature of 200° and for a short time to temperatures up to 500°. Polydimethylsiloxane rubber resists prolonged exposure to a temperature of 180° and intermittent raising of the temperature to 260°. Polyorganosiloxanes exhibit an exceptionally high resistance to the action of moisture and low temperatures. They are, furthermore, chemically inactive, stable with respect to oxidation, and capable of withstanding for a long time the harmful effects of sunlight and ozone. For the reasons stated, the period of useful service of polyorganosiloxanes is at least ten times longer than that of organic polymers.

"The dielectric properties of polyorganosiloxanes are exceptionally favorable and change very little within a wide temperature range.

"A very important property of polyorganosiloxanes is the modifiability of their characteristics within very wide limits as a result of the introduction of different radicals into their composition. Technical polymers contain methyl, ethyl, or phenyl radicals, which affect the heat resistance, elasticity at low temperatures, rate of solidification, and hardness of the polymer. When polyorganosiloxanes are combined with organic resins, the latter acquire a higher heat stability, improved electrical properties, a higher degree of resistance to moisture, and improved properties as far as aging at elevated temperatures is concerned. On being combined with organic polyester resins, polyorganosiloxane resins form electrically insulating enamels which are suitable for operation at 200°.

"Polyorganosiloxane resins and varnishes derived from these resins made it possible to develop a new type of electrical insulation materials known at present as materials of the SV class. Insulating materials of this type made it possible to raise the temperature of operation by 50° above that at which materials of the class V can be used; i.e., the temperature could be raised from 130° to 180°. However, it is known at present that some insulating materials based on polyorganosiloxanes may withstand prolonged exposure to temperatures as high as 200°.

"Heat-resistant electrical insulating materials of the SV type are of great importance for the solution of problems set by the 20th Congress of the CSPU to the electrical power industry and the industry of power machine building, because their use makes it possible to employ improved designs of electrical machines, transformers, and instruments, increasing the reliability of the operation, extending the period of their service, and in a number of cases reducing their dimensions to as little as 40%. Almost equally important is the application of SV insulating materials for the production of new types of dry transformers.

"Some polyorganosiloxanes are suitable for rendering hydrophobic and/or waterproof various materials such as glass, glass textiles, wool, cotton fibers, paper, ceramics, etc. They have acquired great importance for applications in the production of precise metal castings, heat-resistant anticorrosion coating enamels, heat-resistant lubricants, hydraulic and shock-absorber liquids, heat-resistant plastics, etc."

The section on applications of organosilicon polymers (Chapter 10) lists numerous technical and military applications of such polymers on the basis of US and British publications and patents. The USSR work described in this chapter deals mainly with the application of organosilicon compounds as insulating materials and agents for hydrophobization and waterproofing.

The preceding chapters give considerable information on USSR work in the field of organosilicon compounds, including many references to Andrianov's own work.

10. Development of a Petrochemical Raw Material Basis for the USSR Synthetic Rubber Industry

"Synthetic Elastomers and Alcohols," by V. Bibishev, Candidate of Chemical Sciences; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Vol 3, No 32 (332), 14 Mar 58, p 4, columns 1-6

An extensive synthetic rubber industry was created in the USSR in the early 1930s. The production method applied at the early synthetic rubber plants was based on the process developed by S. V. Lebedev. Lebedev's method consists substantially in the catalytic conversion of ethyl alcohol to butadiene. The butadiene is then polymerized by means of metallic sodium. Although this method aided in the development of the industrial production of synthetic rubber on a large scale, it has major drawbacks. One of the drawbacks was the necessity of using food products such as grain, potatoes, etc. for the production of the alcohol which served as the initial raw material for rubber production.

Chemists were faced with the task of finding a more readily accessible and cheaper raw material. Petroleum gases and gaseous by-products of the petroleum conversion industry proved to be a raw material which satisfies these requirements. The gases in question contain ethylene, ethane, propylene, propane, butylene, and butane.

The available supplies of petroleum gases are very great. Particularly large amounts of gas are available in the Bashkirskaya ASSR, the Tatarskaya ASSR, Kuybyshevskaya Oblast, the Azerbaydzhan SSR, and other petroleum-producing areas of the country.

At present, in regions where a considerable supply of this raw material is available, several large plants are being erected at which synthetic rubber will be produced from butane and butylene.

By the dehydrogenation of butylene and butane a synthetic rubber with superior characteristics can be produced, while the capital investment required for plants applying this process is lower. According to calculations made by the Giprokauchuk (State Planning Institute of the Rubber Industry), the cost of a ton of synthetic rubber produced from butane and butylene will be one third and the capital investment required one half of the corresponding values applying to synthetic alcohol derived from crude materials that can be used as foodstuffs.

At new industrial plants elastomers will be produced by the copolymerization of butadiene with styrene or methylstyrene. These elastomers are superior to butadiene rubber as far as characteristics of importance from the standpoint of the application of synthetic rubber are concerned. For instance, the tensile strength of elastomers of this type is almost twice as great as that of butadiene rubber. These grades of rubber are also superior with respect to tearing strength, residual elongation, and a number of other characteristics. At the new enterprises for the production of synthetic rubber, an improved polymerization process will be applied. Specifically, the method of low temperature polymerization will be used more extensively, with the result that elastomers of a better quality will be produced.

Copolymerized elastomers can be combined during the process of production with approximately 20% of oil (Avtol 18). Oil-extended rubber is used successfully in the production of automobile tires and of other rubber articles. Oil extension does not lower the quality of the products made of the rubber, while the cost of the rubber is reduced considerably.

A considerable amount of work has been done in connection with the development of isoprene rubber, which is close to natural rubber in its properties. The production of isoprene rubber on an industrial scale has not been organized as yet. However, trial lots of isoprene rubber that have been produced indicate that it is superior in many respects to other kinds of rubber. The development of the production of isoprene rubber on an extensive industrial scale will be of great advantage to the national economy.

At present, particularly stringent requirements are put to rubber products as far as resistance to heat, chemical stability, resistance to gasoline and oil, and also impermeability to gases are concerned. As a rule, natural rubber does not satisfy these requirements; to give the necessary characteristics to finished rubber, special types of crude synthetic rubber are used.

The most advanced type of synthetic elastomer for special applications is butyl rubber. Butyl rubber exhibits a high chemical stability and superior impermeability to gases. These properties make it possible to use butyl rubber for the production of chemically resistant rubber products, equipment of various types, and inner tubes for automobile tires.

Nitrile rubber has similar properties. This kind of rubber is very stable to the action of gasoline and oil. It can therefore be used successfully for the production of special rubber tubes, hoses, and other articles.

Chloroprene rubber is of great value for the electrical engineering industry and for the production of conveyer belts and other technical rubber products. Silicon rubber, which has an exceptionally high resistance to heat (it withstands temperatures of 250-300°), is also of importance for industrial applications.

In addition to rubber, synthetic ethyl alcohol derived from petroleum gases is of importance for technology. Its use is of great significance from the economic standpoint, because the cost of a ton of alcohol derived from petroleum gases is half that of a ton of alcohol produced from crude materials which may serve as foodstuffs.

Plants which produce synthetic alcohol from petroleum gases are operating at Sumgait, Ufa, Orsk, Saratov, and Kuybyshev. Until recently hydration of ethylene with sulfuric acid was applied at these plants. The application of this method involves the use of a considerable quantity of sulfuric acid. At present a new method has been developed until the stage where it can be applied on an extensive industrial scale, i.e., the method of direct hydration of ethylene. The application of this method eliminates the use of sulfuric acid. Plants which have been constructed and other plants which are still in the process of construction have been planned on the basis of this process. The expansion of the industrial production of synthetic alcohol, combined with an increase of the output of alcohol at hydrolysis and sulfite liquor fermentation plants, will make it possible to satisfy completely within the next few years the demand of synthetic rubber plants for alcohol. By converting a ton of ethylene to alcohol, one achieves a saving of more than 4 tons of grain.

Other products besides alcohol and synthetic rubber will be produced from the hydrocarbons of petroleum gases. For instance, ethane and ethylene will also be employed for the production of styrene, which is another crude material for the manufacture of synthetic rubber. Starting with ethylene, polyethylene is produced, which is utilized as a material in the manufacture of electric cables and of many consumer products. Ethylene is furthermore the starting material for the industrial synthesis of ethylene oxide, which is an intermediate product for the production of antifreezes, detergents, etc.

Propylene is used for the production of phenol and acetone, i.e., of crude materials from which synthetic fibers, plastics, and lubricating oils are produced.

In accomplishing the tasks with which workers of the chemical industry are faced in connection with the developments discussed above, the sovnarkhozes of the economic administrative regions in which extensive deposits of petroleum crude materials are available must play a considerable role. This applies specifically to the sovnarkhozes of the Bashkirskaya ASSR, the Tatarskaya ASSR, the Azerbaydzhan SSR, Kuybyshevskaya Oblast, Saratovskaya Oblast, Omskskaya Oblast, and Irkutskskaya Oblast.

The administrative obstacles which formerly hindered the production of synthetic materials from petroleum gases have been removed; in addition to supplies of raw material, the sovnarkhozes have at their disposal large construction organizations which will build new plants. The production at existing plants can be increased: the Sumgait plant produces almost 1.5 times as much alcohol as the quantity corresponding to planned capacity and the Orsk plant has doubled its production as a result of the use of better crude materials.

11. USSR Developments in the Field of Chromatography

"Resolution of the All-Union Conference on Chromatography, Moscow, 3-6 Feb 58," by K. V. Chmutov, Zhurnal Fizicheskoy Khimii, Vol 32, No 5, May 58, pp 1184-1185

At the conference on chromatography held at the Department of Chemical Sciences, Academy of Sciences USSR, 56 reports were presented. The attendance comprised 507 persons, representing 216 organizations located in 39 cities. Scientists from the People's Democracies attended the conference.

a. The directives given by the 20th Congress of the CPSU indicate the necessity of expanding the production of pure and rare metals and of heat-resistant alloys. They furthermore indicate the necessity of expanding the prospecting for useful minerals and of introducing extensive automatization into production and the control of production processes. The methods of chromatographic analysis are applied in the separation and purification of rare metals and rare earth metals, the production of especially pure reagents, and the separation, concentration, and determination of small quantities of admixtures.

Chromatography and ion exchange techniques are used for the softening of water; the desalting of water and of aqueous solutions of organic substances; the concentration and separation of valuable metals; the purification, analysis, and separation of mineral oils and fuels; the purification and analysis of drugs, antibiotics, vitamins, and alkaloids; clinical analyses of fluids and tissues of the organism; and many other applications. Methods of gas chromatography and of gas-liquid chromatography are being used extensively in the petrochemical industry and other industrial fields for the separation and analysis of different mixtures.

b. During recent years, definite success has been achieved in the USSR in the development of the theory and practical application of chromatography. There has been further progress in the development of the theory of nonequilibrium chromatography, chromathermography, and the thermodynamic method; in work on the determination of new relationships pertaining to the statics and dynamics of the adsorption of complex and

multivalent ions; in research on the effect of the structure of cationites on processes of ion exchange; in the investigation of the stability of ion-exchange resins at high temperatures; in work on the effect of solvents on ion exchange; and in expanding applications of chromatography involving the formation of complex compounds as well as separation of mixtures of complex compounds.

Many publications have appeared on the kinetics of ion exchange on grains of ion-exchange resins and at partitions (membranes) made of ion-exchange resins. Significant progress has been made in the synthesis of new types of ion-exchange resins and laboratory methods have been proposed for the preparation of ion-exchange partitions both with strongly acidic and weakly acidic and/or weakly basic groups. Automatic chromatographic gas analyzers and chromathermographs for the analysis of hydrocarbons and low-boiling gases have been developed and described.

c. Research has been done on the separation of rare-earth elements, titanium, zirconium, hafnium, niobium, and tantalum in the form of their complex compounds. An adsorption method involving the formation of complex compounds has been proposed for the separation of metal cations. Furthermore, methods have been proposed for the chromatographic quantitative analysis of cations and anions by means of ion exchange, precipitation, and oxidation-reduction chromatography.

d. In the field of industrial applications of chromatography investigations have been conducted and trials made in regard to the operation of desalting installations under operational conditions encountered at thermal electric power stations where high-pressure steam and steam above the critical point are used and to applications pertaining to the purification of water.

e. The technology of ion-exchange adsorption and desorption of alkaloids, antibiotics, and different organic compounds has been developed. Problems have been investigated pertaining to the application of ion-exchange resins in medicine, pharmacy, and the food industry. In the field of partition chromatography, work has been done on the separation of higher fatty acids, drugs, protein antigens and antibodies, nucleotides, nitrogen bases, corticosterones, and other substances. The solution of USSR economic problems requires more extensive application of chromatographic methods in various fields of industry as well as at research institutes and higher educational institutions.

The conference therefore recommends:

(1) That research be expanded on the theory of chromatography with the aim of predicting the optimal conditions for the separation of mixtures and reducing the number of observations that have to be made for establishing the required parameters for calculations.

(2) That the theory and practice of the application of organic reagents in chromatography be expanded and the methods of distribution chromatography be applied more widely in the analysis of mixtures of organic and inorganic substances; and that work be expanded on the development and introduction into practice of industrially applied methods of gas chromatography.

(3) That production of equipment for ion-exchange and distribution chromatography be organized. Particular attention must be paid to the improvement and development of new devices for the determination of individual components, measuring devices, rate controllers, and other appliances used in gas chromatography. Furthermore, work must be developed on the automatization of chromatographic separations and of the analysis of complex mixtures not only in the gas phasebut also in solutions, and the production and supply of automatic appliances for distribution chromatography must be organized.

(4) The distribution and retail sale of an extensive selection of cationites and anionites, grades of activated carbon found to be effective, silica gel, aluminum oxide, and natural adsorbents must be expanded. It should be recommended to the Commission on Chromatography that it, jointly with the Ministry of Electric Power Stations and the Ministry of Chemical Industry, request the Gosplan (State Plan) of the USSR to draw up an appropriate plan for 6-7 years pertaining to the organization of an industrial production of the most important ion exchange resins and ion exchange partitions (membranes). The Gosplan should be requested to create a special industrial department for the production of pure ion-exchange materials to he used in scientific research work and to be applied in medicine, pharmacy, and the food industry. Furthermore, a special laboratory should be organized at which resins with a wide range of properties can be produced on the basis of individual orders. The Scientific-Technical Committee at the Council of Ministers USSR should take measures aimed at the most rapid introduction into industrial use of the chromatographic devices that have been developed.

(5) Research should be expanded on the development of new grades of ion-exchange resins, new iorganic adsorbents, new grades of paper for chromatography and cellulose powders, new solvents and eluents, new reagents for detection (before separation), and new methods for the detection of substances that have been separated chromatographically. The Ministry of Chemical Industry USSR should be requested to organize at the Institute of Chemical Reagents a special production of organic reagents and solvents that are to be used in chromatography and are suitable for this purpose.

Extensive industrial production of high-quality chromatographic paper and of an adequate selection of organic solvents and organic substances to be used in chromatography should be organized.

(6) Work should be expanded on the investigation of the stability of ion-exchange resins at high temperatures and their stability toward different types of radiation emitted by radioactive substances. The Institute of Plastics should be entrusted with the compilation of GOST standards pertaining to methods for the testing of ion exchange materials and the revision of the TU standards in force.

(7) Work should be expanded on the application of ion exchangers as catalysts in the synthesis of organic substances. Work should also be expanded on the investigation of the adsorption of complex compounds on ion exchangers and their separation in this manner, as well as of the complex-forming properties of ion exchangers.

(8) Work should be expanded on the application of chromatography in biology, biochemistry, and medicine in the separation, identification, and purification of biologically active substances. The President of the Academy of Medical Sciences USSR should be requested to create a coordination commission on problems of the application of chromatography in medicine, pharmacology, biochemistry, and the food industry, so that the biological activity of ion exchangers can be investigated.

(9) Suggestions should be formulated on a unified terminology of chromatographic concepts, definitions, and processes. The designations pertaining to chromatography should be standardized in USSR literature. This task should be entrusted to a specially selected group of members of the Commission on Chromatography.

(10) The Commission on Chromatography should be requested to do preparatory work on the problem involved in the organization of a single scientific center comprising a scientific research institute on chromatography within the system of the Academy of Sciences. The question should be considered as to whether it is advisable to organize a section on problems of gas chromatography and call a conference on gas chromatography in 1959.

(11) The compilation and publication of monographs, reviews, and manuals on methods of chromatographic analysis should be organized as well as the production of synthetic ion-exchange materials, adsorbents, paper, and equipment used in chromatography. The publication of a bibliography on chromatographic analysis is recommended. It is necessary to improve the technical information available on chromatography. The Department of Chemical Sciences, Academy of Sciences USSR, should be requested to organize the publication of a periodical called Khromatografiya (Chromatography).

(12) A conference should be conducted on problems involved in the teaching of chromatography at both general chemical courses and special courses. Textbooks and manuals on chromatographic analysis must be provided.

(13) This resolution should be published in Zhurnal Fizicheskoy Khimii and also in the form of a separate booklet.

(14) The Commission on Chromatography should put into effect a plan for carrying out the measures recommended in this solution, appointing responsible individuals for carrying out each of its items.

Isotope Chemistry

12. Theory of the Concentration of Isotopes

"On the Calculation of Cascades Used for the Separation of Stable Isotopes," by V. K. Turkin, Chair of Higher Mathematics, Moscow Chemicotechnological Institute imeni D. I. Mendeleyev; Moscow, Nauchnyye Doklady Vysshey Shkoly--Khimiya i Khimicheskaya Tekhnologiya, No 2, Apr-Jun 58, pp 229-232

Mathematical expressions describing the dependence between flow and degree of enrichment are derived for ordinary and triangular cascades serving for the separation of stable isotopes.

13. Separation of Hydrogen, Oxygen, and Carbon Isotopes by the Distillation of Methanol

"Separation of Isotopes by Rectification; Rectification of Methanol," by Ya. D. Zel'venskiy, V. Ye. Sokolov, and V. A. Shalygin, Chair of the Technology of Separation and Application of Isotopes, Moscow, Chemicotechnological Institute imeni D. I. Mendeleyev; Moscow, Nauchnyye Doklady Vysshey Shkoly--Khimiya i Khimicheskaya Tekhnologiya, No 2, Apr-Jun 58, pp 388-391

The efficiencies of the separation of deuterium, O^{18}, C^{13}, and C^{14} by distillation of methanol were determined. Mass-spectrometric measurements were used for the determination of the isotope composition. A method is proposed for the determination of coefficients of separation (relative volatilities) of isotopes by measuring radiometrically the changes in the concentration of a radioactive tracer that has been added to the substance distilled. On the basis of the results obtained, the number of theoretical plates in the column can be calculated and this number used in figuring out the coefficients of separation of other (nonradioactive) isotopes that are present.

Organic Chemistry

14. Review of Work on Ferrocene and Derivatives of Ferrocene

"New Aromatic Systems; Part 1 -- Ferrocene as an Aromatic System," by Academician A. N. Nesmeyanov and E. G. Perevalova, Candidate of Chemical Sciences; Moscow, Khimiya i Khimicheskaya Promyshlennost', Vol 3, No 2, Mar-Apr 58, pp 146-158

This article reviews the methods of preparation, structural characteristics, and physical and chemical properties of ferrocene under the subject headings of procedures for the preparation of ferrocene, physical properties and structure of ferrocene, chemical properties of ferrocene, properties of ferrocenes substituted in the nucleus, methods for proving the structure of ferrocene derivatives, and possibilities of the technical application of ferrocene. A bibliography consisting of 34 USSR references and 90 non-USSR references is appended to the article. Nesmeyanov's own work on ferrocene and its derivatives is reviewed in considerable detail; there are 27 references to Nesmeyanov's work in the bibliography. In the section on the chemical properties of ferrocene, the authors note the great chemical stability of this substance, which is unusual for organometallic compounds. In the section on technical applications of ferrocene, it is stated that the patent literature mentions employment of this substance as an additive to oils, as an antiknock agent, and as a heat transfer agent that is stable at high temperatures. It is also stated that ferrocene can be used to bring about smokeless combustion of oils.

[SIR Note: Ferrocene has been proposed for use as an additive to jet fuels and furnace oils to improve efficiency of combustion and eliminate smoke.]

15. Organophosphorus Research

"Anomalous Reaction of Alpha-Haloketones With Esters of Phosphorous Acids. VII. Reactions of Esters of Phosphorous Acids With Chlorine Derivatives of Beta-Diketones," by A. N. Pudovik and L. G. Biktimirova, Kazan State University; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 6, Jun 58, pp 1496-1500

Reports results of work on the reactions between esters of phosphorous acid and chloro- and dichloroacetylacetone, benzoylacetone, dibenzoylmethane, and 5,5-dimethylcyclohexanedione-1,3 (dimedon). It was shown that none of these reactions take place according to the Arbuzov rearrangement.

Instead, they proceed anomalously and lead to the formation of corresponding unsaturated esters of phosphoric acid. Some of the unsaturated esters of phosphoric acid, especially those containing a phenyl or cyclohexenyl group in the unsaturated radical, decompose under heating to form beta-dicarbonyl compounds.

