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CENTRAL INTELLIGENCE AGENCY

SCIENTIFIC

INFORMATION REPORT

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PLEASE NOTE

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

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I.   CHEMISTRY

Electrochemistry

1.   Functioning of the Gas Diffusion Electrode in Hydrogen-Oxygen Fuel Cells

"The Mechanism of the Work of a Diffusion Electrode in Hydrogen-
Oxygen Fuel Cells," by I. G. Gurevich, Power Institute, Academy
of Sciences Belorussian SSR; Minsk, Inzhenerno-Fizicheskiy Zhur-
nal, Vol 2, No 4, Apr 59, pp 78-86

Starting from considerations based on A. W. Lykov's theory of material
transfer in bodies with capillary pores, a mechanism is proposed for the
functioning of gas diffusion electrodes, on the basis of which electrodes
for gas fuel cells can be designed. After the assumption has been made
that the effective utilization of the inner surface of an electrode of
this type is determined by the kinetics of gas transfer, conditions are
defined which correspond to a maximum inner surface of an electrode with
a unit visible surface.

On the basis of the proposed mechanism, results obtained by F. T.
Bacon and E. Justi in regard to hydrogen-oxygen fuel cells are explained.

Fuels and Propellants

2.   The Explosive Conversion of Methane

"The Explosive Conversion of Methane; Part III -- Processes
Taking Place in an Internal Combustion Engine During the Explo-
sive Conversion of Methane," by Ya. S. Kazarnovskiy, N. I.
Kobozev, A. I. Stezhinskiy, and B. S. Torban, Trudy Gosudar-
stvenogo Nauchno-Issledovatel'skogo i Proyektnogo Instituta
Azotnoy Promyshlenosti, No 8, 57, pp 106-123 (from Referativnyy
Zhurnal -- Khimiya, No 4, 25 Feb 59, Abstract No 13238, by
A. Vavilova)

The possibility has been studied of the development of an equilibrium
state during the incomplete oxidation of CH_4 in intermittently (periodi-
cally) acting equipment. It was established that the final condition of
the system upon explosive conversion of rich gas in an internal combustion
engine corresponds to the equilibrium of the water gas reaction at 1,400°.
When an explosive conversion of coal gas is carried out in the same
engine, the final state corresponds to the equilibrium of the water gas
reaction at 1,550°. Equations are given for the power and material indices
of the explosive conversion of rich gas and coke gas in the range of α
values from 0.39 to 1.00.

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Part 2 of this investigation has been abstracted in <u>Referativnyy</u> <u>Zhurnal -- Khimiya</u>, 1958, Abstract No 75238

Industrial Chemistry

3. <u>Some Current Developments and Trends in the Production of Rare and Nonferrous Metals in Kazakhstan</u>

"The 21st Congress of the CPSU and the Tasks of Science in Kazakhstan," by K. I. Satpayev, President of the Academy of Sciences Kazakh SSR; Alma-Ata, <u>Vestnik Akademii Nauk Kazakhskoy SSR</u>, Vol 15, No 3 (168), Mar 59, pp 3-23

Notwithstanding the fact that complete geological surveys have not yet been carried out, it is known that Kazakhstan occupies one of the foremost places in the USSR and in the world as far as supplies of Chromium, vanadium, copper, lead, zinc, cadmium, silver, iron, tungsten, molybdenum, barite, phosphorites, and inorganic salts are concerned. Kazakhstan also occupies a foremost position with regard to supplies of manganese, nickel, coal, asbestos, germanium, rhenium, and a number of other rare and dispersed elements that are of importance in the new technology.

Among the more noteworthy investigations in the field of metallurgy carried out by power specialists and metallurgists of the Academy of Sciences Kazakh SSR is the fundamentally new cyclone method for the smelting of copper ores and copper concentrates. It was established that this process is very efficient in comparison with the ordinary process of smelting in reverberatory furnaces. The specific output of an [equivalent] volume of a cyclone chamber is almost 30 times greater than the output of the smelting space of a reverberatory furnace. When the heat of combustion of sulfides is used in cyclone smelting, the amount of fuel needed is lowered by 60-70%. The high content of sulfur trioxide in the combustion products, which amounts to 8-10%, makes it possible to establish concurrently a very efficient production of sulfuric acid. Introduction of the cyclone method at the Balkhash Copper Smelting Plant made it possible to increase the productive capacity of the plant by a factor of 1.5-1.6. In the near future, the cyclone method will be tried out in the smelting of ferrous metals and also in the production of phosphate fertilizers and cement.

After the cyclone method has been successfully introduced into ferrous metallurgy, it will be possible to accomplish metallurgical conversion in this branch of industry without the use of coke. As a result, an extensive economy amounting to billions of rubles will be achieved in the country.

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In connection with work related to the implementation of the current Seven-Year Plan, important tasks will devolve on the Institute of Metallurgy and Enrichment, Academy of Sciences Kazakh SSR. This institute will have to assist in every respect in the further development of nonferrous metallurgy in the Kazakh SSR and also aid in the development of new enterprises for the production of light and rare metals. Particular attention must be paid to the subsequent development of the many-sided utilization of ores of nonferrous, light, and rare metals. In this field processes being applied at present must be improved. Furthermore, new technological flow-sheets must be developed which will eliminate the losses of valuable metals in tailings and slags. One must achieve more complete extraction of dispersed elements from intermediate products. This refers to the extraction of indium, germanium, gallium, rhenium, cadmium, thallium, and other metals. One must also develop rapidly new flow sheets on the basis of which the conversion of ores of the Upper Kayrakty deposits and other major deposits of rare metals will become possible.

The technological processes for the enrichment of ores of the Dzhezkazgan, Tekeliysk, and other mines must be improved. Every effort must be made to expedite developmental work on the many-sided conversion by the cyclone method of copper ores and polymetal ores and also of intermediate products derived from different Kazakhstan deposits. The same applies to conversion in the suspended state, in electric furnaces, by the methods of acid and salt leaching, and by other methods. It is very important to establish the technical and economic advantages of using every method mentioned for the treatment of specific ores. Of primary importance are the development of efficient methods for the conversion of raw material containing aluminum oxide and investigations on refractories and silicate coatings required in the ferrous and nonferrous metallurgical production of Kazakhstan.

At the Chemical Institute, Academy of Sciences Kazakh SSR, research has been conducted for a long time on the electrolytic production of zinc. Although some results have been achieved in this field, the institute is not taking appropriate measures to complete this work and transfer the new process to industrial application. Application of the process in question will make it possible to greatly increase the production of zinc and also to mechanize and make completely automatic the production of the metal deposited electrolytically.

4. The Cyclone Method of Smelting

"Reports of Departments of the Academy of Sciences Kazakh SSR" (unsigned article); Alma-Ata, Vestnik Akademii Nauk Kazakhskoy SSR, Vol 15, No 3 (168), Mar 59, pp 78-81

During 1958 two institutes of the Academy of Sciences Kazakh SSR (the Power Institute and the Institute of Metallurgy and Enrichment) continued work on the theory of cyclone processes. Smelting of copper

concentrates was successfully carried out in the cyclone chamber of the Balkhash Copper Smelting Plant. Laboratory research has been completed on the cyclone smelting of the Tekeliysk intermediate product, Leningorsk slag, Ust'-Kamenogorsk zinc conglomerate (kek), and Achisaysk oxidized lead-zinc ore.

5. Method for the Recovery of Capron

"Recovery of Capron," by Engineers I. Bekin, S. Sinyev, and I. Tseytlin, Omsk Scientific Research Designing and Technological Institute of the Tire Industry; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Vol 4, No 30 (485), 11 Mar 59, p 4

At present, the quantity of capron cord waste amounts to 200-250 tons per year. The Omsk Scientific Research Designing and Technological Institute of the Tire Industry has developed a method for the production of capron powder from this waste. The essential steps of the method are as follows:

The capron cord is melted in a liquid medium which does not react with polyamide resins and has a boiling point of 240-300°. The voluminous capron mass which has precipitated is washed with warm water, degreased, and dried at a temperature of 125-140°. The residual moisture must not exceed 0.3-0.35%. Parts made of capron which has been recovered from cord waste are not inferior with regard to their physico-mechanical characteristics to parts manufactured from capron wastes of the textile industry.

6. Thermal Expansion of Polytetrafluorethylene

"Thermal Expansion of Ftoroplast IV Between Minus 190 and +325° C," by I. Ye. Leksina and S. I. Novikova; Leningrad, Fizika Tverdogo Tela, Vol I, No 3, Mar 59, pp 5-511

Measurements of the thermal expansion of Ftoroplast IV (polytetrafluorethylene) produced by the plastics industry were conducted as a part of a program for the investigation of technical materials.

7. Rotary Extractor of a New Design

"A Rotary Continuous Counter-Current Extractor," by Engineers I. I. Salamatov and G. M. Veksler; Moscow, Khimicheskoye Mash-inostroyeniye, No 1, Jan 59, pp 12-14

The design of a new rotary extractor developed at the Scientific Research Institute of Chemical Machine Building is described. This extractor is reported to be superior to that of the Podbielniak type,

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particularly as far as separation of the light from the heavy phase is
concerned. One of the differences between the Podbielniak extractor and
the new counter-current extractor is that the flow of liquids in the
latter is maintained without the use of pumps. The flow through the
rotor, the processes of extraction and separation, and discharge of the
separated phases from the rotor are brought about by centrifugal force.
Laboratory experiments with the new extractor were conducted on solutions
of nitric acid; tributyl phosphate was used as the extracting solvent and
also diisooctylpyrophosphate. The experiments described were carried out
at a velocity of rotation corresponding to 2.400 rpm. These experiments
showed that the rotary extractor, in which the time of contact between the
phases is short, can be used for efficient extraction (up to 6.5 theore-
tical plates) only when rapidly acting extracting agents are used. On
the basis of the tests conducted, the extractor is regarded as a reliable
automatic appliance which will be useful in the production of antibiotics,
rare elements, and other products which require a short time of extraction.

8. Treatment of Water by a Magnetic Method

    "Treatment of Water by a Magnetic Method," by S. Malykh, Alma-
    Ata; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Vol 4, No 15
    (470), 4 Feb 59, p 4

    Equipment for the treatment of hard water by a magnetic method has
been developed at the Alma-Ata Heavy Machine Building Plant. This equip-
ment was mounted inside the feed-water pipe of a boiler of the DKV-6.5-13
type producing 6.5 tons of steam per hour. It consists of several staggered
electromagnetic strips contained in a hermetically closed copper housing.
The windings of the magnet receive direct current from the electric net-
work after this current has been rectified.

    After operation of the boiler equipped with the new water treatment
device has been continued for a period of 3 months, no scale was detected
on the walls of the drums or the pipes. The collectors contained a layer
of soft precipitate which could be removed with facility.

    "An Installation for the Electromagnetic Treatment of Water,"
    by P. Galenko, Plant Director, and M. Vitnyy, Chief Engineer;
    Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Vol 4, No 40 (495),
    5 Apr 59, p 4

    The essential part of the installation is an electric magnet. The
core of this magnet is machined out of a single piece of steel. Six
coils connected in series are wound around the core by means of PEL-1
wire having a diameter of 0.37 mm. Each coil consists of 1,500 windings.
The winding is designed for a potential of 100 volts and a current strength
of 0.3 amperes. The core together with the coils is contained in a

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hermetically closed housing to one of the ends of which a tube is welded. Through this tube the terminals of the winding come out. The housing and tube are made of copper, but any nonmagnetic material would be suitable.

The device is mounted into the water supply pipeline in front of the feed-water reservoir. Power is supplied to the device from a 220-volt alternating current network. The current is passed through a transformer and selenium rectifiers. The maximum output of the device is 15 cubic meters of treated water per hour.

Laboratory testing of the process of treating water by exposure to a magnetic field was begun in 1957. An experimental unit of the type described was connected to a DKV-6.5-13 boiler. After a month's operation, no solid scale was found on the internal surfaces of the heated parts of the boiler.

To acquire certainty in regard to the efficiency of the new method, operations with the device were conducted for 3 months. There still was no hard scale on the walls of the drums or tubes of the boiler. The collectors contained a thin (up to 3 mm thick) layer of soft precipitate which could be removed easily. A commission consisting of representatives of the State Scientific-Technical Committee of the Kazakh SSR, the boiler inspection authority, and plant officials approved the new method of water purification, recommending its introduction.

Preliminary calculations show that the electromagnetic method of water treatment is very effective. Its application makes it possible to achieve an economy of 150,000-200,000 rubles per year at boiler installations of small capacity. Electromagnetic equipment of this type can be constructed at any enterprise without outside help. The cost of a unit does not exceed 3,000-3,500 rubles. No service personnel is required for operation of the equipment.

Isotopes

9. Enrichment of C^{13} and O^{18} by the Distillation of Carbon Monoxide

"Separation of Carbon and Oxygen Isotopes by the Distillation of Carbon Monoxide in a 12-Meter High Column," by M. D. Tikhomirov and N. N. Tunitskiy; Moscow, Zhurnal Prikladnoy Khimii, Vol 32, No 3, Mar 59, pp 531-536

The design and operation of a packed column for the distillation of carbon monoxide are described. By using this column, a coefficient of separation of C^{13} amounting to 67.8, and a coefficient of separation of O^{18} amounting to 23.6, were obtained.

The degrees of separation corresponding to these coefficients did not represent the maximum enrichment that can be obtained with this column. By operating the column no less than 82 grams of CO with a C^{13} content of 30-37% and an O^{18} content of 3.5-4.2% were obtained, as well as a considerable quantity of CO with a C^{13} content of 10-20%.

It is pointed out that, at present, a considerable demand exists for C^{13} to be used in investigations on the mechanism of the association of molecules, research on reaction mechanisms, investigation of optical spectra and of spectra in the radio frequency range, etc.

10. Separation of Isotopes by Diffusion in a Current of Vapor

"Separation of Heavy Isotopes of Carbon, Sulfur, Crypton, and Neon by Diffusion in a Current of Vapor," by I. G. Gverdtsiteli and V. K. Tskhakaya; Moscow, Atomnaya Energiya, Vol 6, No 3, Mar 59, pp 323-330

An investigation was conducted on the separation of isotopes by diffusion in a current of vapor passed through a cascade consisting of 80 glass separation pumps. The diaphragm was a steel cylinder 50 mm high with a diameter of 60 mm. The thickness of the diaphragm was 0.3 mm. The number of orifices, which had a diameter of 0.4 mm, was 500. The total length of the cascade was approximately 6 meters. Mercury was used as the working liquid. The degrees of separation obtained in the separation of isotopes in the systems

$$S^{34}O_2 - S^{32}O_2; \quad S^{36}O_2 - S^{32}O_2; \quad C^{13}H_4 - C^{12}H_4; \quad Kr^{86} - Kr^{84}; \text{ and}$$

$$Ne^{22} - Ne^{20}$$

are indicated.

Nuclear Fuels and Reactor Construction Materials

11. Uranium and Uranium Alloys

"Uranium and Its Alloys," by G. Ya. Sergeyev and V. V. Titova; Moscow, Atomnaya Energiya, Vol 6, No 3, Mar 59, pp 253-260

On the basis of reports given at the Second International Conference on Peaceful Uses of Nuclear Energy (Geneva, 1958) the results of investigations on the physico-mechanical properties of uranium and of its alloys are reviewed briefly. The effects of irradiation on uranium are discussed, specifically the phenomenon of gas swelling. Some examples of α-phase and γ-phase alloys of uranium are mentioned, including

alloys of the fissium type. The temperature limits within which solid fuels based on uranium can be used are given and commented upon. In conclusion, some information is given on the technique of metallographic investigation of irradiated and nonirradiated uranium.

12. Reactor Fuel Elements

"Fuel Elements of Nuclear Reactors," by A. G. Samoylov and V. S. Volkov; Moscow, Atomnaya Energiya, Vol 6, No 3, Mar 59, pp 261-276

On the basis of non-USSR reports presented at the Second International Conference on Peaceful Uses of Nuclear Energy (Geneva, 1958) the designs of fuel elements are discussed and the principal data concerning these elements are given for individual reactors. These data are arranged in the form of a table giving detailed information on 43 reactors. Problems in regard to the selection of the fuel and of reactor construction materials and also technological procedures for the production of fuel elements of different types are subjected to a critical review.

13. Purification of Inert Gases Used to Protect Sodium and Sodium Potassium Alloys From Oxidation

"An Installation for Removing Completely Traces of Oxygen and Water Vapor From Inert Gases," by N. S. Grachev and P. L. Kirillov; Moscow, Atomnaya Energiya, Vol 6, No 3, Mar 59, pp 327-329

An installation is described for the chemical purification of inert gases from traces of oxygen and water vapor when the inert gases are used to protect sodium and sodium-potassium alloys from oxidation.

Organic Chemistry

14. New Organophosphorus Research

"Acid Halide Esters of Phosphonocarboxylic Acids, II, C-Alkyl Acid Dichloride Esters of Phosphonocarboxylic Acids," by K. A. Petrov, F. L. Maklyayev and M. A. Korshunov; Moscow, Zhurnal Obshchey Khimii, No 2, Feb 59, pp 585-588

The action of an excess of phosphorus pentachloride on triethyl esters of phosphonoacetic and phosphonopropionic acids upon heating leads to the formation of C-ethyl acid dichloride esters of these acids.

C-ethyl acid dichloride esters of phosphonodichloroacetic acid, whose phosphorus-carbon bond can be cleaved by hydrogen fluoride or potassium bifluoride, can be synthesized by chlorinating a mixture of the phosphonoacetic ester and phosphorus trichloride.

The reactions are given as follows:

$$\underset{RO}{\overset{RO}{\diagdown}} \underset{O}{\overset{}{\underset{\diagup}{P}}} - (CH_2)_n - C \overset{O}{\underset{OR}{\diagup}} + 2PCL_5 \rightarrow \underset{Cl}{\overset{CL}{\diagdown}} \underset{O}{\overset{}{\underset{\diagup}{P}}} - (CH_2)_n - C \overset{O}{\underset{OR}{\diagup}} + 2POCL_3 + 2RCL$$

$$\underset{C_2H_5O}{\overset{C_2H_5O}{\diagdown}} \underset{O}{\overset{}{\underset{\diagup}{P}}} - CH_2 - C \overset{O}{\underset{OC_2H_5}{\diagup}} + 2\,PCl_3 + 4\,Cl_2 \rightarrow$$

$$\rightarrow \underset{Cl}{\overset{CL}{\diagdown}} \underset{O}{\overset{}{\underset{\diagup}{P}}} - CCl_2 - C \overset{O}{\underset{OC_2H_5}{\diagup}} + 2\,POCL_3 + 2C_2H_5CL + 2HCL$$

$$\underset{CL}{\overset{CL}{\diagdown}} \underset{O}{\overset{}{\underset{\diagup}{PCCl_2}}} - C \overset{O}{\underset{OC_2H_5}{\diagup}} + 2HF \xrightarrow{-2HCL} \left[\underset{F}{\overset{F}{\diagdown}} \underset{O}{\overset{}{\underset{\diagup}{P}}} - CCl_2 - C \overset{O}{\underset{OC_2H_5}{\diagup}} \right] \rightarrow$$

$$\xrightarrow{HF} CHCl_2 - C \overset{O}{\underset{OC_2H_5}{\diagup}} + POF_3$$

$$\xrightarrow{HCl} CHCl_2 - C \overset{O}{\underset{OC_2H_5}{\diagup}} + POClF_2$$
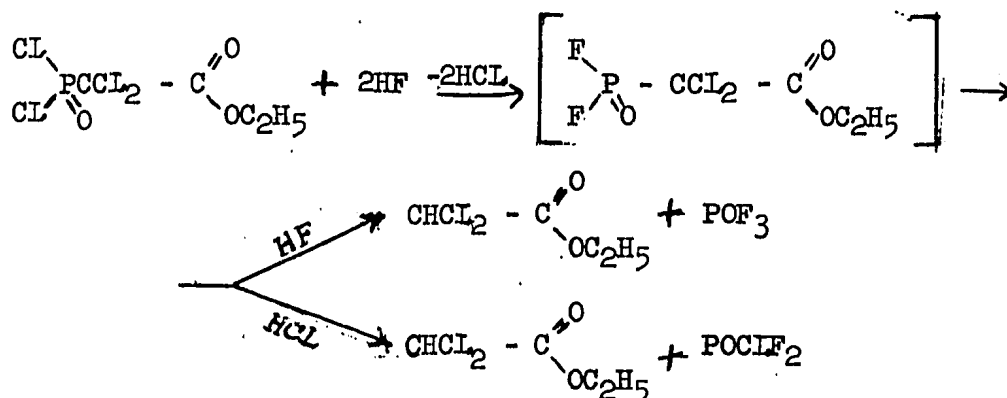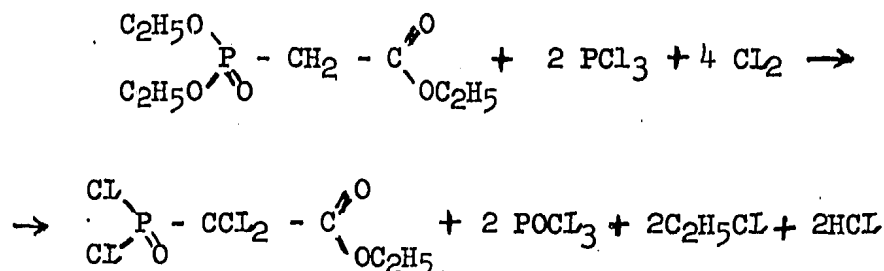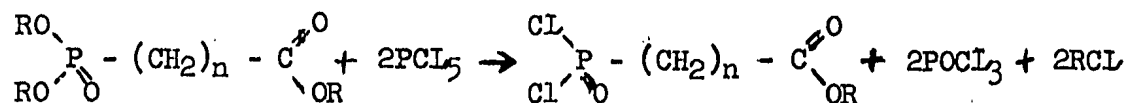
"The Synthesis of Acid Esters of Dialkylaminoalkylphosphonic Acids," by K. A. Petrov, F. L. Maklyayev and N. K. Bliznyuk; Moscow, Zhurnal Obshchey Khimii, No 2, Feb 59, pp 588-591

The acid chlorides and acids fluorides of certain dialkyl esters of dialkylaminomethylphosphonic acids were synthesized and their properties studied.

A method was developed for synthesizing monoalkyl esters of dialkylaminomethylphosphonic acid by the thermal decomposition of the corresponding acid chlorides.