"Synthesis of Organophosphorus Compounds From Hydrocarbons and Their Derivatives. VII. Oxidative Chlorophosphonation of Alkoxy and Dialkylamidodichlorophosphines," by Yu. M. Zinov'yev, V. N. Kulakova, and L. Z. Soborovskiy; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 6, Jun 58, pp 1551-1553

Oxidative chlorophosphonation of hydrocarbons was accomplished with the use of compounds of the type $RXPCl_2$ where the hydrocarbon radical is bound to the phosphorus atom through another element. Cyclohexane was chlorophosphonated with ethoxydichlorophosphine, and vinyl chloride was chlorophosphonated with methoxydichlorophosphine and with dimethylamidodichlorophosphine. The acid chloride and ethyl ester of dimethylamidodichloroethane phosphonic acid, the dimethyl ester of dichloroethane phosphonic acid, and the methyl ester of dichloroethane phosphonic acid was synthesized.

"The Reactions of Dialkyldithiophosphates With Ethylene Sulfide," by T. A. Mastryukova, V. N. Odnoralova, and M. I. Kabachnik, Institute of Element-Organic Compounds Academy of Sciences USSR and the All-Union Scientific-Research Institute of Synthetic Fiber; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 6, Jun 58, pp 1563-1568

The reaction of dialkyldithiophosphates with ethylene sulfide was investigated. It was found that the dialkyldithiophosphate combines with the ethylene sulfide to form dialkyl-S-beta-mercaptoethyldithiophosphate. The presence of the beta-mercapto group in these compounds was proved by acetylation and alkylation with diazomethane.

"Organophosphorus Insecticides, Certain Derivatives of Methylthiophosphonic and Methyldithiophosphonic Acids," by M. I. Kabachnik, N. N. Godovikov, D. M. Paykin, M. P. Shabanova, N. M. Gamper, and L. F. Yefimova; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 6, Jun 58, pp 1568-1573

Acid chlorides of acid esters of methylthiophosphonic acid containing methoxy, ethoxy, and propoxy groups were prepared from the acid dichlorides of methylthiophosphonic acid. Several derivatives of methylthiophosphonic

and methyldithiophosphonic acids were synthesized having groups analogous to thiophos, metaphos, carbophos, potazan, and systox. The insecticidal properties of these compounds were investigated under laboratory conditions using insects (Eurygaster integriceps Put. and Pseudococcus maritimus Ehrh.). It was shown that the majority of the compounds are insecticides whose activity exceeds that of the well-known thiophosphoric and dithiophosphoric acid series. Thus, preparation Gd-18 (an anolog of metaphos) has a stronger contact activity than metaphos.

"Anilids of Alkylsulfonamidophosphoric Acids," by A. V. Kirsanov and N. L. Yegorova, Dnepropetrovsk Metallurgical Institute; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 6, Jun 58, pp 1587-1589

Dianilidochlorophosphazosulfonalkyl, trianilidophosphazosulfonalkyls, and dianilids of alkylsulfonamidophosphoric acids were prepared and their properties described.

"Acid Fluoride Salts of Arylsulfonamidophosphoric Acids," by A. V. Kirsanov and Ye. S. Levchenko, Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 6, Jun 58, pp 1589-1594

Trichlorophosphazosulfonaryls and the acid dichlorides of arylsulfonamidophosphoric acids react with saturated aqueous solutions of potassium fluoride. Depending on the conditions of the reaction, potassium salts of arylsulfonamidophosphoric acid dichlorides, potassium salts of arylsulfonamidophosphoric acid difluorides, and dipotassium salts of arylsulfonamidophosphoric acid monofluorides formed. The structure of the potassium salts of the arylsulfonamidophosphoric acid difluorides was established by converting them into the dimethyl esters of arylsulfonamidophosphoric acids with sodium methylate. It was shown that the potassium salts of the arylsulfonamidophosphoric acid difluorides are more stable to hydrolysis than the potassium salts of the arylsulfonamidophosphoric acid dichlorides.

"Trichlorophosphazocarbonic Acid Diphenylamide and Its Derivatives," by A. V. Kirsanov and Z. D. Nekrasova, Dnepropetrovsk Metallurgical Institute; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 6, Jun 58, pp 1595-1601

The reaction between phosphorus pentachloride and N,N-diphenylurea was investigated. Trichlorophosphazocarbonic acid diphenylamide and all of the theoretically possible hydrolysis products were prepared. Triaroxyphosphazocarbonic acid diphenylamides and diaryl esters of N,N-diphenylcarbamide-N'-phosphoric acid were also prepared and their properties described.

"The Synthesis of Phosphorylaminopyrimidines," by Yu. P. Shvachkin and M. A. Prokof'yev, Moscow State University; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 6, Jun 58, pp 1617-1621

A method for the synthesis of 2-phosphorylaminopyrimidines is proposed which is based on the condensation of phosphorylated guanidines with beta-dicarbonyl compounds. The following compounds have been prepared for the first time: 2-diphenylphosphorylamino-4-oxy-6-methyl-pyrimidine, 2-diphenylphosphorylamido-4,6-dioxypyrimidine, 2-diphenyl-phosphorylamino-4,6-dioxy-5-methylpyrimidine, and 2-diphenylphosphoryl-amino-4,6,dioxy-5-ethylpyrimidine. The hydrolysis of the compounds was also investigated.

"The Synthesis of Organophosphorus Compounds From Hydrocarbons and Their Derivatives. VIII. Studying the Oxidation of Phosphorus Trichloride With Oxygen," by M. K. Baranayev, Yu. M. Zinov'yev, T. K. Skripach, L. Z. Soborovskiy; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 6, Jun 58, pp 1628-1631

The initial stage of the oxidation of phosphorous trichloride with oxygen is a heterogenic process whose rate is determined by the rate of solution of oxygen. The rate of oxidation of phosphorus trichloride by gaseous oxygen is independent of the temperature. The activation energy of the process is very low. This is found to be in agreement with the assumption that this is a free radical type process.

Physical Chemistry

16. Work on the Application of Ultrasound in the Investigation of the Structure of Matter

"Sixth Scientific Conference on the Application of Ultrasound in the Investigation of Matter," by B. B. Kudryavtsev; Moscow, Akusticheskiy Zhurnal, Vol 4, No 2, Apr-Jun 58, p 207

The Sixth Scientific Conference on the Application of Ultrasound in the Investigation of Matter was held 3-7 February 1958. It has been organized by the Ministry of Education RSFSR and the Moscow Oblast Pedagogic Institute imeni N. K. Krupskaya.

About 80 reports were presented at the conference. A report on work in the field of molecular acoustics conducted in Poland was presented by the Polish scientist F. Kucera. A considerable part of the reports given at the conference dealt with theoretical problems of molecular acoustics. Papers in this field reported on work dealing with the investigation of critical state by an acoustic method (V. F. Nozdrev); the microstructure of sound (M. I. Shakhparonov, L. V. Lanshina); the effect of resonance phenomena on the propagation of sound (B. B. Kudryavtsev); the effects of inner electromagnetic fields on the propagation of sound in electrolytes (A. S. Predvoditelev); the correlation between the structure of glasses and their adiabatic compressibility (V. V. Tarasov); the dispersion of ultrasound in ferromagnetic materials (N. S. Akulov); the relaxation theory of nonlinear effects (Ye. V. Stupochenko, I. P. Stakhanov); the absorption of ultrasound waves of finite amplitude (L. K. Zarembo); the effect of fluctuations on the diffraction image (L. A. Chernov); the theory of the ultrasound interferometer (S. N. Rzhevkin); the dispersion of ultrasound at low pressures (N. I. Perepechko); the calculation of absorption in gases (A. A. Senkevich); the propagation of ultrasound in a Van der Waals gas (A. A. Kasparyants); the theory of dispersion and absorption of sound in acetates (B. A. Belinskiy); etc.

A number of reports dealt with experimental investigations of the characteristics of ultrasound propagation in various media such as reacting mixtures (S. A. Balyan); solutions of electrolytes (R. F. Kanatova); suspensions (R. T. Temnikova); binary mixtures (T. V. Klevtsova); ternary mixtures (A. S. Shilyayev); and deuterium-substituted compounds (I. B. Rabinovich). Other papers in this field discussed the propagation of ultrasound close to the region of solidification of liquids (N. F. Otpushchennikov); in nitrogen at pressures up to 1,000 kilograms per square centimeter (M. P. Valarovich, D. B. Balashov); in liquids at pressures up to 2,000 atmospheres (L. F. Vereshchagin, N. A. Fuzefovich); in saturated water vapor (V. I. Avdonin); in barium titanate ceramics (I. V. Bushev); in coals (A. K. Matveyev, Ye. G. Martynov); in ethyl alcohol vapors (K. T. Akhmetzyanov, M. G. Shirkevich); etc.

Lively discussions were held on the absorption of sound in acetates (I. G. Mikhaylov, N. I. Koshkin, V. S. Lutovinin, V. F. Nozdrev, O. A. Starostina); in the critical region (B. I. Kal'yanov); in single crystals of quartz (L. G. Merkulov, Ye. S. Sokolova); in the region of transition from liquid to crystals (M. A. Gorbunov, N. I. Koshkin); etc.

A number of papers was concerned with the investigation of phenomena accompanying the propagation of ultrasound and methods to be used in work in this field. The subjects discussed included the theory of the interferometer (V. I. Ilgunas, E. P. Yaronis); the behavior of cavitation bubbles (A. V. Kustova); the pulse method of measuring absorption (B. I. Kal'yanov); application of multiple reflection in the investigation of liquids

(A. V. Zipir, V. F. Yakovlev); interferometric measurements at high temperatures (Yu. S. Trelin); correlation of acoustic measurements of heat capacity with direct measurements (Kh. I. Amirkhanov, A. I. Kerimov, A. I. Alibekov); the application of ultrasound in the investigation of electric discharges during cavitation (V. I. Skorobogatov); the dispersion effect produced by cavitation (B. B. Kudryavtsev); methods for making ultrasound fields visible (V. I. Makarov); some problems pertaining to defectoscopy (I. N. Yermolov); the effect of ultrasound on the ferromagnetic properties of matter (A. V. Kerenskiy, V. S. Cherkashin, A. I. Drokin); the transmission of centimeter-range electromagnetic waves through an ultrasound grating (Ye. M. Gershenzon); etc.

Great interest at the conference was elicited by reports concerned with practical application of ultrasound. The reports in question were concerned with the elimination of the corrosion of metals (L. B. Pirozhnikov); acceleration of the dyeing of synthetic fibers (G. V. Goryachko, N. A Dmitriyeva, N. I. Larionov); the determination of the pressure of saturated petroleum crudes in strata (G. V. Cherchenko, V. M. Nikolayev, Ya. G. Bezrukov, V. I. Belousov); the determination of the initial temperature of the crystallization of paraffin wax (A. V. Savinikhina); the effect of ultrasound on electrochemical processes (F. I. Kukoz); the effect of ultrasound in intensifying the process of absorption (B. I. Dal', N. N. Mal'tsev); the effect of ultrasound on foodstuffs (A. I. Zolotova); application of ultrasound for improving the quality of the seam in electric slag welding (L. F. Lependin); coagulation of aerosols by ultrasound (Ye. P. Mednikov); the use of ultrasound in the precipitation of suspensions (A. Ye. Barzhanova); the effect of ultrasound on the distribution of the metal in electrolytic deposition (A. I. Trofimov); etc.

A special session was devoted to the demonstration of experiments in acoustics (A. S. Mel'nikov) and the problem of teaching the fundamentals of musical acoustics at schools (K. Ye. Baranov).

The animated discussions which took place at the conference made it possible to clarify many questions on which disputes arose and to indicate ways for the solution of these questions. A greater number of investigations in the field of applied research was reported than at previous conferences.

17. The Formation of a Layer of Suspended Explosive and the Role Played by This Layer in the Initiation of the Explosion Under Different Conditions

"Concerning the Flashing of Some Explosive Substances and the Effect Exerted by Pressure on This Phenomenon," by K. K. Andreyev and B. S. Samsonov, Moscow Chemicotechnological Institute imeni D. I. Mendeleyev; Moscow, Nauchnyye Doklady Vysshey Shkoly -- Khimiya i Khimicheskaya Tekhnologiya, No 2, Apr-Jun 58, pp 229-232

It is assumed that formation of a layer of suspended particles leads to the explosion; the sharp rise in pressure initiating the detonation wave originates in this layer. The influence of pressure on explosions of liquid substances proceeding by this mechanism is discussed and the role played by the Landau effect considered. Under the assumption that a suspended layer of droplets of a liquid explosive can be formed not only because of the Landau effect, but also as a result of slow heating of the explosive, experiments were carried out on the detonation of nitroglycerin by slow heating. The experimental results obtained are held to justify the assumptions in regard to the mechanism of explosion that have been made; the conditions under which explosions can be produced by slow heating are discussed.

18. Effect of High-Amplitude Ultrasonic Waves on Structure of Solutions

"The Absorption of High-Amplitude Ultrasonic Waves in Structured Solutions," by I. G. Mikhaylov and N. M. Fedorova, Leningrad State University; Moscow, Akusticheskiy Zhurnal, Vol 3, No 3, Jul-Sep 57, pp 239-242

The absorption of ultrasonic waves in solutions of polyisobutylene in benzene (MB 20 000, 98 000 and 180 000) and of perbutane [?] toluene is investigated. The measurements were carried out by a pulse method at a 5-Mc frequency. It was established that in polymer solutions, starting with a certain threshold intensity, a destruction of the structure of the solution occurs. The threshold intensity is determined by the nature of the dissolved polymer and solvent.

Radiation Chemistry

19. Free Radical Formation Investigated

"On the Formation of Free Radicals and Atoms During the Radiolysis of Hydrocarbons at a Temperature of 77°K," by N. Ya. Chernyak, N. N. Bubnov, V. V. Voyevodskiy, L. S. Polak, and Yu. D. Tsvetkov, Institute of Petroleum, Academy of Sciences USSR; Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 120, No 2, May 58, pp 346-348

The formation of free radicals and atoms at 77°K was investigated. The sample was frozen with liquid nitrogen in a Dewar flask and then irradiated with Co^{60} gy a dose of about 3.10^8 r. After irradiation, the frozen samples were placed in the resonator of an electronic paramagnetic resonance (EPR), spectrometer where the formation of the free radicals, their identification, and measurement of their concentration took place. An apparatus having a high frequency modulated magnetic field was used to establish the presence of free radicals and determine the superfine structure of the corresponding EPR spectra. With this apparatus, the authors were able to photograph the screen of the electronic oscillograph which showed the spectra. The sensitivity of the apparatus, which operated at a wave length of 3 cm, was about 4.10^{-10} moles of diphenylpicrylhydrazyl. It was also established that after removal of liquid nitrogen, the concentration of hydrogen atoms started to decrease only after 10-12 seconds, and the concentration of the radicals decreased after 30-35 seconds. It was therefore assumed that in the operation of transferring the frozen sample from the Dewar flask to the resonator, there was no loss of free radicals.

Miscellaneous

20. All-Union Institute of Artificial Fibers to be Built in Kalinin

"Institute of Synthetic Fibers" (unsigned article); Moscow, Komsomol'skaya Pravda, 23 May 58, p 2

The All-Union Scientific Research Institute of Synthetic Fibers (Vsesoyuznyy Nauchno-Issledovatel'skiy Institut Sinteticheskogo Volokna) has recently been built in the city of Kalinin. The institute will work in close cooperation with the Kalinin Combine of Synthetic Fibers. The institute will have laboratories for experimental work and four pilot plants.

21. Investigation of Aircraft Icing

Fizicheskiye Osnovy Obledeneniya Samoletov (Physical Bases of Aircraft Icing), by I. P. Mazin, Gidrometeoizdat, Moscow, 1957, 120 pp

The work is published by the Central Aerological Observatory, Main Administration of the Hydrometeorological Service under the Council of Ministers USSR.

Edited by A. M. Borovikov, the text is devoted to a theoretical and experimental investigation of aircraft icing in flight. An examination is made of the effect of microphysical parameters of clouds and of the flight pattern on icing intensity. Questions of flow around various bodies by currents of air-suspended water drops and the role of heat-exchange processes which decrease aircraft icing are subjected to theoretical consideration. Problems of icing at supersonic speeds are also examined.

A foreword by A. Kh. Khrgian notes that Mazin's work answers a number of aviation engineering questions concerning intensity of icing, its relationship with cloud structure, etc. The computations are likewise applicable to calculating glaze formation -- a serious problem in communications management. Khrgian notes further that some simple principles found with regard to icing at supersonic speeds are of special interest. He concludes that Mazin's work is a great contribution to the development of atmosphere research by aircraft, "in which field the Soviet Union has already done a great deal and is pulling ahead of other countries."

The Introduction, following the Foreword, covers briefly the problem of combating aircraft icing, states the conditions to be examined in the work and defines the symbols used in mathematical notation. The author then proceeds to discuss, respectively: aerodynamics of flow around bodies by a monodisperse aerosol stream; aerodynamics of flow around bodies by a polydisperse aerosol stream; role of heat exchange processes in aircraft icing; experimental investigations on the icing of propeller-driven aircraft (a specially outfitted IL-14 aircraft was used); the icing of high-speed aircraft.

 In the last-named section, Mazin makes the following statements:

"From an examination of the mechanism of icing which leads to a very dangerous form of ice deposit on the surfaces of high-speed aircraft, a significant quantitative conclusion can be drawn. From figure 28 [graph plotting relationship of airspeed necessary to raise the temperature of a

wetted surface to 0°, to air temperature under different water-drop-size reduction factors; temperature range plotted is 0° to minus 40°, speed range is 0 to 400 m/sec] and the speed and temperature values at which icing of this type can occur, it follows that a 30- to 40-meter per-second increase in airspeed should obviate the conditions conducive to such icing and eliminate further ice accumulation. Such a 'speed maneuver' in many cases is readily attainable for modern aircraft and can be an effective means of combating icing at high subsonic speeds. Unfortunately, the lack of experimental data at our disposal does not permit verification of these considerations."

In his concluding paragraph Mazin states: "...regardless of the validity of the conclusions on the extremely low probability of aircraft icing during flights under actual conditions at speeds greater than the speed of sound, the question of the fundamental possibility of icing under such conditions should be solved in special experimental flights."

About two-thirds of the 80 references cited by the author are of US and British origin.

22. Accumulation of Germanium During the Formation of Coal Deposits

"On Ways of the Accumulation of Germanium in Coals and Further Problems in Research on the Subject" by A. B. Travin, West-Siberian Affiliate of the Academy of Sciences USSR; Novosibirsk, Izvestiya Vostochnykh Filialov Akademii Nauk SSSR, No 1, Feb 57, pp 44-48.

Summarizes the results of an investigation in regard to primary and secondary accumulation of germanium in coal deposits and the content of germanium in coal as affected by oxidation and other processes which take place during the formation of deposits, the composition of the coal, and geological conditions. Outlines further research to be done on the subject, which would include investigations on the enrichment of germanium during the treatment of coal and correlation of data culminating in the compilation of maps and charts that would aid in prospecting for germanium contained in coal strata.

Instruments and Equipment

23. New Flickering-Light Meter

"New Model of Impulse Light Meter," by B. V. Byshev and Yu. M. Kutev, Moscow, Svetotekhnika, No 6, Jun 58, pp 14-16

The article describes construction and operation of a new series manufactured photometer known as ISM-57 flickering-light candle-power meter. The device was displayed at the Brussels Exposition.

A vacuum antimony-cesium phototube connected to a capacitor acts as a measuring unit of the device. During the flash of flickering light source, the capacitor is charged with the photo-current in such a way that the potential difference is proportional to flickering light intensity. The ISM-57 flickering light candle-power meter is built as a single unit, incorporating in it optical and photoelectric systems, power supply unit and control illuminator. The device can measure light pulses from sources up to 200 mm wide. The measuring range of the device is from one candle*sec up to 500,000 candle*sec for flash duration from 30 microsec to one sec.

The device can be ordered through the Moscow Sovnarkhoz.

Components

24. Noncontact Rotary Synchrotransformers

"Noncontact Sine-Cosine Rotary Synchrotransformers," by Yu. M. Pul'er, Moscow, Elektrichestvo, No 1, Jan 58, pp 5-9

The noncontact sine-cosine transformers should find wide application in remote control systems and computer automation, where the presence of sliding contacts may upset stability and reliability of controls.

The problem of noncontact rotary synchrotransformer design consists mainly in determining the most economic transformer unit and its proper matching to machine unit.

The article discusses construction and operating characteristics of STB-1, STB-2T and STB-2P type noncontact synchrotransformers. The mentioned types of synchrotransformers are recommended for applications requiring accuracy equal to that of contact type servosystems. Use of STB-2T, STB-2P and STB-3 in conjunction with computer automation has the advantage of high inductive decoupling between the input transformer and the machine unit.

25. New High-Frequency Induction-Heating Generator

"New Series High-Frequency Electric Heating Generators," by A. V. Donskoy, A. M. Borok, G. V. Ivenskiy and A. A. Khanaevarov, Moscow, Vestnik Elektro-Promyshlennosti, No 4, Apr 58, pp 42-47

The LPZ-67 high-frequency generator operates in the frequency range of 60 to 74 kc. The generator is intended for induction melting or heating of metals. Power supply can be drawn from a 220- or 380-v ac line; the rated output power of the tube oscillator is 60 kw.

This high-frequency generator comprises the following units: stabilized high-voltage anode rectifier, tube generator, oscillatory circuit, and control and protection circuits. Two type TP-1 6/15 thyratrons are incorporated in the stabilized high-voltage anode circuit. The tube generator utilizes a GK-3A oscillator triode, which operates on half-wave principle.

The generator was tested under various operating conditions and proved to be highly satisfactory. The efficiency of the generator tube is in the range from 72 to 78%.

It is believed that the new series high-frequency generator should find a wide application in the field of induction heating and melting.

26. Czechoslovak Press Reports Soviet Work With Photocells

"Photocells for the Study of Cosmic Phenomena," (unsigned article), Prague, Obrana Lidu, 3 Jun 58, p 2

The semiconductor laboratory at the Lithuanian Academy of Sciences has developed photocells with which it is possible to investigate infrared rays penetrating through to the earth from outer space and to determine hitherto unknown characteristics of celestial bodies. These photocells do not react to infrared rays under normal circumstances, but respond to their action only after cooling to a temperature of 190 degrees below freezing point.

27. Soviet Television and Motion Picture Patents

"USSR Authorship Certificates in the Field of Television and Motion Pictures," (unsigned article), Moscow, Tekhnika Kino i Televideniya, No 11, Nov 57, pp 88-92

"Single-Beam Color Television Receiving Tube" by Yu. F. Ivanov and S. I. Katayev, Class $21a^1$, 32_{34}, No 104456, 13 Apr 55

"Television Transmitting Tube," G. V. Braude, Class $21a^1$, 32_{35}, No 104424, 13 Jul 51

"Transmitting Cathode-Ray Tube," by K. A. Fedorov, Class $21a^1$, 32_{35}, No 104426, 21 Jun 54

"A Method for Compensating Aperture Distortions," G. V. Braude, Class $21a^1$, 33_{40}, No 105090, 6 Aug 52

"Device for Compensating Aperture Distortions in Television Receivers," G. V. Braude, Class $21a^1$, 32_{40}, No 105181, 28 Jul 52

"Method for Combines Television Program Transmission," D. A. Taranets, Class $21a^1$, 34_{11}, No 104083, 9 Nov 54

"Capacitor Viewing Screen," G. V. Koval'skiy, Class $21a^1$, 34_{11}, No 105182, 16 Nov 53

"Screen for Television Receiver," I. Ya. Lemichev, Class $21a^1$, 34_{12}, No 104839, 17 Feb 55

"Device for Reconstruction of Color TV Images," V. V. Odnol'ko, Class $21a^1$, 34_{31}, No 104592, 15 Sep 52

"Method of Measuring Nonlinearity and Geometric Distortions in Transmitting TV Tube Scanning Devices," M. I. Krivosheyev, Class 21e, 36_{10}, No 104685, 20 Mar 51

"Deflecting System for Intensity Modulation of Electron Beam," A. V. Frishman, Class 21g, 10_{01}, No 104340, 5 Mar 54

"Optical Device for Densitometer," A. A. Lapauri, Class 42h, 17_{02}, No 104299, 13 Dec 52

"Method of Manufacturing Colored Optical Measuring Wedges," S. M. Khazan, Class 42h, 18_{01}, No 104420, 8 Sep 54

"Photoelectric Device for Colorimetric Measurement in Several Spectral Zones," Class 42h, 18_{02}, No 105982, 23 May 56

"Optical Switch-Over for Motion Picture Projectors," G. D. Tuchin, Class 57a, 61, No 104528, 26 May 55

"Magnetic Recording Head," N. G. Zagoruyko, Class 42g, 10_{01}, No 104982, 19 Dec 55

28. Recent Soviet Patents in Electronics

"Publication of Authorship Certificates Awards for Inventions Registered in The State Inventions Register of USSR, Class 21, Electrical Engineering," (unsigned article), Moscow, Byulleten' Izobreteniy, No 2, 58, pp 25-48

Class 21a, 36, No 111244, A. M. Tseytlin, Device for Generating High-Voltage Trapezoidal Pulses.

Class $21a^1$, 9_{04}, No 110847, V. I. Ponomarev, Electromechanical Band-Pass Filter.

Class $21a^1$, 11_{01}, No 111449, B. P. Terent'ev and Yu. V. Bogoslovskiy. A Method of Automatized Telegram Reception.

Class $21a^1$, 32_{11}, No 111258, V. A. Vatsenko, I. Ye. Goron and V. G. Patrunov. A Method of Ferrographic Recording of Stationary Images.

Class $21a^2$, 18_{08}, No 111846. I. A. Petrusenko, V. G. Baranovskiy and V. A. Dunaykin. Push-Pull Amplifier with AC Output.

Class $21a^3$, 61_{01}, No 111456, P. N. Verevkin and A. V. Smirnova. DC Electromagnetic Relay.

Class $21a^4$, 13. No 111720. G. I. Rukman. Parametric Generator.

Class $21a^4$, 14_{01}. No 109765. N. A. Zheleznov. A Method for Increasing the Noise Immunity of a Pulse Modulated Radio Line.

Class $21a^4$, 14_{01}, No 111116. A. A. Leonov. A Method for Obtaining a Single-Band Signal.

Class $21a^4$, 54. No 111439. A. S. Vinitskiy. Multichannel Communication Method.

Class $21a^4$, 73, No 111118. I. V. Chernetsova and V. V. Zateyeva. A Method of Manufacturing Printed Circuits.

Class $21d^2$, 14_{02}. No 110804. D. A. Zavalishin, N. M. Krivonogov and A. S. Uyferev. Device for Control-Pulse Forming in Frequency Converter.

Class 21e, 35. No 111257. V. S. Voyutskiy. Correlation Method for Measuring Weak Signals.

Class 21g, 13_{17}, No 111802. L. G. Lisenko. Matching Device for Traveling Wave (or Backward Wave) Tube

Class 21g, 13_{21}, No 110729. B. V. Krusser and K. I. Bich. A Method for Increasing Electron Beam Modulation in Superorthicon Tubes.

Computers and Automation

29. Computer of the Gor'kiy Physicotechnical Research Institute

"Certain Feature of Logic Structure of GIFTI Machine and Its Code Programming," by G. M. Gil'man, Gor'kiy, Izvestiya Vysshikh Uchebnykh Zavedeniy -- Radiofizika, No 1, 58, pp 141-149

The article gives some information of the logic structure and coding of the Gor'kiy Physicotechnical Research Institute computer GIFTI. It is pointed out that the main peculiarity of coding consists in a special method of changing the addresses.

The GIFTI computer is intended for solution of engineering problems of medium complexity and logical problems arising in machine building. In the design of this computer, it was stipulated to keep the dimensions and number of tubes as low as possible. The GIFTI is a sequence-controlled type of computer and has two kinds of internal storage units. The main storage unit is made of 1984 cells placed on 31 tracks of a magnetic drum and a special storage unit placed on recirculating registers of the same drum. Each cell can store a 32-digit "word." The average extraction time is equivalent to drum's half revolution for the main storage unit, and about 1/128 revolution for special storage unit. The main storage unit is single-address and the special storage unit is three-address. The computer has a fixed point. Calculation can be carried out with 32 or 64 digit numbers.

The GIFTI computer comprises the following units: command counter, current command register, unit for storing operational code, unit for preliminary estimation of nature of scan, register scanner, coincidence system, registering and reading initiating signal generator.

30. Magnetic Amplifier Simulating Circuit

"Physical Modeling of Circuits With Choke-Coupled Magnetic Amplifier," by E. A. Yakubaytis and V. P. Glukhov, Riga, Izvestiya Akademii Nauk Latviyskoy SSR, No 4 (129), 58, pp 129-137

Methods of physical simulation, which are widely used in various fields of engineering can be readily applied to design of choke-coupled magnetic amplifiers. This method obviates the necessity of solution of complex differential equations, as well as determination by analytical or graphical methods of the expressions for a magnetization curve.

Two specific cases were analyzed for windings connected in series and in parallel. With this method of simulation, both magnetic amplifier and measuring devices should be subjected to analysis simultaneously. Simulation of a choke-coupled magnetic amplifier circuit is defined by eight criteria.

31. Czechoslovak and Soviet Electronic Computers

"Perspectives of Cybernetics in Military Technology," (unsigned article), Prague, Obrance Vlasti, 6 Jun 58, p 4

The Soviet electronic computer "BESM" can perform 250 million calculations on a system of 800 equations in 20 hours.

Czechoslovakia also has an electronic computer called "SAPO" which was designed by Docent Dr A. Svoboda at the Institute of Mathematical Machines (Ustav matematickych stroju) of the Czechoslovak Academy of Sciences (Ceskoslovenska akademie ved). "SAPO" can perform 10,000 calculating operations per hour.

It will not be long before electronic computers are made using diodes and transitors, which will greatly reduce their size and weight. At the end of last year, the first completely transitorized electronic computer, which is half the size of a typewriter, was put in operation in the Soviet Union.

32. The Kiev Computer

"Kiev Electronic Computer", (unsigned article), Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Moscow, No 32 (332) March 1958, p 1

The Kiev universal electronic computer was developed in the Mathematics Institute of the Academy of Sciences Ukrainian SSR. It was built by a group of scientific workers under the direction of Academician B. Gnedenko, Academy of Sciences Ukrainian SSR, Prof V. Glushkov, and L. Dashevskiy, Candidate of Technical Sciences. The machine was designed for the solution of a wide scope of complicated mathematical problems and may also be utilized for the control of metallurgical, chemical, and petroleum processes at industrial enterprises, as well as for other purposes.

The Kiev computer enables one, for example, to establish the most advantageous conditions for the operation of a blast furnace as a function of the charge in ore, coke, and agglomerate. In the course of a blast furnace operation with the help of automatic components the machine will maintain appropriate conditions and will signal when the pig iron is ready for tapping.

The utilization of electronic computer techniques in metallurgical plants gives the possibility to obtain more homogeneous metal, shorten the melting time, and reduce the personnel employed in operating the furnace.

The Kiev computer conveniently performs no less than seven thousand operations per second and possesses a number of characteristic features. All its units, the arithmetic, the memory, and other devices work independently, that is, on a different frequency, which substantially facilitates the adjustment of the calculator.

The independence of the operation of the units, as well as a more perfect electrical circuit and the application of semiconductors and other new elements increase the reliability of the entire electronic computer system. An area of 40 square meters is sufficient to house and service a Kiev computer.

Acoustics and Audio Frequencies

33. Ultrasonic Frequency Oscillator

"Oscillator for Driving Powerful Magnetostrictive Transducers," by Yu. I. Kitaygorodskiy and M. G. Kogan; Moscow, Elektrichestvo, No 2, Feb 58, pp 67-69

The recently developed UZG-10 oscillator can drive up to four different types of magnetostrictive transducers simultaneously. Its operating characteristics are as follows: power consumption up to 15 kw, power output up to 8 kw, frequency range from 18 to 25 kc, output voltage range from 200 to 450 v, magnetizing current range from 0 to 60 a, operating from three-phase ac 220/380 v line, cooling water consumption 25 liters per min, over-all dimension 600 X 750 X 1,620 mm.

The UZG-10 oscillator comprises the following units: power supply transformer, plate rectifying thyratron, phase inverter, oscillator tube, oscillatory circuit inductors and capacitors, output transformer, magnetostrictive transducer.

The UZG-10 oscillator can be used for ultrasonic cleaning of various parts, machining hard materials, treating of solidifying castings, cold welding, etc.

Materials

34. Movement of Fast Current Carriers in Polar Crystals

"Nature of Motion of Fast Current Carriers in Polar Crystals," by Yu. I. Gorkun and K. B. Tolpygo; Moscow, Doklady Akademii Nauk SSSR, Vol 120, No 3, 21 May 58, pp 491-494

The motion of fast electrons in solids is responsible for such phenomena as electric breakdown, also secondary, photo- and field electron emission in semiconductor and dielectric materials.

The article discusses in some detail the behavior of major current carriers in ionic crystals, a phenomenon which has been insufficiently studied thus far. The calculated results were in poor agreement with the experimental data, probably due to diversity of major current carrier velocity. The author concludes that actual crystals with distorted lattice have a lower dielectric strength than the ideal crystals.

[For additional information on materials see Items No 4, 9, 22 and 96]

Miscellaneous

35. New Soviet Periodical

Izvestiya Vysshikh Uchebnykh Zavedeniy -- Radiofizika, (News of Higher Educational Institutions-Radiophysics).

Publication data: organ of the Ministry of Higher Education USSR. A bimonthly periodical in the Russian language, published by Typographical Office No 3 of Gosstroyizdat, 6/2 Kuybyshevskiy proyezd, Moscow. It has a circulation of 5,000 copies. Its editorial board consists of V. L. Ginzburg, chief editor; A. S. Alekseyev and A. N. Malakhov, deputy editors; G. V. Aronovich, N. N. Bautin, I. L. Bernshteyn, S. Ya. Braude, A. V. Gaponov, V. I. Gaponov, S. D. Gvozdarev, G. G. Getmantsev, N. G. Denisov, N. A. Zheleztsov, V. A. Zverev, V. I. Kalinin, M. I. Kuznetsov, Ye. A. Leontovich, M. A. Miller, L. L. Myasnikov, Yu. I. Neymark, S. P. Strelkov and V. S. Troitskiy.

Review of contents: The following divisions of radiophysics will be presented in the periodical.

1. Electrodynamics -- Radiation, channeling, and diffraction of electromagnetic waves.

2. Wave propagation -- Wave propagation along the earth's surface, in the troposphere, and in the ionosphere. Sound wave propagation.

3. Electronics -- Physical basis of high and ultrahigh frequencies. Methods of generating, amplifying, and converting oscillations. Cathode electronics. Electric phenomena in gases.

4. Physics of ionosphere -- Ionosphere structure. Microprocesses and statistical phenomena in ionosphere.

5. Statistical Radiophysics -- Fluctuations and noises in various radio equipment. Wave propagation in statistically heterogeneous media.

6. Radioastronomy -- Cosmic radio emission. Radio emission from discrete sources, sun, moon and planets. Radioastronomical equipment and methods. Radar methods in astronomy.

7. Radiospectroscopy -- Radiospectroscopy of gases, liquids, and solids.

8. Theory of Oscillations -- Mathematical problems in theory of oscillations. Dynamics of oscillatory systems.

9. Theory of Automatic Control -- Dynamics of controlled systems. Systems of automatic regulation.

10. Mathematical Machines -- Synthesis of mathematical machines and its units. Dynamics of electronic mathematical machines of digital and analog type. Application of mathematical machines to investigation of dynamic systems.

The periodical will publish information on conferences and meetings relating to radiophysics and theory of oscillations.

The periodical is intended for professorial -- teaching personnel, scientific workers and engineers, as well as graduate and senior undergraduate students.

V. ENGINEERING

36. Ferromagnetic Frequency Tripler

"Basic Characteristics of Ferromagnetic Frequency Triplers with R-C Load," by N. A. Galochkin; Minsk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Energetika, No 5, May 58, pp 43-53

An extensive use of electric equipment and instruments in operation with higher-frequency current (of the order 100 to 500 c) has resulted in increased efficiency of their performance. A number of tube-welding mills have been converted for operation with higher-frequency current.

The author has conducted a series of theoretical and practical experiments with a Spinelli-type frequency tripler which displayed a high power output. The highest efficiency observed with this experimental frequency tripler was 73%, even for small cross-section of windings and incomplete filling of aperture. The maximum power output for the experimental unit was 1,700 w.

37. Conversion of Single-Phase Voltage to Three-Phase With Ferroresonance Regulators

"Conversion of Single-Phase Voltage to Three-Phase With Aid of Ferroresonance Stabilizers," by V. V. Gubanov; Minsk, Izvestiya Vysshikh Uchebnykh Zavedeniy -- Energetika, No 3, Mar 58, pp 46-51

In 1955 A. G. Lur'ye suggested a static device for conversion of single-phase voltage to three-phase voltage with the aid of three ferroresonant voltage regulators. This device possesses high efficiency, high power factor, a fair stability, and a rather low load unbalance.

The experimental unit consisted of three identical ferroresonance voltage regulators of 3-kw capacity each. The primary winding was placed over the unsaturated core of the regulator and the compensating winding (secondary) over the saturated core. The secondary three-phase winding was delta connected.

The experimental testing of this phase converter has shown its high efficiency and reliability. The device should find wide application in rural regions, in railway traction, etc.

[For additional information, see Item No 21.]

Bacteriology

38. Transformation of Brucella Variants

"The Possibilities of Transformation of Brucella Variants," by Yu. Parnas, Chair of Microbiology, Lublin Medical Academy; Moscow,, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 29, No 5, May 58, pp 123-128

This article discusses research on the occurrence of transformations among Brucella variants under natural conditions as a result of migration from one species of animal to another. In the author's opinion, certain facts definitely establish natural transformation; he cites the work of Zdrodovskiy and Yushkovich, who consider the melitensis type to be genetically connected with the bovis type and to originate as a result of passage from cattle to sheep and goats. Parnas states that he has encountered melitensis strains which are in a formative stage but which retain some of the bovis characteristics. Data presented in Table 1 demonstrate the significance of migration of Brucella types in the epidemiology and epizootology of brucellosis.

In his own experiments (1945-1955), the author attempted to transform Brucella variants by metabolic hybridization. The bovis strain was cultured by prolonged passage on substrate containing Proteus OX_{19}, and Proteus was cultured in the presence of Brucella metabolite. As a result, Brucella stains which agglutinated sera against Proteus OX_{19} were obtained and vice versa. Other results of the experiments are discussed in the text, and characteristics of strains obtained are presented in Table 2. Further experimentation with these strains are summarized in Tables 3 and 4.

 The following conclusions drawn from examination of these results are given:

"1. Transformation of the biochemical and serological characteristics of Brucella melitensis, bovis, and suis variants was successfully produced by the metabolic hybridization method. Atypical and intermediate strains whose characteristics approximate sometimes one and sometimes the other standard variant were obtained by this process.

"2. In biochemical investigations of the strains obtained, we observed a predominance of Br. suis characteristics. Characteristics of serological intermediate strains were noted with the help of serological monospecific sera.

"3. It can be supposed that the phenomena observed in the experiments described also occur in nature. It is possible that these phenomena occasion changes in variants in the biocentric media systems in which the variants develop. These facts indicate that Brucella variants are not stable but undergo various changes characteristic for Brucella."

39. Luminescent Microscopy for Study of Rickettsiae

"Experimental Use of Luminescent Microscopy for Studying Rickettsiae," by V. G. Miterева, Institute of Epidemiology and Microbiology imeni Gamaleya; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 29, No 5, May 58, pp 14-17

Interest in the possibilities offered by fluorescent microscopy for studying the biological (particularly morphological) characteristics of Rickettsiae motivated the experiments described in this article; the following species were selected for investigation: R. prowazeki (Brownlee stain), R. mooseri (Musanov and Vel'mington strains) and R. burneti (Grita strain). Special optical apparatus was used for the experiments in conjunction with an MBI-1 microscope with dry and immersion apochromatic objectives and compensating oculars. OI-17 and OI-18 luminescent illuminators and UFS-3 and SZS-7 light filters were among other special equipment used to produce the effects desired.

On the basis of the discovery that Rickettsiae have no luminescence themselves, a method of producing induced or secondary luminescence was devised by means of fluorochromes -- various chemically pure dyes which are selectively absorbed on microorganisms. It was found through experimentation with these dyes that the clearest contrast and most intensive luminescence were achieved by staining the pathogens with an aqueous solution of auramine or rivanol in a concentration of 1:1,000 to eliminate the undesirable phenomenon of nonspecific luminescence of the background which occurred after treatment of Rickettsiae with fluorochromes, the "defluorochromation" method, further explained in the text, was employed.

Two alternative methods of preparing specimens to be examined are recommended and described in detail. In addition to the species enumerated above, live Rickettsiae were examined by infecting yolk sacs of 6-7-day chick embryos, making smear impressions, and treating them with fluorochromes. Material from guinea pigs and lice infected with Rickettsia was also treated for examination in vivo. Preparations from chick embryo yolk sacs, internal organs of guinea pigs, and excreta of lice not infected with Rickettsia were stained with fluorochromes as controls. Both live and killed Rickettsia fluoresced with green light.

The author states in conclusion that fine morphological structures of the Rickettsiae examined by these methods could not be observed. Even though separate species could not be differentiated, the procedure discussed is considered valuable for investigation of materials containing small amounts of Rickettsia, since even a single cell can be detected.

Contagious Diseases

40. Bacterial Antigen Observed in the Blood of Brucellosis Patients

"The Observation of Bacterial Antigen in the Blood of Brucellosis Patients," by B. G. Khaykina, Institute of Experimental Medicine and Orenburg Medical Institute; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 29, No 5, May 58, pp 56-60

The author presents results of research in which he investigated the significance of observing bacterial antigens in the blood of patients with infectious diseases for immunological purposes; the dynamics of the bacterial antigen curve in brucellosis patients and persons inoculated with live antibrucellosis vaccine was comparatively evaluated. Antigen determination was carried out using the complement fixation reaction. Killed Brucella suspensions and high-titer rabbit immune sera were employed. The following four tables summarize results, which are discussed in the text: (1) Frequency of Isolating Brucella in Relation to Observation of Bacterial Antigen in the Blood; (2) Frequency of Observing Bacterial Antigens in the Blood and Isolation of Brucella at Different Stages of the Disease; (3) Dynamics of Observation of Brucella Antigen in the Blood of Persons Inoculated With Live Vaccine From Brucella Strain VA; (4) Results of Comparative Serological Examination of Brucellosis Patients and Inoculated Persons.

Conclusions presented on the basis of these results are as follows:

"1. Specific antigen is sucessfully observed in the majority of brucellosis patients in all stages of the disease.

"2. Comparison of the bacterial antigen curve with data on bacteremia demonstrates the necessity of differentiating between fixation of microbial elements of the reticuloendothelial system and their disintegration in the organism.