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"The Synthesis of Aminodiphosphonates and Aminotriphosphonates,"
by K. A. Petrov, F. L. Maklyayev and N. K. Bliznyuk; Moscow,
Zhurnal Obshchey Khimii, No 2, Feb 59, p 591-594

Esters of aminodi- and tri-(methylphosphonic) acids, eight compounds
in all, were synthesized by reacting dialkylphosphites with formaldehyde
and primary amines or ammonia. Free acids were obtained by the hydrolysis
of the esters.

15. New Organophosphorus Antioxidation Additives for Mineral Oil

"The Effect of the Thio-compounds of Unsaturated Phosphinic Acids
On the Antioxidation Properties of Mineral Oil," by K. K. Papok,
K. N. Anisimov, B. S. Zuseva and N. Ye. Kolobova; Leningrad,
Zhurnal Prikladnoy Khimii, Vol 32, No 3, Mar 59, pp 656-659

The authors had earlier studied the effect of complete esters,
tetraalkyldiamides and dipiperidides of unsaturated phosphinic acids on
the antioxidation properties of MS-20 oil.

In the course of the work on the effect of the derivatives of unsat-
urated phosphinic acids, research was conducted on the effect of the
dithioethyl esters of unsaturated phosphinic and thiophosphinic acids,
as well as the esters of alkylthiovinylphosphinic acids on the antioxida-
tion properties of MS-20 oil.

Compounds of the following types were synthesized for the purpose of
the experiments:

$$ROCH = CHPO(SR)_2,$$
$$RCH = CHPO(SR)_2,$$
$$ROCH = CHPS(SR)_2,$$
$$RSCH = CHPO(OR)_2,$$
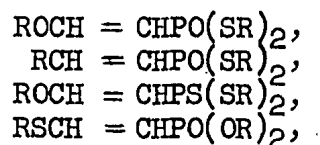
where R may be C_2H_5, C_4H_9, $CH_3-O-CH_2CH_2$, $C_2H_5-O-CH_2-CH_2$, $C_4H_9-O-CH_2-CH_2$,
C_6H_5, or C_6H_{13}.

The properties of each compound are presented in a table.

As a result of this work on the effect of thioesters of unsaturated
phosphinic and thiophosphinic acids as well as complete esters of alkyl-
thiovinylphosphinic acids on the antioxidation properties of mineral oil,
the authors found that the thioesters of beta-alkoxy-(phenoxy)vinylphos-
phinic acids appear to be effective antioxidants; of these, the dithio-
ethyl ester of beta-ethoxyethoxyvinylphosphinic acid is the best anti-
oxidant.

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The introduction of sulfur into esters of unsaturated phosphinic acids sharply increases the antioxidation properties of the compounds.

The esters of alkylthiovinylphosphinic acids do not bring about an increase in the thermo-oxidation stability nor decrease the formation of resin.

16. New Hypotensive Agents Being Investigated

"Piperidine Derivatives as Possible Hypotensive Agents," by Ye. S. Nikitskaya, B. S. Usovskyay and M. V. Rubtsov, All-Union Scientific Research Chemical-Pharmaceutical Institute imeni S. Ordzhonikidze; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 2, Feb 59, pp 472-6

The article describes the synthesis and characteristics of several N-substitute derivatives of 2,6-dimethyl piperidine and of the ethyl ester of 6-methylpipecolinic acid (12 compounds in all).

The purpose of this investigation was to study the pharmacological activity, namely ganglio-blocking activity, of these compounds. This activity had previously been noted in work on secondary and tertiary amines of the quinuclidine and piperidine series, as reported by the same scientists in an earlier publication Zhurnal Obshchey Khimii, Vol 26, p 130, 1956.

No physiological data are given in the present report.

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Physical Chemistry

17. The Work of A. A. Zhukhovitskiy in the Fields of Surface Phenomena, Chromathermography, Nuclear Chemistry, etc.

"A. A. Zhukhovitskiy (On the Occasion of his 50th Birthday),"
by K. A. Gol'bert and K. S. Ponomareva; Moscow, Zhurnal Fizich-
CPYRGHT eskoy Khimii, Vol 33, No 3, Mar 59, pp 738-739

"Prof A. A. Zhukhovitskiy's 50th birthday was observed in September 1958. On the occasion of his birthday, the 28th anniversary of his scientific activity and activity as an instructor was also celebrated.

"After completing a course of study at the Chemical Faculty of the Don Polytechnic Institute in 1930, Zhukhovitskiy received an aspirantship at the Physico-Chemical Institute imeni L. Ya. Karpov, which he completed in 1932.

"During 1932-1948 Zhukhovitskiy worked at the Physico-Chemical Institute, occupying a number of positions there. In 1948, he was transferred to the Moscow Steel Institute, where he is still active, being in charge of the Chair of Physical Chemistry.

"Zhukhovitskiy is the author of more than 80 scientific publications. Many of them laid the basis for new lines of research and initiated extended investigations both by USSR and non-USSR physical chemists.

"Zhukhovitskiy's research was carried out principally in three fields of physical chemistry: that of surface phenomena, that of the structure of matter and quantum chemistry, and that of the thermodynamics and velocities of processes occurring in actual solutions.

"Zhukhovitskiy has worked for a number of years on the formulation of a theory of actual surface solutions. By considering the conditions of equilibrium between a surface solution and the volume phase from the standpoint of the theory of activity, he derived a general theory of surface tension and of adsorption from solutions. Specifically, he formulated relationships which make it possible to calculate the surface tension of solutions from the surface tension of components and the activities of these components in three-dimensional solutions. Subsequently, the correctness of the expressions formulated by him was confirmed completely in a great number of investigations dealing with aqueous and non-aqueous solutions and also with alloys and/or melts. The formulas given by Zhukhovitskiy were included in many monographs and textbooks.

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"In the solution of the problem of the dynamics of sorption, which is important from the practical standpoint, Zhukhovitskiy applied for the first time in work in this field methods based on the theory of mass transfer. Together with his co-workers (Ya. Zabezhinskiy and others) he carried out an exhaustive analysis of the case arising when external diffusion is the determining stage. On the basis of the concepts which were derived, he, together with Tikh mov, gave a complete mathematical solution to the problem. After the expiration of several years, analogous investigations were carried out outside of the USSR by Klotz, Hinshelwood and others.

"Zhukhovitskiy's work on the theory and practical applications of chromatography is closely related to his work on the dynamics of sorption. On the basis of an analysis of the role played by the temperature in chromatography, Zhukhovitskiy and his co-workers developed new variations of the method of chromatographic analysis. The investigations in question culminated in the design of chromatographic devices and the practical application of these devices.

"Work by Zhukhovitskiy and A. Kh. Breger on the surface "condensation" of different characteristics made it possible to calculate the surface tension of metals and predict the dependence of the heat capacity at low temperatures on the magnitude of the specific surface.

"Zhukhovitskiy began quantum-chemical research already under the direction of Heitler. In work published by Zhukhovitskiy, jointly with Heitler, calculations were carried out on complex organic molecules and a semi-classical method for the determination of bond energies was developed.

"Among other quantum-chemical papers by Zhukhovitskiy one may note a report in which a new formulation is given to Pauli's principle. This formulation makes it possible to reduce the problem of multiple-electron motion to that of the motion of a single electron.

"The difference between the energies of the initial and transitional states of adsorption at an ionic lattice was calculated in one of Zhukhovitskiy's investigations on the quantum theory of catalysis. Consideration of this problem as applied to the simplest possible system was of basic importance for the theory of catalysis.

"Throughout his scientific activity, Zhukhovitskiy concentrated on the solution of the most urgent problems of physical chemistry. It is understandable that the development of nuclear physics and nuclear technology induced him to conduct a number of investigations, the aim of which was advancement of related fields of physical chemistry.

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"Utilizing the properties of radioactive tracers, Zhukhovitskiy and his coworkers developed a number of ingenious methods for the determination of thermodynamic and diffusion characteristics of solid and liquid alloys. Among them the methods of the thin and thick layer for the determination of coefficients of diffusion and self-diffusion are simple and precise.

"The replica method is rapid and shortens the time required for the determination of diffusion coefficients by hundreds of times.

"A non-isothermic method on which a report was published recently makes it possible to determine the temperature dependence of the coefficient of diffusion in a single experiment.

"The diffusion and exchange methods, which have been applied in a number of investigations for the determination of partial pressures of vapors and of heats of the formation of solid solutions, expanded the field in which radioactive tracers are applied. The methods that have been developed made it possible to accumulate extensive experimental data and to approach the making of theoretical generalizations concerning a number of important problems of the theory of actual solutions.

"It was established that the effect of composition on the velocity of diffusion is in many cases determined not by the thermodynamic properties of the alloy, but by the specific characteristics of the transition stage. By applying an analogy with electrical conductivity, a quantitative description of diffusion in inhomogeneous media could be given.

"Of great theoretical and practical importance is work published recently by Zhukhovitskiy and his co-workers on the mechanism of reactive diffusion. The theory which has been formulated on the basis of the work in question applies to many phenomena associated with phase transformations.

"Measurements of the thermodynamic activity of sulfur in liquid iron made it possible to formulate a theory of the solution of non-metals in metals. Instead of the simplified concept of an interstitial solution, the problem was treated by applying the concept of a combined interstitial and substitution solution, with the result that an interpretation corresponding more closely to the liquid state was given.

"Zhukhovitskiy combined successfully his extensive activity in scientific research with his activity as an instructor. He is a brilliant lecturer who is very popular with his students. Zhukhovitskiy devotes a lot of time to the development of methods. He always seeks forms of expression which are unconventional, very precise, and which convey the meaning in an easily understood manner. He made many original conclusions and developed a number of methods of exposition which have now been introduced into textbooks and are used by man lecturers. His lectures on physical chemistry always correspond to the contemporary state of this science.

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> "Being a many-sided scientist who works creatively in different fields of physical chemistry, Zhukhovitskiy maintains constant contacts with many scientific institutions, collaborating with a great number of his students who are active at these institutions."

Radiation Chemistry

18. Nuclear Energy Research in Kazakhstan

"News Items -- USSR" (unsigned report); Moscow, Atomnaya Energiya, Vol 6, No 4, Apr 59, p 496

The Institute of Nuclear Physics, Academy of Sciences, Kazakh SSR, is being built in the vicinity of Alma-Ata.

At this institute a nuclear reactor will be constructed that is to be used for the investigation of experimental loops, work on the interaction of neutrons with matter, research on neutronography and changes in the structure of matter under the action of neutrons, the production if isotopes of different chemical elements exhibiting different activities, and research on problems of nuclear power generation.

In addition to the reactor, a cyclotron will be constructed at the institute and a radiochemical laboratory will be equipped. The cyclotron will be used for the investigation of nuclear reactions and also for the production of some isotopes needed in the national economy and in connection with work done at specialized branch scientific research institutes.

It is intended to establish laboratories at the institute in which methods will be developed for the application of penetrating radiation and isotopes in geology, mining and smelting, metallurgy, chemistry, agriculture, biology, and medicine. Equipment for the purposes indicated will be developed in the laboratories. A special scientific sector of applied physics is foreseen which will include a building for the laboratories mentioned and another building for the radiochemical laboratory.

A scientific sector for the investigation of the structure of matter is being organized. This sector will comprise laboratories for work on nuclear reactions, cosmic rays, radiation emitted by radioactive substances, and computer techniques, as well as a division of theoretical physics.

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The scientific sector of technical physics will consist of the laboratories of the former Physico-Technical Institute (the laboratories of metal physics, spectral analysis, and electronics and automatics) and also new laboratories to be opened in which work will be done on semiconductors, X-ray methods of testing, and experimental devices. Furthermore, mechanical workshops, a designing bureau, and a cryogenic unit for research in the field of low temperatures are being organized at the institute.

Radiochemistry

19. A Conference on the Application of Radioactive Isotopes in Automotive Vehicle Testing

A Scientific-Technical Conference on the Application of Radioactive Isotopes and of Radiation in Automobile and Tractor Technology," by A. I. Nisnevch and D. I. Vysotskiy; Moscow, Atomnaya Energiya, Vol 6, No 3, Mar 59, pp 341-343

A Conference on the Application of Radioactive Isotopes and of Radiation in Automobile and Tractor Technology was held at Moscow on November 12-15, 1958. The conference was called at the initiative of the Scientific Research Automobile and Automotive Engine Institute (NAMI), the Scientific Research Tractor Institute (NATI), the Academy of Sciences USSR, and the Scientific Research Society of the Machine Building Industry.

Twenty-three reports were given at the conference. The majority of these reports dealt with the application of radioactive isotopes in the investigation of the wear of parts of automotive engines. Papers were presented on various aspects of the investigation of lubricants and lubrication; the effect of fuels on wear, the characteristics and quality of construction materials, and the radiometric determination of the amount of dust contained in the air, as well as the estimation of other conditions which affect the operation of automobiles on the road. Applications of scintillation counters for measuring radioactivity were described in several papers.

20. Preparation of Artificial Radioactive Isotopes in China

"Brief News Items -- Chinese People's Republic" (unsigned item); Moscow, Atomnaya Energiya, Vol 6, No 3, Mar 59, p 356

With the use of the first Chinese nuclear research reactor, which has been constructed with the aid of the Soviet Union and recently started, more than 30 kinds of radioactive isotopes were produced in 1958. Among these isotopes were Co^{60}, Na^{24}, P^{32}, and Ca^{45}.

[For additional information on radiochemistry see Item No 18.]

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Miscellaneous

21. New Plastics Institute Established in Ukraine

"Scientific Centers of Chemical Industry in the Donbass" (unsigned article); Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 24 Apr 59

According to the Seven-Year Plan, new shops and enterprises, which will produce special resins to be used in the production of plastics and materials for developing synthetic fibers, are being established in the Donbass area. In order to work out the problem of chemical development, there has been established a Ukrainian Scientific Research of Plastics (Ukrainskiy Nauchno-Issledovatel'skiy Institut Plasticheskikh Mass) in Stalino. A branch of the All-Union Scientific Research Institute of Chemical Reagents (Vsesoyuznyy Nauchno-Issledovatel'skiy Institut Khimicheskikh Reaktivov) was also established in Stalino.

22. Ukrainian Chemical Research Outlined

"Resolutions of the Joint Meeting of the Department of Chemical and Geological Sciences and the Department of Biological Sciences and the Department of Biological Sciences Held on 17 October 1958 Dedicated to the Development of the Chemistry of Naturally Occurring and Biologically Active Compounds" (unsigned article); Kiev, Ukrainskiy Khimicheskiy Zhurnal, Vol 25, No 1, 1959, pp 141-142

A joint meeting of the two departments, which was dedicated to naturally occurring and biologically active compounds, noted that research in this field is one of the most essential in modern organic chemistry.

The explanation of the chemical structure and properties of proteins, nucleic acids, carbohydrates, hormones, and other naturally occurring substances will provide the path to a materialistic knowledge of living nature. The practical importance of research on the chemistry of naturally occurring and biologically active compounds is evident from the fact that the development of synthetic and natural physiologically active substances is related to this field. Among these can be included antituberculous, anticancer and antiradiation substances, antibiotics, vitamins, and plant and animal growth stimulants.

The basis for the broad development of scientific research in all these areas comes immediately from the decisions of the May Plenum of the Central Committee of the Communist Party of the Soviet Union and from N. S. Khrushchev's report to the 21st Communist Party Congress.

Nevertheless, this most important section of organic chemistry has not been advanced to the extent required and is a sharply lagging branch of the chemical sciences, retarding research in adjacent fields of natural science (biology, biochemistry, physiology, and medicine). In the Ukraine, research on the chemistry of naturally occurring and biologically important compounds has been and is being conducted by extremely inadequate staffs. Among endeavors of this nature being conducted by insufficient personnel are research in the field of antituberculous derivatives of phenazine and thiazole at the Institute of Organic Chemistry, Academy of Sciences, Ukrainian SSR, by A. I. Kirprianov and associates; the development of methods for producing and analyzing carotene and tocopherol at the Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR, by B. G. Savinov and associates; the synthesis and investigation of esters of dithioacids at the L'vov Polytechnic Institute by B. G. Boldyrev; the synthesis and investigation of the biological activity of thiazolidine at the L'vov Medical Institute by N. M. Turkevich; the synthesis of certain steroid hormones at the Khar'kov Institute of Endocrinology by G. I. Kiprianov and associates; the synthesis of anticancer substances of the alkylating compound type at the Ukrainian Sanitary Chemical Institute by K. A. Kormeyev; the synthesis and investigation of diothiols at the same institute by V. Ye. Petrun'kin; the synthesis of Vitamin D_3, the preparation of synthetic protein addition compounds of fat-soluble vitamins and of highly active concentrates of vitamins A and K from naturally occurring raw materials at the Institute of Biochemistry, Academy of Sciences Ukrainian SSR, by V. P. Vendt and others; the development of methods for the isolation of antibiotics, microcides, and other substances at the Institute of Microbiology, Academy of Sciences Ukrainian SSR, by N. M. Pidoplichko and V. I. Bilay; the synthesis of organophosphorus insecticides at the Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR, by A. V. Kirsanov and associates (where the insecticide K-20-35, highly effective against garden beet curculionidae, was synthesized); the work on carbohydrates at the Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR, by P. V. Golovin and associates; and the initial work on the preparation and investigation of the new growth stimulants, i. e., gibberellins, at the Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR, by B. G. Savinov and associates.

Having in mind the exceptional importance of research on naturally occurring and synthetic biologically active substances, the joint meeting considers it necessary:

To expand work on the chemistry of naturally occurring, biologically important compounds, which has already been started in the Ukraine, especially (a) on the chemistry, biochemistry, and technology of tocopherols and their analogs, of vitamins B_{12}, D, A, and others, gibberellins, on the investigation of products of the activity of various fungi and bacteria (in the laboratories of the Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR; the Institute of Microbiology, Academy of Sciences Ukrainian SSR, and the Institute of Biochemistry, Academy of Sciences Ukrainian SSR); (b) on synthetic physiologically active compounds.

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To expand the work on the synthesis of drugs for the treatment of cardiovascular diseases, cancerous tumors, tuberculosis, and of substances for protection against radiation.

To recommend to the chairs of organic chemistry of the Ukrainian universities the inclusion in their scientific work of problems related to the chemistry of naturally occurring and biologically important compounds.

To bring to the attention of the Pharmacopeia Committee of the USSR the need for acceleration of the testing of synthetic medicinal preparations.

To ask the Presidium of the Academy of Sciences Ukrainian SSR the following: (a) in 1959, to organize within the Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR, a laboratory of synthetic physiologically active substances to synthesize and investigate anticancer, antiradiation, and antituberculous compounds; (b) to establish in 1959 in that same institute a laboratory of protein chemistry; (c) to organize within the Institute of Physiology, Academy of Sciences Ukrainian SSR, a laboratory of pharmacology to investigate new naturally occurring and synthetic biologically active substances; (d) to reorganize the analytical laboratory of the Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR, so that provisions will be made for work on the identification, analysis, and determination of the structure of naturally occurring compounds; (e) to organize an enlarged installation at the Institute of Organic Chemistry for the production of preparations having prospects of being introduced into practical use; (f) to take necessary measures for the rapid production of 10 tons of the insecticide K-20-35 for 1959 spring sowing, to conduct state-wide testing; (g) to increase the number of scientific visits abroad for scientists working in the fields of naturally occurring and biologically active compound; (h) to supply the chemical and biological institutes conducting research on biologically active compounds with unique modern foreign equipment; (i) to obligate the biological institutes of the Academy of Sciences Ukrainian SSR to perform the biological testing of the new preparations synthesized by the Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR. In 1960 it should organize an auxiliary laboratory at the institute for the biological and toxicological testing of new synthetic preparations; (j) to organize a commission to coordinate the research being done in the Ukraine on naturally occurring and biologically important compounds.

To ask the Presidium of the Academy of Sciences Ukrainian SSR to submit a petition to the Ministry of Higher Education and Public Health Ukrainian SSR to expand and provide adequate finances for work on synthetic physiologically active compounds at the L'vov Polytechnic and the L'vov Medical Institutes, the Khar'kov Institute of endocrinology, the Khar'kov Scientific Research Chemical Pharmaceutical Institute, and the Ukrainian Sanitary Chemical Institute.

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To request the Presidium of the Academy of Sciences Ukrainian SSR to request the Ministry of Higher Education Ukrainian SSR to consider the necessity of introducing special courses in the biochemical and chemical faculties in the course of reorganizing the work of institutes of higher learning.

The Joint Meeting of the Department of Chemical and Geological Sciences and the Department of Biological Sciences, dedicated to the development of the chemistry of naturally occurring and biologically active compounds, expressed assurance that Ukrainian chemists are doing everything possible so that in the near future the research in this field will be considerably expanded.

II. ELECTRONICS

Acoustics and Audio Frequency

23. Diffraction of Surface Sound Waves on Impedance Rods Studied

"Diffraction of Surface Sound Waves on Semi-Infinite Impedance Pipe and Rod," by Kuan Ting-hua; Moscow, Doklady Akademii Nauk SSR, Vol 124, No 3, 21 Jan 59, pp 559-562

The diffraction of surface sound waves on the end of a semi-infinite impedance pipe is studied. An infinite system of algebraic equations which can be solved by the successive-approximation method is then set up to solve the problem of diffraction of surface sound waves on an impedance rod.

24. Isophon Measurements in Diffuse Sonic Field

"Curves of Equal Loudness for Octave-Band-Pass Noise," by G. Jahn, Institute of Electrical and Architectural Acoustics, Dresden Technische Hochschule; Leipzig, Hochfrequenztechnik und Elektroakustik, Vol 17, No 6, Mar 59, pp 186-189

Curves of equal loudness for octave-band-pass noise were measured in a diffuse sonic field at 55 phon on six person and at 40 phon, in the diffuse field, as well as in the frontally incident plane wave, on a group of ten persons. The loudness values were compared according to the Bekesy method with constant level of the reference signal and variable octave noise level. The reference signal used was a one-kilocycle noise passed through a 1/3-octave band-pass filter, the level of which was selected so that the loudness corresponded to 55 and 40 phon, respectively.

The difference between the 40-phon curves measured in both sonic fields is in agreement with earlier results obtained by the author in an objective determination. The isophons measured in the diffuse sonic field above 1.6 kilocycles, however, deviate considerably from corresponding results obtained by other authors, for which no explanation could be found.

Communications

25. New Radio Receivers

"New Mass-Produced Radio Receivers," by G. Levitov; Moscow,
Radio, No 4, Apr 59, pp 12-14

Two new models of radio receivers, the "Strela" and "Zarya" which
incorporate miniature tubes, are now being mass produced. Both models
are three-tube superheterodyne receivers, designed for reception in the
range of 723-2,000 m and 187.5-522 m waves. The sensitivity of the receivers
is not less than 400 microvolts at output power of 0.5 w and sound pressure
of 3-3.5 bars. Selectivity is not less than 17 db for the condition of $\pm$
10 kc detuning. The loudspeaker reproduction band is 150-5,000 cycles when
the coefficient of nonlinear distortion is not over 5%. The sets can be
supplied with power from 127 or 220 v ac power line and consume about 40 w.
Each set has two 6I1P and one 6I14P tubes. One of the 6I1P tubes acts as
a frequency converter and the second as an IF amplifier and power preamplifier.
Detection is carried out by a semiconductor diode. The tube 6I14P acts as
a power amplifier. The intermediate frequency is 465 kc. The over-all
dimensions of the "Zarya" receiver are 290 X 208 X 158 mm.

26. Competition of Women Radio Operators

"Leadership Was Captured by the Strongest," by S. Karaush and
G. Shchelchkov; Moscow, Radio, No 4, Apr 59, p 9

The All-Union Competition of female short-wave radio operators for
the prize of the "Radio" periodical has been completed. A total of 685
female radio operators participated in the competition, of which 324 were
members of various teams, 29 participated individually, and the remainder
acted as observers; 74 radio clubs from various parts of the nation were
represented.

The team of the radio station UH8KAA from Ashkhabad took first prize.

CPYRGHT

"A justified alarm was stirred up by the fact that, in the Fourth
All-Union Competition for female short-wave radio operators, considerably
fewer radio clubs have participated than in the previous year."

"The Fourth All-Union Competition has revealed the high skill of
female radio operators."

27. Simplified Method of Linearizing Nonlinear Oscillations

"On a Simplified Method of Linearization in the Theory of
Nonlinear Oscillations," by K. V. Belyakov, Kiev; Kiev,
Izvestiya Vysshikh Uchebnykh Zavedeniy, Radiotekhnika, No 1,
1959, pp 18-23

A graphic interpretation is given for a simplified method of line-
arization of one of the types of nonlinear equations used to find the
amplitude and frequency characteristics of nonlinear oscillations of
systems with one degree of freedom.

Components

28. Speed of Magnetic Polarity Reversals in Ferrites

"Speed of Magnetic Polarity Reversals in Ferrites," by R. V.
Telesnin and Ye. F. Kuritsina, Physics Faculty, Moscow State
University; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Fiz-
icheskaya, No 3, Mar 59, pp 352-356

The purpose of this work was to study the mechanism of magnetic
polarity reversals in ferrite toroids with rectangular hysteresis loop and
to establish temperature dependence of the speed of polarity reversals in
various commercial types of ferrites. The magnesium-manganese ferrites
which are used in computers as the matrix and commutation components were
selected for this experiment. The speed of magnetic polarity reversals in
relation to the field strength, temperature, and number of turns of mag-
netizing coil were studied.

The experimental set-up consisted of a square-pulse generator capable
of forming pulses with steep leading edge and 3 to 50 microseconds duration.
The SI-4 oscilloscope was used to study the output voltage. The examination
revealed that the speed of magnetic polarity reversal in ferrites which are
used as operating elements in the computers is, in general, controlled by
the magnetic viscosity.. It has also been established that the study of
magnetic polarity reversals should be carried out with oscilloscopes having
a low capacitance. The coefficient of magnetic polarity reversal was but
slightly affected by the temperature fluctuation in the type K-28, K-65,
PP-1, PP-4, PP-5, and PP-24 ferrites.

29. Solution of a Differential Equation of a Superregenerative Circuit

"On the Solution of the Differential Equation of a Superregenerator," by D. D. Klovskiy; Kiev, Izvestiya Vysshikh Uchebnykh Zavedeniy, Radiotekhnika, No 1, 1959, pp 71-79

The BWK (Brillouin-Wentzel-Kramers) method is employed for obtaining an approximate solution of the differential equation of a superregenerative circuit within a linear regime. The error in the value of the coefficient of superregeneration and the phase shift of the input oscillations which is incurred in the use of this solution is explained. The spectral relationships and the nature of the transient process are also considered.

Since the original BWK method did not provide a means of determining the selective properties of a superregenerative circuit which are due solely to the phenomenon of superregeneration, the author provides a coefficient for use in the determination of the selectivity which is shown to depend only on the resonance properties of the circuit, taking regeneration into account.

30. Stabilization in Self-Oscillators

"On the Question of the Fluctuating Character of the Stabilization of Oscillations in an Electronic Self-Oscillator," by V. I. Grigulevich; Kiev, Izvestiya Vysshikh Uchebnykh Zavedeniy, Radiotekhnika, No 1, 1959, pp 65-70

A theoretical investigation is made of the general case of a statistical process of stabilizing the oscillations in a self-oscillator in the presence of external excitation and transient switching processes. The stabilization period obtained for the statistical characteristic can be used for the determination of the spectra of signals and noises and of the duration of pulses in oscillator spectra, superoscillators, radio links with types of pulse modulation, and similar systems.

31. Neutralization of Fluctuations

"On the Influence of the Form of the Frequency Characteristic on the Process of the Neutralization of Fluctuations," by N. M. Malyarevskiy; Kiev, Izvestiya Vysshikh Uchebnykh Zavedeniy, Radiotekhnika, No 1, 1959, pp 31-37

This article investigates the influence of the form of the frequency characteristic of a band filter at the input of a detector with a square-wave characteristic on the quality of a post-detector averaging of the fluctuating voltage, applied at the filter input. The optimal form of the frequency characteristic of such a filter is found; it guarantees a maximum proportion for the constant component (or for its increment, caused by a change of the fluctuating voltage at the filter input) in the total root-mean-square value of the fluctuation at the detector output. The results of the analysis are illustrated by examples.

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32. Time Domain Approximation in Linear Network Synthesis

"The Synthesis of Linear Networks Which Produce Pulses of a Given Shape by Breaking Down Integral Functions Into Infinite Series," by P N Matkhanov; Kiev, Izvestiya Vysshikh Uchebnykh Zavedeniy, Radiotekhnika, No 1, 1959, pp 58-64

For the synthesis of linear networks which form pulses of a given shape and which possess system functions with transcendental exponents, a simple method is proposed which is based on the breakdown of hyperbolic functions into infinite series. For the case of symmetrical pulses, the method guarantees that reactive networks will be obtained. Time domain approximation can be employed satisfactorily.

33. Superregenerative Receivers

"Signal and Noise at the Output of Superregenerative Receivers," by M. K. Belkin; Kiev, Izvestiya Vysshikh Uchebnykh Zavedeniy, Radiotekhnika, No 1, 1959, pp 24-30

An investigation is made of the simultaneous effect of a pulse signal and a fluctuating noise on a superregenerative circuit. Expressions are obtained for the signal-to-noise ratio at the output of linear and square-wave detectors at various intervals of smoothing.

Computers

34. Simplified Triggering Circuit Proposed for Use in Computers

"Triggering Devices Which Utilize the Capacitance of a p-n Junction," by V. I. Samoylenko and I. A. Glotov; Kiev, Izvestiya Vysshikh Uchebnykh Zavedeniy, Radiotekhnika, No 1, 1959, pp 38-47

An investigation is made of a triggering method in a nonlinear LC circuit using the capacitance of a p-n junction as a controlling element. The basic relationships are given for a choice of system parameters. The possibility of devising a parametric trigger by utilizing the capacitance of a p-n junction is confirmed by experiment.

The suggested triggering device has a number of advantages over those which employ vacuum tubes and semiconductor triodes. The suggested circuit is extremely simple. In comparison with semiconductor-triode triggering devices, the device proposed here has a much lower temperature dependence, thus the value of the capacitance, in comparison with the other parameters of the p-n junction, depends very little on temperature. One disadvantage of the suggested circuit is the fact that the rate of transition from one condition of stability to another might be slower than that of a triggering circuit using a semiconductor triode of the P-6 type. The triggering circuit proposed here can be used in various radio engineering devices, particularly in computers.

35. Numerical Analysis of the Equation of Heat Transfer

"On the Numerical Integration of the Equation of Heat Transfer," by V. K. Saul'yev; Moscow, Doklady Akademii Nauk SSSR, Vol 125, No 1, 1959, pp 48-50

The equation

$$\partial U / \partial t = \Delta U \; (\Delta = \sum_{i=1}^{m} \partial^2 / \partial x_i^2) \text{ is considered.}$$

Two formulas are compared for the calculation of the above equation as regards accuracy and the time required on a computer.

36. Slovak Periodical Reports Polish Computer

"Polish Electronic Brain" (unsigned article); Bratislava, Priroda a Spolocnost, No 5, 1959, p 3

The chief components of the "XYZ" computer of the Institute of Mathematical Equipment of the Polish Academy of Sciences, which required almost 2 years to build, have now been tested and have successfully performed all the control tasks.

The "XYZ" computer was designed on the basis of electronic and transformer technology and possesses a rapid memory based on ultrasonic principles. It can solve 800 basic arithmetic and logic operations per second.

It is to be furnished with a magnetic drum of larger capacity, and with the drum memory it will be able to solve complex differential equations.

The computer's effectiveness can be compared to that of the English [sic] machine which costs 200,000 dollars.

Almost all of the computer's design, including about 500 electron tubes and more than 10,000 parts, was based on original suggestions of the Institute of Mathematical Equipment.

The "XYZ" computer will be used to solve various mathematical problems for scientific and technical purposes.

Instruments and Equipment

37. A New Device for the Testing of Scintillators

"Brief News Items -- USSR" (unsigned article); Moscow, Atomnaya Energiya, Vol 6, No 3, Mar 59, p 356

As a result of work done at the Khar'khov Affiliate of the All-Union Scientific Research Institute of Chemical Reagents, a simple design of a single-channel analyzer of pulse amplitudes was developed. This device is to be used for the mass control of scintillators. The analyzer makes it possible to record automatically the gamma-spectrum, to determine more rapidly the half-width of the photo-peak in percent, and to determine the relative light yield on the basis of a graduated scale or standard. The curve of the gamma spectrum is recorded by the self-recording device of a MSShchPr-154 galvanometer; the recording time amounts to 15 minutes with the use of a Cs^{137} source having an activity of 0.05 millicuries. Using the analyzer, one can also take gamma-spectrum curves by the ordinary method of counting pulses according to channels. In addition to that, the new device can be used for testing photoelectronic multipliers.

38. Measuring Complex Dynamic Modulus of Elasticity

"A Method of Measuring the Complex Dynamic Modulus of Elasticity," by H. Andres, Heinrich Hertz Institute of the German Academy of Sciences, Berlin-Adlershof; Leipzig, Hochfrequenztechnik und Elektroakustik, Vol 67, No 6, Mar 59, pp 174-180

The method described makes use of two electromechanical transducers for the purpose of converting forces into corresponding electrical values, which are then compared in a bridge circuit. From the adjusted control variables of the balanced bridge, the real portion of the modulus of elasticity and the loss factor can be determined.

The measuring device operates with an electrodynamic excitation system, which produces transverse oscillations in small cylindrical samples of soundproofing materials. The AC amplitude, the initial static loading, the test frequency, and the specimen temperature can be varied arbitrarily at all times.

Some measurement results on commercial soundproofing materials are given.

Materials

39. A New Method for the Zone Refining of Silicon

    "Zone Refining of Silicon With an Electron Beam", by V. Husa,
    I. Kriz, and I. Ladnar; Leningrad, Fizika Tverdogo Tela, Vol1,
    No 2, Feb 59, pp 290-293

    A method has been developed for the vertical zone refining of silicon
    with electronic heating. The problem involved was solved by focusing an
    electronic ray by means of a cathode especially designed for this purpose.

40. Method for Evaporation of Silicon by Electronic Bombardment

    "Evaporation of Silicon Without a Crucible," by R. M. Voytenko,
    T. N. Dunayeva, and Ye. A. Kolenko, Institute of Semiconductors,
    Academy of Sciences USSR, Leningrad; Leningrad Fizika Tverdogo
    Tela, Vol 1, No 2, Feb 59, pp 294

    Describes the melting and evaporation of silicon by electron bombard-
    ment. The purpose of the evaporation (carried out in vacuum) is deposition
    of a thin film of silicon by the condensation of vapor. Because a cruci-
    ble does not have to be used when this method is applied, destruction of
    the evaporation device by the highly reactive liquid silicon is avoided.

41. Changes in the Conductivity of Germanium Under the Action of Light

    "Long-Term Changes in the Contact Potential and Conductivity
    of Germanium Due to the Action of Light and of a Transverse
    Electric Field", by M. S. Kosman and I. I. Abkevich, Lenin-
    grad Pedagogic Institute imeni A. I. Gertsen; Leningrad,
    Fizika Tverdogo Tela, Vol 1, No 3, Mar 59, pp 378-387

    It was established that upon illumination of germanium there is an
    increase of the negative charge in slow surface traps. Furthermore, it
    was found that upon illumination with short-wave light, the changes in
    the conductivity and in the contact potential after heating are small in
    comparison with changes due to an increase in the negative charge of the
    surface. Models of the surface that have been proposed are discussed.
    It is shown that R. H. Kingston's and A. L. McWhorter's models explain
    best the changes of the contact potential in time established in experi-
    mental work.

42. Velocity of the Solution of Germanium in Hydrogen Peroxide

"Solution of Single-Crystal Germanium in Hydrogen Peroxide,"
by G. S. Supin; Moscow, Zhurnal Prikladnoy Khimii, Vol 32,
No 3, Mar 59, pp 478-481

By investigating the rate of the dissolution of germanium in hydrogen peroxide at pH = 4-5 and pH = 7-8 at the temperature of 100-103°, it was established that when the pH increases, the rate of dissolution of germanium also increases. The results obtained are of interest in connection with the treatment of germanium at plants producing semiconductor devices. After single crystals of germanium have been cut, their surface layer is damaged: the damaged surface layer must be removed to expose the intact surface of the single-crystal material. One of the chemical agents used for this purpose is hydrogen peroxide.

43. Mixed Single Crystals of Cadmium Sulfide and Cadmium Selenide

"Preparation of Mixed Cadmium Sulfide-Cadmium Selenide Single Crystals From the Vapor Phase and Some of Their Characteristics", by N. I. Vitrikhovskiy and I. V. Mizetskaya,
Physics Institute, Academy of Sciences Ukrainian SSR, Kiev;
Leningrad, Fizika Tverdogo Tela, Vol 1, No 3, Mar 59, pp 397-402

A new method has been proposed for preparing mixed single crystals of cadmium selenide and cadmium sulfide with different ratios of components by subliming powder mixtures in an inert atmosphere of argon. An X-ray diffraction investigation of the single crystals obtained indicated that they represent solid solutions of the substitution type.

The unchanging correspondence of the maximum of the photocurrent for every composition of the cadmium sulfide-cadmium selenide single crystals to a definite wave-length indicated the homogeneity of these crystals in regard to their composition within individual batches. The linear dependence of λ_m on the composition of the mixed crystals makes it possible to determine the approximate content of components in them.

44. Properties of Aluminum Selenide

"The Semiconductor Properties of Aluminum Selenide", by
V. P. Mushinskiy; Leningrad, Fizika Tverdogo Tela, Vol 1,
No 3, Mar 59, pp 515-517

The semiconductor properties of polycrystalline aluminum selenide samples with a stoichiometric composition ($Al_2 Se_3$) and also with an excess of selenium or aluminum were investigated. A law describing the

temperature dependence of the electrical conductivity was derived from the data obtained. Experiments on the determination of the sign of current carriers showed that melts containing no less than 60% by weight of selenium have a hole mechanism of conductivity independently of the fact whether the measurement was carried out in vacuum or in air. In samples containing smaller quantities of selenium an electron mechanism of conductivity was found at low temperatures (down to minus 40° C), while at higher temperatures the sign of the current carriers changed to the positive. The hole mechanism of the conductivity at low temperatures in aluminum selenide is apparently due to vacant places left by aluminum atoms in the crystal lattice.

45. Homogenization of Indium Arsenide- Indium Selenide Alloys Under Pressure

"Homogenization of Alloys in the System InAs- In_2Se_3 by Annealing Under Pressure", by N. A. Goryunova, S. I. Rădăutsan, and V. I. Deryabina, Leningrad Physico-Technical Institute, Academy of Sciences USSR: Leningrad, Fizika Tverdogo Tela, Vol 1, No 3, Mar 59, pp 512-514

Homogenization of samples by annealing under pressure was carried out in equipment of the Laboratory of High Pressures, Leningrad Scientific Research Institute for the Conversion of Petroleum and the Synthesis of Liquid Fuels (cf N. N. Kolgatin, L. A. Glikman, and V. P. Teodorovich, Zavodskaya Laboratoriya, No 9, Sep 57, p 1098)

It is concluded on the basis of the results obtained that annealing under pressure is a new and effective method of homogenization. It is assumed that this method will also prove useful for the homogenization of other complex semiconductor materials.

46. Solid Solutions in the System Zinc Selenide-Gallium Arsenide

"Solid Solutions in the System ZnSe-GaAs," by N. A. Goryunova and N. N. Fedorova; Leningrad Physico-Technical Institute of the Academy of Sciences USSR and All-Union Scientific Research Storage Battery Institute at the Gosplan USSR, Leningrad, Fizika Tverdoga Tela, Vol 1, No 2, Feb 59, pp 344-345

The results obtained by the investigation of the pseudobinary section ZnSe-GaAs of the four-component system Zn-Ga-As-Se are briefly reported. The work in question represents a part of the investigation conducted at the Leningrad Physico-Technical Institute, Academy of Sciences USSR, on the homogeneous regions of multicomponent semiconductor alloys with the purpose of studying the possibilities of the variation of electrical characteristics.

47. Effect of Alloying on Cobalt Antimonide

"Alloying of the Semiconductor Compound Co Sb$_3$", by L. D. Dudkin
and N. Kh. Abrikosov; Leningrad, Fizika Tverdoga Tela, Vol 1,
No 1, Jan 59, pp 142-151

The effect of 13 alloy constituents on the thermoelectric and thermal
properties of the semiconductor compound Co Sb$_3$ was investigated. It was
established that four of them (iron and nickel which replace cobalt in the
compound, and tin and tellurium which replace antimony) are active in this
respect.

Impurity atoms of nickel and tellurium are donors which are completely
ionized at room temperature; tin is an acceptor; the effect of iron amounts
to a lowering of the lattice heat conductivity and stabilization in the 3-
component system of the $\mathcal{E}$-phase lattice with defects.

It is concluded that the principal criterion for the selection of
active alloy additives to chemical compounds of the semiconductor type
is the magnitude of their solubility in the initial material. In solid
substitution solutions formed by electronic semiconductors, solubility
of impurities is determined by their capacity to form the same type of
bond as that which the component replaced by them has in the chemical com-
pound. The atoms of the impurity must also have a radius very close to
that of the atoms substituted by them.

48. Characteristics of Alloys and Compounds in the Silicon-Manganese
     System

"Investigation of Semiconductor Properties in the Silicon-
Manganese System", by Ye. N. Nikitin, Institute of Semicon-
ductors, Academy of Sciences USSR, Leningrad; Leningrad,
Fizika Tverdoga Tela, No 2, Feb 59, pp 340-343

The electrical conductivities and the thermal electromotive force in
the system silicon-manganese were investigated.

49. Siegnettoelectrics of the Calcium Bismuth Niobäte and Calcium Bis-
     muth Tantalate Type

"A New Group of Siegnettoelectrics With a Laminar Structure",
by G. A. Smolenskiy, A. A. Isupov, and A. I. Agranovskaya;
Leningrad, Fizika Tverdogo Tela, Vol 1, No 1, Jan 59, pp 169-
170

The crystal structure of niobates and tantalates of the Ca Bi$_2$ Nb$_2$ O$_9$
type is distinguished by the existence of oxygen octaheders in the center
of which ions of niobium or tantalum are located. These octaheders are

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joined together by their pinnacles just as in perovskite and form layers of the composition $(CaNb_2O_7^{2-})_x$ or $(CaTa_2O_7^{2-})_x$ separated from each other by $(Bi_2O_2^{2+})_x$ layers. The results of an investigation of the electrical properties of $PbBi_2Nb_2O_9$, which belongs to the same structural type, are reported.

50. Lead Scandate - Niobate and Lead Scandate - Tantalate Seignettoelectrics

"New Seignettoelectrics of Complex Composition of the A_2^{2+} $(B_I^{3+} B_{II}^{5+})$ O_6 Type - Part I," by G. A. Smolenskiy, V. A. Isupov, and A. I. Agranovskaya; Leningrad, Fizika Tverdogo Tela, Vol 1, No 1, Jan 59, pp 170-171

It was established in the investigation described that lead scandate-niobate and lead scandate-tantalate are seignettoelectrics with a structure of the perovskite type.

51. A Method for Preparation of Plastic Scintillators

"Preparation of Plastic Scintillators," by Ye. Ye. Baroni and V. M. Shoniya; Moscow, Atomnaya Energiya, Vol 6, No 3, Mar 59, pp 330-332

Describes a method for the preparation of plastic scintillators based on polystyrene by heat polymerization in closed metal vessels.

Radar

52. Testing of Radar Transmit-Receive Switch

"Methods of High-Power Simulation in Testing the Discharge-Gap Switch of a Radar Antenna," by V. Ye. Golant and M. Ya. Mandel'shtam; Moscow, Radiotekhnika i Elektronika, No 4, Apr 59, pp 661-673

Describes an experiment showing the possibility of simulating high-power in the process of testing the discharge-gap TR switches inside a cavity resonator. Using a cavity resonator with the standing wave a simulated power magnification of the order of 10-20 times was obtained, and for a ring resonator with traveling wave the simulation of power magnification was of the order 4-5 compared to the actual power at the pulse.

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The experiment was conducted on the 3-centimeter wave. The ring cavity resonator with traveling wave was used for most of the experiments since its operating conditions are equivalent to that of the discharge-gap TR switch. Thus the application of this device, simulating the high-power, permits actual tests of the discharge-gap TR switches with a much lower actual power at the transmitter. This simulation device permits testing new types of TR discharge-gap switches simultaneously with the development of the radar transmitters with higher power at the pulse, as well as testing the over-load capacity of the TR switches and their reliability.

The author expresses thanks to M. L. Pesina for her assistance.