"3. The bacterial antigen curve in connection with microbiological data characterizes the course of the process and can have prognostic significance.

"4. The appearance of bacterial antigen in the blood of inoculated persons during the 2-3 weeks following inoculation indicates active proliferation of the microorganisms introduced. At the same time, a rapid decrease in the antigenic curve is characteristic for the inoculation process in contrast to the disease itself."

41. Diphtheria in the Belorussian SSR

"In the Scientific Society of Microbiologists, Epidemiologists, and Infectionists," by B. Rubinshteyn; Minsk, Zdravookhraneniye Belorussii, No 4, Apr 58, p 80

The problem of diphtheria in the Belorussian SSR and measures for its control and clinical peculiarities during 1957 were discussed at a plenary session of the Belorussian Branch of the All-Union Society of Microbiologists, Epidemiologists, and Infectionists on 7 February 1958.

It was disclosed that during 1957, diphtheria morbidity had decreased by 30.6 percent below 1956, but that the number of cases was still high, being 9.8 per 10,000 population. The greatest decrease was recorded for the cities of Minsk and Brest and in Vitebskaya Oblast. The greatest number of cases was recorded in the city of Minsk and in cities of Mogilevskaya Oblast.

It was pointed out that insufficient inoculation of children was the principal cause for the high number of diphtheria cases. The session adopted a plan for reducing the number of diphtheria cases.

Hematology

42. Blood Cholinesterase Activity Reflects Reaction of Organisms to Heterogenic Hemotransfusion, Tests Indicate

"Deviations in the Activity of Cholinesterase of Blood of Experimental Animals After Heterogenic Hemotransfusion," by P. T. Gorbunov, Nauch. Rabot. Minskiy Med. In-t. (Scientific Works Minsk Medical Institute), 1957, 18, 16-31 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 8, 25 Apr 58, Abstract No 9718)

"Heparinized blood of guinea pigs, dogs, or cats was introduced into the femoral artery or vein of rabbits, and after various periods determinations were made of the blood cholinesterase activity. The blood of guinea pigs and of dogs caused increased enzyme activity in the blood of recipients, but the blood of cats caused decreased activity. The effect

did not depend on the cholinesterase activity in the blood of donors, but it was the expression of the reaction of the organism to heterogenic hemotransfusion. The greatest change was evident at 10 minutes after the transfusion, but even at 24 hours enzyme activity differed from the original level in the majority of cases."

Immunology and Therapeutics

43. Soviets Reveal Effectiveness of Vaccination Against Influenza and Mumps

"Soviets Reveal Effectiveness of Vaccination Against Influenza and Mumps", (unsigned article); Brussels, Le Drapeau Rouge, 1 Jul 58, p 4

Specialists in virus diseases from 20 countries attended the recent International Congress on Virology in Lyon. Among them were Smorodintsev of the USSR, who reported that the USSR has had great success in preventing influenza with a live vaccine which has reached a maximum degree of attenuation in successive passages from chick embryo to human. A total of 18 million persons have been vaccinated nasally with this product.

A vaccine against mumps has also been perfected using a similar process. It has raised the natural immunity of the population from 10 to 75 percent.

44. Soviet Influenza Vaccine Tested by French Physician

"Resumption of Antipolio Vaccine Distribution Before End of Week," by Francois Mennelet; Paris, Le Figaro, 30 Jun 58, p 2

During the debate at the International Congress on Virology in Lyon at the end of June, Dr Koprowski of Philadelphia and Professor Smorodintsev of the USSR presented what they termed satisfying conclusions on vaccinations made with attenuated viruses. Dr Koprowski's experiments were made in the Belgian Congo, and Professor Smorodintsev's in the USSR.

On the subject of influenza, Professor Smorodintsev stated, "We vaccinate between 10 million and 15 million persons every year.". He admitted that there is difficulty in finding a vaccine which corresponds to the exact type of influenza virus.

The article on the congress further stated that in Lyon, thanks to Soviet sources, Dr Charles Merieux used serum to immunize hospital and police personnel during the height of the influenza epidemic. The percentage of cases resulting was clearly lower than that registered in other cities.

45. Biologically Active Organophosphorus Compounds

"Biologically Active Alkylated Amidoesters and Mixed Esters of Alkylphosphinic Acids," by A. I. Razumov, Ye. A Markovich, and O. A. Mukhacheva, Khimiya i Primeneniye Fosfororganicheskikh Soyedineniy (The Chemistry and Application of Organophosphorus Compounds); Moscow, Academy of Sciences USSR, 57, pp 194-204; (from Referativniy Zhurnal -- Khimiya, Biologicheskaya Khimiya,

 No 11, 10 Jun 58, Abstract No 14527, by A Travin)

"Amidoesters, $RPO(OR')(NR''R''')$ (I), and certain of their thio analogs, where $R = CH_3$, C_2H_5 or iso-C_3H_7; $R' = CH_3$, C_2H_5, n-C_3H_7, iso-C_3H_7, n-C_4H_9, iso-C_4H_9, n-C_6H_{13}, C_6H_{11}, $C_6H_5CH_2$ or $4\text{-}O_2NC_6H_4$; $R'' = H$, CH_3 or C_2H_5; $R''' = CH_3$, C_2H_5, CH_2CH_2Cl or $CH(CH_3)(CH_2)_3N(C_2H_5)_2$, as well as mixed esters, $C_2H_5PO(OR')(OR'')$ (II), and certain of their thio analogs, where $R' = CH_3$, C_2H_5, n-C_3H_7 or iso-C_3H_7 and $R'' =$ o-, m- and P-$O_2NC_6H_4$, o- and P-ClC_6H_4 or CH_3CO, were synthesized by the interaction of unsaturated acid chlorides of alkylphosphinic acids, $RPOCl(OR')$, or their thio analogs with amides and alcohols. Amidoesters are slightly toxic, possess miotic action, and are cholinesterase inhibitors. For example, (I) ($R = R' = R'' = R''' = C_2H_5$), (I) ($R = R'' = R''' = C_2H_5$, $R' =$ iso-C_3H_7), (I) ($R = R'' = R''' = C_2H_5$, $R' =$ iso-C_4H_9), (I) ($R = R' = R'' = C_2H_5$, $R''' = H$) and (I) ($R = CH_3$, $R' = R'' = R''' = C_2H_5$) produce pupilary contraction with the following minimum concentrations (in %, in rabbits and cats, respectively): 2 and 3; 0.15 and 0.25; 0.25 and 1; 0.1 and 0.25; 3 and 10. The molecular concentration which causes 50% cholinesterase inhibition is expressed for the above-mentioned five preparations by the following figures (for cerebral and serum cholinesterase, respectively): $5 \cdot 10^{-5}$ and $2.5 \cdot 10^{-5}$; $6 \cdot 10^{-6}$ and $1 \cdot 10^{-6}$; $5 \cdot 10^{-6}$ and $1.5 \cdot 10^{-6}$; $1 \cdot 10^{-6}$ and $1.5 \cdot 10^{-6}$; $2 \cdot 10^{-5}$ and $2.5 \cdot 10^{-5}$. Among (II), all of which are highly active, the most effective is ($R' = C_2H_5$ and $R'' = 4\text{-}O_2NC_6H_4$), used against glaucoma under the name of 'armin.' It possesses miotic action in a concentration of 1:200,000 and an anticholinesterase action on frog muscles in a molecular concentration of $1 \cdot 10^{-7}$. The toxicity of the preparation for mice is expressed in amounts of 0.54 mg/g (subcutaneously) and 0.4 mg/g (internally)."

46. Organophosphorus Compounds and Their Biological Activity

"The Esters of Alkylphosphinous and Dialkylphosphinic Acids and Their Biological Activity," by A. I. Razumov, O. A. Mukhacheva, and I. V. Zaikonikova, Khimiya i Primeneniye Fosfororgan. Soyedineniy (The Chemistry and Application of Organophosphorus Compounds), Moscow, Academy of Sciences USSR, 57, pp 205-212, Discussion 212-217; (from Referativniy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 11, 10 Jun 58, Abstract No 14526, by A. Travin)

"The esters of alkylphosphinous acids, $RP(OR')_2$ (I), where R and R' = C_2H_5, n-C_3H_7, iso-C_3H_7, n-C_4H_9 or iso-C_4H_9, were obtained by the alkoxylation of alkyldichlorarsines. The esters of alkylthiophosphinic acids, $RPS(OR')_2$, where R and R' = C_2H_5, n-C_3H_7 or n-C_4H_9, and their selenium analogs, $RPSe(OR')_2$ with the same radicals, were synthesized by the interaction of (I) with sulfur and selenium. $R_2PO(OR')$ (III) esters, where R = C_2H_5, n-C_3H_7, iso-C_3H_7, n-C_4H_9, or iso-C_4H_9 and R' = CH_3, C_2H_5, n-C_3H_7, iso-C_3H_7, n-C_4H_9, iso-C_4H_9, n-C_6H_{13}, n-C_7H_{15}, n-C_8H_{17}, $C_6H_5CH_2$, C_6H_5, o- and p-$CH_3C_6H_4$, o- and p-ClC_6H_4, o-, m- and p-$O_2NC_6H_4$, were obtained by the isomerization of (I) or the interaction of the acid chlorides of dialkylphosphinic acids (II) with alcohols. $R_2PONR'R''$ amides (IV), where R = C_2H_5, n-C_3H_7 or n-C_4H_9, R' = H or C_2H_5 and R'' = C_2H_5, were obtained by the interaction of (II) with amides. The synthesis of organophosphorus compounds answering the formulas $CH_3PS(OR)(OR')$ (V), where R = CH_3 or C_2H_5 and R' = $CH_2CH_2SC_2H_5$, 4-$O_2NC_6H_4$ or 4-methylcoumarinil-7, $CH_3PO(SC_2H_5)(SCH_2CH_2SC_2H_5)$ (VI), $CH_3PS(OR)SCH_2CH_2SC_2H_5$ (VII), where R = SH_3, C_2H_5 or C_3H_7, and mixed anhydrides of $(C_2H_5)_2P{-}O{-}P(OR)_2$ were also described (in the discussion). From a biological point of view, the most interesting compounds are the aromatic esters of type (III); for example, (III) where R = n-C_3H_7 and R' = 4-$O_2NC_6H_4$ is as powerful a cholinesterase inhibitor as armin, however, it is one twentieth as toxic. Many compounds of this series possess miotic action and lower intraocular pressure. Aliphatic esters of this type and amides of type (VI) are not very active. Certain compounds of type (V), (VI), and (VII) possess valuable insecticidal properties."

47. Local Anesthetic More Powerful Than Novocain

"Concerning the Pharmacology of the Stereoisomers of the Chlorine Hydrate of the Benzoic Ester of 2-Methyl-4-Oxydecahydroquinoline," by I. I. Chebekova, Izv. AN KazSSR, Ser. Med. i Fiziologii No 1(8), 1957, pp 105-110; (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 11, 10 Jun 58, Abstract No 14524, by A. Travin)

"Stereoisomer alpha, beta, gamma, and delta forms of the chlorine hydrate of 2-methyl-4-benzoyloxydecahydroquinoline possess strong local anesthetic action, surpassing the action of novocain (in 0.25-0.5% concentrations) by 3.6-5.7 times. The intensity of the local anesthetic action changes depending on the steric disposition of substituted radicals; the gamma form is the least effective. The minimum lethal dose of the gamma form, in quantitative terms, is equal to that of novocain (0.3 mg/kg); the rest of the preparations are more toxic than novocain. After the internal administration of 5-20 mg/kg to dogs, a decrease in blood pressure was observed, accompanied by a marked decrease in the contraction amplitude of the heart, with an increase in rhythm along with an increase or decrease in respiration. Subcutaneous administration of large doses (20-50 kg/mg) produce clonico-tonic spasms together with increased blood pressure and a marked increase in respiration. In experiments on the isolated ear of a rabbit, vascular dilation was observed with concentrations of 1:1,000 1:5,000, and 1:10,000."

48. Adrenalin Antagonism

"Adrenalin as an Antagonist of Ditiline and Other Curare-Like Preparations," by A. F. Danilov, Fiziol. Rol' Atsetilkholina i Izyskaniye Novykh Lekarstv. Veshchestv (The Physiological Role of Acetylcholine and the Search for New Medicines), 57, 413-418 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 11, 10 Jun 58, Abstract No 14542, by M. Shuster)

"The antagonistic action of adrenalin (in experiments on cats) appears with a dose of 0.005 mg/kg, becomes strongly expressed (at 0.02-0.03 mg/kg, and is observed if ditiline is administered in the first 5-6 minutes after the administration of adrenalin."

49. Antishock Therapy Solution

" A Heteroalbumose Antishock Solution," by G. A. Tsinman, Nauchn, Tr. Kubansk. Med. In-ta. (Scientific Works of the Kubansk Medical Institute), 57, 15 (28) 82-86 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 11, 10 Jun 58, Abstract No 14576, by G. Vigdorovich)

"The authors propose a solution called "Oval" -- a product produced from denatured egg albumin, miscible with alcohol in all proportions without coagulation. The proposed antishock solution consists of the following: 25 ml of alcohol, 15 g of glucose, 0.25 g of NaBr, 0.025 g of ephedrine, and 4% "Oval" to 250 ml. This preparation gave good results in traumatic shock therapy with animals."

50. Extracts of Vitamins C. P. E. and A Obtained From Fruits of the Dog Rose

"Fruits of the Dog Rose," unsigned article; Moscow, Meditsinskiy Rabotnik, No 42, 27 May 58, p 4

"Until now, the vitamin industry has extracted from dry fruits of the dog rose only vitamin C concentrates in the form of syrups or nutritive pigments used for coloring margarine.

"At the All-Union Scientific Research Vitamin Institute of the Ministry of Health USSR, a scientific method has been developed for using the fruit of the dog rose from which four preparations are obtained: concentrates of vitamin C, P, E, and A, and also food coloring pigments.

"It has been established that, in addition to obtaining 2,163 liters of vitamin C concentrate from one ton of the dry fruit of the dog rose, it is possible to obtain 63.5 kg of vitamin P preparation and 22.8 kg of concentrates of vitamins E, and A (carotin).

"Tests indicate a high biological activity of vitamin P concentrates obtained from this raw material. Data from literature point to bactericidal properties of dog rose oil which contains significant amounts of vitamins E and carotin.

"Presently, the activity of vitamin P concentrates obtained from dog rose is being tested in therapeutic and gynocological clinics of Moscow and Leningrad."

Physiology

51. Physiology of Higher Nervous Activity

" Some New Facts on the Physiology of Higher Nervous Activity," by Prof P. Kupalov; Moscow Meditsinskiy Rabotnik, 4 Mar 58, No 18 p 3

Physiology now has at its disposal a general concept of the activity of higher branches of the brain, an understanding of the basic physiological regularities of the behavior of animals, and is able to direct this behavior to attain desired results. The chief organ of higher nervous process is, of course, the cerebrum. By understanding the mechanism of neural processes, exhibited in the cerebral cortex, it has been possible to develop complicated behavior in a dog and to unify the more elementary conditioned reflexes and movements of the animal.

Systematic experiments have been conducted continuously in the Institute of Experimental Medicine to determine the mechanism of formation of a conditioned reflex and the characteristics and organization of integrated nervous processes that arise during the formation of a conditioned reflex.

A conditioned reflex is a nervous synthesis phenomenon and continued study of the actual neural mechanisms involved in this phenomenon is a great problem for the future.

Public Health and Sanitation

52. Bacterial Aerosol Experiments

"A Hermetic Chamber for Experimental Work With Bacterial Aerosols," by A. Ye. Vershilova, Chair of Microbiology, Kiev Institute for Advanced Training of Physicians; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 29, No 6, Jun 58, pp 105-108

"Models of bacterial aerosols formed from pathogens of air-borne infections are used in hermetic chambers for resolving numerous problems connected with the mechanisms of dispersal of these infections. There are descriptions of various chambers for similar investigations in foreign literature, but they are very complex in construction.

"Experimental investigations with synthetic bacterial aerosols were first performed in the USSR by Rechmenskiy and his associates in an original chamber (1946). In 1955 he designed an apparatus consisting of a system of hermetic glass flasks for studying the kinetics and biological activity of bacterial and viral aerosols. In 1956, Baroyan and his associates designed the I-1 apparatus, a metal chamber with a volume of 50 liters supplied by various devices and equipped for infecting animals and sterilizing air, for performing aerosol experiments.

"We assigned ourselves the task of constructing a hermetic chamber which would be suitable for creating models of stable bacterial aerosols in a large space for studying the relationship of their kinetic properties to various factors -- air temperature, humidity, state of aggregation, etc. With these models, we proposed to study the trapping capacity of various apparatuses designed for separating microorganisms from the air. With this in mind, we developed the designs according to which this chamber was produced in April 1956 at the Kiev Factory of Metal Wares and Disinfection Equipment. (Footnote: Working designs according to our sketch were drawn up by engineers V. G. Vrublevskiy and K. M. Motuz.)

"The chamber itself is a sheet-iron box with dimensions of 120 x 80 x 70 cm (Figure 1). The walls are 3 mm thick. Inside the box are two partitions which divide it into three equal compartments each with a volume of 200 liters. On the anterior wall of the chamber there are three round windows 10 cm in diameter, through which it is possible to observe equipment or animals in the compartments. There are connecting pipes for spraying bacteria in and taking air samples from the compartments at a height of 15 cm above the windows (two per compartment). On the lateral walls are circular ports (diameter, 25 cm) which are sealed hermetically by lids with screw clamps (Figure 2). Various equipment and animals are placed in the chamber through these ports. Small lids (diameter, 11 cm) are located under the large ports. Rings are installed in the small ports. Rubber sleeves can be attached to these rings to permit manipulation with the hands inside the compartments during the performance of experiments. The large and small ports of the middle compartment are on the rear wall. (Figure 3). Each compartment contains electric lights and sockets for plugging in electric apparatus; there is an opening on the slanting lower wall for draining the liquid with which the chamber is washed. The top of the chamber is sealed on hermetically with screw clamps, and there is a rubber gasket between the walls and partitions of the body of the chamber and its top. The exterior and interior surfaces of the chamber are painted with oil paint.

"The droplet phase of a bacterial aerosol is formed with a special 'troynik' (Figure 4), the use of which creates an aerosol of uniform concentration simultaneously in all three compartments. The 'troynik' is a spherical glass container (5 cm in diameter); five tubes protrude from it, three of which are outlet tubes (0.5 cm in diameter and 6 cm long) on the anterior wall of the container, one is an intake tube (one cm in diameter and 2 cm long) on the rear wall; the last tube (0.5 cm in diameter, 3 cm long) is on the bottom. The intake tubes are for dispersing a bacterial emulsion into the container of the 'troynik.' The smallest aerosol droplets are expelled through the outlet tubes in the form of a stream of mist. Large droplets which are formed in the container flow out through the tube at the bottom of the container.

"A study of the kinetic properties of bacterial aerosols in dust and droplet phases was carried out in the chamber described, and the trapping capacity of various apparatuses designed for catching microorganisms from the air was compared.

"A convenient feature of work with our model chamber is the possibility of creating three equal volumes of aerosol with identical concentrations, whereby three parallel experiments can be performed simultaneously.

"Due to the necessity of conducting experiments with pathogenic aerosols, the chamber can be easily equipped with an adapting device for disinfection of the air entering through the chamber (a muffle furnace) or with an aerosolizing apparatus inside the chamber."

53. Food Crops and Hexachlorane-Treated Soils

"Hygienic Assessment of Food Crops Grown on Soil Treated With Hexachlorane," by N. M. Rusin, G. P. Andronova, I. N. Sapronova, and O. I. Vasil'yeva, Moscow Scientific Research Institute of Sanitation and Hygiene imeni F. F. Erisman; Moscow Gigiyena i Sanitariya, No 6, Jun 58, pp 32-36

Food crops (wheat and potatoes) grown on soil which has been treated before sowing with large quantities of hexachlorane dust (up to 400 kg/hectare) which has been enriched and unenriched with the gamma-isomer containing the so-called residual hexachlorane, i.e., organic substances containing chlorine, are nontoxic to animals.

Potatoes grown in this soil, as a rule, acquire a foreign disagreeable taste which renders them unsuitable for food. However, starch prepared from the potatoes does not possess this strange disagreeable taste.

At the same time, wheat grown on soil treated with hexachlorane against the colorado beetle contains up to ten times as much residual hexachlorane as the potatoes, but it is not toxic for animals nor does it possess the foreign unpleasent taste or smell.

Therefore, it is recommended that for the first 3-4 years after the treatment of soil with hexachlorane only cereals be grown, and later potatoes.

54. Fifth Congress of Medical Workers' Trade Union

"Fifth Congress of Medical Workers' Trade Union" (unsigned article); Moscow, Meditsinskiy Rabotnik, No 44, 3 Jun 58, pp 1, 3

The Fifth Congress of the Medical Workers' Trade Union was held in Moscow, 29-31 May 1958. The first session was held in the evening on 29 May and was devoted to discussing the report of the central committee of the Medical Workers' Trade Union. A few delegates asked questions concerning reorganization of the work of trade union organizations. This reorganization is supposed to result in bringing those organizations closer to the needs of health service. The delegates also exchanged views and discussed the value of public participation in cultural activities and in therapeutic and preventive medical work.