53. East German Shipborne Collision Radar

"From the Work of the DAMW," by Engineer Reitmann; Berlin, Radio und Fernsehen, No 5, Mar 59, p 164

This report on nautical instruments tested by the DAMW (German Office for the Testing of Materials and Commodities) gives the following information on the KSA-3 shipboard anticollision radar manufactured by VEB Funkwerk Koepenick:

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"The KSA 3 is the first East German radar set developed for use in commercial shipping. It is therefore understandable that the first tests should reveal shortcomings. In particular, it must be mentioned that 0.1-watt resistors and germanium rectifiers failed the tests. Obviously, the failure of various components will be noted by the DAMW, and a quality testing of such components at the manufacturing firms will be arranged. To increase operational reliability, the development firm, VEB Funkwerk Koepenick, will make use, in part, of other components.

"Several design changes were found to be necessary. Among other things, a better heat dissipation in the generator section must be provided.

"The installation causes an interference of varying intensity in the 1.2-20-megacycle range, which impairs the reception of the ship's radio, particularly in A-2 operation. The manufacturing firm is making an effort to suppress the interference.

"The tests also revealed the following:

"The range discrimination is better than 70 meters; the angular resolution for targets at least 90 meters apart is about 2 degrees; the close-up resolution is 70 meters; the distance error with respect to the distance marks is less than 5 percent.

"Under normal weather conditions and with an antenna height of 7.5 meters, the following distances were ranged: coastlines 60 meters and over in height, 16 nautical miles; vessels larger than 7,000 BRT, about 18 nautical miles; first-class buoys, 3-4 nautical miles.

"At a distance of 1.5 nautical miles, second-class channel-marking buoys were reproduced.

"Other data: pulse duration, 0.2 microsecond; pulse power, about 20 kilowatts; wavelength, 3 centimeters; pulse repetition rate, 2,000 cycles per second; antenna rotation speed, 20 revolutions per minute; measuring ranges, 0.75, 1.5, 3, 6, 12, and 24 nautical miles; sea-clutter suppression adjustable in two stages; rain-clutter suppression with zero-point extension provided.

"The Elbe pilots who took our experimental ship in and out of port during the trip to and from Dakar appreciated the quality of the radar image. The specifications are satisfied by the radar set.

"Brief mention should be made of the fact that, obviously, ship radar installations will be developed further. Among other things, future plans call for the production of a radar installation which will indicate the true motion of fixed and moving targets."

54. Radar Design With Aposteriori Probability Method

"Some Results of Application of the Aposteriori Probability Method to the Problems of Radar Design," by S. Ye. Fal'kovich; Moscow, Radio-tekhnika i Elektronika, No 4, Apr 59, pp 618-628

The results are given for application of the aposteriori probability method to the problem of selection of the radar-receiver circuit which fully utilizes the potential capabilities of a system during the reception of signals reflected from a moving target.

The article examines three methods for establishing conditions suitable to coherent pulse accumulation: selection of pulses not requiring exclusion of parasitic random parameter, i.e., frequency shift; application of multiplex systems, which assure averaging with respect to the speed of the target; utilization of two-channel system which permits introduction of correction with respect to the speed of the target.

III. ENGINEERING

55. Wing Profile Constructed on Basis of Chord Diagram

"Constructing a Wing Profile for a Given Chord Diagram," by O.
M. Kiselev, Kazan' State University; Kazan', Izvestiya Vyssh-
ikh Uchebnykh Zavedeniy, Seriya Aviatsionnaya Tekhnika, No 1,
1959, pp 10-15

The following problem is treated: to find a profile over which a po-
tential flow passes in such a way that the velocity distribution on the
upper and lower surfaces may be expressed in terms of given continuous
single-valued functions of the abscissas of points of the profile. The
solution of the problem is reduced to finding an analytic function $z = f(\zeta)$
which maps the exterior of a circle of unit radius with center at the
origin of the ζ-plane onto the exterior of the desired profile in the
z-plane.

56. Supersonic Wings With Minimum Resistance Considered

"Supersonic Wings With Minimum Resistance and Providing a
Given Stability Reserve," by Ye. V. Bulygina, Novosibirsk
Electrical Engineering Institute; Kazan', Izvestiya Vyssh-
ikh Uchebnykh Zavedeniy, Seriya Aviatsionnaya Tekhnika, No 1,
1959, pp 3-9

The problem of determining the profile of a wing which has a given
stability reserve at supersonic velocities is considered for a balanced
system. The problem is solved for a three-dimensional wing on the as-
sumptions that perturbations imposed on the flow by the wing are small
and that a linearized theory is applicable. It is noted that flows may
be superimposed in the linear theory, making it possible to consider
separately the effects of wing thickness, concavity, and incidence.

57. Characteristics of Monolithic Wings Studied

"On Calculating the Characteristic Forms and Frequencies
of Monolithic Wings," by M. B. Vakhitov, Kazan' Aviation
Institute; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy,
Seriya Aviatsionnaya Tekhnika, No 1, 1959, pp 16-27

The characteristic forms and frequencies of a console plate of the
most general type are determined. The plate is assumed to be anisotropic,
laminar, and tapered, with thickness varying according to some arbitrary
law involving the span or chord. The plate is described as a calculation
model of a thin tapered monolithic wing or fin with a thick casing rein-
forced with ribs. The method of successive approximations is employed.

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58. Bending of Hinged Square Plate Discussed

"More Exact Solution of the Problem of the Bending of a Square Plate With Hinge-Supported Edges Under a Normal Pressure," by M. B. Vakhitov, Kazan' Aviation Institute; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Seriya Aviatsionnaya Tekhnika, No 1, 1959, pp 28-31

A hinge-supported square plate with a uniformly distributed normal load is considered. It is assumed that the edges of the plate remain rectilinear during the deformation. The Bubnov-Galerkin method is used to solve the problem in the second approximation. The results showed that stresses at the angle point are greater than at the center for plates with freely moving edges. Significant differences were observed between the first and second approximations.

59. Selection of Control System Parameters On Basis of Stability

"The Dynamics of Indirect Control, Taking into Account the Coulomb Friction in a Slide Valve and Servomotor, and the Nonlinear Characteristics of a Servomotor of the Saturable Type," by R A Nelepin, Leningrad; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, Energetika i Avtomatika, No 1, 1959, pp 65-73

The problem originated in connection with the investigation of a number of control systems for thermal power plants.

In the article, the method of point conversion of A A Andronov is used for the solution, which does not take into account the forces of inertia of the controlling devices. In the case in question, the construction of nomograms permits a selection of system parameters on the basis of their stability.

60. Causes of Instability of Metallic Arcs Investigated

"Increase of Arc Stability in a Magnetic Field and the Principle of Field Maximum," by I. G. Kesayev, All-Union Electrical Engineering Institute imeni V. I. Lenin; Moscow, Doklady Akademii Nauk SSSR, Vol 124, No 3, 21 Jan 59, pp 563-566

Changes in arc stability which depend on internal discharge conditions are studied for purposes of explaining the internal instability of metallic arcs and the role this instability plays in the behavior of the cathode spot. It is concluded from the experiments that the primary cause of instability is the scattering of charges and their associated energy from the region of the cathode spot.

61. Design of Heavy-Rotor Motors

"Examination and Design of Induction Motors with Heavy Steel Rotor," by V. S. Sharov, Moscow Power Engineering Institute; Moscow, Elektrichestvo, No 4, Apr 59, pp 55-59

Greater need for induction motors with a heavy rotor is expected in the future. Such motors possess good speed-stability characteristics needed for certain operating conditions.

The main difficulty in design of induction motors with a heavy rotor, is in securing high performance efficiency. Experience in designing induction motors with a heavy rotor has been rather limited up to the present time. The author derives a series of formulas for calculation of the parameters of such a heavy-rotor induction motor.

62. New Prefabricated Electric Power Stations

"Standardized State Regional Electric Power Plants (GRES)" (unsigned article); Moscow, Nauka i Zhizn', No 4, Apr 59, p 66

The "Teploelektroproyekt" Institute has designed the largest USSR thermal electric station with a capacity of 1,2. million kw. The turbo-generator units will be of 200,000-kw capacity and the boilers will have a steam-generating capacity of 640 tons of steam per hour. The main building of the station will be constructed entirely from prefabricated reinforced concrete components, permitting a reduction in the total amount of steel needed in construction of almost 30%.

A series of stations is to be built very soon in accordance with this design. The following persons participated in the design of this "GRES-1,200" station: Z. G. Pavlova, T. I. Smirnova, R. N. Vidman, A. N. Biber, V. D. Khomyakova and L. K. Gogua.

IV. MATHEMATICS

63. Analytical Functions Approximated by Entire Functions

"On the Approximation of Analytical Functions by Entire Functions," by G. M. Avetisyan, Leninakan Pedagogical Institute imeni M. Nalbandyan; Yerevan, Doklady Akademii nauk Armyanskoy SSR, Seriya Fiziko-Matematicheskikh Nauk, Vol 11, No 6, pp 3-14

In the work of M. V. Keldysh, DAN SSSR, Vol 47, No 4, 1945, it is proved that if an analytic function is in the strip $|\text{Im} z| < a$, then it may be uniformly approximated by entire functions in the strip $|\text{Im} z| < a' < a$, where the growth of an approximating entire function is bounded in the dependence on the velocity of increase of the analytic function, the speed of the approximation, and the difference $\delta = a-a'$.

An analytic function defined on a curvilinear unbounded belt is considered in the present work. On the basis of the method of M. V. Keldysh, the possibility of approximating this function by entire functions is demonstrated on the real axis and the growth of the approximating entire function is estimated.

64. Method of Successive Approximations Applied to Singular Integral Equations

"Application of the Method of Successive Approximations to One Form of Singular Integral Equations in Connection With the Solution of the Generalized Tricomi Problem for the Equation of M. A. Lavrent'yev," by Yu. V. Devingtal'; Moscow, Uspekhi Matematicheskikh Nauk, Vol 14, No 1 (85), Jan/Feb, 59, pp 169-176

A modification of the method of successive approximations is applied to the solution of equations of the form

$$(x) + \int_0^1 \frac{K(\lambda(x), t)}{t - \lambda(x)} \varphi(t)\, dt = \phi(x), \tag{1}$$

where $\lambda(x)$ is a nondecreasing function, continuous with the first derivative for $\lambda(0) = 0$ and $\lambda(1) < q < 1$. Equations of this form arise during the solution of the generalized Tricomi problem for the equation of M. A. Lavrent'yev, which has the form

$$\frac{\partial^2 u}{\partial x^2} + \text{sign}\, y \frac{\partial^2 u}{\partial y^2} = 0. \tag{2}$$

65. Convergence of Series of Fourier Coefficients

"On the Convergence of Certain Series of Fourier Coefficients,"
by A. A. Konyushkov; Moscow, Uspekhi Matematicheskikh Nauk,
Vol 14, No 1(85), Jan/Feb 59, pp 189-196

Let $f(x)$ be a function contained in $L_p(0, 2\pi)$, $1 \leq p \leq \infty$, of period 2π having the Fourier series

$$(1) \quad f(x) \sim \frac{a_o}{2} + \sum_{n=1}^{\infty} (a_n \cos nx + b_n \sin nx).$$

The best approximation of f in the L_p metric by trigonometric polynomials of order less than or equal to n is denoted by $E_n(f)_{Lp}$ $(n=0, 1,...)$

The modulus of continuity of the k-th order $(k \geq 1)$ of the function f in the metric L_p is designated by $\omega_k(\delta, f)_{Lp}$; thus

$$\omega_k(\delta, f)_{Lp} = \sup_{|h| \leq \delta} \left\| \sum_{j=0}^{k} (-1)^{k-j} \binom{k}{j} f(x+jh) \right\|_{Lp}.$$

Conditions for the convergence of the series of Fourier coefficients

$$(2) \quad \sum_{n=1}^{\infty} n^{\gamma} \left(\left| a_n \right|^{\beta} + \left| b_n \right|^{\beta} \right), \beta > 0, -1 \leq \gamma < \infty,$$ in terms of the best approximations or the moduli of continuity are considered.

A positive sequence $\left\{ \varphi_n \right\}$ $(n=1, 2, ...)$ is assumed given and the class $M_{\{\varphi n\}}^{(p)}$ of all functions f for which

$$E_n(f)_{Lp} = O(\varphi_n) \quad (n=1, 2, ...) \text{ is considered.}$$

At the beginning of the article the question is asked, "What are the necessary and sufficient conditions to place on the sequence $\left\{ \varphi_n \right\}$ such that for any $f \in M_{\{\varphi n\}}^{(p)}$ the series (2) converges?"

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66. The Best Approximation for Differentiable Functions Discussed

"Concerning the Dimensionality of the Polyhedrons for the Best
Approximation of Differentiable Functions," by A. L. Garkavi;
Moscow, Izvestiya Akademii Nauk SSSR, Seriya Matematicheskaya,
Vol 23, No 1, Jan/Feb 59, pp 92-114

The problem concerning the best uniform approximation of s-time dif-
ferentiable functions by the means of a finite dimensional subspace belong-
ing to the manifold of these functions is investigated. Conditions are
derived which are necessary and sufficient for the dimensionality of the
polyhedron of the best approximation of any s-time differentiable func-
tion not to exceed the number r. In addition, inequalities are established
between the maximum dimensionalities of the indicated polyhedrons accord-
ing to the class of s-time differentiable functions and according to the
class of all continuous functions.

67. Estimation of a Trigonometric Sum

"Estimation of a Trigonometric Sum in Terms of Ordinary Numbers,"
by I. M. Vinogradov, Mathematics Institute imeni V. A. Steklov,
Academy of Sciences, USSR; Moscow, Izvestiya Akademii Nauk SSR,
Seriya Matematicheskaya, Vol 23, No 2 , Mar/Apr 59, pp 157-164

It is proved that a modification of the author's method of estimating
a trigonometric sum, presented in "A New . Estimate of the Function
ζ (1+it)," Izvestiya Akademii Nauk SSSR, Seriya Matematicheskaya, Vol 22,
1958, pp 161-164, may be applied during the consideration of trigonometric
sums in terms of ordinary numbers.

68. Functions With a Given Modulus of Continuity Approximated by Fourier
Series

"Approximation of Functions With a Given Modulus of Continuity
by Fourier Series," by A. V. Yefimov; Moscow, Izvestiya Akademii
Nauk SSSR, Seriya Matematicheskaya, Vol 23, No 1, Jan/Feb 59,
pp 115-134

An estimation from above is given of the deviations of a function by
its Fourier series for functions with a given modulus of smoothness and
an asymptotic exact estimate of such deviations is given for classes of
functions with a given majorant of the modulus of continuity.

69. Linear Difference Equations Having Linear Coefficients

"The Solution of Linear Difference Equations having Linear Co-
efficients," by M. A. Soldatov; Moscow, Matematicheskiy Sbornik,
Vol 47(89), No 2, Feb 59, pp 221-236

In the present work the question concerning analytical solutions of
the difference equation

$$(1) \quad M[y(x)] \equiv \sum_{k=0}^{m} (a_k x + b_k) \; y(x + h_k) = 0$$

is considered where x is a complex variable, a_k and b_k are constant coef-
ficients and h_k are real differences, for $0 = h_0 < h_1 < \ldots < h_m$. It is assumed
that $a_m = 0$ (in general $a_m = \ldots = a_{s+1} = 0$, $a_s \neq 0$), $a_0 \neq 0$. A. A. Miroly-
ubov in his paper, "Solution of One Class of Linear Differential Difference
Equations," Matematicheskiy Sbornik, Vol 34(76), 1954, pp 357-384, consid-
ered an equation of a more general form; namely,

$$\sum_{i=0}^{n} \sum_{k=0}^{m} (a_{ik} x + b_{ik}) \; y^{(i)}(x + h_k) = 0 \quad \text{under the conditions} \quad a_{nm} \neq 0 \quad \text{and}$$

$a_{n0} \neq 0$. Upon application to equation (1) these conditions imply that $a_m \neq 0$
and $a_0 \neq 0$. Under these conditions A. A. Mirolyubov proved that the system of elementary equa-
tions, constructed by A. F. Leont'yev, 'Differential Difference Equations Having Linear Coefficients,"
Trudy Gor'k. gos. ped. in-ta im. A. M. Gor'kiy, No 14, 1951, pp 3-30) is
complete in the class of analytical solutions of the indicated equation.
We consider the case when one of the coefficients a_m, a_0, for example, a_m,
is equal to zero. The case $a_0 = 0$, $a_m \neq 0$ is considered analogously to
the given case. In that case, the above mentioned system of elementary
equations, called elementary solutions of the first type by the author
are not complete. The author succeed in obtaining a system of new ele-
mentary equations, which he has called elementary solutions of the sec-
ond type, after which the augmented system of elementary equations is
complete.

70. Complete System of Internal-Homologous Invariants Found

"Algebraic Structure of Groups of Internal Homologies," by B.
G. Averbukh; Moscow, Doklady Akademii Nauk SSSR, Vol 125, No 1,
1 Mar 59, pp 11-14

A proof of the following theorem is given: the group D^k of internal
homologies does not contain any elements of order $p > 2$ for any k. It is
stated further that it follows directly from the theorems of Pontryagin
(Matem Sborn, 21(63), Vol 2, 1947, p 232), Thom (Comm Math Helv, 28, 1,
1954, p 17), Rokhlin (DAN, 119, No 5, 1958, p 876), and the present arti-
cle, that the characteristic numbers and residues of Pontryagin form a
complete system of internal-homologous invariants. This is restated as:
two manifolds are internal-homologous if, and only if, their characteris-
tic numbers and residues coincide.

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V. MEDICINE

Antibiotics

71. New Hemostatic-Antibiotic Preparation Made From Neutralized Oxy-Cellulose

"A Study of the Properties of a New Preparation Made From Neutralized Oxy-Cellulose," by S. K. Udalov, Military Medical Order of Lenin Academy imeni S. M. Kirov; Moscow, Khirurgiya, No 2, Feb 59, pp 115-117

The purpose of the present research was to study the properties a resorbable gauze made from neutralized oxy-cellulose, in the form of calcium or sodium salts in combination with antibiotics (streptomycin, gramicidin, penicillin, furacilin, and thrombin).

Tests were conducted on rats and rabbits. Effects on gram-positive and gram-negative microflora are discussed.

The author concludes that the gauze preparation made from neutralized calcium cellulose salts is a new preparation capable of being resorbed and can be combined with antibiotics for use in the initial surgical treatment of gun shot wounds.

72. Hydrophilic Polysiloxanes in the Fermentation of Antibiotics

"Investigation of Some Hydrophilic Polysiloxanes as Foam Extinguishers in the Fermentation of Antibiotics," by P. S. Zasypkina, O. P. Belozerova, L. V. Gornets, Ya. I. Mindlin, and K. A. Andrianov, All-Union Scientific Research Institute of Antibiotics; Moscow, Meditsinskaya Promyshlennost, Vol XIII, No 2, Feb 59, pp 27-32

A report is given on experiments conducted in the search for a hydrophilic substance which can be utilized as a foam extinguishing agent in the process of the biosynthesis of antibiotics. The vegetable and animal oils presently used as foam extinguishers represent a loss of hundreds of tons of valuable food a year. In their search for a substitute foam extinguisher, the authors were guided by the following prerequisites:

The foam extinguisher was to be a surface active substance with an energy greater than that of the foam.

The coefficient of its flow as to be sufficiently greater than that of the foam so that it rapidly effect the process of foam extinguishing.

It was to be minimally soluble in aqueous medium.

It was to be nontoxic to the producer of the antibiotic.

Methyl- and ethylpolysiloxane liquids with hydroxyl groups in the silicone atom were tested to determine their effectiveness as foam extinguishers in the fermentation of penicillin; liquid methylpolysiloxane with hydroxyl groups in the organic radical was tested for its effectiveness as a foam extinguishing agent in the fermentation of oxytetracycline. The experiments established the following:

Polysiloxanes when used in conjuction with foam extinguishers of vegetable origin permitted the normal accumulation of penicillin during the process of fermentation. The expenditure of the extinguisher was reduced 2-2.5 times.

Liquid polysiloxane when used as a foam extinguisher in the fermentation of oxytetracycline permitted the normal accumulation of the antibiotic, while reducing the expenditure of the extinguisher by 20 times (as compared with the expenditure of sunflower oil).

Bacteriology

73. Radioactive Anthrax Bacillus

"The Preparation of Radioactive Anthrax Bacillus," by M. M. Agababyan, Chair of Epizootology, Yerevan Zool-veterinary Institute; Yerevan, Izvestiya Akademii Nauk Armyanskoy SSR, Biologicheskiye i Sel'skokhozyaystvennyye Nauki, Vol 12, No 1, Jan 59, pp 69-73

This report describes the establishment of conditions under which highly radioactive anthrax Bacillus could be prepared. The objectives of the research were: (a) a search for a specific culture medium for culturing B. anthracis; (b) an explanation of the mechanism of absorption

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of radioactive sulfur depending on different concentrations of radioactive sulfur in the medium, and (c) the obtaining of maximum culture growth and an increase in the absorption of radioactive sulfur by anthrax Bacilli. Tagged sulfur in the form of methionin was used in the experiments, which are described in detail.

Since bacteria cultured on ordinary media containing nonradioactive sulfur will absorb only insignificant amounts of radioactive sulfur added to the medium, a medium which does not contain sulfur, or which contains only minimum amounts of it, was sought. The relative merits of different synthetic media tested are given. Glycerine-peptone agar was found to be the most suitable medium for culturing B. anthracis. The percentage of radioactive sulfur absorbed by the bacilli was then investigated. These results are shown in a table.

Vitamins B_6 and B_{12} were added to the medium to increase prolifera-tion of the bacteria and absorption of radioactive sulfur. A table summarizes the results of these experiments.

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

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"1. For culturing anthrax Bacilli, we succeeded in preparing a special culture medium which did not contain sulfur. This medium is glycerine-peptone agar.

"2. On culturing B. anthracis on glycerine-peptone agar which con-tains radioactive sulfur in the form of methionin, the Bacilli became labeled, since they absorbed radioactive sulfur.

"3. After increasing the concentration of radioactive substance, a proportional relationship in the medium was not observed with respect to an increase in the total percent of radioactive sulfur absorbed by the bacilli.

"4. The optimum concentration of radioactive sulfur in a culture medium for culturing B. anthracis is 5.5 microcuries per milliliter of medium.

"5. When added to a culture medium containing radioactive sulfur, vitamin B_6 increased the growth of the microbial bodies and correspond-ingly increased their radioactivity by 40%. On the addition of vitamin B_{12}, adsorption of sulfate was increased by 50%.

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"On simultaneous addition of vitamins B_6 and B_{12} to the culture medium, the radioactivity of the anthrax Bacilli was increased, in comparison with media without these vitamins, by 80%."

74. Effects of Physical and Chemical Agents on Ornithosis-Psittacosis Virus

"The Resistance of Ornithosis-Psittacosis Virus to the Action of Physicochemical Agents," by V. M. Bolotovskiy, Institute of Virology imeni D. I. Ivanovskiy; Moscow, Voprosy Virusologii, Vol 4, No 1, Jan/Feb 59, pp 63-67

To develop better disinfection methods in disease foci, the author studied the preservation of the ornithosis-psittacosis virus under various environmental conditions and its resistance to the action of a number of chemical and physical factors.

Strains B and Lori of the ornithosis-psittacosis virus, cultured in mouse brains and in chick embryos, were used in the experiments, which are described in detail. The virus was subjected to the action of water, milk, snow, varying temperatures, ultraviolet rays (from a PRK-7 lamp), a bactericidal lamp (BUV-15), and a number of chemical substances; results are shown in three tables.

The following conclusions are presented on the basis of these results:

"1. Under the experimental conditions described above, the ornithosis virus was found to be comparatively resistant and maintained its activity in tap water and well water for 17 days, in melted snow for 15 days, in snow under natural illumination for 18 days, in snow without light for 29 days, and in pasteurized milk for 23 days. Short-wave ultraviolet rays inactivated the virus in 3 minutes at a distance of one meter from the source. Long-wave rays did not inactivate the virus after 2-hour irradiation.

"2. Irradiation with short-wave ultraviolet rays can be recommended for disinfecting fine cotton fabric (linen) and objects which have not been subjected to thermal treatment or the action of a disinfecting agents.

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"3. We did not succeed in completely disinfecting woven wool fabric with ultraviolet rays.

"4. A 5% solution of lysol or a 5% solution of carbolic acid (exposure of at least 30 minutes), and also a 2% solution of chloramine (exposure of at least 3 hours) can be used for disinfecting areas, rooms, and isolation rooms in ornithosis foci."

75. Filterable Rickettsia prowazekii

"Filterable Forms of Rickettsia prowazekii," by V. I. Zhurbina, Tr. Mosk. N.-I. In-ta Vaktsin i Syvorotok (Works of the Moscow Scientific Research Institute of Vaccines and Sera), No 11, 1958, pp 287-306 (from Referativnyy Zhurnal--Biologiya No 5, 10 Mar 59, Abstract No 19364)

"A study of old, fresh, and spontaneously lysed Rickettsia by passage on chick embryos and guinea pigs showed the presence of filterable forms in all samples. The largest quantity of regenerated Rickettsia were observed in filtrates of fresh and spontaneously regenerated Rickettsia prepared on Martenovskiy bouillon, pH 8.0, which had been passed through a Seitz filter for 20 minutes at 20 mm of pressure. The morphology of the regenerated Rickettsia in chick embryos is characterized by acute polymorphism (bacilliform types are observed in isolated cases). Rickettsia variants regenerated from filtrates produce a weak general and a pronounced local reaction in guinea pigs; weakly expressed histological symptoms of typhus were established; Rickettsia variants have lost oxygen resistance, are slightly pathogenic for chick embryos and guinea pigs, have antigenic properties, and confer immunity in guinea pigs."

76. Combined Method of Culturing Rickettsia for Corpuscular Antigen

"A Combined Method (in vivo and in vitro) of Culturing Rickettsia Used in the Production of Corpuscular Antigen From Rickettsia burneti," by L. Shindarov, Acta Virol., Vol 2, No 1, 58, pp 62-64 (from Referativnyy Zhurnal--Biologiya, No 5, 10 Mar 59, Abstract No 19373, by P. L. S.)

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"Yolk sacs from chick embryos infected with Rickettsia burneti and R. conori, before the beginning of mass death of the embryos, were extracted, pulverized, and cultured in a liquid culture medium for 5 days. The average coefficient of yield of corpuscular antigen for R. burneti was 3.7, and for R. conori, 3.3 times greater than the yield of antigen cultured by the Koks method; the antigens did not differ in quality."

[Note: Acta Virol. may be a Russian publication; the usual indication of foreign origin is not given.]

77. Virulent Changes in R. mooseri

"The Possibility of Changes in R. mooseri as a Result of Prolonged Culture in Lice," by Ye. F. Epshteyn, Rikketsiozy (Rickettsioses), Leningrad, 1958, pp 79-85 (from Referativnyy Zhurnal--Biologiya, No 5, 10 Mar 59, Abstract No 19370, by P. L. Soliterman)

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"The process of adaptation of R. mooseri to lice infected with massive doses in the larval stage was traced through 14 passages. The author arrives at the conclusion that R. mooseri is adapted to the louse organism in proportion to the number of passages, and acquires virulence, causing the death of these insects at approximately the same rate as R. prowazekii. The study of the antigenic structure of a strain of R. mooseri passed through the louse organism in agglutination experiments with nonadsorbed and adsorbed immune sera showed that it was identical with the initial strain and differed from R. prowazekii. The experiments carried out do not substantiate the fact that R. mooseri altered in the process of passage through the louse organism are pathogens of secondary typhus."

Chemical, Biological, and Radiological Warfare

78. Combined Use of Chemical, Biological, and Radiological Agents

Organizatsiya Meditsinskogo Obespecheniya pri Massovykh
Porazheniyakh Naseleniya (The Organization of Medical Service
Following Mass Contamination of the Population), edited by
A. Ye. Minenko; Kiev, State Medical Publishing House of the
Ukrainian SSR, 1957, pp 265, 266

After a detailed discussion of biological warfare agents and princi-
ples and advantages of their dissemination in various forms, the follow-
ing paragraphs concerning the combined use of chemical, biological, and
CPYRGHT radiological weapons are presented:

"In surveying the problem of methods of employing a biological
weapon, the fact that one may anticipate combined methods of attack
cannot be ignored. The biological weapon permits very diverse combina-
tions. Above all, the combination of various biological agents which
in conjunction can bring about a more severe course of infection with
very high mortality is possible. In addition, the use of disease patho-
gens with different mechanisms of transmission, which renders the success
of the attack more probable, is possible. Finally, the combined use of
pathogens may cause the side being attacked to err, which leads to in-
effectiveness of the measures being taken, due to the difficulty of
diagnosis, etc. The effectiveness of the attack may thus increase sharply.

"The combined use of different species of microorganisms, evidently,
must always be kept in mind.

"However, the possibilities offered by the combined use of the bio-
logical weapon are not at all exhausted with these considerations. The
combination of biological agents with various toxic and radioactive sub-
stances, i.e., the combining of two or three different agents of mass
destruction, is feasible.

"Combination with chemical toxic substances may seek to facilitate
the penetration of microorganisms into the organism through tissues
which are being impaired by them. Naturally under these circumstances
the course of the infection, which is always more severe in persons
suffering with some other kind of affliction, will also be complicated.

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It is natural that the combination of one microorganism or another with toxic substances is possible only under conditions in which the latter do not act destructively on the microorganisms themselves.

"The combination of biological agents with radioactive substances is no less probable. Radioactive radiation, as recent investigations have shown, does not affect the growth, proliferation, or pathogenic character- istics of the pathogens of various infections. The microorganisms are cultured just as easily on media containing radioactive substances as on ordinary media. It has been proved that radioactive isotopes of chemical elements are assimilated by the microbial cell and enter into the composi- tion of the substances from which the microbial body is built, while not curtailing or altering its vital activity. At the same time, radioactive radiation vitally affects human and animal organisms. Independent of the method by which the organism is subjected to the action of radioactive substances, as a result of external irradiation or the ingestion of them, a sharp reduction in the activity of the natural defense mechanisms, and evidently their barrier functions above all, was noted. It has been ob- served that the most threatening complication of radiation sickness is the development of infection. Therefore, as a result of damage to barrier, and evidently phagocytic mechanisms, disease can be produced even by the ordinary intestinal microflora which are not pathogenic for the adult organism. With the presence, therefore, of pathogenic microorganisms in the immediate environment, infection can be expected to occur more rapidly. It is possible that a comparatively small degree of contamina- tion by effective radiation will be sufficient to allow pathogenic micro- organisms to penetrate the organism more easily.

"In addition to the fact that radiation sickness is accompanied by affection of the natural barrier mechanisms which impede the penetration of microorganisms into an organism, it almost completely paralyzes im- munological reactivity, as a result of which the organism loses the capacity to develop immunity. It has been experimentally proved that the introduction of vaccines to animals affected with radiation sickness causes absolutely no elaboration of antibodies and does not produce immunity in them. The possibility of infection of humans after the pene- tration of saprophytic microflora and a more severe disease course after infection with a pathogenic microorganism is facilitated by these very considerations.

"Such an action of radioactive radiations on the organism evidently precludes active immunization (vaccination) as a prophylactic measure in a focus subjected to the combined action of a biological and a radioactive weapon.

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"Thus, the combined use of pathogenic microorganisms and radioactive substances increases the effectiveness of both types of agents of mass destruction. Radioactive radiation facilitates the infection of humans, increases the severity of the disease course, and negates the efficacy of specific prophylaxis of infections. The pathogenic biological agent complicates the course of radiation sickness and thus augments the effectiveness of the radioactive weapon."

Forensic Medicine

79. Group Specificity of Human Hair

"On the Problem of Group Specificity of Human Hair," by R. G. Genbom and N. P. Korneyeva, Chair of Forensic Medicine of the Central Institute for the Advanced Training of Physicians, Moscow; Moscow, Sudebno-Meditsinskaya Ekspertiza, Vol 2, No 1, Jan-Mar 59, pp 11-14

Experiments were conducted by the authors to confirm the already established fact that human hair contains group specific substances which correspond to group specific substances of the blood. The experiments were conducted on hair obtained from cadavers and living persons. The hair was thoroughly washed, reduced to a powder, and placed in ether to remove fats and contaminating substances. An absorption method with sera was used to determine the group specificity of the hair. Simultaneously, an absorption reaction of dried blood taken from the same organism as that of the hair was carried out. Titration tests established the similarity between the group specific substances of the hair and the group specific substances of the blood.

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80. Methods of Establishing Hair Similarity

"Concerning Some Methods of Investigation of Hair Similarity
in Forensic Medicine Expertise," by A. N. Kishinevskiy, Chair
of Forensic Medicine, Second Moscow Medical Institute imeni
N. I. Pirogov; Moscow, Sudebno-Meditsinskaya Ekspertiza, Vol 2,
No 1, Jan-Mar 59, pp 14-19

Expert opinion on hair similarity or dissimilarity plays an im-
portant role in the exposure of many crimes and in the apprehension of
persons responsible for crimes. The morphological method of hair in-
vestigation, presently used, is not satisfactory, and in many cases
because of the inexperience of the experts reflects on the quality of
their testimony and diminishes its value.

New and more reliable methods of investigations of hair properties
have been developed. They are not yet being utilized in forensic medicine.
In these methods, light refraction by hair, hair sturdiness, and hair
elasticity are used as criteria in establishing hair similarity. The
investigations established that a difference of 0.0045 in the value of
light refraction between hairs makes it possible to conclude that the
hair does not belong to the same person; that a difference in excess
of 40 grams in the value of stress necessary for breaking hair excludes
the possibility of the hair belonging to the same person; however, at
least ten hairs from each subject should be tested to arrive at this
conclusion; regional origins may be determined by the study of the sturdi-
ness and elasticity of human hair.

Immunology and Therapy

81. Immunity Following Tularemia in Humans

"The Problem of Immunity Following Tularemia in Humans," by
V. P. Dzhanpoladova, Chair of Microbiology, Rostov-na-Donu
Medical Institute; Moscow, Zhurnal Mikrobiologii, Epidemiol-
CPYRGHT ogii i Immunobiologii, Vol 29, No 12, Dec 58, pp 106-107

"Workers of one of the meat preserving combines in the Transcaucasus
were observed for immunity to tularemia in accordance with a directive of
the Ministry of Health USSR. An outbreak of tularemia during mass
slaughter of sheep had been observed on this combine during the second

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half of October and the first half of November 1954. The source of infection was of a unique, occupational nature, the composition of the patients was uniform, and the outbreak arose on a limited territory. Clinical diagnosis was established by positive agglutination and allergy reactions, and in several cases by isolation of the tularemia pathogen. We succeeded in observing 60 persons who had recovered from tularemia. The form of tularemia was bubonic in the majority (42 persons). According to case histories of the disease, the serological reaction was negative in three out of four patients during the first 'decade' of the disease. From the second 'decade,' agglutinins were observed in the majority of patients (23 out of 26), and the titer was frequently high, and from the third and fourth 'decades,' there were no negative results. The allergic reaction in the first 'decade' of the disease was positive in 66.7% of the tularemia patients, and from the second 'decade' it reached 100%, while the agglutination reaction was positive in only 88.4% of the patients. The results of both reactions corresponded in almost 100% of the patients.

"To explain immunobiological shifts in a human organism which has recovered from tularemia, we used serological and allergic methods.

"A second investigation of the blood serum for the presence of agglutinins was made from 2 years, 8 months, and 22 days to 2 years, 9 months, and 28 days after the onset of the disease. We investigated 60 samples of blood with tularemia diagnosticum. In all but one case, the agglutination reaction was positive. The titer varied sharply: 1:10-1:25 in 14 persons, 1:40 in one, 1:50 in 17, 1:80 in 3, 1:100 in 16, 1:160 in 4, 1:200 in 2, and 1:400 in 2. Consequently, the titer reached diagnostic limits in 24 persons.

"The aforementioned data demonstrate specific reconstruction of the organism as a result of tularemia.

"Together with determination of the presence of agglutinins, we determined the allergic composition of the organism. Tularin was introduced intracutaneously in the amount of 0.1 ml. Fifty-six samples were collected from 2 years, 8 months, and 29 days to 2 years, 9 months, and 28 days after the onset of the disease. The reaction was positive in 51 persons (91.1%) and negative in only 5 (8.9%). The extent of the positive reaction varied. It was evaluated as plus 4 in 18 persons (32.1%), as plus 3 in 20 (35.8%), as plus 2 in 10 (17.9%), and as plus 1 in 3 (5.3%). Thus, in the majority of persons who had recovered from tularemia, the allergic reaction was sharply pronounced and was maintained for a long time.

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"After the intracutaneous introduction of tularin, a general reaction of the organism was observed; it was expressed by the appearance of lymphangitis (3 persons), elevation of temperature to 37.3--39.1° C (13 persons), enlargement and painfulness of regional lymph nodes, malaise, weakness, and headache. The introduction of tularin produced a general reaction of the organism in 23 persons (41%) in all.

"On comparison of the agglutination and allergic reaction in persons who had recovered from tularemia, it can be noted that in the majority of cases the extent to which both reactions were expressed corresponded, but there were some cases in which the allergic reaction (in 7 persons) was sharply pronounced (plus 3 or 4), while the agglutination titer was low (1:10-1:25), and conversely, indexes were observed when the allergic reaction (in 2 persons) was positive (plus one to plus 2), whereas the agglutinin titer reached diagnostic values (1:100-1:200); finally, the allergic test was negative in 4 persons (7.1%) when agglutinins were present (in low titers--1:10-1:25).

"On comparison of the data on agglutination reactions during the disease period (1954) with results obtained in the second investigation at a later time (1957), it was seen that agglutinins were preserved in the blood serum in the majority of persons (98.3%), but that the titers of these antibodies was decreased by 2-13 times. On comparison of the data on the allergic condition of the organism during the disease period (1954) with results obtained in the second investigation following tularemia (1957), it was seen that if the allergic condition of the organism was sharply pronounced in almost 100% in 1954, the allergic condition was decreased somewhat, and this reaction was absent in 8.9%. The data obtained thus indicate prolonged preservation of the allergic condition in the overwhelming majority of the persons we examined.

"Inasmuch as a positive allergic reaction was considered to be an indication of immunity, it can be concluded that there was stable immunity which was maintained for a long time in the majority of the persons we examined."

82. Therapy of Experimental Tularemia

"On the Application of Streptomycin in Combination With Other
Antibiotics in Experimental Tularemia," by Ye. M. Tsvetkova,
Tularemia Laboratory of the Division of Natural Foci of In-
fections, Institute of Epidemiology and Microbiology imeni
N. F. Gamaleya, Academy of Medical Sciences USSR; Moscow,
Antibiotiki, Vol IV, No 1, Jan-Feb 59, pp 104-106

Data on the effectiveness of streptomycin when used in combination
with ecmolin, chlortetracycline [biomycin], colimycin, oxytetracycline,
tetracycline, mycerin, and levomycetin in the therapy of experimental
tularemia. The experiments were carried out on white mice infected with
ten cells of a virulent strain of Bacillus tularense No 503/125. Therapy
of the animals began 1-2 hours after their infection. The course of
treatment continued for a period of 12 days. The 24-hour doses of one or
another combination of the antibiotics varied with the kind of drugs used
and the method of their application. The results of the experiments es-
tablished the following:

In experiments in vitro, the antibacterial action of streptomycin
against the tularemia microbe was enhanced when used in combination with
chlortetracycline, colimycin, mycerin, and particularly with levomycetin.

In experiments in vivo, streptomycin in doses of 5,000 units every
24 hours and chlortetracycline in doses of one milligram every 24 hours
administered subcutaneously for a period of 12 days were therapeutically
effective against tularemia in white mice.

The synergic action of streptomycin was particularly expressed when
used in combination with chlortetracycline and levomycetin. The combina-
tion of streptomycin with chlortetracycline and levomycetin is recommended
for clinical testing on humans.

83. Study of Antibody Formation by Conditional Reflex Method

"A Study of the Possibility of the Formation of Anti-Influenza
Antibody Formation in Rabbits by the Conditional Reflex Method,"
by T. F. Yanchenko and N. I. Nekrashevich: Gripp (Influenza),
Medgiz, 1958, pp 110-117 (from Referativnyy Zhurnal--Biologiya,
No 4, 25 February 59, Abstract No 14623)

CPYRGHT

"In certain rabbits, it is possible to obtain conditional reflex
formation of anti-influenza antibodies by the use of a buzzer as a con-
ditional stimulus for 30 minutes. A conditional reflex immunological
reaction was not obtained in rabbits after brief (10 seconds) use of
the buzzer. In rabbits it is also possible to produce a conditional
reflex from the exteroreceptors of the skin and nasal mucosae to the
development of anti-influenza antibodies by using $CaCl_2$ or hypertonic
NaCl solution as a conditional stimulus."

84. Therapy of Cutaneous and Venereal Diseases

"Innovations in the Therapy and Prophylaxis of Some Cutaneous
and Venereal Diseases," by Prof B. M. Pashkov (Moscow);
Moscow, Sovetskaya Meditsina, Vol XXIII, No 3, Mar 59,
pp 3-13

A brief account of the successes which have been achieved in recent
years in the therapy of a number of cutaneous and venereal diseases,
among them pemphigus, tuberculosis cutis, leprosy, gonorrhea, and others.
Pemphigus was one of the more serious diseases in the past. It resisted
all efforts at therapy and frequently terminated in the death of the
patients. Since 1950, when corticosteroid preparations began to be used
in the therapy of the diseases, many patients have returned to normal and
productive lives. Tuberculosis cutis, a disease which not so long ago
made invalids of many patients, is now successfully treated with isonic-
otinic acid, streptomycin, vitamin B_2, and other drugs.

Encouraging successes are being attained in the therapy and prophy-
laxis of leprosy. Leprosaria which in the past were known as camps of
death have been converted into therapeutic establishments where patients
receive modern treatment with the hope of eventually returning to their
families and a productive life. Soviet preparations used in the therapy
of leprosy are diaminodiphenylsulfone, sulfetron, and sulfatine (sulfone-3).
Antimalarial preparations are used in the therapy of lupus erythematosus,
a disease the etiology and pathogenesesis of which are not yet fully
known.

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Successes have been attained in the therapy of such cutaneous diseases as dermatitis herpetiformis which is treated with diamino-diphenylsulfones; pyoderma treated with antibiotics and immunobiological preparations; psoriasis treated with vitamin B_{12}; erythema exudativum treated with antibiotics; eczema, and allergy disease, treated with ganglioblocking and antihistamine drugs.

A method for treating syphilitic patients with a combination of penicillin and artificially induced high temperature has been developed. The patients are administered 40,000 units of penicillin every 3 hours until they receive a total of 3.4 million units. Simultaneously they are subjected to high temperature therapy. As yet, however, the mass application of this method of therapy is not advisable because of the large number of contraindications.

Greater successes have been achieved in the therapy of gonorrhea with combinations of two antibiotics: penicillin and streptomycin, penicillin and biomycin, and penicillin and levomycin. The successes in the therapy of gonorrhea have been marred somewhat by the large number of postgonorrheal urethritis cases. Various methods are suggested for the therapy of this disease.

It should be noted, the author writes in conclusion, that soft chancre, at one time a widespread affection, has been completely eradicated in the USSR.

85. Gonorrhea Therapy

"Synthomycin in the Therapy of Gonorrhea in Males," by V. K. Kichikyan, Tr. Karagandinsk. med. in-ta (Works of the Karaganda Medical Institute), 1957, 1, No 5, 349-351 (from Referativnyy Zhurnal--Biologiya, No 6, 25 Mar 59, Abstract No.27922)

CPYRGHT

"Synthomycin is an effective drug in the control of gonorrheal infections, including forms of the disease resistant to sulpho-penicillin therapy. Observations were carried out on 25 patients."

<u>Oncology</u>

86. <u>Tumors Induced by 9,10-dimethyl, 1,2-benzanthracene</u>

"Experimental Tumors Induced by 9,10-dimethyl, 1,2-benzan-
thracene in the Steppe-Lemming," by N. I. Bolonina, Lab-
oratory of Tumor Strains, Etiology Division of the Insti-
tute of Experimental Pathology and Cancer Therapy;
Moscow-Leningrad, <u>Voprosy Onkologii</u>, Vol V, No 3, 1959,
pp 348-351

Lemmings were used in experiments conducted to determine the sensi-
tivity of the skin, digestive tract, and other organs of the body to the
cancerogenic action of 9,10-dimethyl, 1,2-benzanthracene [DMBA]. Skin
susceptibility to cancer was tested by the direct application of a 0.5-
percent solution of DMBA in benzene directly to the skin. Malignant
tumors developed in 90 percent of the animals. Papilloma developed in
all the experimental lemmings.