V. G. Golovkova, chairman of the Leningrad Oblast Committee of the Medical Workers' Trade Union, spoke on the work of a medical district physician. She said that the load of a medical district physician is so great that he has no time to organize properly whatever preventive medical work is necessary in his district. Proper planning and organization of preventive medical work, no doubt, could eliminate long lines of patients in outpatient clinics, which, in turn, could rectify other defects and inadequacies.

N. F. Popov, chairman of the Voronezhskaya Oblast Committee of the Medical Workers' Trade Union, spoke on results of merging rayon hospitals with sanitary-epidemiological stations. The reorganization proved beneficial in rural areas. Proper distribution of the work load among physicians still remains unsolved under the new setup.

L. P. Baranovskaya, the chairman of the Belorussian SSR Committee of the Medical Workers' Trade Union, and a number of other delegates were critical of health agencies and of the Ministry of Health USSR. They claimed that little attention has been paid to the health and safety of medical workers. They claimed that the Ministry of Health USSR issues too many directives, but exercises very little supervision over their proper execution. Violators of regulations dealing with the health and safety of medical workers have remained unpunished.

K. A. Suchkova, the chairman of the Moscow Oblast Committee of the Medical Workers' Trade Union, stated that the scientific research institutes should re-examine the system of medical aid to employed women, find out the causes for illness among them, and come up with an idea of how to prevent those illnesses. Medical research workers must keep their eyes open for practical requirements of the medical profession and for the needs of the health service in general. Frequent and thorough investigations of the activities of research workers must be conducted by the Ministry of Health USSR in conjunction with the Central Committee of the Medical Workers' Trade Union and with the Presidium of the Academy of Medical Sciences USSR.

K. A. Suchkova criticized the members of the Central Committee of the Medical Workers' Trade Union because, she claimed, they made no attempts to familiarize themselves with the most advanced achievements in medical science or to publicize the experiences of the leading medical establishments.

Greetings from the Ministry of Health of the Democratic People's Republic of Korea, from the General Secretary of the Federation of Hospital Workers of West Bengal, from the Council of the Medical Workers' Trade Union of Peiping, and from the Central Committee of the Medical Workers' Trade Union of Czechoslovakia were read at this session.

M. D. Kovrigina, Minister of Health USSR, spoke at the 30 May morning session on the long-range draft plan for development of health service in the USSR, 1959-1965. She stated that the Soviet government each year allocates enormous sums of money for improvements in health service, for protection of the health of medical workers, and for safety devices. The Communist Party and the government are interested also in reducing the incidence of various diseases and the mortality rate and in improving the therapeutic and sanitary service throughout the Soviet Union, she said.

M. D. Kovrigina stressed that defects in the operation and management of medical establishments and health agencies must be pointed out. One of the most important defects is the absence of efficient medical service to industrial workers. Many outpatient clinics and outpatient departments of hospitals are often crowded into small buildings and are not supplied well enough with necessary equipment. Waiting lines in outpatient clinics have not been entirely eliminated, and in a number of places, no arrangements have been made to treat people in the evenings or on their day off from work. She continued her comments as follows:

There are 350,000 physicians now practicing in the USSR: one physician per 600 people. The solution to this problem lies in strengthening the outpatient clinics. For many years the Ministry of Health USSR has been trying to call to the attention of the local health agencies the fact that an outpatient clinic is the principal link in the chain of medical establishments.

All medical districts, including the industrial medical districts, must be broken up into smaller units. This can be done by increasing the number of positions for physicians even at the expense of auxiliary branches of health service. Medical documentation must be abridged and overhauled in such a manner as to enable physicians to utilize their time in a more rational manner. The Ministry of Health USSR has cooperated with health agencies in their effort to promote rational utilization of professional medical personnel: the ministry gave permission to the heads of therapeutic and preventive medical establishments to shift their professional medical personnel from one department to another, from hospital to outpatient clinic, and vice versa.

The dispensary method of serving the population has found wide acceptance throughout the country, but this method of treatment has embraced only certain morbid conditions and the quality of supervision over people who are in need of this type of service still remains inadequate.

Little effort has yet been made to capture the interest of the general public in health protection. The most effective form of public participation results when the medical workers, trade unions, and administrative personnel of industrial establishments cooperate with each other and with "activists" to educate the public.

The decree issued by the February Plenum of the Central Committee of the Communist Party of the Soviet Union, "Concerning Further Development of the Collective Farm System and Reorganization of Machine-Tractor Stations," was issued to further improve the rural economy and to raise the cultural level of the rural population. Improvement in medical service to the rural population consists of extensive construction projects to house hospitals, feldsher-midwife posts, maternity homes, creches, and homes for medical personnel. The collective farms of the Ukrainian SSR have had 7,000 maternity homes built by using their own resources. The collective farms of the Moldavian SSR have built 400 maternity homes and, during 1956-1957, the number of rural hospitals in this republic increased by 76. The collective farms of Tyumenskaya, Voronezhskaya, Ryazan'skaya, Irkutskaya, and Chkalovskaya oblasts and of Krasnodarskiy Kray have all launched construction projects to house medical establishments.

It is a well-established fact that improvement in general health depends on steady improvement in the living conditions of the population, higher cultural level of the workers, good working conditions, better housing facilities, well-organized populated communities, a high level of medical science in general, constant improvement in the quality of therapeutic and preventive medical care, l public eating places, the operation of which is based on scientifi principles. Realistic improvement in medical service must consist of sharp reduction in the incidence of those communicable and parasitic diseases whose incidence has been persistently high. Child mortality must be reduced, greater stress must be placed on the health and physical development of adolescents, and loss of man-hours from work by industrial and service personnel must also be drastically reduced.

Soviet medical science has made sufficiently great progress to be able to cope with cardiovascular diseases, malignant tumors, and tuberculosis.

Oncological dispensaries of various republics, oblasts, krays, and cities must be required to have radiological units and must have at least 75 beds available. Cities that do not have oncological hospitals or

dispensaries must have special oncological units in their general hospitals, provided, of course, that these establishments are large enough. These units must have special gamma- and roentgenotherapeutic devices available. Treatment must encompass the majority of people with malignant tumors during the next 2 years.

Efforts in tuberculosis control, improvement in living standards and in the cultural level of the population, and proper sanitary conditions are building a foundation for the complete eradication of tuberculosis within the next 15-20 years.

There is room for improvement in health service to the rural population. Specialized medical care must be expanded in rural hospitals and the capacity in each one of these hospitals must be increased to 75 beds in some of them and to 100 and 150 beds in others. These hospitals must have X-ray machines, laboratories, and physiotherapeutic devices. Hospitals on the oblast level must become the genuine centers of highly qualified medical aid. The rural medical district must be strengthened. In organizing the rural medical district it is necessary to foresee any economic dislocation that may take place such as: misplacement of state farms or misplacement of collective farms. The number of beds in any rural medical district must be increased to 25 and more.

Medical aid to women and children is one of the most important branches of medicine. Infant mortality and childbirth deaths have been gradually declining.

Women are employed in almost all branches of industry; about 45% of all industrial workers are women. In some industries women constitute 90% of the working force. This makes it imperative that all kinds of organized qualified medical service be brought closer to industrial establishments.

Midwives, obstetrical, and gynecological workers have demonstrated the importance of psychological preparation of pregnant women for childbirth. All scientific and practical medical workers must strive to improve this method further.

One way to help all employed women is to give proper care to their children; this can be done by expanding the network of creches. New types of creches began to be organized in 1956. Up to 32% of creches are now able to take care of children 24 hours a day. Since annual plans for construction of more buildings to house creches were never fulfilled, shortage of space exists everywhere.

The Minister of Health USSR then turned to scientific research. "The Academy of Medical Sciences USSR," she said, "is the chief organizing and coordinating center of scientific medical research in the country. The Fifth Congress of the Medical Workers' Trade Union has a right to demand from the Academy of Medical Sciences USSR all the assistance they need."

The Minister of Health USSR continued, the long-range draft plan for development of health service during 1959-1965 will provide for an increase in bed capacity by 550,000 or by 37.7% over the number of beds available by the end of 1958 throughout the USSR. This will bring the total bed capacity in hospitals, maternity homes, and outpatient clinics to over 2 million. Consequently there will be 8.8 beds per 1,000 people by the end of 1965 against 7 beds per 1,000 people as of the end of 1958.

The number of beds available in hospitals at the end of 1965, in various republics, will show the following percentage increase over the number expected to be available at the end of 1958: the increase in the Kirghiz SSR will be by about 74%; in the Tadzhik SSR, by 60%; in the Belorussian SSR, by 55%; in the Azerbaydzhan SSR, by 50%; in the Uzbek SSR, by 46%; and in the Kazakh SSR, by 47%.

It is desirable that each city hospital have a capacity of about 400-500 beds, depending, of course, on regional peculiarities.

The feldsher-midwife posts must be re-enforced. They are the vanguard of the Soviet health service in rural areas, particularly as far as calls on and other preventive medical services for infants and pregnant women are concerned.

The long-range draft plan for 1959-1965 will provide for an increase in the number of maternity homes and maternity wards in hospitals. The number of beds for pregnant women in confinement and for mothers will be brought to 205,000 by 1965. It is expected that there will be 128,000 beds for gynecological patients by 1965. The total number of beds in the feldsher-midwife posts and in the maternity homes of collective will reach 52,000 by 1965. The work load of medical district obstetrician-gynecologists must be reduced and two positions must be set up for nurses for each position of obstetrician-gynecologist.

The children's consultation clinic is the main link in the therapeutic-preventive service to children and the medical district pediatrician plays an important role in it. By 1965 there should be one pediatrician for 900-1,000 children and there should be two positions set up for visiting nurses for each position of pediatrician. It is expected that by 1965 there will be over 75,000 pediatricians practicing in the USSR, which will be an increase of 27,000 over the number practicing in 1957.

In 1965 there should be 1,520,000 spaces available in creches, for an increase of 604,000 over 1957.

The long-range Seven-Year Plan (1959-1965) will also contain provisions for further expansion of the network of sanitary-epidemiological establishments.

Sanatoriums and health resorts have been concentrated mainly in the southern parts of the USSR. No new resorts have been organized in the Urals, Siberia, the Far East, Kazakhstan, Belorussia, and Central Asia. The same is true of rest homes. The ministries of health of the union republics and the republic committees of trade unions must rectify the situation.

In concluding her report, the Minister of Health USSR assured her listeners that all remarks dealing with the long-range planned project will be carefully examined by the ministries of health of the union republics and necessary action will be taken.

Ya. M. Kasymov, chairman of the Turkmen SSR Committee of the Medical Workers' Trade Union, said that particular attention must be given to eradication of diseases of the eyes, helminthiasis, and brucellosis in the next few years. A foundation has been laid for eradication of these diseases. What is needed is a combined effort of both the health agencies and the agricultural establishments. Greater assistance from the Ministry of Health USSR is also needed.

A congratulatory telegram from the Presidium of the Central Committee of the Medical Workers' Trade Union of the Polish People's Republic was read at this session.

Ye. R. Yushchenko, chairman of the Kiev Oblast Committee of the Medical Workers' Trade Union, at the 30 May evening session, said that rural hospitals are short of professional medical personnel. This, she said, has created a situation whereby many beds in rural hospitals remain unoccupied because patients have to be sent to hospitals in cities and to oblast hospitals where trained personnel are available.

Prof. G. A. Miterev, chairman of the Executive Committee of the Union of Red Cross and Red Crescent Societies USSR, spoke next. Members of the Red Cross and Red Crescent Societies can be found everywhere. They can be found in industrial establishments, construction projects, state farms, collective farms, and transportation. There are more than 500,000 medical deputies of the Red Cross and Red Crescent Societies who are helping to carry on a campaign of health education. All segments of the medical service must cooperate with the Red Cross and Red Crescent Societies in their effort to spread medical information among the Soviet population, the professor said.

The deputy chairman of the All-Union Council of Trade Unions, L. N. Solov'yev, said that everyone must help to make outpatient clinics a strongly entrenched institution. The Ministry of Health USSR and the ministries of health of the union republics must strive to establish in all city outpatient clinics a procedure whereby people can be treated on their days off or during the evening hours. He said that he was in favor of placing the existing network of pharmacies under the jurisdiction of health departments.

A resolution was adopted by the delegates at the concluding session. The resolution stated that the 3 million members of the Medical Workers' Trade Union approve the decision of the World Peace Council to call a world peace congress to be held in Stockholm to discuss disarmament and peaceful coexistence. The resolution stated the following:

"A large number of people belonging to various national groups and different political opinions and religious convictions favor suspension of nuclear tests.

"The Soviet medical workers endorse the decision of the Soviet government in its unilateral decision to suspend nuclear tests. They hope that medical workers of the West will urge their governments also to suspend such tests.

"The Fifth Congress of the Medical Workers' Trade Union of the USSR is appealing to all medical workers on all five continents of the world to support this noble decision.

"Humane principles can flourish in times of peace only. Medical workers the world over are members of the most humane profession in the world. They cannot stand indifferently on the sidelines and see the future of humanity endangered."

The delegates to the congress elected a 62-member central committee and 21 candidates to membership in the central committee, as well as a 7-member revisory committee. Twenty-four delegates were chosen to the 12th Congress of Trade Unions.

The First Plenum of the Central Committee of the Medical Workers' Trade Union, which chose an 11-member presidium of the Central Committee of the union, was held the same day. D. V. Pokrovskiy was chosen chairman of the Central Committee of the Medical Workers' Trade Union. K. P. Sakharova was elected secretary.

Radiology

55. Changes in Respiratory Properties of the Blood During Acute Radiation Sickness Evident During the Third Period of Disease

"Change in the Respiratory Properties of Blood During Acute Radiation Sickness," by V. V. Merenov, Tr. Vses. Konferentsii po Med. Radiol. Eksperim. Med. Radiol. (Works of the All-Union Conference on Medical Radiology. Experimental Medical Radiology); Moscow, Medgiz, 1957, 146-147 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 8, 25 Apr 58, Abstract No 10320)

"Tests conducted on eight dogs subjected to single general X-irradiation (600 r) indicated decreased efficiency of hemoglobin in transporting oxygen, disturbances of tissue respiration, and the presence of toxemia. However, during the first and second periods of the disease, no pronounced or acute disturbances were noted in the respiratory properties of the blood. Hypoxy of an anemic nature was noted during the third period of the disease (in the peripheral blood hemoglobin content decreased to 8.75%, and the number of erythrocytes and leukocytes was decreased). Due to improved dissociation of oxyhemoglobin, acceleration of respiration, and other compensatory mechanisms the organism did not suffer acute oxygen deficiency. Before the death of the animal, this compensation collapsed."

56. Tagged Iron and Sulfur Compounds Reveal Characteristic Changes in Erythropoiesis During Radiation Sickness

"Characteristics of Erythropoiesis in Radiation Sickness Judged by the Rate of Accumulation of Iron and Sulfur in the Composition of Erythrocyte Hemoglobin," by L. A. Klyucharev, Tr. Vses. Konferentsii po Med. Radiol. Eksperim. Med. Radiol. (Works of the All-Union Conference on Medical Radiology. Experimental Medical Radiology); Moscow, Medgiz, 1957, 127-129 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 8, 25 Apr 58, Abstract No 10322)

"To rabbits which were subjected to X-irradiation in doses of 400, 700, and 800 r, were administered intravenous solutions of the Fe^{59} salt of ascorbic acid, or subcutaneous solution of S^{35} tagged methionine. During the first day after irradiation, it was shown that due to the preservation of body weight of the animals, and due to insignificant changes in the red blood, the inclusion of Fe^{59} in the erythrocytes was decreased. However, the rate of S renewal in the erythrocytes during the first few days was half as great as in the controls. Sulfur metabolism in bone marrow was also decreased."

57. Changes in Blood Choline Content of Patients Suffering From Radiation Sickness Discussed

"Choline Content in the Blood of Patients With Radiation Sickness," by M. P. Yeleazarova and V. S. Stepanova, Tr. Vses. Konferentsii po Med. Radiol. Klinika i Terapiya Luchevoy Bolezni (Works of the All-Union Conference on Medical Radiology. Clinical Aspects and Therapy of Radiation Sickness); Moscow, Medgiz, 1957, 45-47 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 8, 25 Apr 58, Abstract No 10484)

A total of 50 people subjected to chronic effects of various types of ionizing radiations due to their work, and 20 people exposed as a result of radiation therapy of malignant neoplasms, were subjected to tests of blood choline content. Choline content during the first stage of radiation sickness decreased from the normal 3-3.8 mg % to 0.1-1.9 mg %. Choline content of blood was decreased in patients with malignant tumors (to 0.14-1.6 mg %). X-irradiation doses of 100 and 200 r caused a rise in blood choline content up to 0.24-3.2 mg % in these patients during the first days after irradiation. A further increase of the general dose of irradiation to 6,000-8,000 r showed a tendency toward returning the choline content to the original low figures."

58. Radiosensitivity Determined by Course of Acute Radiation Sickness in Corresponding Age Periods

"Concerning the Sensitivity of Newly Born Rats Towards Various Doses of Penetrating Radiation," by V. V. Kholin, Chair of Medical Radiology (head, Prof M. N. Pobedinskiy) of the Leningrad State Order of Lenin Institute for the Advanced Training of Physicians imeni S. M. Kirov; Moscow, Meditsinskaya Radiologiya, Vol 3, No 2, Mar/Apr 58, pp 49-53

The aim of this research was to study the characteristics of acute radiation sickness in newly born rats (823) and to compare them with the characteristics of acute radiation sickness in mature rats (248), following different doses of radiation (500, 1,000, and 2,000 r).

The author's conclusion is that in a comparative evaluation of radiosensitivity one should bear in mind not the difference of radiosensitivity, but the specific course of the acute radiation sickness in the corresponding age period.

59. General X-Irradiation Intensifies Gastric and Enteric Secretory Functions

"The Effect of General X-Irradiation on the Secretory Function of the Stomach and Intestines," by M. F. Nesterin, Radiobiological Laboratory (head, G. P. Yeremin) of the Institute of Nutrition of the Academy of Medical Sciences USSR; Moscow, Meditsinskaya Radiologiya, Vol 3, No 2, Mar/Apr 58, pp 61-66

Because one of the fundamental symptoms of the sickness caused by ionizing radiation is the disturbed function of the gastrointestinal tract, especially the secretory and enzymatic functions, the following research was conducted to study the effect of general irradiation by 200 r of X-rays on gastric and intestinal secretions of dogs. The following English abstract accompanies the article.

"...Following irradiation, the quantity of gastric juice was increased. This condition of hypersecretion lasted 12-14 days. On analysis of the secretory curve in dogs with Pavlov's pouch, a disturbed relationship of the phases of gastric secretion was noted (following irradiation, the relative amount of the juice secreted during the nervous phase was decreased while that secreted during the chemical phase increased). The periodic character of the secretion of the intestinal juice was not changed after irradiation, but the amount of intestinal juice secreted (Tiery's method) was increased in certain dogs. The value of enterokinase and alkaline phosphatase in one gm of "mucous lumps" was increased by 2 to 3 times. This change lasted for about 2 weeks. Excretion of enterokinase and phosphatase with feces was, likewise, increased during the first few days after irradiation."

60. Edema Following Local Effect of Large Doses of X-Rays Explained by Changes in Capillary Permeability, Disturbed Lymphatic Circulation, and Chemical and Other Factors

"Permeability Change After Local Effect of Large Doses of Ionizing Radiation," by V. M. Mastryukova; Moscow, Meditsinskaya Radiologiya, Vol 3, No 2, Mar/Apr 58, pp 66-71

The aim of this research was to study permeability changes in capillary walls following large doses (4,500 r) of X-rays and to attempt to explain the role of this phenomenon, i.e., permeability changes, in the pathogenesis of edema during radiation trauma. A total of 60 tests were conducted on 16 rabbits. The following English abstract accompanies the article.

CPYRGHT

"It was established that irradiation by X-rays in a dose of 4,500 r brings about considerable increase of permeability of the skin vessels on the third day after irradiation. On the 11th day after the action of ionizing radiation, this permeability is decreased in comparison with the normal. Edema of the tissues which occurs after local irradiation is due not only to disturbed permeability of capillaries, but also to disturbed lymphatic circulation, as well as to certain other factors."

61. Preliminary Intravenous Administration of Novocain Solution Decreases Deleterious Effects of X-Rays and Gamma Rays

"The Effect of Intravenous Administration of Novocain on the Course of Radiation Sickness Under Experimental Conditions," by S. P. Sizenko and V. V. Markevich, Laboratory of Experimental Cancer (director, S. P. Sizenko, Candidate of Medical Sciences), Kiev Scientific Research Roentgeno-Radiological and Oncological Institute; Moscow, Meditsinskaya Radiologiya, Vol 3, No 2, Mar/Apr 58, pp 72-77

The aim of this research was to study the development of radiation sickness against a background of novocain blockade, paying special attention to the effect of novocain on the central nervous system. A total of 50 experimental rabbits were subjected to gamma and X-ray irradiation. Detailed experimental data and the following English abstract accompany the article.

CPYRGHT

"Preliminary intravenous administration of the novocain solution in the dose of 0.08 to 0.1 cc per kilogram of body weight decreases the effect of X-ray and gamma-ray irradiation (LD_{-50}) on the organism of the animal. It is manifested by a less severe course of the radiation sickness, an increased number of surviving animals, a prolongation of life, and a less pronounced reduction in weight.

"Administration of the novocain solution following the irradiation has no therapeutic effect on the course of radiation sickness and in certain cases even aggravates it.

"Leukopenia is less marked in animals with preliminary novocain administration, as compared to control animals."