The sensitivity of the submaxillary gland to the cancerogenic effect
of DMBA was determined by the injection of a one-percent solution of the
chemical in peach oil into the skin of the surgically isolated gland.
Tumors developed in 84.6 percent of the animals.

The susceptibility of the digestive tract of the animals to the
cancerogenic effect of DMBA was tested by the administration of 0.5
percent of the solution of DMBA in peach oil per os. Sarcomas developed
at various sites in 28.6 percent of the animals, although none appeared
in the stomach.

The data obtained in the experiments disclosed that lemmings are
susceptible to the cancerogenic   on of DMBA when the latter is admin-
istered in various doses and by different methods.

The data also revealed that lemmings differ somewhat from rats and
mice in their sensitivity to the cancerogenic action of DMBA. It is
practically impossible to develop skin carcinoma in rats by the applica-
tion of DMBA, although sarcomas of other sites rapidly develop in the
animals. On the other hand, lemmings develop sarcomas of the skin and
other sites, and are similar to mice in this respect. Lemmings, however,
differ from mice in the resistance of their stomachs to the action of
DMBA.

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87. <u>Inhibition of the Growth of Ehrlich's Ascitic Tumor</u>

"Effect of Immunospecific Serum on the Growth of Ehrlich's Ascitic Tumor," by Z. I. Rovnova, Institute of Virology imeni Ivanovskiy, Academy of Medical Sciences USSR; Moscow-Leningrad, <u>Vorposy Onkologii</u>, Vol V, No 3, 1959, pp 332-337

Experiments were carried out on white mice to determine the effectiveness of immunospecific serum when used for the control of the growth of Ehrlich's ascitic tumor. Tumors were induced in the animals by the intraperitoneal administration of 0.1 milliliter of ascitic fluid. Immune sera were obtained from rabbits immunized for a period of 4 weeks. The specific antitumor serum was administered to the mice in different dilutions and in different doses. The experiments established that the specific antitumor serum inhibited the growth of the tumors when administered either whole or in dilutions of 1:10; when administered in small doses and in dilutions of 1:60 it not only failed to inhibit the growth of the tumors, but on the contrary, stimulated their growth. This must be taken into consideration when serotherapy of malignant tumors is undertaken.

88. <u>Effect of Cancer on the Nerve Plexuses of the Esophagus</u>

"Pathohistological Modifications of the Nerve Plexuses in the Walls of the Esophagus Following Its Affection by Cancer. Condition of the Nerve Elements in a Malignant Tumor of the Esophagus," by V. I. Zak, <u>Tr. Chkalovskovo med. in-ta</u> (Works of the Chkalov Medical Institute), 1956, No 5, 277-292 (from <u>Referativnyy Zhurnal--Biologiya</u>, No 6, 25 Mar 59, Abstract No 27453, by Ye. A. Skvirskaya)

CPYRGHT

"Histological examinations were made of the entire esophagus wall above and below the tumors in 17 cases, and of the tumor tissue itself in 14 cases. The nerve formations of the wall of the esophagus around the tumor exhibited symptoms of irritability, regeneration, and destruction which diminished as the distance from the tumor increased. Regenerating nerve formations were found together with pre-existing nerve formations in the tumor tissue. It is emphasized that large numbers of viable nerve cells and fibers are retained in all areas of the esophagus. The changes which were observed are regarded by the author as reflex trophic disturbances."

89. Chemical Compounds Inhibiting and Stimulating P^{32} Absorption by Cancerous Tissues

"Absorption of Phosphorus-32 by Heteroplastic Transplants of Infiltrating Cancer of the Mammary Glands in Animals Treated With Triethylenemelamine, Aminopterin, and Folliculin," by I. Petrya, Al. Bojinescu, E. Cioranescu, and D. Rosner, Studii si Cercetari Endocrinol. Acad. RPR, 1957, 8, No 4, 467-469 (Rumanian); (from Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 1, 10 Jan 59, Abstract No 586)

CPYRGHT

"Rats with tumor transplants were subjected to therapy by triethylenemelamine, aminopterin, and folliculin; P^{32} was then administered to them. Results showed a slight decrease in P^{32} absorption due to triethylenemelamine, a 50% decrease in absorption due to aminopterin, and stimulation of P^{32} absorption due to the effect of folliculin."

90. Review of Monograph on Cancer and Adenoma of the Lungs

'Lungenkarzionom und Lungenadenom (Cancer and Adenoma of the Lungs), by Joseph Balo, Akademie der Wissenschaften, Budapest, 1957, 363 pp, reviewed by Prof S. S. Wayl; Moscow, Voprosy Onkologii, Vol V, No 2, 1959, pp 244-245

The monograph by Professor Balo is on the origin and morphology of pulmonary cancer, based on personal observations, experimental investigations, and literary data. The book opens with a brief introduction, followed by 14 chapters, and a conclusion. The first nine chapters deal with the problem of pulmonary cancer; five chapters are devoted to the problem of pulmonary adenoma.

In the first six chapters of the book the author discusses the pathological anatomy of primary cancer and the pathological histology and histogenesis of pulmonary cancer. In Chapter VII the author deals with the problem of the etiology of the disease. The concrete etiological factors responsible for the development of the diseases are taken up in detail. Literary, clinical, and experimental data are presented. In the author's opinion, smoking may play an important role in the development of pulmonary cancer, but only if the proper predisposition for the development of the disease already exists in the organism. In rabbits, for instance, the factor which contributes to the cancerogenic action of

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nicotine is the administration of cholesterine to the animals with food. In Chapters VIII and IX the author describes the initial manifestations of pulmonary cancer and the precancerous modifications which take place in the lungs.

The second part of the book is devoted to the problem of pulmonary adenoma. Chapters X, XI, and XII describe the various forms of adenoma. In Chapters XIII and XIV the author reports on experimental adenomas induced in mice. Chapter XV, the concluding chapter of the monograph, is a summation of the material and data presented in the preceding 14 chapters. The book is well illustrated.

In a brief appendix the author calls attention to the necessity for the careful cytological diagnosis of tumors. A table of contents is at the end of the book. In discussing the problems of the origin of pulmonary cancer and adenoma, the author stresses the role which pharmacological irritants and hormone preparations play in the development of the disease. The monograph by Balo, the reviewer writes in conclusion, is a valuable work and will be of great interest to clinicians and morphologists.

Pharmacology and Toxicology

91. Effect of Pacatal on Chiasmal Circulation

"On the Central and Peripheral Action of pacatal (N-
methylpiperidyl-3-methylphenothiazine) in Experiments With
Chiasmal Blood Circulation," by A. Kovach, H. Kleinsorge,
P. Roheim, M. Iranyi, and K. Rosner, Kiserl. orvostud.
(Hungary), 1958, 10, 2-3, 271-278 (from Referativnyy Zhurnal --

Biologiya, No 6, 25 Mar 59, Abstract No 27717, by the author)

"By applying the chiasmal circulation method to anesthesized dogs it
was found that pacatal, when introduced into cerebral circulation, produces
a rise in blood pressure; it lowers blood pressure when introduced into the
body blood flow. When introduced into the cerebral circulation in conjunc-
tion with adrenalin, pacatal depresses the effect of adrenalin; when adren-
alin is introduced into the cerebral circulation and pacatal is introduced
into the body blood flow alone, the peripheral reactions to adrenalin are
depressed, and, on the contrary, the central administration of pacatal de-
presses only those peripheral reactions to adrenalin which are related to
the cerebral circulation. The peripheral administration of pacatal has a
distinctly inhibiting effect on only the peripheral reactions caused by the
injection of adrenalin into the body blood flow. The influence of pacatal
on the effects produced by acetylcholine are less pronounced than those on
the effects caused by adrenalin. Pacatal depresses the action of lobeline
only when both preparations are introduced into the same half of the body.
Pacatal depresses sinus reflexes only when it is introduced into the body
blood flow. In the author's opinion, the above-described effects of pacatal
cannot be ascribed to its sympatholytic properties alone."

92. Derivation of 4,4'-Diaminodiphenylsulfone

"New Method of Derivation of 4,4'-Diaminodiphenylsulfone," by
V. A. Zasosov, Ye. I. Metelkova, and M. I. Galchenko, All-Union
Scientific Research Chemicopharmaceutical Institute imeni S.
Ordzhonikidze and Institute of Pharmacology and Chemotherapy
of Academy of Medical Sciences USSR; Moscow, Meditsinskaya
Promyshlennost, Vol XIII, No 2, Feb 59, pp 18-20

Describes new method of derivation of 4,4'-diaminodiphenylsulfone prep-
arations. These preparations form a series of highly valuable chemicophar-
maceutical remedies which, despite their being closely related to sulfanil-
amides, are important in themselves because of their specific activity
against pathogenic microorganisms which are resistant to sulfanilamides.
Preparations of this group which are now being manufactured in the USSR are
as follows:

1. 4,4'-diaminodiphenylsulfone (DDS).

2. Solyusulfone -- a product of the condensation of DDS with cinnamic aldehyde and sodium bisulfate.

3. Sulphatine -- a product of the condensation of DDS with opianic acid. The three above-mentioned preparations are used in the therapy of leprosy.

4. Sulfodiamine -- 4,4'-diacetyldiaminodiphenylsulfone, an effective remedy in the therapy of gas gangrene and in the therapy and prophylaxis of pertussis.

5. Sulfomethin -- a polymer of the product of condensation of DDS and p-dimethlamino benzaldenhyde. An active remedy in the therapy of bone tuberculosis.

The new method of derivation of the preparations is technologically simple, economical, and highly productive.

93. Effect of Organophosphorus Compounds on Fungi

"Investigation of the Fungistatic and Fungicidal Properties of Various Chemical Compounds. Report 1. Effect of Organophosphorus Compounds No 36 and No 45 on Dermatophytes," by A. P. Vitorskiy, Sb. nauchn, rabot belorussk. n.-i Kozhno-venerol. In-t (Collection of Scientific Works of the Belorussian Scientific Research Dermato-Venereological Institute), 1957, 5, 319-321 (from Referativnyy Zhurnal -- Biologiya, No 6, 25 Mar 59, Abstract No 27886, by the author)

CPYRGHT

"Organophosphorus compounds No 36 and 45 when diluted 1:2,000 or greater possess no fungicidal properties in relation to Tr. gipseum. Preparation No 36 is fungistatic to Tr. violaceum in dilutions of 1:3,000 or less, while preparation No 45 is fungistatic to Tr. violaceum in dilutions of 1:2,000 and less."

94. Effect of Aminazine on Protein Metabolism

"Effect of Aminazine on the Protein Metabolism of Cerebral and Hepatic Tissues," by L. V. Mitina, Uch. zap. 2-y Mosk. med. in-t (Scientific Notes of the Second Moscow Medical Institute), 1957, 6, 53-58 (from Referativnyy Zhurnal -- Biologiya, No 6, 25 Mar 59, Abstract No 27695, by V. I. Rozengart)

CPYRGHT

"A single administration of aminazine to rats in a dose of 10-30 milligrams per kilogram body weight, as well as repeated daily administrations of the drug in doses of 10-20 milligrams per kilogram body weight for a period of 10 days had no effect on the rapidity with which S^{35} of methionine was absorbed by cerebral and hepatic proteins. Only when aminazine was administered in a dose of 10 milligrams per kilogram body weight was there a slight rise in the intensity (from 885 to 804 [sic] per minute) of the restoration of proteins in the liver noted within 1 1/2 hours. Under the same conditions the residual nitrogen content increased in the liver (from 246 to 281 milligram %), and a rise in the autolytic activity (from 5.49 to 6.07) occurred."

95. Blocking of Autonomic Nerve Ganglia

"Concerning New Chemical Compounds Which Block the Action of Autonomic Nerve Ganglia," by B. Bobranski and T. Jakobiec, Dissert. pharmac. PAN, (Poland), 1956, 8, No 4, 249-255 (from Referativnyy Zhurnal -- Biologiya, No 6, 25 Mar 59, Abstract No 27769, by I. V. Sanotskiy)

CPYRGHT

"Bis-quaternary nitrogen compounds of the pendiomid type are obtained by heating methyl-bis(beta-bromethyl)-amine with tertiary amines. Compounds containing diethylethyl amine, N-methyl-piperidine, N-methyl morpholine, and N-methy pyrrolidine groups produce the best therapeutic effects; their action is close to that of pendiomid, but without side effect (tachyphylaxis). Bibliography -- 16 references."

96. Chemical Structure of Tranquilizers in Relation to Blood Coagulation

"Relationship Between the Chemical Structure of Phenothiazine Derivatives and Their Effect on Blood Coagulation," by M. M. Nikolayeva and S. I. Zolotukhin, Sb. nauchn. rabot Mosk. Pharmatsevt. in-t (Collection of Scientific Works of the Moscow Pharmaceutical Institute), 1957, 1, 313-317 (from Referativnyy Zhurnal -- Biologiya, No 6, 25 Mar 59, Abstract No 27687)

CPYRGHT

"Blood coagulation and prothrombin time were determined in rabbits are half, one, and 2 hours after the administration of the following phenothiazine derivatives: melazine (I), aminazine (II), diparcol (III), T-020 (IV),

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G-015 (V), and etizine (VI). The preparations were administered in doses of 10 milligrams per kilogram body weight. The experiments have shown that I, II, and VI prolong the period of blood coagulation; that V and VI in particular accelerate blood coagulation. III retards blood coagulation during the first hour, but accelerates it within 2 hours. None of the preparations had any effect on prothrombin time."

Physiology

97. Experimental Subjects Adapt Rapidly to Vibration

"Evaluation of the Vibration Factor of the MI-4 Helicopter on Health," by Candidate of Medical Sciences N. N. Gurovskiy, Central Institute for Advanced Training of Physicians, Gigiyena i Sanitariya, No 3, Mar 59, pp 27-33

The author of this article states that results of his experiments on white rats, dogs, and humans indicate the ability of the living organism to adapt itself rapidly to vibration on the MI-4 helicopter and provide sufficient ground to believe that the existing parameters of vibration of the MI-4 helicopter are permissible. Vibration frequency of 45 cycles and amplitude of 0.3 millimeter, lasting 1 1/2 hours, is a powerful irritant that inhibits the nervous system of animals and humans. Such an irritant approximates the highest frequency limits experienced on a helicopter. The initial effect of vibration was found to consist of considerable changes in the conditioned motor reflexes and in the general behavior of the 20 white rats and 4 dogs used in the experiments. Pronounced changes in the latent period of the response motor reaction were also noted in 36 humans who were exposed repeatedly to the above-mentioned vibrations, under laboratory and actual flight conditions. Repeated exposure resulted in rapid adaption to the effects of vibration in both the animal and the human subjects.

98. Seasonal and Diurnal Fluctuations in White Blood Cells Linked to the Function of the Cerebral Cortex

"Seasonal and Diurnal Fluctuations in White Blood Cells of Lower Primates," by M. I. Kuksova, Laboratory of Biology of the Sukhumi Medicobiological Station, Academy of Medical Sciences USSR; Moscow, Zhurnal Obshchey Biologii, Vol 20, No 1, Jan-Feb 59, pp 73-80

Tests were conducted on 15 monkeys (10 months to 4 years old). Tests included a count of the seasonal fluctuations in total leukocyte number, determined three times monthly all through the year; and the effect of altering feeding and illumination by reversing the day-night cycle. Results are presented in graphs and tables.

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Results indicate that reversing the day-night cycles inverts the curves of the total white blood count and differential indexes. However, a month is required to establish the new rhythm. This new rhythm is attributed to the formation of new temporary links in the cerebral cortex.

99. Effect of High Temperature on the Organism

"Modification of Some Biochemical Processes in the Organism Caused by the Action of High Air Temperature," by G. Kh. Shakhbazyan, Corresponding Member, Academy of Medical Sciences USSR, and F. M. Shleyfman, Candidate of Medical Sciences, Kiev Institute of Labor Hygiene and Occupational Diseases; Gigiyena i Sanitariya, Vol 24, No 1, Jan 59, pp 30-35

Investigations were conducted on rabbits to determine the effect of high temperature on the organism. The animals were exposed to a temperature of 40 degrees 3 hours daily for a period of 4 weeks. Body and skin temperatures, frequency of respiration, and the weight of the aminals were determined before and after their exposure to the high temperature. The alkalinity and sugar content of the blood were established every 5 days. The investigations disclosed that the daily 3-hour exposure of the rabbits to a temperature of 40 degrees produced a sharp decline in the alkalinity of the plasma, a drop in the alkaline reserves of the blood, and a decrease in the blood sugar content; that the indicated modifications continued for some time after the experiment was terminated, a fact which points to the protracted effect of exposure to high temperature on the organism; that in the solution of the problems which bear on microclimatic conditions, it is necessary to take into consideration changes in the metabolic processes caused by these conditions.

100. Cholinesterase Activity of Contractile Muscle Protein

"Concerning the Cholinesterase Activity of Contractile Protein (Properties and Physiological Role)," by E. Varga, Physiological Institute of the Medical University, Debrecen, Hungary; Moscow, Zhurnal Obshchey Biologii, Vol 20, No 1, Jan/Feb 59, pp 3-15

The purpose of the present research was to verify whether the myosin molecule possesses the capacity to split acetylcholine.

The author reviews pertinent literature and cites personal data on cholinesterase activity and myosin content found in rabbit muscle under normal conditions and after denervation; cholinesterase activity in muscle, and muscle sensitivity to acetylcholine after denervation; changes in cholinesterase activity in striated rabbit muscle sections during the first few weeks of postnatal life; and finally, changes in myosin-cholinesterase and adenosintriphosphatase activity in rabbit muscles sections during the first few weeks of life.

The author makes the following conclusions:

"1. Myosin, or more accurately L-meromyosin -- i.e., the component of the myosin molecule -- which, until now, has been considered enzymatically inactive, possesses cholinesterase activity. Our observations allow us to suggest that the cholinesterase activity of myosin is not due to charging, but is the property of the myosin molecule itself.

"2. In normal skeletal muscles of rabbits and of dogs, the myosin-cholinesterase activity, on the average, comprises half of the total cholinesterase activity.

"3. In tetanic muscles which have tonic characteristics during early stages of ontogenesis, and under dedifferentiation conditions after denervation, the specific activity of myosin-cholinesterase is significantly increased.

"4. The myosin of tonic muscles is characterized by the high cholinesterase activity, low adenosintriphosphatase activity, and decreased capacity to combine actively. Due to the increased activity of myosin-cholinesterase, there is simultaneous decrease, to the same degree, in adenosintriphosphatase activity.

"5. Tonic muscles, which possess high myosin-cholinesterase activity and low adenosintriphosphatase activity, are sensitive to acetylcholine and do not react to adenosintriphosphate. In contrast to this, tetanic muscles with high adenosintriphosphatase activity and low myosin-cholinesterase activity contract due to the effect of adenosintriphosphate, and are significantly less sensitive to acetylcholine."

Public Health and Sanitation

101. Allowable Maximum Concentration of HCl Aerosols in the Air

"Data Concerning the Determination of the Threshhold of the Allowable Maximum Concentration of Hydrochloric Acid (Hydrogen Chloride) Aerosols in Atmospheric Air," by Aspirant Ye. V. Yelfimova, Moscow Scientific Research Institute of Sanitation and Hygiene; Moscow, Gigiyena i Sanitariya, Vol 24, No 1, Jan 59, pp 13-20

Report on methods and results of experimental investigations conducted to determine the threshold of allowable maximum concentration of HCl aerosols in the air and the degree of air contamination by HCl aerosols in shops where the chemical is used in the production of titanium, magnesium, silico-organic compounds, explosives, paints, and other products. Air samples were collected at the rate of one liter per minute in V-shaped vessels made from molybdenum glass and filled with freshly prepared distilled water. The vessels were equipped with No 1 glass filters.

The investigations established that the threshold of maximum tolerance for the concentration of HCl aerosols in the air by the olfactory senses was 0.1-0.2 milligrams per cubic meter of air; for optic chronaxy,-0.6 milligram per cubic meter of air; for eye sensitivity to light,-0.2 milligram per cubic meter of air; for vascular reaction, 0.5 milligram per cubic meter of air; for respiration, 0.1-0.2 milligrams per cubic meter of air.

On the basis of the data obtained, it is recommended that the allowable maximum concentration of HCl aerosols in the air be established at 0.05 milligram per cubic meter of air; that further study be conducted on the allowable concentration of HCl aerosols in the air of shops, that in the construction of new plants steps be taken to equip the buildings with special gas and air purifiers, and that other sanitation and hygiene measures be taken to protect workers from the harmful effects of air pollution.

Radiology

102. Quantitative and Qualitative Changes in Ovarian Tissue due to Chronic Gamma Irradiation

"The Effect of Chronic Gamma Irradiation on Mouse Ovaries," by Ye. N. Kapylova, Institute of Genetics, Academy of Sciences USSR; Moscow. Izvestiya Akademii Nauk SSR, Seriya Biologicheskaya, No 5; Sep/Oct 58, pp 592-596

The aim of this research was to study quantitative and qualitative changes in the follicular apparatus and in other tissues of ovaries which were subjected to the chronic effects of small doses of ionizing radiation.

Tables and photomicrographs accompany the article.

Results indicate the following:

Chronic irradiation by small doses of gamma rays (0.05, 0.1, 0.2, and 0.4 r) caused a quantitative decrease in all follicle groups (16.38, 17.83, 18.07, and 40.0 %, respectively). Degenerative changes were most intense in the ovarian tissue and in the follicles subjected to the largest dose, i.e., 0.4 r daily dose.

Despite significant tissue injury to many ovaries, they still contained a small number of cavities with the primordial follicles preserving their normal structure.

Chronic irradiation exerted no effect on the formation of ovarian tumors, although proliferation processes in the healthy epithelium and luteal stroma were evident.

Chronic irradiation, using the above-mentioned small daily doses, had no effect on body weight in general or on the weight of the ovaries in particular.

103. Radiation Damage to Hepatic Tissue

"Concerning Changes in the Liver due to Radiation Injury,"
by Ye. A. Moiseyev, Izv. Yestestv.-Nauchn. In-ta im P. F.
Lasgafta (Izvestiya of Natural Sciences Institute imeni P. F.
Lasgaft), 1957, 28, 169-175; (from Referativnyy Zhurnal --
CPYRGHT   Biologiya, No 16, 25 Sep 58, pp 419-420, Abstract No 75282)

"Guinea pigs were subjected for 1-3 hours to general irradiation by
gamma rays from cobalt-60 in doses ranging from 240 to 700 r. By using
pathological, anatomical, and histological tests, sharp changes could be
noted in the liver beginning on the 10th day after irradiation. The liver
had a light yellow color or a pale grayish clay color. In the central por-
tion of the hepatic lobules, it was possible to observe lipoidosis, necrosis
of hepatic cells, the presence of fine hemorrhages in hepatic tissue, and
the complete absence of glycogen. Changes in the liver did not depend on
the radiation dose. Essentially, the changes noted in externally healthy
animals on the 23d day were the same as those observed on the 10-15th day.
In five animals which either died or were sacrificed during the 200-203-
day period after irradiation, it was noted that the liver was saturated with
yellow, was almost completely devoid of glycogen, and showed sharp changes
in the structure of the hepatic tissue and in individual cells. It is
thought that the cause of death during this period is changes in the liver."