62. Beneficial Effects of Intravenous and Peroral Administration of Urotropin Solution in Treating Radiation Sickness Discussed

"Certain Data on the Use of Urotropin in Treating Radiation Sickness," by M. P. Domshlak and L. B. Koznova; Moscow, Meditsinskaya Radiologiya, Vol 3, No 2, Mar/Apr 58, pp 78-80

The purpose of this research was to use urotropin to eliminate decomposition products from an organism suffering from symptoms of radiation sickness caused by the therapeutic use of gamma and X-rays.

Observations were made on 27 patients who were subjected to radiation effects of 150 and 500 r with a total dose of up to 12,000 r. The authors make the following observations:

1. The use of intravenous injections of a 40% solution of urotropin in 5 ml doses and its peroral use in 0.5 g doses three to five times per day has favorable effects on radiation sickness which has been caused by complications resulting from the use of radiation for therapeutic purposes.

2. Urotropin arrests nausea and vomiting in 15-30 minutes following its intravenous injection, and it is effective within 24 hours after its peroral use. This favorable effect lasts for one to 8 days.

3. The favorable effect of urotropin was independent of the time of its use (considered from the moment of onset of pronounced radiation symptoms). The duration of the improved condition of the patient was independent of the dose of urotropin used.

4. Urotropin exerted no noticeable favorable effect on the peripheral blood picture.

5. Urotropin may find a place in the complex therapy of radiation sickness.

63. Chronic Effects of Ionizing Radiation From Small Doses of X-Rays on Bone Marrow and Peripheral Blood of Dogs Studied

"Blood Changes in Chronic Radiation Sickness," (Experimental data), by M. S. Lapteva-Popova; Moscow, Meditsinskaya Radiologiya, Vol 3, No 2, Mar/Apr 58, pp 53-61

The aim of this research was to study the chronic effects of ionizing radiation caused by small doses of X-rays on the bone marrow and the peripheral blood. Tests were conducted on 17 dogs that were subjected to X-ray doses of 5 and 10 r over a period of several years. The following English abstract accompanies the article.

"...These investigations showed that the reaction of the organism is manifested by alternation of the periods of increased symptoms of chronic radiation sickness with the periods of stabilization of the temporary compensation of the process.

"Sequence of development of the above periods, the time of survival of the animals, and other specific features in the development of this disease varied depending on the daily doses of irradiation (5 or 10 r) and individual characteristics of the organism.

"The results of the chronic radiation sickness were aplastic or hyperchromic macrocytic anemias and leukoses.

"There were no diseases or significant changes in the blood picture in the control group of animals kept in the same conditions as the experimental animals."

64. Nitrogen Metabolism Studied in Acute Radiation Sickness in Dogs

"Nitrogen Metabolism in Experimental Acute Radiation Sickness in Dogs," by I. V. Fedorov, Tr. Vses. Konferentsii po Med. Radiol. Eksperim. Med. Radiol. (Works of the All-Union Conference on Medical Radiology. Experimental Medical Radiology); Moscow, Medgiz, 1957, pp 108-111 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 8, 25 Apr 58, Abstract No 10319)

"Research was conducted on the intensity of tissue decomposition in radiation sickness by studying certain phases of nitrogen metabolism in injured animals both under normal physiological conditions and under fasting conditions. At the beginning and during the latent periods of acute radiation sickness, in severe cases and in cases of medium severity, the intensity of tissue decomposition was not increased. Distinct disturbance of nitrogen and phosphorus balance was evident only in the extremely severe cases and at the agonal stage of the disease and, on the whole, were not connected with the direct effect of penetrating radiation but depended on a number of secondary factors."

65. X-Ray Irradiation Decreases Inclusion of P^{32} in Nucleic Acids of Certain Systems and Organs

"Change in Nucleic Acid Metabolism in Radiation Sickness," by Ye. A. Dikovenko, Tr. Vses. Konferentsii po Med. Radiol. Eksperim. Med. Radiol. (Works of the All-Union Conference on Medical Radiology. Experimental Medical Radiology); Moscow, Medgiz, 1957, pp 96-99 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 3, 10 Feb 58, Abstract No 3580)

"It was noted that rats subjected to general or partial X-ray irradiation exhibited a significant decrease in the inclusion of P^{32} in the nucleic acids of the spleen, bone marrow, lymph glands, the thymus, and the mucous membrane of the intestines."

66. Radioactive Phosphorus Used To Diagnose Breast Cancer

"The Use of Radioactive Phosphorus in the Diagnosis of Breast Cancer," by P. Ye. Dmitriyeva, Institute of Surgery imeni A. V. Vishnevskiy (director, Prof A. A. Vishnevskiy, Active Member of the Academy of Medical Sciences USSR), Academy of Medical Sciences USSR; Moscow, Eksperimental'naya Khirurgiya, Vol 6, Nov/Dec 57, pp 37-40

The use of radioactive phosphorus (P^{32}) for diagnosis of mammary carcinoma is described. Sixteen patients were studied. Thirteen had cancer and three had benign tumors.

Results point to some evidence that the inclusion of phosphorus in malignant tumor tissue depends on the intensity of the processes of renewal of the nucleic acids in the growing areas of the tumor.

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Surgery

67. Use of Amniotic Tissue in Treating Burn Injuries of Eyes Speeds Healing and Stimulates Regenerative Processes

"The Use of Amnion in Eye Burns," by T. G. Uglova, Candidate of Medical Sciences, and R. S. Goleminova, Senior Assistant, Chair of Eye Diseases V. M. I. (Higher Medical Institute) imeni Chervenkov, Sofia (Bulgaria); Odessa, Oftalmologicheskiy Zhurnal, No 8, 1957, pp 498-501

The authors briefly review the use of biogenic stimulants in tissue therapy. In this article the amnion was used on 20 patients in 23 cases of burns of second and third degree to the eyes. The amniotic tissue had been preserved under refrigeration or by other means which preserve its biogenic properties. In complicated cases, repeated implantations of amniotic tissue were used, and this exerted a favorable effect on the course of the healing process in eye injuries -- both new and long-standing ones.

The authors stress the fact that implantations of amniotic tissue under the conjuctiva and also amniotic tissue locally grafted onto necrotic sites in the conjuctiva act not only as a substitute for the defective tissue, but also exert a favorable effect as a biogenic stimulant. Healing in patients into whose eyes implantations of amnion were made (especially during the first 2 days after burn accidents) was faster than in treatment of eyes by the usual methods.

The authors make the following conclusions:

1. Preserved amnion may be used in severe cases of burns of eyes as a substitute tissue for the necrotic conjuctiva.

2. Preserved amnion implanted under the conjuctiva of burned eyes exerts a favorable effect on restoration processes in the conjuctiva and on the regenerative processes of the corneal epithelium.

3. Implantation of preserved amniotic tissue under the conjuctiva in prolonged herpetic keratitis usually produces sloughing and leads to the formation of a softer corneal opacity.

4. These observations are in full agreement with results reported by Academician V. P. Filatov.

68. All-Union Conference of Surgeons To Be Held in September at Kazan'

"All Union Conference of Surgeons," unsigned article;
 Moscow, Meditsinskiy Rabotnik, No 42, 27 May 58, p 4

"The All-Union Conference of Surgeons, Traumatologists, and Anesthesiologists will be held at Kazan' on 25-30 September 1958.

"The conference will consider the problems of "Prophylaxis of Traumatism," "Open Bone Fractures," "Problems of Anesthesiology," and "Tumors of the Large Intestines (excluding the rectum)."

"People wishing to speak on any of these topics are requested to apply to the president of the organization committee, Prof N. V. Sokolov, at the following address: Kazan', Roshcha Frunze, 5, Hospital Surgical Clinic of Kazan' State Medical Institute."

69. General Conference of the Academy of Medical Sciences USSR, Moscow, Discusses Traumatology

"The Problem of Trauma," (from material presented at the 11th session of the General Conference of the Academy of Medical Sciences USSR) by A. S. Vol'pe, Candidate of Medical Sciences, and V. M. Lotman; Frunze, Sovetskoye Zdravookhraneniye Kirgizii, No 6, Nov/Dec 57, pp 60-64

The 11th session of the General Conference of the Academy of Medical Sciences USSR was held at Moscow from the 15th to the 20th of April 1957, to discuss the problem of trauma. The main subdivisions were: Trauma of the Central Nervous System, Burn Trauma, and Radiation Trauma. The following are some of the reports presented.

Prof I. V. Davydovskiy, Active Member of the Academy of Medical Sciences USSR, talked on "Trauma as a Biological Problem." It was mentioned that radiation trauma presents the greatest danger because it injuries the tissues not so much anatomically as biologically depriving them of their capacity for regeneration.

Prof P. K. Anokhin, Active Member of the Academy of Medical Sciences USSR, talked on the topic "On the Characteristics of Pain Reactions in Trauma." He explained the initial and delayed disorganizing effects of trauma of the spinal cord and of the hypothalamus and the harmful shifts that result, the physiological mechanism of pain reaction, and the genesis of shock conditions.

Prof I. R. Petrov, Corresponding Member of the Academy of Medical Sciences, USSR, talked on "The Pathogenesis, Experimental Prophylaxis, and Therapy of Various Types of Shock," and pointed out the role of hypothermia in treatment and prophylaxis of the harmful effects of oxygen deficiency. It was mentioned that in experimental research on cats and dogs, the use of artifical hypothermia prevents ill effects due to the cessation of the general circulation for 17 to 40 minutes. Deep artificial hypothermia is ineffective in burn shock. Effective therapy in experimental shock was obtained by the use of dibasol with glucose, the transfusion of blood substitutes, and the use of vitamins.

Prof A. A. Vishnevskiy, Corresponding Member of the Academy of Medical Sciences USSR, talked on "The Nervous System in the Pathogenesis and Therapy of Burn Disease" and stressed the importance of the nervous system in the development of the reactions of an organism to burn trauma.

Prof I. N. Priorov, Corresponding Member of the Academy of Medical Sciences USSR, dwelt on "Burns and Their Therapy." He pointed to the complex pathogenesis of burn disease in its various phases. He stressed general measures to be taken (for example bringing the victim out of shock) and the treatment of the injured focus.

Prof N. S. Molchanov, Corresponding Member of the Academy of Medical Sciences USSR, talked on "Changes in Internal Organs During Burns." Two types of electric burns were observed, i.e., one due to contact of the surface of the skin with electric wires and the second due to short circuiting and its consequence in producing tissue injury.

Prof N. A. Fedorov reported on "Immunohemotherapy of Burn Disease." He mentioned that his experimental work indicates the presence of autoantigens in the burn victim and that the use of isoimmune serum is very effective therapy. Clinical data from a number of therapeutic institutions indicate that immunotherapy is a highly effective method for preventing autointoxication in severe burn disease.

M. M. Kapichnikov, Candidate of Medical Sciences, and P. M. Chepov, Candidate of Medical Sciences, reported on "Immunobiological Bases of Tissue Incompatibility in Homoplastic Grafts."

Prof A. V. Lebedinskiy, Corresponding Member of the Academy of Medical Sciences USSR, talked on "Radiation Trauma Due to the Effect of Various Types of Ionizing Radiation." Basic differences in trauma due to radiation were enumerated as disturbances of the immunological reactivity of an organism and changes in permeability of vascular walls, as well as inhibited processes of regeneration which prolong the course of radiation trauma.

Prof P. D. Gorizontov, Corresponding Member of the Academy of Medical Sciences USSR, reported on "Pathophysiological Characteristics of Certain Forms of Experimental Radiation Trauma." Prof N. A. Krayevskiy, Corresponding Member of the Academy of Medical Sciences USSR, presented a similar paper, "Data on the Pathological Anatomy of Radiation Trauma." Radiation burns and the type of reaction in response to general irradiation of an organism were discussed.

Prof N. A. Kurshakov, Corresponding Member of the Academy of Medical Sciences USSR, reported on "The Prophylaxis, Clinical Management, and Therapy of Radiation Sickness in Man." The different phases (stimulation of the nervous system, inhibition, etc.) are outlined.

Prof P. S. Kupalov, Active Member of the Academy of Medical Sciences USSR, reported on the topic of the "The Influence of Penetrating Radiation on the Activity of the Central Nervous System." By experiments using local radium irradiation on the spinal cord, the direct effect of penetrating radiation on the activity of the central nervous system was proven.

Prof A. N. Filatov, Corresponding Member of the Academy of Medical Sciences USSR, talked on "Hemotherapy in Trauma." His topic was subdivided into six parts, i.e., use of blood preparations for hemostasis, transfusion of blood and blood substitutes to prevent shock, use of blood preparations containing antibiotics and antiseptics, use of blood and proteins to prevent protein depletion and intoxication, use of blood stimulants to prevent anemia, and use of blood preparations to speed local healing of wounds.

Prof A. A. Bagdasarov, Corresponding Member of the Academy of Medical Sciences USSR, talked on "Blood Substitutes in the Course of Traumatic Shock, Burns, and Radiation Disease." Modern colloidal blood substitutes were described as preparations obtained from human blood, especially processed heterogenic proteins and synthetic preparations.

M. D. Kovrigina, the Minister of Health USSR, participated in the discussions and talked on hygiene of industrial and agricultural labor, the significance of radiation trauma, the organization of therapeutic nutrition, etc.. She emphasized the fact that the medical science must be sensitive to the needs of the population it serves.

Veterinary Medicine

70. Inoculation Tests For Brucellosis in Cattle

"Protective Inoculation Experiments With Killed Brucella Abortus Vaccine in Cattle," by A. Geissler, State Testing Institute for Veterinary Medicine; Leipzig, Monatshefte fuer Veterinaermedizin, Vol 13, No 11, 1 Jun 58, pp 331-337

Inoculation experiments with killed Brucella abortus vaccine (chinosol vaccine) and live Brucella abortus vaccine (Buck-19 vaccine) were carried out on a total of 25 young cows.

Of the 13 animals inoculated with the killed vaccine, 7 proved to be protected against a very massive experimental infection. Six animals aborted, had a premature birth, or exhibited a Brucella infection of the uterus.

Two of the four animals inoculated with Buck-19 live vaccine were abortive. In both of the young cows, a persistent titer, produced by the inoculation, could be determined even before infection.

Of eight control animals, only one remained uninfected.

The results show that killed Brucella abortus vaccines can produce a prophylactic effect. For this reason, they should be tested further, and more intensively than heretofore, for applicability in stamping out Brucellosis. A necessary condition is the fact that the choice and care of the production strain, the preparation of the vaccine (especially the killing process), and the organization of the inoculation process, including the required hygienic conditions, be carried out with the same care and uniformity as are now exercised in the case of inoculations with live Buck-19 vaccine.

It is wrong to inoculate animals which are already infected, since they can no longer be protected by an active inoculation.

71. Diagnosis of Brucellosis in Cattle and Hogs

"On Methods and Diagnostic Reliability of Agglutination and Complement Fixation In the Cast of Brucellosis in Cattle and Hogs," by S. Hajdu, Zvolen Branch of the State Scientific Veterinary Institute, Bratislava; Leipzig, Archiv fuer Experimentelle Veterinaermedizin, Vol 11, No 6, Nov/Dec 57, pp 976-993

The deficiencies of the two main methods of serological testing for brucellosis, agglutination and complement fixation, are discussed.

In the case of both reactions, special attention is given to the appearance of a regional phenomenon which can lead to false interpretation of the results in the case of mass tests. On the basis of experimental findings, it is assumed that, in a majority of cases, the regional phenomenon is caused by incompleted antibodies, both in the case of agglutination and in complement fixation. The two forms of incomplete antibodies are not identical (not in an immunobiological sense); both are thermostable. Methods of eliminating the regional phenomenon are discussed.

Because of the frequent appearance of nonspecific agglutinins in the sera of domestic animals, a circumstance which greatly reduces the reliability of low agglutination titers, complement fixation, especially since it never produces nonspecific results, seems to be more reliable than the agglutination method. In complement fixation even low titers can be interpreted. Complement fixation is particularly advantageous when used in herds which have been infected for a rather long time.

The introduction of complement fixation in the routine diagnosis of brucellosis in swine is recommended.

A necessary condition for obtaining correct results in the case of complement fixation is carrying out the reaction in dilute solutions, just as is done in the case of agglutination tests, a procedure which, however, for technical reasons, is hard to apply in the case of mass tests.

A feasible combination of agglutination, complement fixation, and the Coombs' test for mass serological tests for brucellosis is described.

72. Dry Foot-and-Mouth Disease Antigen

"Dry Antigens of Foot-and-Mouth Disease for Complement Fixation," by E. Kunter, Friedrich Loeffler Institute, Riems; Leipzig, Archiv fuer Experimentelle Veterinaermedizin, Vol 11, No 6, Nov/Dec 57, pp 930-934

A description is given of the preparation of dry substances from the aphthae scabs of cattle (tongues) to types O_2, A_5 and C foot-and-mouth-disease virus, with a phosphate buffer solution and twice distilled water used as extraction solvents.

The dry antigen, the weight of which amounts to 1.26-10.6 percent of the initial weight, depending on the method of preparation, has a 40- to 80-fold complement-fixation-antigen titer in relation to dry antigen.

The type-specificity of the dry antigen is not impaired in any way by the drying process.

Very slight losses of complement-fixation antigen were observed only in the case of dry antigen which had been rinsed with chloroform and that which had been obtained from extracts of twice-distilled water.

Extracts inactivated by means of heat produced a noninfectious dry antigen which can be stored at room temperature without difficulty.

The stability of dry antigen produced from buffer-solution extracts is retained for at least 6 months under refrigeration and for at least 3 months at room temperature. For the dry antigen obtained from twice-distilled water extracts, the stability under refrigeration and at room temperature is retained for at least 2 months.

It is recommended that the dry antigen be used in the evaluation of hyperimmunization of guinea pigs, and for comparative tests over rather long periods of time.

73. Specificity of Organic Changes in Foot-and-Mouth Disease

"On the Occurrence of Organic Changes in Experimental Foot-and-Mouth Disease in the Guinea Pig and the Question of Their Specificity," by K. Potel, Friedrich Loeffler Institute, Island of Riems; Leipzig, Archiv fuer Experimentelle Veterinaermedizin, Vol 11, No 6, Nov/Dec 1957, pp 879-905

As far as the heart muscle is concerned, the virus exerts a direct effect in the development of the characteristic inflammatory-degenerative tissue processes. This is confirmed by the positive identification of virus, by the absence of bacterial pathogens, and by the frequent sympathetic affection of the myocardia.

The situation is quite different in the case of other organs. First of all, it must be determined that extremely rare tissue changes are to be encountered in several organs (spleen, kidneys, brain) and that these changes are not produced by the virus itself, but by bacteria. On the other hand, in control animals not infected by foot-and-mouth disease, which have been exposed to a bacterial infection, especially salmonellosis, exudative-proliferative and degenerative tissue processes can very often be detected in the above-mentioned organs, primarily in the brain.

On the basis of the author's experiments, it was decided that there was no justification for assigning a specificity to the tissue processes of the parenchymatose organs, which are more or less frequently observed, since these processes, although not always so pronounced, can also occur in the case of bacterial diseases.

74. Harmful Effects After Use of Crystal Violet Vaccine

"Bad Effects of Vaccination After Use of Crystal Violet Vaccine Against Hog Cholera," by H. Krueger; Leipzig, Monatshefte fuer Veterinaermedizin, Vol 13, No 12, 15 Jun 58, pp 356-358

With the introduction of the crystal violet vaccine in 1953, epidemic conditions [in East Germany] have improved greatly. Out of 166,018 pigs vaccinated in the Gera district (Bezirk) from 1 January 1953 to 31 August 1957, only 575 (0.34 percent) succumbed, which is proof that, under proper conditions, the crystal violet vaccine is generally well tolerated.

Fuchs (Archiv fuer Experimentelle Veterinaermedizin, No 9, 1955, 618) reports that he often (in 13.2 percent of the cases) observed chronic, catarrhal bronchopneumonia of the superior and median lobes during the dissection of swine for the purpose of obtaining virus. The use of the blood of swine with bronchopneumonia should be considered acceptable for the production of vaccine only when it can be assumed with certainty that the virus of enzootic pneumonia of young pigs is not -- even temporarily -- circulating in the blood and being reduced in infectiousness just as much as the virus of hog cholera itself. The test of the safety of the vaccine extends only to the determination of whether or not the virus of hog cholera, in attenuated but still infectious form, is being inoculated along with the crystal violet vaccine.

The inflammation of the tissue at the inoculation site is most likely due to the combined effect of glycerin and crystal violet. The dye, a hexamethyl-p-rosaniline hydrochloride, depending on the commercially used substances for its preparation, contains various amounts of impurities. Presumably, the toxicity of the commercial dye varies greatly, which means that not all crystal violet has to cause a harmful tissue inflammation. It would be well to study in detail the problem of the occurrence of bronchopneumonia after inoculation of crystal violet vaccine in connection with processes which occur in the reticulo-endothelial system. It is certain that the dye produces a certain disturbance in the organism which, possibly, is not without effect on the development of inflammatory changes in the lungs.

The use of the crystal violet vaccine cannot, at this time, be dispensed with in the GDR, even if the suspicion that it has a harmful effect on the respiratory organs is confirmed. It is better to wipe out hog cholera immediately and dispense with protective inoculations, as has been done, as far as we know, in the USSR.

75. Complement Fixation in the Case of Rabies

"The Diagnostic Significance of the Complement-Fixation Reaction in the Case of Rabies," by H. Bindrich and E. Kuwert, Friedrich Loeffler Institute, Riems; Leipzig, Archiv fuer Experimentelle Veterinaermedizin, Vol 11, No 6, Nov/Dec, 57, pp 1015-1034

The production of a specific, rabicidal hyperimmunoserum in the dog for the purpose of the complement-fixation reaction is described. The use of a virus washed with chloroform as an immunizing antigen for the serum donors prevents the nonspecific brain-antigen-antibody reactions described in the literature.

The complement-fixation reaction represents a strictly specific reaction for the diagnosis of rabies.

There is considerable agreement between the results of the virological and histopathological methods and those of the complement-fixation reaction.

In the case of the fixed virus, the titer of the complement-fixing antigen is higher than that of the street virus.

The uniformity of the antigen structure of various strains of the rabies virus is confirmed by means of the complement-fixation reaction.

It is recommended that the complement-fixation reaction be introduced into the diagnosis of rabies.

Miscellaneous

76. Prof T. Ye. Boldyrev, Soviet Epidemiologist

"Boldyrev, Tikhon Yefimovich," by V. Rozhdestvenskiy; Moscow, Bol'shaya Meditsinskaya Entsiklopediya, Vol 4, 1958, pp 44-45

"Tikhon Yefimovich Boldyrev (born in 1900), Corresponding Member of the Academy of Medical Sciences USSR, is an outstanding Soviet epidemiologist, disinfector, and organizer of Soviet public health.

"In 1919 Boldyrev was drafted into the Soviet Army where he served until 1953. In 1926 he graduated from the Leningrad Military Academy. He received his Doctor of Medical Sciences degree in 1939 and became chief of the Chair of Epidemiology, Kuybyshev Military Medical Academy. He has held the rank of professor since 1940.

"From 1942 to 1949 Boldyrev was head of the Chairs of Epidemiology of the Military Faculty, Central Institute for the Advanced Training of Physicians and the Third Moscow Medical Institute. With the beginning of World War II, he became head of the Antiepidemiological Administration, Main Administration for Military Sanitation of the Soviet Army, and organized the present system of epidemiological protection of troops, which provided satisfactory sanitary-epidemiological safeguards of the army during the war.

"From 1947 to 1954 Boldyrev was Deputy Minister of Health USSR and Chief State Sanitary Inspector of the USSR. During this period the Sanitary Inspectorate, under his leadership, supervised the improvement of sanitary conditions during the reconstruction of cities, industrial enterprises, and major reservoirs.

"During 1954-1956, Boldyrev was a senior adviser for the Ministry of Health of the People's Republic of China. In addition to performing organizational work, he produced three monographs on problems of public health which were published in Chinese in Peiping. For his productive work in China he was awarded the Sino-Soviet Friendship Medal and a Certificate of the Government of the People's Republic of China.

"In 1956 Boldyrev was head of the Chair of Epidemiology, Central Institute for the Advanced Training of Physicians and the Division of Epidemiology, Institute of Epidemiology and Microbiology imeni N. F. Gamaleya, Academy of Medical Sciences USSR.

"Boldyrev's sphere of interest is varied. He has published over 100 works on epidemiology, epidemiological protection of troops, disinfectants, and the organization of public health. His works also encompass military epidemiology under conditions of contemporary warfare, the means of establishing important prophylactic and antiepidemiological measures, and methods of disinfecting troops.

"From 1945 to 1953 Boldyrev was editor of the periodical Gigiyena i Sanitariya, editor of the section on 'Military Epidemiology' in the Entsiklopedicheskiy Slovar' Voyennoy Meditsiny and Entsiklopedicheskiy Slovar'-Spravochnik dlya Voyennykh Fel'dsherov, and headed the editorial bureau of the sections on 'Epidemiologiya i Gigiyena' in the text, Opyt Sovetskoy Meditsiny v Velikoy Otechestvennoy Voyne 1941-45.

"Boldyrev is currently the editor of the section, 'Epidemiologiya i Infektsionnye Bolezni' in the Bol'shaya Meditsinskaya Entsiklopediya. Since 1956 he has been Chairman of the Organizational Committee, All-Union Society of Epidemiologists, Microbiologists, and Infectionists."

77. Conference on Medical Training in the USSR

"All-Union Conference on Higher Medical Training," by I. B. Kardash' Minsk, Zdravookhraneniye Belorussii, No 4, Apr 58, pp 76-77

The All-Union Conference on Higher Medical Training was held at the conference hall of the Ministry of Health USSR from 30 January to 1 February 1958. The conference was attended by directors of all medical institutes of the USSR, their deputies, deans of all medical faculties of universities, and ministers of health of the USSR and union republics.

The principal address was given by M. D. Kovrigina, Minister of Health USSR. Kovrigina pointed out that at present, within the system of Soviet public health, there are 79 medical vuzes (higher educational institutions) and five medical faculties in universities. Over 153,000 students study in these institutions. During the past few years eight new medical institutes were organized and two medical faculties opened.

Kovrigina disclosed that the goal of Soviet public health is to have one physician for every 400 persons in the USSR. During 1957 346,000 physicians, excluding dentists practiced; this gives a ratio of one physician for less than 600 persons. In the Belorussian SSR, however, the ratio was one physician for 980 persons during 1957. The speaker also indicated the necessity of establishing a stomatology faculty in the Belorussian SSR.

Kovrigina also recommended that training be available for advanced specialization in principal medical institutes. Greater interest in inducing students to participate in advanced training was also discussed.

Atomic and Molecular Physics

78. Density Distribution in Proton Source Studied

"Radial Distribution of Charged Particles in a Magnetic Ion Source," by M. D. Gabovich and Yu. B. Yermolovich, Physics Institute of the Academy of Sciences of the Ukrainian SSR, Ukr. fiz. zh., 1957, 2, No 2 165-174 (from Referativnyy Zhurnal, Fizika, No 4, Apr 58, Abstract No 8751)

A study of the distribution of charged particles in a magnetic proton source is described. Ions are produced in the source through the ionization of gas by fast primary electrons. A magnetic field is applied along the direction of electron motion. It is assumed that the secondary electrons move in a radial direction and the secondary ions, in the direction of the magnetic field. It is also assumed that concepts of forced diffusion are applicable to the secondary electrons and ions. The expression obtained for the concentration of charged particles in a radial direction is checked experimentally.

Nuclear Physics

79. X-ray Quanta Emitted by a Nucleus

"Polarization and Angular Distribution of X-Ray Quanta Emitted After Electron Capture by a Nucleus or After a Conversion Transition", by A. Z. Dolginov, Leningrad Physicotechnical Institute, Academy of Sciences USSR; Moscow, Zhurnal Eksperimentalnoy i Teoreticheskoy Fiziki, Vol 34, No 4, Apr 58, pp 931-941

"The results obtained previously by the author (Nucl. Phys., 2, 723, 1956/57) are extended to the case of K- or L-capture of any degree of forbidden transition with account of nonconservation of parity. It is shown that observation of the correlation between the polarizations of x-ray quanta emitted by the atom after K- or L-capture and the direction of nuclear spins or the polarization of the subsequent nuclear radiation may yield important data on beta-interaction. The angular distribution of the x-ray quanta is anisotropic if the capture occurs from the L III shell. Some formulas are presented which permit determining spins and parities of nuclear levels by observing the polarization of x-ray quanta after conversion transitions."

80. Scattering of Particles

"Scattering of Particles With Arbitrary Spins", by L. D. Puzikov, Academy of Sciences USSR; Moscow, Zhurnal Eksperimentalnoy i Teoreticheskoy Fiziki, Vol 34, No 4, Apr 58, pp 947-952

"Geometrical consequences of scattering following from the fact that nuclear particles possess spins are analyzed. A scattering matrix for a particle with an arbitrary spin is constructed. Quantities which can be experimentally measured, such as cross section, polarization, correlation of polarizations etc. are expressed in terms of this matrix. It is examined to what extent the polarization experiment is sufficient and it is shown that to recontruct the scattering matrix it is necessary to measure the scattering cross section of a polarized beam on a polarized target or the polarization correlation after scattering. Finally the change in polarization of the incident particles occurring during scattering are sufficient if the spin of the beam is smaller than that of the target."

81. Time Reversal in Gamma Reactions

"Time Reversal and Polarization Phenomena in Reactions Involving Gamma-Quanta," by L. I. Lapidus, Joint Institute of Nuclear Research; Moscow, Zhurnal Eksperimentalnoy i Teoreticheskoy Fiziki, Vol 34, No 4, Apr 58, pp 922-930

Consequences of the invariance of gamma-reactions under time reversal are analyzed. Examples are given by discussing the Compton effect, photon production, and radiative capture of pions. The obtained results are also interesting from an experimental viewpoint in that the study of nucleon polarization in photon fission of a deuteron gives the same information as the radiative capture of a polarized nucleon; and the study of polarization of a gamma-quantum in the radiative capture of a neutron by a proton is equivalent to the study of a cross section for the photofission of a deuteron by polarized gamma-quanta.

82. Particle Distribution in Showers

"On the Spatial Distribution of Particles in Extensive Atmospheric Showers", by G. B. Khristiansen, Moscow State University; Moscow, Zhurnal Eksperimentalnoy i Teoreticheskoy Fiziki, Vol 34, No 4, Apr 58, pp 956-961

The spatial distribution of densities of electron beams, μ-mesons and other charged particles in atmospheric showers of cosmic rays in the lower atmospheric layers was recently extensively studied in USSR (Yu. N. Vavilov, S. N. Nikolskiy, Ye. I Tukish, DAN SSSR, 93, 233 (1953); A. T. Abrosimov, A. A. Bednyakov, V. I. Zatsepin et al. ZhETF 29, 693 (1955); Yu. A. Antonov, Yu. N. Vavilov, G. T. Zatsepin et al. ZhETF, 32, 227, (1957); L. Kh. Eydus, M. I. Adamovich, I. A. Ivanovskaya et al, ZhETF, 22, 440, (1952); A. T. Abrosimov, N. N. Goryunov, V. A. Dmitriev et al. ZhETF, (1958) in printing. An analysis is attempted to find the relative role of various factors affecting the spatial divergence of charged particles in extensive air showers. It is shown that the spatial distribution of electrons is completely determined by Coulomb scattering. The spatial distribution of μ-mesons is to a large degree determined by Coulomb scattering and by the deflection in the magnetic field of the Earth. The transverse momentum transferred to π- and K-mesons in an elementary nuclear cascade is respectively $\leq 1.5 \cdot 10^8$ ev/c and $\leq 5 \cdot 10^8$ ev/c.

83. New Betatron Design Suggested

"Relativistic Problem of Electron Motion in an Axially Symmetrical Magnetic Field. Moving along the Axis of Symmetry," by N. V. Konyukov and Ya. P. Terletskiy, Moscow State University, Tula Pedagogical Institute, Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 34, No 4, Apr 58, pp 1003-1005

After the publication of the known betatron design by R. Wideroe (Arch. Elektrotechn., 21, 387, 1928) only two versions of relativistic problems of electron motion in an alternating axially symmetrical magnetic field were analyzed: motion in a parallel uniform magnetic field in the direction of the axis of symmetry (Ya. P. Terletskiy, ZhETF, 11, 96, 1941) and motion in a barrel shaped magnetic field (D. W. Kerst and R. Serber, Phys. Rev. 60, 53, 1941; Ya. P. Terletskiy, J. of Phys. USSR, 9, 159, 1945). A new approach to the problem is presented by assuming the magnetic field decreasing in the direction of the axis of symmetry (bottle-shaped field) and moving along this axis with a variable or uniform velocity. This

design may be used for a new type of accelerators-the linear induction accelerator, or linear betatron. The here derived formulas for the linear betatron with a uniformly moving magnetic field are analoguous to those of the conventional betatron $E/E_0 \sim H/2H_0$. However, as distinguished from the betatron, a strong field H may concentrate in a small region, due to the relation $Hr^2 =$ constant.

84. New Betatron Design Suggested

"A Betatron With Sharply Focusing Sections" by G. I. Dimov and A. F. Bondarev, Tomsk Polytechnical Institute imeni Kirov; Tomsk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Fizika, No 2, 1958, pp 78-84

Improvement in focusing with a consequently higher efficiency of the accelerator is attempted in a new betatron design. The magnetic fields for bending and for focusing are separated. The focusing field consists of short lenses located in the straight sections of the betatron. (G. I. Dimov, A Betatron With Straight Sections, Izv. vuzov. Fizika, Vol 1, 62, 1957). The described betatron has four straight sections and four bending sections with eight sharply focusing sections. The attained sharp focusing of electrons increases the amount of accelerated electrons during one cycle of the betatron.

85. Injection Into a Betatron

"Accou... of Collective Interaction of Electrons in Cyclic Accelerators by L. M. Kovizhnykh and A. N. Lebedev, Physics Institute im Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 34, No 4, Apr 58, pp 984-992

The collective electron interaction in the computation of current at the instant of injection into a betatron is discussed. Much research in the USSR was devoted to the problem of betatron capture (V. N. Logunov, Ye. P. ...chinnikov and V. D. Rusanov, ZhTF, 27, 1135, 1957; Yu. S. Korobochko, ZhTF, 27, 745, 1603, 1957). The occurrence of capture in a constant field was experimentally confirmed, although it did not substantially alter the qualitative picture of capture as presented by Korobochko. It was concluded that the mechanism is of collective nature with a predominantly Coulomb interaction. The mathematical analysis of injection of nonrelativistic electrons into the betatron is approached statistically by using a kinetic equation with introduction of a self-consistent interaction.

86. Neutron Amount From U^{235} Fission Measured

"Determination of the Mean Number of Neutrons Emitted in U^{235} Fission by 14.8 Mev Neutrons," A. N. Protopopov and M. V. Blinov, Moscow, Atomnaya Energiya, Vol 4, No 4, Apr 58, pp 374-376

The detector used for carrying out these measurements was an ionization chamber with a U^{235} layer on the high voltage electrode (D. J. Hughes and J. A. Harvey, Neutron Cross Sections, N. Y. 1955; G. A. Dorofeyev, Yu. P. Dobrynin, Atomnaya Energiya II, 10 (1957)). Because of the low efficiency of this detector it was set closely to a chamber recording the fission fragments. Practically the two chambers formed one double chamber with two similar U^{235} layers on the high voltage electrode. Each chamber was a detector of primary fission and a detector of neutrons from fissions occurring in the other chamber. The ratio of the mean number of neutrons emitted in a single act of fission by 14.8 Mev neutrons to the mean number emitted in thermal neutron fission was determined as $\nu / \nu^T = 1.90 \pm 0.17$. Using a value $\nu^T = 2.47 \pm 0.03$, the value for ν is given as 4.7 ± 0.5.

87. Theoretical Investigations of Proton Structure

"On the Question of the Structure of the Proton," by B. B. Dotsenko, Institute of Physics, Academy of Sciences Ukrainian SSR; Moscow, Doklady Akademii Nauk SSSR, Vol 119, No 3, 21 Mar 58, pp 466-468

A theoretical investigation of proton structure is given. Because of the difficulties in approaching the problem strictly on the basis of field theory, certain phenomenological assumptions are made. The model taken is that of a kernel surrounded by a meson shell where this shell consists of a single meson. An expression for the interaction potential is obtained using Tamm's hypothesis of the dissociation of a meson in the field of the kernel into a nucleon-antinucleon pair. The steady-state solution for the kernel-meson system is obtained, following Tamm's hypothesis that the steady-state is disturbed through the annihilation of the central kernel upon the appearance of the antinucleon in pair formation.

These expressions are used to obtain the wave functions of a meson forming the cloud around the kernel. By putting $2j=1$ in the wave function a meson distribution is obtained which agrees with the experimental results of Chambers and Hofstadter (Phys Rev 103, No 5, 1454, 1956).

88. Further Measurement of Assymetry Coefficient in μ^+ - Meson Decay

"Angular Correlation in $\pi^+ \longrightarrow \mu^+ \longrightarrow e^+$ Decay, Observed in Nuclear Emulsions," by Kh. P. Babayan, N. A. Marutyan, K. A. Matevosyan, and N. M. G. Sarinyan, Physics Institute, Academy of Sciences Armenian SSR; Yerevan, Doklady Akademii Nauk Armyanskoy SSR, Vol 26, No 3, 1958, pp 145-148

The angular assymetry of positrons in $\pi^+ \rightarrow \mu^+ \rightarrow e^+$ decay was studied to increase the statistic on the assymetry coefficient in the formula for the angular distribution of electrons from the beta decay of polarized muons. Six hundred events were analyzed. A value α equals $-(0.300 = 0.095)$ was obtained, taking the depolarization effect into account. An average of this value with the α's from four other cosmic ray studies was computed as $\alpha = -(0.311 \pm 0.095)$. The authors note that certain chemical properties of the emulsion evidently cause additional depolarization effect.

89. Deuteron Scattering on Nuclei

"Double Elastic Deuteron Scattering on Nuclei," by O. D. Cheyshvili, Tbilissi University, Soobshch, AN GruzSSR, 1957, 19, No 1, 23-28 (from Referativnyy Zhurnal, Fizika, No 6, Jun 58, Abstract No 12729)

Computation of polarization is carried out by taking the nucleon-nucleus interaction, averaged over the deuteron wave function. A potential of interaction of a neutron and proton with the nucleus is chosen as well as the potential of Coulomb interaction of the proton with the nucleus. The computation is carried out in the Born approximation. For the computation of polarization and of the differential cross section the spin matrix of density is used. The final expression for the differential cross section of a double deuteron scattering on nuclei contains values characterizing the interaction of nucleons with the nucleus.

90. Inelastic Proton Scattering

"Angular Distribution of Protons from (n, d) Inelastic Scattering" by I. Sh. Vashakidze, Tbilissi University, Soobshch. AN GruzSSR, 1957, 18, No 6, pp 663-670 (from Referativnyy Zhurnal, Fizika, No 6, Jun 58, Abstract No 12703)

Two final states from the above reaction are distinguished: (1) the proton produced is fast, and (2) the proton produced is slow. It was found that the angular distribution of fast protons exhibits two maxima: at angles $\sim 0^{\circ}$ and 90°. The first maximum is affected by central force interaction, the second one by spin-orbit interaction. The angular distribution of slow neutrons also has two branches, an isotropic and an anisotropic. The first is due to central forces, the second to spin-orbitals. Experiments at a 14 Mev energy seem to agree with these results.

91. Equilibrium Spectrum of Photons Computed

"Equilibrium Spectrum Characterizing Particles at Energy Close to the Initial," by V. I. Lendyel and V. A. Shkoda-Ulyanov, Nauchn, zap. Uzhgorodsk. un-t, 1957, 18, 121-125 (from Referativnyy Zhurnal, Fizika, No 4, Apr 58, Abstract No 7734)

The equilibrium spectrum of photons is computed by using a method devised by S. Z. Belen'kiy and by applying a more exact expression for the probabilty of pair production. Numerical computations show that in the region of $E \approx E_0$ the supplementary term which appears in the expression describing the equilibrium spectrum acquires considerable importance.

92. Cross Sections for Protons and Pions in Graphite Measured

"Nuclear Interactions of π-mesons and Protons In Graphite," N. M. Kocharyan, G. S. Saakyan, M. T. Aleksanyan, Kh. B. Pachadzhyan, Institute of Physics, Academy of Sciences Armenian SSR; Izv AN ArmSSR. ser. fiz.-matem. n. 1957, 10, No 3, 81-88 (from Referativnyy Zhurnal, Fizika No 4, Apr 58, Abstract No 7751)

A magnetic mass spectrometer for cosmic rays was used to find, the inelastic interaction cross section of π-mesons and protons in graphite. In an interval of total energies of 0.36-66 Bev, the cross section was determined as 210 mb for pions; and for protons in an interval pulses of 2-16 Bev/sec, 202 mb.

93. Bubble Chambers of Soviet Construction

"Liquid Hydrogen Bubble Chamber" by V. Z. Kolganov, A. V. Lebedev, S. Ya. Nikitin and V. T. Smolyankin Moscow, Pribory i Tekhnika Eksperimenta No 1, Jan/Feb 58, pp 31-34

A bubble chamber with capacity for one liter of liquid hydrogen and 10 cm in diameter was constructed at the Moscow Cryogenic Laboratory. The same design will be applied to the construction of a larger chamber. A special method of reliable sealing of the glass windows to the chamber at low temperatures was devised. Pictures of tracks of particles obtained by introducing neutron beam from the synchrocyclotron of the Joint Institute for Nuclear Research are presented. They are used for investigating the generation of pions in n-p collisions.

The accomplishment of the construction met with many difficulties, successfully overcome by the constructors, A. N. Yershov and N. A. Zubkov, under the guidance of V. A. Beketov.

"The Large Freon Bubble Chamber" by G. A. Blinov, M. F. Lomanov, A. G. Meshkovskiy, Ya. Ya. Shalamov and V. A. Shebanov; Moscow, Pribory i Tekhnika Eksperimenta, No 1, Jan/Feb 58, pp 35-38

The efficiency of a chamber for observation of high energy particles increases with the size of the chamber. But the construction and operation of large chambers met with so many difficulties that no chambers larger than 5 liter capacity were built.

The chamber described here has a capacity of 17 liters, and operates at room temperature under 38 atm pressure. It is filled with a mixture of freon-12 and freon 13 of 1.2 density. The chamber was intended for operation with high energy accelerators and it was successfully tested by injecting a 680-Mev neutron or proton beam from the synchrocyclotron of the Joint Institute for Nuclear Research. The large volume of the chamber and the relatively long response period made this instrument usable for cosmic ray research.