104. Gamma Radiation Effects on Hepatic Phosphatase Activity

"Hepatic Phosphatase After Intravenous Gamma Radiation," by
S. Z. Tepikina, Tr. Stalinabadsk. Med. In-ta (Works of the
Stalinabad Medical Institute), 1957, 27, 59-61; (from Ref-
erativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 1,
10 Jan 59, p 71, Abstract No 591)
CPYRGHT

"Daily doses of 25-45 microcuries of Fe^{59} were introduced into rats for
a period of 6 days and the liver homogenates were tested for hepatic phos-
phatase activity. Results showed acid phosphatase activity decreased by a
factor of 2.8, and alkaline phosphatase activity increased by a factor of
1.3 as compared with the controls."

105. X-Ray Irradiation Effects on Albumin and Globulin Fractions of Serum Proteins

"Determination of the Blood Serum Protein Fractions of Irradiated Animals Using The Paper Electrophoresis Method" (Preliminary Report), by S. G. Shukurin, Vopr. Rentgenol, i Onkol. (Problems of Roentgenology and Oncology), Vol 2; Yerevan, 1957, 235-239 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 1, 10 Jan 59, p 72, Abstract No 596)

CPYRGHT

"By using paper electrophoresis, it was shown that 24 hours after the X-ray irradiation of rabbits the blood albumin fraction was decreased, while the globulin fraction increased. Changes in alpha- and beta-globulins were insignificant, but the gamma-globulin fraction was significantly increased. Total protein level remained almost unchanged."

106. Comparative Evaluation of the Effect of Ionizing Radiation and Benzene Poisoning on Hemopoiesis

"A Comparative Evaluation of the Effect of Ionizing Radiation and Benzene on Bone Marrow Hemopoiesis in Rabbits," by L. S. Musikhin, Chair of Faculty Therapy of No 2 Military Medical Order of Lenin Academy imeni S. M. Kirov; Moscow, Problemy Gematologii i Perelivaniya Krovi, Vol 4, No 2, Feb 59, pp 32-34

The aim of this research was to investigate the quantitative and qualitative changes occurring in the peripheral blood and bone marrow due to the effect of beta- and gamma-radiation from P^{32} and Co^{60}, respectively, and to compare these changes with those produced by benzene poisoning with respect to leukopenia.

Tests were conducted on 86 rabbits irradiated by a 600 r dose of gamma rays, or 0.5, 1.0, or 1.5 millicurie dose of beta rays/kg, and the results were compared with data on animals subjected to a daily dose of one ml of benzene/kg body weight for 5-7 days. A table presents a differential study of various blood components.

Small and medium doses of beta radiation were found to selectively suppress the myeloid blood-forming elements of bone marrow, but large doses suppressed both the erythroblastic and myeloid elements. Gamma radiation suppressed both the erythroblastic and myeloid blood-forming elements. Benzene poisoning-presented a different picture in the bone marrow. While changes in the peripheral blood at the peak of benzene injury resemble those due to large radiation doses from P^{32}, in the bone marrow, from the very beginning there is a tendency toward general hypoplasia of the hemopoietic tissue and the erythroblastic elements are suppressed sooner and to a significantly greater degree than the myeloid elements. At the height of leukopenia development, the bone marrow seems devastated and bears signs of panmyelophthisis.

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"Leukocyte stability in the peripheral blood under leukopenia condi-
tions caused by radioactive phosphorus and benzene poisoning is decreased.
However, this decrease in stability, despite the use of large doses of P^{32},
is insignificantly expressed, and differs only slightly from the average
stability of the leukocytes of healthy animals. Of all the leukocytes, the
least stable were the lymphocytes: a condition which resembles lymphopenia
developing due to the effect of beta radiation."

107. Glucose Tolerance Curve in Irradiated Animals

"Concerning the Problem of the Reactivity of Organisms After
Total X-Ray Irradiation (Data From a Study of Carbohydrate
Metabolism)", by S. A. Akopyan and T. G. Arutyunyan, Vopr.
Rentgenol. i Onkol. (Problems of Roentgenology and Oncology),
Vol 2, Yerevan, 1957, 201-209 (from Referativnyy Zhurnal --

Khimiya, Biologicheskaya Khimiya, No 1, 10 Jan 59, p 72, Abstract
No 597)

"The administration of insulin in small amounts (0.5 unit/kg body
weight) to rabbits caused a sharp decrease in the blood sugar level during
the entire experimental period. Furthermore, the introduction of insulin
increased the susceptibility of animals to irradiation and shortened their
life span. The administration of adrenalin did not increase the sensitivity
of animals to irradiation. The administration of adrenalin to irradiated
animals (small doses) increased their blood sugar level. The administra-
tion of large doses of adrenalin caused some decrease in blood sugar level
initially (for the first 15 minutes after its injection) but then blood
sugar level rose. The subcutaneous injection of a 40% solution of glucose
at rate of 3 mg/kg body weight to irradiated rabbits did not produce any
sharp or rapid peak in the hyperglycemic curve (as occurs in non-irradiated
animals); maximum blood sugar content was noted within 2-3 hours, as com-
pared with 60-120 minutes in nonirradiated animals. The hyperglycemic
coefficient in the experimental rabbits was 2.27-3.58, as compared with
3.22-3.62 in control animals. Return to normal was speedier in irradiated
animals."

108. Effect of Polyphosphates on Distribution and Elimination of Ce^{144}

"The Effect of Polyphosphates on the Distribution of Ce^{144},"
by Yu. I. Moskalev, Moscow, Meditsinskaya Radiologiya, Vol 4,
No 1, Jan 59, pp 65-72

The aim of this research was to discover methods of accelerating
elimination of radioactive emitters from organisms by the use of complex
forming compounds. Hexametaphosphate (HMP), which is a complex forming
compound, speeds the elimination of lanthanum, yttrium, cerium, and
strontium.

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Tests were conducted on 110 rats. Various tables present the distribution and elimination of Ce^{144} combined with different phosphates.

The author makes the following conclusions:

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"1. The intravenous administration of HMP immediately after the intravenous administration of radioactive Ce^{144} lowers the content of radioactive Ce^{144} in rat liver (from 38.7 to 5.4%), and in the skeleton (from 12.4 to 7.2%), and sharply increases its excretion in the urine (from 1.2 to 40.7%), and to a lesser degree in the feces (from 2.3 to 10%).

"2. Peroral administration of HMP immediately after either the intravenous or intraperitoneal administration of Ce^{144} decreases the content of Ce^{144} in the essential organs (liver and skeleton) by a factor of 1.6-2.1 as compared with the controls.

"3. The effectiveness of HMP administered perorally within the known limits is proportional to the dose. Optimum peroral dose for HMP ranges between 100 and 200 mg for the rat.

"4. The delayed use of HMP (6 hours, and 1-2 days later) has no effect on the total content of Ce^{144} in the organs; it decreases Ce^{144} in the liver (by 4-7%), but increases its content in the skeleton (by 2-5%) and in the kidneys (by up to 3%).

"5. Peroral administration of the monosodium phosphate and trimetaphosphate have no effect on Ce^{144} distribution.

"6. The polyphosphates, i. e., "kurorshevskaya" and "madrelevskaya" salts, which possess a greater molecular weight than HMP, when administered intravenously, decrease the content of Ce^{144} in the organs by a factor of 1.5 as compared with the controls. The effect of "kurorshevskaya" and "madrelevskaya" salts does not depend on the dose."

109. All-Union Conference on Combined Radiation Injuries Held in Moscow

"All-Union Conference on Combined Radiation Injuries" (Moscow, June, 1958), by V. A. Polyakov; Moscow, Meditsinskaya Radiologiya, Vol 3, No 6, Nov/Dec 58, pp 77-79

The First All-Union Conference on Combined Radiation Injuries, organized by the Ministry of Health USSR and by the Central Institute of Traumatology and Orthopedics was held in Moscow, June 9-12 1958. "The first 2 days were devoted to the subject of wounds occurring against a background of radiation sickness; the reports of the third day concerned burns; and the last day of the conference was devoted to bone fractures combined with radiation injuries."

CPYRGHT

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"The following is a short summary of some of the reports heard at this conference:

The conference opened with a few remarks by Prof N. N. Priorov, Active Member of the Academy of Medical Sciences USSR, who discussed the significance and progress of scientific research on the problem of combined radiation injuries.

V. A. Polyakov, Moscow, reported on the characteristics of the course and the therapy of surgical trauma when combined with radiation sickness.

A joint report was presented by scientists from Tbilisi -- Prof V. K. Zhgenti and G. P. Nazapish -- who substantiated the fact that a traumatic insult is complicated by radiation sickness even when the victims are exposed to comparatively small doses. The authors also discussed the neglected yet important subject of the nature and characteristics of the effect of shock waves.

A report by Docent V. G. Mitrofanov, Leningrad, presented an observation suggesting that, during traumatic shock occurring against a background of radiation sickness, tissues develop a new character due to which their restoration capacity is markedly suppressed. The organism is changed and weakened and, therefore, a more rapid development of shock is observed.

Prof N. S. Dzhavadyan and others, Moscow, reported on the therapy of traumatic shock during acute radiation sickness. They came to the conclusion that third degree radiation sickness acutely aggravates the course of shock and that traumatic shock along with combined radiation injuries responds to standard therapy.

A. A. Lipats and N. V. Nikolayeva, Moscow, reported on their encouraging results of treating shock by "polyglyukin" [polyglycine].

A report by Prof A. N. Berkutovyy and N. N. Aleksandrovyy, Leningrad, received much attention and was concerned with mass data on the study of combined injuries. It substantiated the fact that ionizing radiation changes the reactivity of an organism which in turn alters the course of trauma. Rational and timely therapy, which was quite energetically expounded by the authors of the report, made it possible for them to treat a significant portion of the animals suffering from gun shot fractures against a background of radiation sickness.

Yu. M. Lubenskiy, Krasnoyarsk, who reported on penetrating gun shot wounds of the femoral region against a background of acute radiation sickness, verified the fact that the surgical treatment of wounds should not be attempted during the period of initial radiation reaction, but during the initial development of radiation sickness or during the latent period of radiation sickness.

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A report by A. I. Morozov, Moscow, attracted great attention because it contradicted the report preceeding it, and showed that the postponement of the surgical treatment of wounds until the third day after trauma proved to be a positive therapeutic measure.

Prof A. N. Syzganov and others, Alma Ata, reported on the initial treatment of infectious, contusion-laceration wounds in irradiated animals. They proved that the energetic washing of wounds, in combination with the intravascular lavage through numerous veins of the bones proved to be the most favorable method of treating wounds contaminated with radioactive substances.

A report by V. I. Trubachev, Leningrad, confirmed the fact that antibiotics, especially streptomycin and penicillin, are very powerful surgical aids in treating complicated wounds.

During the proceedings of the third day of the conference, 13 reports were devoted to the subject of burns occurring against a background of radiation sickness. The following reports are mentioned:

R. L. Ginzburg, Moscow, analyzed the characteristics of the course and the therapy of burns accompanied by radiation injuries.

Reports by V. A. Polyakov and I. I. Revzin, Moscow, contained experimental and clinical data on films made from fast-congealing plastic fluid which were used for the initial covering of wounds.

The characteristics of the course and therapy of burns against a background of radiation sickness were reported by several other scientists from Moscow, Minsk, and Sverdlovsk.

The following reports were presented on the fourth day of the conference, which concerned the problem of bone fractures against a background of radiation sickness. Prof N. N. Priorov, Active Member of the Academy of Medical Sciences USSR, presented a basic report on the characteristics of the course and the treatment of bone fractures and the principles and techniques of their therapy.

V. A. Polyakov, Moscow, presented results of research on the characteristics of the formation of the formation of bone calluses due to the effect of various doses of ionizing radiation. Use was made of radioactive indicators and of a new method of using a 45° power X-ray microscope.

Prof F. R. Bogdanov and others, Sverdlovsk, reported on: the characteristics of the course of fractures under penetrating radiations; conditions; the course of infectious wounds; and the blood picture and morphology of bone fractures. The data were obtained by various method of research including the use of radioactive isotopes.

Prof G. P. Nazarishvil' and others Tbilisi, presented the results obtained by treating combined injuries in dogs with vitamins C, B_1, B_{12}, and penicillin.

A report by N. N. Ivanov, Novosibirsk, concentrated on the characteristics of the healing of bone fractures after general irradiation by various X-ray doses. The author experimented with fractures contaminated by radioactive calcium and radioactive strontium. He came to the conclusions that combined injuries and the contamination of the fracture area by radioactive substances give rise to radiation sickness, acutely delay regeneration processes, and make it possible for tumors to develop in these bones, sometimes within a short period of time.

B. S. Kasavina, Moscow, reported on the characteristics of protein metabolism accompanying of fractures combined with ionizing radiation.

V. P. Torbenko, Moscow, reported on the alkaline phosphatase and amylase activity of bone tissue and noted that acute radiation sickness suppresses the enzyme activity of bone tissue. She suggested that one cause for the delay in the formation of calluses is the disturbance of metabolic processes in bone tissue.

The characteristics of bone tissue regeneration under the effect of ionizing radiation were also reviewed in reports by V. I. Stetsul, Sverdlovsk; Prof N. I. Blinov, Leningrad; and Prof A. D. Zurabashvil' and others, Tbilisi.

Docent A. M. Timko reported on specialized medical aid, and Ye. I. Vorob'yev reported on the organization of dosimetric control. The conference adjurned after a few words by Prof N. N. Priorov.

More than 300 people representing 110 institutes in the country, including 122 delegates from the periphery of the country, participated in this conference. A total of 53 reports were heard, and 23 people took part in the discussions. A resolution was passed which summarized the general results of the work of the conference and designated the basic measures to be taken in the organization and conduct of further work on the problem of combined radiation injuries.

Surgery

110. Cervical Vagosympathetic Block in Severe Traumatic Shock

"Cervical Vagosympathetic Block in Traumatic Shock," by D. V.
Pomosov, Candidate of Medical Sciences, Chair of General
Surgery (chief, Prof V. I. Popov), Military-Medical Academy
imeni S. M. Kirov; Moscow, Novyy Khirurgicheskii Arkhiv, No
1(217), Jan/Feb 59, pp 93-96

The purpose of the present research was to study the effectiveness
of the vagosympathetic block, using novocain, according to the A. V.
Vishnevskiy method, during shock developing due to severe injuries to the
abdominal region and the extremities. Tests were conducted on 52 rabbits,
and clinical observations were made on 22 patients.

Experimental results and clinical observations prove the positive
therapeutic use of the vagosympathetic block. The effectiveness is in-
creased by the supplementary use of other measures, such as blood trans-
fusion, antishock fluid infusion, etc.

The author explains the therapeutic effectiveness of the vagosympathetic
block in traumatic shock as due to the interruption of the flow of path-
ological impulses from the site of trauma to the central nervous system,
and the exclusion of the cardio-aortal, and carotid sinus reflex zones.
Thus, the course of vascular reflexes is changed, and the pressor function
of other reflexogenic zones of the vascular network appears.

111. Endoophthalmooperator

"Instrument for Intraoptical Operations (Endoophthalmo-
operator)," by S. B. Soskin, Medico-Instrument Plant
'Krasnogvardeyets'"; Moscow, Meditsinskaya Promyshlennost,
Vol 13, No 2, Feb 59, pp 60-61

Description of a new instrument which permits the extraction of non-
magnetic metallic fragments from the vitreous humor of the posterior section
of the bulbus oculi. Because of the expanding use in industry of steel
alloys with nonmagnetic properties which are negligible as compared with
those of carbon steel alloys, the extraction of steel fragments from the
eye is difficult. The new instrument has been designed for this purpose.
It consists of a base, an optical tube, and a light reflector. The
optical tube is equipped with a manipulator, a dilator, and a lens. The
foreign body is removed with pincers.

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Miscellaneous

112. Personnel Changes in the Ministry of Health USSR

"Chronicle" (unsigned article); Moscow, Meditsinskiy Rabotnik, 28 Apr 59

The Council of Ministers USSR has appointed Ivan Georgiyevich Kochergin Deputy Minister of Health USSR and member of the Collegium of the Ministry of Health USSR.

The Council of Ministers USSR released Avetik Ignat'yevich Burnazyan from his duties as Deputy Minister of Health USSR.

The Council of Ministers USSR also released Mikhail Vasil'yevich Khomutov from his duties as Deputy Minister of Health USSR and from membership in the Collegium of the Ministry of Health USSR.

113. Pharmaceutical and Stomatological Correspondence Faculties Established in USSR

"Pharmaceutical and Stomatological Correspondence Faculties" (unsigned article); Moscow, Meditsinskiy Rabotnik, 24 Apr 59

Pharmaceutical and stomatological correspondence faculties have been established in a number of Soviet medical vuzes (higher educational institutions). Enrollment will begin with the new academic year.

Some 1,500 persons will be accepted at Pharmaceutical Correspondence Faculties of the First Moscow Medical Institute, the Perm Pharmaceutical Institute, and medical institutes in Leningrad, Odessa, Baku, Tashkent, and Kaunas.

Some 400 persons will be accepted at Stomatological Correspondence Faculties of Moscow, Riga, Kiev, and Tbilisi vuzes. A course of studies will take 4 1/2 years. All applicants are required to take three examinations: Russian language and literature, physics, and chemistry.

114. Medical Personnel Trained for Work in Research Institutes of Academy of Medical Sciences USSR

"Medical School of the Academy of Medical Sciences USSR" (unsigned article); Moscow, Meditsinskiy Rabotnik, 24 Apr 59

A special educational institution has been organized on the basis of Medical School No 36 in Moscow. It will train intermediate medical personnel for scientific institutions of the Academy of Medical Sciences USSR. The training of personnel will be slanted toward qualifying them for work in scientific research institutes of the Academy of Medical Sciences USSR.

115. Soviet Medical Periodicals Criticized

"A Higher Level of Medical Journals" (unsigned article); Moscow, Meditsinkiy Rabotnik, 7 Apr 59

An editorial in source states: ". . .There is no basis to assume that our periodicals [medical] satisfy the high, ever increasing demands of public health practitioners and workers in scientific research institutes. The medical periodicals are still far behind the inquiries of physicians." One of the serious shortcomings of Soviet medical periodicals is the lack of attention toward "organizational problems of specialized and branch services and experiences of leading scientific research institutes and therapeutic-prophylactic establishments."

The editorial points out the following additional criticisms: Soviet medical periodicals should be improved in the organization of material; more critical reviews and summaries of important Soviet and foreign medical literature should be included in all periodicals including the authoritative central medical journal; more articles should be published by specialists working in other than the principal and central institutes; editorial boards should take on more responsibility in selecting articles and should stop publishing articles written by the same authors in every issue; periodicals should publish letters to the editors and comments by readers; and finally periodicals should be published on time. The periodicals mentioned in the editorial were: Khirurgiya, Arkhiv Patologii, Akusherstvo i Ginekologiya, Voprosy Virusologii, Problemy Endokrinologii i Gormonoterapii Klinicheskaya Meditsina, Sovetskoye Zdravookhraneniye, Eksperimental'naya Khirurgiya, and Terapevticheskiy Arkhiv.

VI. METALLURGY

116. New Institute Plans First Ukrainian Metal Powder Plant

"New Institute in the Ukraine" (unsigned article); Moscow,
Promyshlenno-Ekonomicheskaya Gazeta. 25 Mar 59, p 3

The complete article is as follows:

CPYRGHT

> "'Ukrgiprotsvetmet,' the Ukrainian State Institute for the Planning
> of Nonferrous and Rare Metal Plants, has been established in Zaporozh'ye.
> In the first year of the Seven-Year Plan, its collective will prepare
> plans for the construction of new and reconstruction of existing enter-
> prises in the Zaporozhskiy, Stalinskiy, and other economic regions of
> the Ukraine.
>
> "Planning operations have begun for a powder metallurgy plant in
> Zaporozh'ye. This will be the first enterprise in the republic for the
> manufacture of iron and high-melting powders."

[For additional information on metallurgy, see Section I, Chemistry,
Industrial Chemistry.]

VII.   PHYSICS

Atomic and Molecular Physics

117.   Electron-Atom Collision Continuum in Mercury Arc

"On an Observation of the Electron-Atom Collision Continuum
in the Electrode-Stabilized High-Pressure Mercury Arc," by
W. Neumann and H. Reimann, Institute of Technical Physics,
German Academy of Sciences, Radiation Sources Area, Berlin;
Leipzig, Annalen der Physik, Vol 3, No 3/4, 1959, pp 211-219

The temperature dependence of the three-dimensional radiation density
of the continuum in an electrode-stabilized high-pressure mercury arc was
determined for wave lengths of 11,400, 14,500 and 16,000 angstrom. The
excitation potential of the continuum decreased in the direction away
from the center of the arc and amounted to 5.0 plus-minus 0.4 volt in the
outer portions of the arc. In the central part of the arc the mercury-
electron-atom collision continuum was superimposed by the electron-ion
collision continuum, which had a noticeable intensity in this region.

The measurements of the radial intensity distribution of the radia-
tion of the arc were made with a recording spectrometer arrangement con-
sisting of a Zeiss mirror monochromator, and PbS photoresistance as radia-
tion receiver, and an amplifier-recorder unit.

Atomic Energy Development

118.   Atomic Power Source

"An Atomic Source of High Voltage," by P.V. Timofeyev and
Yu. A. Simchenko; Moscow, Atomnaya Energiya, Vol 6, No 4,
Apr 59, pp 470-472 ·

An atomic source of high voltage designed by the authors is described.
It is termed suitable for mobile equipment and for feeding electronic instru-
ments. The device may also be applied for measuring high resistances, from
10^{11} to $1.5 \cdot 10^{13}$ ohm, and for feeding various intermittent action circuits,
ionization chambers and the like.