"A System of Photography for Large Hydrogen Bubble Chambers," by A.V. Belonogov, A. G. Zeldovich, V. Z. Kolganov, L. G. Landsberg A. V. Lebedev, S. Ya. Nikitin, V. T. Smolyankin and A. P. Sokolov, Moscow, Pribory i Tekhnika Eksperimenta, No 1, Jan/Feb 58, pp 38-41

A method of illuminating and photographing tracks in bubble chambers from one side was devised and tested on the above described liquid hydrogen chamber. A gas bubble in liquid hydrogen has a sharp directional diagram of scattered light and makes photography at 90° to the incident light impossible. To overcome this difficulty the scattering diagram of light of a hydrogen bubble was computed. The back wall of the chamber is a spherical mirror with a light source in its optical center. The reflected light gathers again in the center without reaching the camera. Only the light which, after reflection, is scattered by the bubbles enters the camera and gives a picture of the tracks.

Crystallography

94. Neutron Diffraction of Single Crystals

"Study of Single Crystal Defective Structure With the Aid of the Neutron Diffraction Method," by B. G. Lyashchenko, D. F. Litvin, I. M. Puzey, Yu. G. Abov and V. S. Golovkin, Moscow, Kristallografiya, Vol 3, No 2, 58, pp 148-154

An intense source of neutrons generated bya nuclear reactor can be utilized to study the defects of single crystals of various substances. The defects of single crystals of nickel and iron alloys were studied by irradiating such crystals with a beam of neutrons generated from an experimental heavy-water reactor. A single-crystal neutron spectrometer, designed by the Academy of Sciences USSR, was used in this experiment.

The cross-section of the neutron beam irradiating the sample was greater than the surface of the sample, so that the diffraction pattern was reproduced by the whole volume of the sample and revealed the overall structure of the crystal.

All of the single crystals studied with the neutron diffraction method revealed some structural defects, even with the most carefully prepared samples.

Solid State Physics

95. Work Function at 110-Surface of Tungsten Measured

"Positive Surface Ionization of Sodium and Potassium and Work Function of Electrons at Face (110) of Tungsten Single Crystal," by G. N. Shuppe, Ye. P. Sytaya and R. M. Kadyrov, Tr. Sredneaz. un-ta, 1957, No 91, 5-15 (from Referativnyy Zhurnal, Fizika, No 4, Apr 58, Abstract No 8653)

Contradictory published data concerning the work function of face (110) of tungsten is ascribed to interference by other faces with lower work function. The authors consider that correct results may be obtained only by simultaneous use of two methods: the method of thermoelectron emission, by which sections with a minimum of work function may be investigated and the method of surface ionization which yields the value for φ_{max}. The average work function of the face (110) was determined on the basis of electron current as 4.8 ev; and on the basis of ionic current, as 5.14 ev. The latter value represents the lower limit for $\varphi_{(110)}$. Impurities of other faces in the direction (110) constituted 50% or more, thus explaining the low value of φ obtained by the electron—current method.

Electricity

96. Investigation of Dark Current

"Problems of Temperature Dependence of Dark Currents Observed in Preilluminated Dielectric Single Crystals," by G. V. Aslanidi and R. V. Tsitayshvili, Georgian Polytechnical Institute, Tbilissi, Tr. Gruz. politekhn. in-ta. 1957, No 4 (52) pp 199-206 (from Referativnyy Zhurnal. Fizika, No 6, June 58, Abstract No 13425)

The energy diagram of a dielectric crystal is analyzed, taking into account that to the centers releasing electrons of the dark current and due to preillumination of the crystal, these correspond to energy levels located in the forbidden zone near the lower boundary of the conductivity zone. Kinetic equations are derived for the variation of the number of electrons n per unit of time in the conducting zone and at the levels corresponding to the centers responsible for the existence of the dark current. It is shown that the dependence of n on temperature for small values of the time after darkening of the crystal begins is determined by the product of two functions, one of which is an increasing and the other a decreasing function of temperature.

Ultrasonics

97. Photodiffusion Method for Visualization of Ultrasonic Fields Discussed

"Study of Photodiffusion Method of Ultrasonic Field Visualization," by M. Ye. Arkhangelskiy and V. Ya Afanasyev, Acoustics Institute of the Academy of Sciences of USSR; Moscow, Akusticheskiy Zhurnal, Vol 3, No 3, Jul-Sep 57, pp 214-219

The accelerating action of ultrasound on the process of developing of an illuminated photolayer of ordinary photographic paper at a normal incidence of the ultrasonic wave is investigated. The dependence of relative blackening on the time of ultrasonic exposure and the intensity of the ultrasound is determined. The optimal conditions for visualization of the cross section of the ultrasonic beam and the sensitivity of the method at a frequency of 2 Mc are given. The convenient construction of the radiometer used for intensity measuring is described.

98. Method of Converting Ultrasonic Patterns Into Visible Patterns Given

"On the Conversion of Ultrasonic Patterns Into a Visible Picture", V. G. Prokhorov, Moscow, Akusticheskiy Zhurnal, Vol 3, No 3, Jul-Sep 58, pp 254-261

The conversion mechanism of an ultrasonic pattern into visible range by means of an electron acoustic tube is described. The operation of a piezoquartz plate in the operating reception range of the pattern is studied and the threshold of the tube's response is determined. Some practical applications in the frequency range of 4 to 10 Mc are presented.

99. Catenoidal Ultrasonic Concentrator Found to Give Best Amplification

"Calculation of Ultrasonic Concentrators", L. G. Merkulov, Leningrad Electromechanical Institute imeni Ulyanov, Moscow, Akusticheskiy Zhurnal, Vol 3, No 3, Jul-Sep 57, pp 230-238

Ultrasonic concentrators, i.e., velocity transformers, in the shape of conic, exponential and catenoidal horns are investigated. Equations for computing the resonance dimensions of concentrators and the amplification factors of the oscillating velocity are derived. The catenoidal concentrator was found to be the most advantageous for obtaining high amplification. Computation for correcting errors of lateral deformations is carried out. Experimental results are given.

Mechanics

100. Development and Application of Lyapunov Methods Described

Metody A. M. Lyapunova i ikh Primeneniya (Methods of A. M. Lyapunov and Their Application), by V. I. Zubov, Leningrad State University; Leningrad, Izdatel'stvo Leningradskogo Universiteta, 1957, 242 pp

The following is the introduction by Academician V. I. Smirnov to the monograph on Lyapunov [Liapounoff] methods for solving problems in nonlinear mechanics, "particularly for solving problems concerning automatic control." Considerable attention has been devoted in recent Soviet literature of the problem of finding the "Lyapunov function" for various types of differential equations.

"V. I. Zubov's monograph is a direct extension of A. M. Lyapunov's famous work "General Problem of the Stability of Motion." We shall recall briefly the basic results of this work. A. M. Lyapunov reduces the problem of stability to an investigation of the null solution $x_1 = x_2 = \ldots = x_n = 0$ of a system of ordinary differential equations

$$\frac{dx_s}{dt} = f_s \quad (x_1, \ldots, x_n, t), \quad (s = 1, \ldots, n) \quad (1)$$

where the right side is a power series in $x_1, \ldots, x_n$ without a free term.

The series converge in the neighborhood $x_1 = x_2 = \ldots x_n = 0$.

"If the right sides, i.e., if the coefficients of these series do not contain t, A. M. Lyapunov speaks of steady state motion (an autonomous system). In investigating the stability of the null solution of (1) he developed and applied two methods; expansion of the solutions of system (1) into a series of a special type and the use of functions V ($x_1, \ldots, x_n, t$), which together with their derivatives with respect to t, as computed from (1)

$$W(x_1, \ldots, x_n, t) = \frac{dV}{dt} = \frac{\partial V}{\partial t} + \sum_{s=1}^{n} \frac{\partial V}{\partial x_s} f_s$$

exhibit certain properties as functions of ($x_1, \ldots, x_n, t$). If these functions are constructed they yield sufficiency conditions for stability or instability. In constructing functions of this type A. M. Lyapunov used a theorem which he had proved earlier concerning the solution of systems of partial differential equations which do not satisfy the conditions of the well-known theorem of S. V. Kovalevskaya. We shall call the functions V mentioned above 'Lyapunov functions' and we shall refer to the theorem mentioned as the 'auxiliary theorem.'

"In his work, A. M. Lyapunov established conditions under which individual linear terms of equation (1) resolve the problem of stability, and he considered a number of important particular cases where this problem can be resolved only by considering terms of higher order, the so-called "doubtful cases." A procedure for constructing periodic solutions is given in one of the doubtful cases of an autonomous system (1). In further investigations he departed from the systems of differential equations and he considered the points P of an n-dimensional space which move according to fixed laws upon a change in t. These are so-called dynamical systems. Such systems are considered further, not in an n-dimensional Euclidean space ($x_1, \ldots, x_n$), but in a certain metric space.

"Dynamical systems in a metric space are considered in the first chapter of this monograph and the question of stability (in various senses) of invariant sets, i.e., sets consisting of trajectories. The functions V are replaced by functionals in the application of the second Lyapunov method. The behavior of a trajectory in the neighborhood of invariant sets is investigated under the condition of stability and in certain cases, the entire region of asymptotic stability is characterized by means of a proper function. This chapter is of a purely theoretical character and does not cover the construction of these functions.

"In the second chapter, the results of the first chapter are applied to systems of differential equations of the form (1). Particular attention is given to the case when the right sides are homogeneous functions of $(x_1, \ldots, x_n)$. Necessary and sufficient conditions for asymptotic stability are given in this case.

"If the right sides of the equations (1) are analytic and the systems are autonomous, that doubtful case is considered when the characteristic equation of the first approximation has k null and k pairs of unique, purely imaginary roots, with simple elementary divisors wherein the remaining roots have a negative real part. The condition for the existence of k holomorphic solutions is given which leads to a sufficiency condition for the stability of the null solution. A sufficiency condition for asymptotic stability is also given. In the absence of null roots a family of boundary solutions is given which is analogous to the family of periodic solutions of A. M. Lyapunov, as mentioned above. The author also considers the case when the right sides of equation (1) contain t.

"The third chapter deals mainly with the generalization of A. M. Lyapunov's auxiliary theorem concerning systems of partial differential equations and the application of his first method. The result leads naturally to a generalization of the results of Briot and Bouquet (Ecole Polytech, Vol 21, 1856), and of Poincare (Ecole Polytech, Vol 45, 1878) concerning the construction of solutions of differential equations in the neighborhood of particular points. Autonomous systems (1) are considered whose right sides are holomorphic and do not contain linear terms. Integral curves are constructed on the basis of certain additional assumptions and these approach the origin of the coordinate system as t approaches plus infinity. If this origin gives the point of asymptotic stability all the integral curves may be obtained in this manner. In certain cases necessary and sufficient conditions are given for asymptotic stability.

"In the fourth chapter the notion of a dynamic system in metric space is generalized to obtain a procedure which would be applicable in investigations of stability in one sense or another for problems involving partial differential equations. As in the first chapter an analogue is constructed for the second Lyapunov method. In addition, estimates of the distance of the moving point from the invariant set are given. This yields new results when applied to systems of ordinary equations.

"The results of the previous chapter are applied in the fifth chapter to partial differential equations.

"In the foreword to his paper, 'General Problem of the Stability of Motion,' A. M. Lyapunov wrote, 'In this essay I had only the intention of describing what I had already done towards solving the problem as presented to me and hope that it might, perhaps, serve as a point of departure for further research of the same type!'

"This hope has been amply fulfilled: hundreds of papers have appeared in print which are directly related to the research of A. M. Lyapunov. The present monograph of B. I. Zubov has considerably expanded and generalized this work."

The following summary of the contents of the monograph is given by the author, V. I. Zubov.

"The purpose of this book is to acquaint the reader with new results in the theory of the stability of motion and also to sum up the investigations of the author in this area of mathematics. It is well known that the problems of stability reduce not only to a study of systems of differential equations but also of partial differential equations. In the present work therefore this is taken into account.

"The following is a brief summary of the contents of the present monograph.

"In sections one to five of Chapter 1, basic information concerning the notion of a metric space is given and the terms used in the work are defined. Sections six and seven contain examples of dynamical systems in various spaces. Section eight contains a definition of a notion of a dynamical system in a metric space and the basic theorems of the book of Nemytskiy and Stepanov, (Kachestvennaya Teoriya Differentsial'nykh Uravneniy (Qualitative Theory of Differential Equations) 2d edition, GITTL, Moscow-Leningrad, 1949) are given. Sections nine and ten give the basic definitions concerning the notion of Lyapunov stability of invariant sets of a dynamical system and the properties of certain stable invariant sets are investigated. In Section 11, a method for the quantitative construction of the neighborhood of a stable (asymptotically stable) invariant set is given. In particular, it is established that

for the Lyapunov stability of an invariant set M of a dynamical system f (p, t) it is necessary, (and, in the case of a sufficiently small compact neighborhood of the set M, sufficient,) that there be no motion of f (p, t), p a member of M, having σ^+ limit points in M. The results obtained here are new even for the theory of ordinary differential equations. Sections 12 and 13 give criteria for the stability and instability of Invariant sets with the aid of certain functionals. These functionals are analogous to Lyapunov functions, so the method developed here may therefore be considered a development of the second Lyapunov method. All results of these sections have a local character. We shall give one of these as an example. So that an invariant set M be uniformly asymptotically stable, it is necessary and sufficient that a functional V, possessing the following properties exist in a certain neighborhood S(M,r) of the set: the number $c_1 > 0$ may be indicated by $c_2 > 0$ such that $V(P) > c_2$ for $\rho(p,M) > c_1$; $\dot{V}(p) > 0$ for $\rho(p,M) \neq 0$; the function $V(f(p,t))$ is non-increasing for $f(p,t) \in S(M,r)$ and $V(f(p,t)) \to 0$ for $t \to +\infty$ uniformly relative to $p \in S(M,\delta_1)$ where δ_1 is some number such that $0 < \delta_1 < r$.

"In section 14 one of the central theorems of a nonlocal character is developed. It is shown that for an invariant open set A containing a sufficient neighborhood of the set M to be a region of asymptotic stability of a uniformly asymptotically stable and uniformly attracting set M, it is necessary and sufficient that there exist two functions V(p) and $\Phi(p)$ such that:

1. V(p) be assigned and continuous in A, and $\Phi(p)$ be assigned and continuous in R, $\Phi(p) = 0$, $p \in M$, whereupon $-1 < V(p) < 0$ for $p \in A$; $\Phi(p) > 0$ for $\rho(p,M) \neq 0$.

2. γ_1 and α_1 may be indicated by $\gamma_2 > 0$, such that $V(p) < -\gamma_1$, $\Phi(p) > \alpha_1$, for $\rho(p,M) > \gamma_2$.

3. V and $\Phi \to 0$ for $\rho(p,M) \to 0$.

4. $dV/dt = \Phi(1+V)$.

5. $V(p) \to -1$ for $\rho(p,q) \to 0$, $p \in A$, $q \in \overline{A} \setminus A$, and $q \notin M$

"Here, as above, p and q are elements of the space R and $\rho(p,M)$ is the metric distance of the point p to the set M. Section 15 gives a method for determining the distance from the motion to the invariant set sought. Sections 1-15 make up the contents of the first chapter, which consists of an investigation of invariant sets of dynamical systems.

"In Chapter 2, the ideas and methods of Chapter 1 are applied to the theory of ordinary differential equations. In Section one, the theorem of Section 14 of the previous chapter is developed for stationary systems of differential equations. It is shown that the Lyapunov function V may be chosen such that it is differentiable to the same order as the right sides of the system. In this chapter, a representation of this function is given using line integrals and the problem of the analytic structure of the right sides of the system is solved, where the region of asymptotic stability has been previously assigned. In Section 2, the case when the right sides are holomorphic is considered. In this case, the function V, the existence of which was established in Section 1 of this chapter, is represented in the form of a converging series. The function may be obtained over the whole region of asymptotic stability by the analytic continuation of these series. The method used to construct such series may be used to obtain the approximate solution of certain nonlocal problems and to construct boundary solutions in the form of series which converge either for $t > 0$ or for $t \in (-\infty, +\infty)$. These series are obtained from the fact that any boundary solution may be described by functions which are analytic with respect to t in any belt or semi-belt containing the real semi-axis. In Section three, a theory of equations with homogeneous right sides is developed. It is shown that in order for the null solution to be asymptotically stable, it is necessary and sufficient that there exist two homogeneous functions, a positive-definite function W of order m and a negative-definite function V of order $(m+1-\mu)$ such that $dV/dt = W$, where u is the index of homogeneity of the right sides of the system. If the right sides of the system are differentiable, these functions satisfy a system of partial differential equations whose solution may be found in closed form. This fact makes it possible to give a necessary and sufficient condition for asymptotic stability in the case when the right sides are forms of degree μ. In Sections four and five, a number of doubtful cases are considered, the case of k null roots and 2k purely imaginary roots. Several results are obtained concerning stability and the existence of integrals of the system and the family of boundary solutions. In Section six, the theory developed in Chapter 1 is applied to the theory of nonstationary systems of equations. Theorems which follow from the results of Section 14 are formulated and a method for investigating periodic solutions is proposed.

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"In Section one of Chapter 3, the problem is solved of representing the solutions of partial differential equations analytically, in the case when the conditions of Kovalevskiy's theorem are not fulfilled. The theorems obtained in this section are applied in the following section to systems of ordinary differential equations. This is an extension of the investigation of Briot and Bouquet, H. Poincare, Picard, Horn, and others, and makes it possible in Section 3 to develop a method for constructing the series describing the family of O-curves whose right sides do not contain terms which are linear with respect to the functions sought. This method of constructing such series affords another approach to solving the problem of stability in the case of the systems considered in sections three to five of Chapter 2. The method also makes it possible to formulate theorems resting on the properties of the solutions of certain systems of nonlinear algebraic equations. The third chapter thus represents an attempt to solve the problem of stability with the aid of the first Lyapunov method.

"In Chapter 4, metric spaces and families of transformations in them are again considered. The notion of a general system in metric space is introduced in Section one. A general system is a two-parameter family of operators from R to R. These operators have properties similar to those which occur in solutions of the Cauchy problem and the problem for partial differential equations. The notion of the stability of invariant sets of general systems is developed. In Section two, the second Lyapunov method is extended to the solution of problems concerning the stability of invariant sets of general systems. Necessity and sufficiency theorems are obtained. Basically, these theorems amount to a method for investigating two-parameter families of operators with the aid of one-parameter families of functionals. A general method is proposed for determining the distance from the motion to the invariant set. Section three gives several applications of the theory to the Cauchy problem for the solution of ordinary differential equations. The results thus obtained do not occur in any published literature.

"The fifth chapter contains several applications of the theory to the problem of the stability of the null solution of systems of partial differential equations in the case of the Cauchy problem or the mixed problem. General theorems are developed in Section 1. These embody a method for solving the problem of stability and have an oriented character. Concrete systems of partial differential equations are given in Sections two and three, and criteria for asymptotic stability are found. In Section three, the stability of the solution of the Cauchy problem for linear systems of equations is investigated with the aid of a one-parameter family of quadratic functionals assigned in $W_2^{(N)}$. The stability criteria are obtained according to the norm $W_2^{(N)}$. Several examples are given of the investigation of stability in the case of a mixed problem."

101. Effect of Pockets on Noise Level in Air Duct Studied

"On the Formation of Noise in an Airduct With Pockets," A. G. Munin and Ye. Ya. Yudin, Central Aerohydrodynamic Institute imeni N. Ye. Zhukovskiy, Moscow, Akusticheskiy Zhurnal, Vol 3, No 3, Jul-Sep 57, pp 291-292

Experimental research of sound forming in a duct with pockets in the wall was carried out to verify the sonic power of turbulent noise. The equipment was described by the author in ZhTF 14, 9, 561, (1944). The mean velocity of the flow was 10-35 m/sec. It was experimentally established that in presence of pockets the noise of the flow is proportional to the eighth power of the flow velocity. It is concluded that the law of the eighth power holds not only in the case of a free flow in an unbounded space, but also in a certain range of velocities in channel flow, provided the liquid surface of separation is sufficiently sharp.

VIII. MISCELLANEOUS

102. Soviet Technicians Visit Czechoslovakia

"Soviet Technicians in Prague," (unsigned article), Prague, Obrana Lidu, 30 May 58, p 1

On 29 May, a six-member delegation of Soviet technicians arrived in Prague. The group was led by Pavel Ivanovich Korobov, first deputy chairman, State Scientific-Technical Committee of the Council of Ministers USSR. The Soviet guests came to Czechoslovakia to attend the 13th session of the commission for scientific and technical cooperation between Czechoslovakia and the USSR.

103. Birthday of Czechoslovak Academician

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

On 29 June 1958, Eduard Cech, mathematician and academician, will be 65 years old. Cech is a professor of mathematics at Charles University (Karlova universita) in Prague and has twice been awarded a state prize.

104. Russian Scientist in Czechoslovakia

"Local and Foreign News," (unsigned article), Prague, Obrana Lidu, 15 Apr 58, p 2

On 14 April 1958, V. N. Stoletov, Deputy Minister of Higher Education of the USSR, and Academician N. A. Maysuryan, head of the Department of Plant Protection, Moscow Agricultural Academy imeni K. A. Timiryazev, arrived in Prague. They will take part in the discussions on "Michurin's Aerobiology," which will take place 15-17 April under the sponsorship of the Czechoslovak Academy of Agricultural Sciences (Ceskoslovenska akademie zemedelskych ved).

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