The device is a glass envelope consisting of two cylinders joined by
a metal ring within which is fastened a beta-particle collector. The
collector has a nickel outer cylinder and an inner aluminum cylinder.

Mounted coaxially with collector is a beta-emission source -- a seamless nickel tube several microns thick within which a uniform thin layer of an active preparation is applied. The whole is situated in a metal housing thick enough to weaken the brems-strahlung and is termed quite safe. A rubber-insulated conductor leads out via a plug from the positive electrode.

The device with Sr-90-Y-90 in the emitter (total activity about 343 microcuries) yielded up to 24 kv with resistance of $1.6 \cdot 10^{13}$ ohm (source and S-96 electrostatic voltmeter resistance) and a time constant of about $6 \cdot 10^2$ sec.

It is stated that since the average energy of the Sr-90-Y-90 beta-spectrum is about 1.1 Mev and the spectrum contains a small quantity of electrons of less than 24 kev energy, the current developed by the source is practically independent of the voltage when voltage is varied from 0.24 kv. Coefficient of utilization of the beta-emission in the source is given as approximately 76%.

CPYRGHT

"Long observations of several sources have shown that the service life of the source is apparently determined by the radioactive decay constant of Sr-90. Source parameters are practically independent of termperature in the range +50 to -50°C."

There is no short-circuit or electrical injury hazard.

CPYRGHT

"The sources permit parallel and series hook-ups, are not accompanied by noise, and cause no radio interference."

119. Cooling by Liquid Metals

"Heat Transfer in Tubes to Mercury and to Sodium-Potassium Alloy," by P. L. Kirillov, V. I. Subbotin, M. Ya. Suvorov and M. F. Troyanov; Moscow, Atomnaya Energiya, Vol 6, No 4, Apr 59, pp 382-390

Attempt is made to find the cause of disagreement of experimental data on heat exchange to liquid metals. It is inferred that the basic cause of divergence is in the thermal resistance occurring on the boundary of the heat exchanging surface and the liquid metal. This conclusion was reached after measurements of the heat exchange coefficient to the liquid metal by two methods: measuring the temperature distribution in the liquid flow and measuring the wall temperature. The temperature distribution in the flow concurred with the distribution computed from the Lyon equation. It was found that the admixture of oxygen to the alloy sodium-potassium leads to a decrease of the heat transfer coefficient. Results

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of experiments carried out in absence of a contact thermal resistance on the boundary between the wall and the liquid metal coincide with the results by Isakoff and Drew (General Discussion on Heat Transfer, London Conference, 405 (1951)), as well as with H. E. Brown, B. H. Amstead, B. E. Short (Transactions of the ASME, 79, 279 (1957)).

Mechanics

120. Flow of Liquid in Pipes Discussed

"Steady-State Motion of a Viscous Incompressible Liquid in a Pipe," by O. A. Ladyzhenskaya, Leningrad Division, Mathematics Institute imeni V. A. Steklov, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 124, No 3, 21 Jan 59, pp 551-553

The existence of at least one laminar motion at any Reynolds number was shown in a previous paper considering steady-state flow around a body of finite dimensions at infinity. It is shown in the present article that this does not hold for a pipe of infinite length and arbitrary cross section.

121. Tresk's Plasticity and Free Flow Compared

"On the Relations Defining Plastic Flow Under Tresk's Plasticity Condition and Its Generalization," by D. D. Ivlev; Moscow, Doklady Akademii Nauk SSSR, Vol 124, No 3, 21 Jan 59, pp 546-549

Relations are considered which define plastic flow corresponding to the edge of a prism representing Tresk's plasticity condition in a space of the main stresses, i.e., a condition of complete plasticity. Also considered are the relations defining the motion of a free-flowing medium under conditions of a limiting state. The conditions are a generalization of Tresk's plasticity condition. It is shown that the characteristic manifolds of the systems of differential equations defining the stress field and the displacement velocities are the same under certain conditions.

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122. Effect of Friction on Stability of Rods Analyzed

"On the Influence of Internal and External Friction on the
Dynamic Stability of Rods," by K. R. Kovalenko, Odessa;
Moscow, Prikladnaya Matematika i Mekhanika, Vol 23, No 2,
Mar/Apr 59, pp 239-248

CPYRGHT

"Analysis of a number of problems on parametric resonance without
consideration of forces of resistance led to paradoxical results. In
an investigation of the dynamical stability of rods, a linear presenta-
tion of the problem without consideration of damping yields the result
that however small may be the amplitude of the longitudinal pulsating
force, there will be some small pulsation frequencies at which dynamical
instability will set in. Inquiry into the zones of instability in this
presentation of the problem yields only a first approximation for the
first zones of instability and in this case it is impossible to set a
lower and upper limit on the unstable frequencies of the longitudinal
pulsating forces."

Expressions are set up for the characteristic function and character-
istic indexes of the equation

$$d^2y/dt^2 + \lambda p(t)y = 0,$$

where $p(t)$ is a real function of period 2π and λ is a certain parameter
which is inversely proportional to the square of the frequency of the
parametric excitation, of which $p(t)$ is independent.

123. Conditions for Stability Over Finite Time Interval Given

On Stability of Motion in a Finite Time Interval, by Chang
Ssu-ying, Moscow-Mukden; Moscow, Prikladnaya Matematika i
Mekhanika, Vol 23, No 2, Mar/Apr 59, pp 230-238

The situation is considered when it is required to know the properties
of certain physical systems for stability, not over any time interval
$t \geq t_0$ (Lyapunov stability), but over a cetain finite time interval
$t_0 \leq t \leq T$. Unperturbed motion is called stable relative to given ε
and C over a finite time interval if

$$\sum_S x_{S_0}^2 \leq \varepsilon$$

holds for $t = t_0$ and if

$$\sum_S x_S^2 \leq C$$

holds for all t on the finite time interval.

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Conditions for stability of the unperturbed motion of a system are found for the following cases: a linear system with variable coefficients, a linear system with constant coefficients, a nonlinear system, and a nonlinear system with constantly acting perturbations. Two examples are worked.

124. Conditions Given for Optimum Control of Nonlinear Systems

"On the Problem of Optimum Control of Nonlinear Systems, by N. N. Krasovskiy, Sverdlovsk; Moscow, Prikladnaya Matematika i Mekhanika, Vol 23, No 2, Mar/Apr 59, pp 209-229.

Problems of existence and necessary and sufficient indications of optimum trajectories are considered for the nonstationary system of differential equations·

$$dx/dt = f(x,t) + q(t)\,\eta(t),$$

where $f(x,t)$ and $q(t)$ are known functions. It is assumed that the function f is defined and continuously differentiable at all points of the space x except for points lying on the surfaces

$$\xi_\alpha(x,t) = 0 \qquad (\alpha = 1,\ldots,\mu)$$

of the space $x \times t$.

The problem of optimum control for the system at high speed with the restriction $|\eta(t)| \leq 1$ is formulated as follows:

Given an initial time $t = t_0$, the point $x = x_0$, and a smooth curve $x = z(t)$, it is required to find a piecewise-smooth function $\eta^0(t)$ such that the moving point $x(x_0, t_0, t, \eta^0)$ of the trajectory of the system, where $\eta(t) = \eta^0(t)$, falls on the curve $x = z(t)$ for the shortest possible time $T = t - t_0$.

The analysis is carried out for the general case of an n-order system. It is noted, however, the difficulty, is encountered in formulating the theorems for $n > 2$. Several examples of applications are given.

Nuclear Physics

125. (Gamma-p) Reaction Yield

"A Study of (Gamma-p) Reaction Yield on Different Cadmium
Isotopes," Ko Chi-ti and B. S. Ratner, Physics Institute
imeni Lebedev, Academy of Sciences USSR; Moscow, Doklady
Akademii Nauk SSSR, Vol 125, No 4, Apr 59, pp 761-764

The study of the relation of the yield of the (γ,p) reaction to the
maximum energy of the incident gamma rays in the spectrum of bremsstrahlung
was carried out on several Cd isotopes 112, 113, 114, and 116 on the FIAN
30-Mev synchrotron. The results were plotted in graphs for various $E_{\gamma,max}$.
A great difference was noticed in the yield of (γ, p) reaction on
various Cd isotopes depending on the value of $E_{\gamma max}$. particularly at
low values of $E_{\gamma max}$. At $E_{\gamma max} = 10$ Mev the (γ,p) reaction yields for Cd isotopes
112, 113, 114, 116 are respectively 6 : 1.8 : 1.0 : 0.25.

126. Fission Cross Sections of U-233 and U-235

"The Fission Cross Section of U-233 and U-235 for Neutrons
of Energy Between 3 and 800 kev," by G. V. Gorlov, B. M.
Gokhberg, V. M. Morozov, G. A. Otroshchenko, and V. A.
Shigin; Moscow, Atomnaya Energiya, Vol 6, No 4, Apr 59,
pp 453-457.

The effective cross sections of U-233 and U-235 induced by neutrons
of energies from a few kev to about 1 Mev were measured. The neutrons
were produced on an electrostatic generator from the $T(p,n)He^3$ reaction.
In measuring the neutron energy from 3.4 to 780 kev the fission cross
sections decrease from 7.5 to 1.9 barn for U-233 from 4.8 to 1.05 barns
for U-235.

127. Variation of Neutron Spectra

"Neutron Spectra Forming During Passing of 14 Mev Neutrons
Through Thick Layers of Iron, Lead, and Uranium," by Yu. S.
Zamayatin, N. I. Ivanova, and I. N. Safina; Moscow, Atomnaya
Energiya, Vol 6, No 4, Apr 59, pp 466-468

The variation of 14 Mev neutron spectra after passing thick layers
of iron, lead, or uranium was studied. The variations are due to inelastic
collisions of secondary neutrons with matter. The comparison of the obtained
results with previously tabulated data by the author et al. (Ibid, Vol 3,
540 (1957); Vol 6, 337 (1958) indicated that, due to inelastic secondary

neutron collisions, evaporation of neutrons from less excited nuclei occurs and the spectrum is enhanced with low energy neutrons. The effective temperature usually expressed as log $N(E)/E$ appears to be different for various sections of the spectrum.

128. Radioactive Analysis for Impurities

"Radioactive Analysis by the Use of 14 Mev Neutrons," by A. A. Lbov and I. I. Naumova; Moscow, Atomnaya Energiya, Vol 6, No 4, Apr 59, pp 468-470

14-Mev-neutron induced reactions were used for detecting impurities of materials where other means failed. Beta radiation from N-16, obtained from the reaction $O^{16}(n,p)N^{16}$, induced by 14 Mev neutrons, revealed small oxygen impurities. The short half life of N-16, equal to 7.3 sec prevents radiochemical yield of nitrogen, while the high beta energy (up to 10 Mev) secures the evaluation of the activity of the irradiated object.

129. Particle Acceleration by Plasma

"Particle Acceleration in a Plasma," by Ya. B. Faynberg; Moscow, Atomnaya Energiya, Vol 6, No 4, Apr 59, pp 431-446

Physical principles underlying a new method of linear particle acceleration in which plasma wave guides play the role of the accelerating system are described, as well as the use of noncompensated elecronic and ionic beams. The propagation of electromagnetic waves in the case of a narrow plasma wave guide is analyzed in a nonlinear approximation. The particle acceleration by means of nonlinerar longitudinal waves in plasma and the excitation of such waves is studied. The problem of adiabatic invariants for wave motion in plasma in connection with acceleration is analyzed. Brief results are mentioned, dealing with amplification methods of high-frequency electromagnetic fields, based on the application of reflection of electromagnetic fields, using the reflection of electromagnetic waves from the moving plasma.

130. Slow Waves in Plasma

"A Nonlinear Theory of Slow Waves in a Plasma," Ya. B.
Faynberg; Moscow, Atomnaya Energiya, Vol 6, No 4, Apr 59,
pp 447-452

The propagation of electromagnetic waves in a narrow plasma wave
guide is analyzed in a nonlinear approximation. The relation of phase
velocity to amplitude was determined. The frequency multiplication was
studied. The amplitude of the second harmonic has been found. Because
of nonlinear effects a new possibility was revealed of varying the phase
velocity of the wave by means of varying the amplitude and of securing the
radial and phase stability in accelerators and also of some modification
of amplification methods and of generation of microwaves.

131. Saturation of Nuclear Forces

"On the Theory of the Saturation of Nuclear Forces," by
W. Brunner, Institute of Nuclear Physics, German Academy
of Sciences in Berlin, Zuethen; Leipzig, Annalen der
Physik, Vol 3, No 3/4 1959, pp 137-154

A relatively simple nuclear model is used to calculate the binding
energy of nuclei. First, the nucleons are described as a noninteracting
Fermi gas. The corresponding kinetic energy is given in accordance with
an interpolation formula given by London, with an additional component
caused by the hard cores of the nucleons also taken into account. The
potential energy is then computed by combining the totality of the
nucleons with their meson fields into a system of coupled fields, the
source-(nucleon-) field and the meson field. Whereas the theory is
presented in general form, a Ritz approximation is used for the numerical
treatment of the equations. With a rational value for the nuclear radius,
a binding energy of about 7 mev per nucleon is obtained.

The results indicate that, on the one hand, a stabilization of the
nuclear material at normal densities is possible only through the inter-
action of kinetic energy and mesic (two-particle) energy, and that, on
the other hand, a description of the totality of the nucleons by means
of a system of coupled fields is logical, if shell properties are neglected.

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Solid State

132. Molecular Rotation in Smectic Phases

"Nuclear Resonance Studies On Crystalline Liquids: On the Question of Molecular Rotation in Smectic Phases," by K. H. Weber, VEB Vakutronik, Dresden; Leipzig, Annalen der Physik, Vol 3, No 3/4, 1959, pp 125-136

The nuclear resonance experiments conducted on the crystalline-liquid phases of azoxyphenol-di-p-n-alkylether and azoxybenzoic acid-di-p-ethyl ester can be explained quantitatively, if it is assumed that the intermolecular nuclear magnetic dipole interactions between the protons in resonance are small in comparison with the corresponding intramolecular components. An approximation of the intermolecular contributions to the average second moment shows that this assumption is valid only if the molecules of these compounds, in both the nematic and the smectic phases, are able to rotate freely, or with only slight hindrance, around their longitudinal axes.

133. Hall Effect in Nickel Ferrites

"Hall Effect Measurements in Magnetite and a Nickel Ferrite With an Excess of Iron," by W. Mann, Physics Institute, Karl Marx University, Leipzig; Leipzig, Annalen der Physik, Vol 3, No 3/4, 1959, pp 122-124

Hall effect measurements were made at room temperature on polycrystalline ferrites with relatively low specific resistance. A simple DC method was used, in which the Hall potential was determined by means of compensation. The results of measurements obtained on plate specimens magnetized perpendicular to the surface were used to determine the ordinary and extraordinary Hall constant. The computed average electron mobility of Fe_3O_4 is in satisfactory agreement with data given by Lavine (Bull. Amer. Soc. Japan, (2) 1, 1956, p 23).

No measurement results for nickel ferrites of the examined composition are known from the literature.

[For additional information on solid state physics, see Section II, Electronics, Materials.]

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Spectroscopy

134. Joint Commission on Spectroscopy

Leningrad, Optika i Spektroskopiya, Vol 6, No 4, Apr 59

The April 1959 issue of Optika i Spektroskopiya (Vol 6, No 4) presents a report on the Conference of the International Joint Commission on Spectroscopy held in Moscow 12-15 August 1958.

Besides a discussion of current problems of organization, a number of scientific reports was presented, including those of the American scientists G. Herzberg, Dr W. F. Meggers, Dr Charlotte Sitterli-Moore, and Prof R. S. Mulliken (all translated into Russian). B. Edlen sent a report on fundamental spectral standards which had already been read at the meeting of Commission 14 at the International Astronomical Congress. It describes the decision taken at the International Committee on Weights and Measures of accepting a new fundamental spectral standard, the line 6056 Kr-86, instead of the red cadmium line. This report will be published in the Transactions of the International Astronomical Congress.

The following reports and short communications by Soviet scientists at the Joint Commission Conference are published in this issue:

Reports:

L. A. Vaynshteyn and I. I. Sobel'man: "Nonstationary Theory of Stark's Broadening of Spectral Lines in the Plasma"

I. V. Orlova and I. N. Godnev: On the Connection Between the Larnaudie Method and the Elyashevich-Stepanov Method of Zero Approximations

V. G. Veselago: Determination of the Structure and Dipole Moment of the HDSe Molecule From Its Microwave Spectrum

V. I. Dianov-Klokov: On the Origin of the Spectrum of Liquid and Compressed Oxygen (12,600-3000 Å)

G. A. Khachkuruzov: Vibrational Constants of the Water Molecule

G. S. Denisov: On the Measurement of the Intensity of Strong Absorption Bands in the Infrared Spectra of Liquids

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M. S. Kozyreva: Application of Infrared Spectroscopy to the Investigation of Polymerization of Polyisobutylene

L. A. Lyzina and A. T. Vartanyan: Influence of Water Vapors on the Absorption Spectra of Sublimated Layers of Dyes

Yu. V. Nabcykin, B. A. Zadorozhnyy, and Ye. N. Pavlova: Some Peculiarities of the Luminescence of Ortho-Disubstituted Aromatic Hydrocarbons. II

A. S. Cherkasov: On the Influence of Substituting Groups on the Position Absorption and Luminescence Spectra of Anthracene Derivatives

A. S. Cherkasov and T. M. Vember: On the Influence of Oxygen on Photochemical Transformations and Concentration Quenching of Certain Anthracene Derivatives

Z. A. Trapeznikova: On the Interaction of "Blue" and "Samarium" Centers in the Phosphor ZnS-Sm(Cl)

I. V. Obreimov and Ye. F. Yamshchikov: Dispersion Curves of Chloroform and Carbon Tetrachloride in a Wide Temperature Range

V. S. Sukhorukikh: Fresnel Diffraction From a Narrow Screen, a Slit, and a Semiplane for a Nonspherical Wave

I. N. Shklyarevskiy, A. A. Avdeyenko, and V. G. Padalka: Measurement of the Optical Constants of Antimony in the Infrared Spectral Region at 290° and 110° K

P. G. Kard: On the Influence of Thin Films on the Total Reflection

B. V. Bokut and F. I. Fedorov: On the Theory of the Optical Activity of Crystals. III

B. P. Kozyrev and O. Ye. Vershinin: Determination of Spectral Coefficients of Diffuse Reflection of Infrared Radiation From Blackened Surfaces

V. I. Malyshev and S. G. Rautian: Use of Echelettes at Large Angles of Diffraction

A. O. Sall': On the Sensitivity Threshold of Optico-Acoustic Receivers of Radiation

Short Communications:

V. K. Ablekov: On the Treatment of Spectrograms Obtained with a Fabry-Perot Interferometer

N. Ya. Chernyak, N. N. Bubnov, L. S. Plyak, Yu. D. Tsvetkov, and V. V. Voyevodskiy: On Cetain Regularities in Spectra of Electronic Paramagnetic Resonance of Alkyl Radicals

N. N. Bubnov, V. V. Voyevodskiy, L. S. Polyak, and Yu. D. Tsvetkov: On Spectra of Electronic Paramagetic Resonance of Hydrogen Atoms Stabilized on Solid Surfaces

Ya. S. Bobovich and T. P. Tulub: Temperature Dependence of the Intensity of Stokes Bands of Combination Scattering in the Spectra of Certain Solids

Ye. F. Gross, B. V. Novikov, B. S. Razbirin, and L. G. Suslina: Absorption Spectra of Crystals of Some Gallium Chalcogenides

Theoretical and Experimental Physics

135. New Contraction Phenomenon Yields High Temperatures

"Theory of the Electrical Discharge in a Moving Conducting Medium," by V. N. Zhigulev, Central Aerohydrodynamics Institute imeni N. Ye. Zhukovskiy; Moscow, Doklady Akademii Nauk SSSR, Vol 124, No 6, 21 Feb 59, pp 1226-1228

A "new contraction phenomenon" of electrical discharges in a moving conducting medium is analyzed. It is noted that this phenomenon can be used to obtain high temperatures. A theory of the phenomenon is developed and an expression for the temperature is derived.

136. Transport Process in Secondary Electron Emission

"On the Theory of the Secondary Electron Emission of Metals. The Transport Process," by H. Stolz, Institute of Theoretical Physics, Humboldt University, Berlin; Leipzig, Annalen der Physik, Vol 3, No 3/4, 1959, pp 197-211

With the aid of the Boltzmann transport equation, the distribution function of internal secondary electrons in metals is computed for a given excitation function. From this distribution function, the

angular distribution of energy of the external secondary electrons is obtained, which leads directly to the additional characteristic functions for the secondary electron emission. These functions are determined for a special model and compared with empirical values.

The theory of secondary electron emission formulated here and in the preceding article of this issue (H. W. Streitwolf, Annalen der Physik, Vol 3, 1959, pp 183-196) fails with respect to the establishment of the angular distribution [of excitation] and the angular distribution of energy. In general, the energy spectrum and yield are in agreement with empirical values. It is shown that the $H \neq 0$ processes (exchange of momentum with the lattice) are not without significance for the phenomenon. On the other hand, it can be expected that the surface has no decisive influence on the distribution of the internal S; thus the factors responsible for the essentially observed cosine law of the energy distribution angle must still be explained. Such an explanation would require more exact knowledge of the angular distribution of energy and of the excited $H \neq 0$ electrons and of the influence which the ultimate condition of the primary electrons has on the excitation function. To this end, the theory of excitation and transport for the area of small primary energies would have to be refined.

137. New Equation in Relativistic Electrodynamics

"The Material Equations in Arbitrary Media," by M. Tischler, DAMG Physical Technical Central Institute, Berlin, and S. Hess, Institute of Theoretical Physics, Rostock University; Leipzig, Annalen der Physik, Vol 3, No 3/4, 1959, pp 113-121

The three material equations of the relativistic electrodynamics are formulated in a homogeneous form in completely arbitrary media. From the calculation it then follows that, along with the known material equations for D and H and Ohm's law, a new equation can be derived for the "magnetic" portion of the current produced as a result of the motion of the medium. Until now, this equation has not appeared in relativistic electrodynamics.

It is further shown that the current tensor introduced corresponds to that defined by Schlomka (Annalen der Physik, Vol 8, 1951, p 246).

Pavel Feliksovich Zdrodovskiy, Active Member, Academy of Medical Sciences USSR, and Yelena Mikhaylova Golinevich, Doctor of Medical Sciences -- for their scientific work Ucheniye o rikketsiyakh i rikketsiozakh (The Study of Rickettsia and Rickettsiosis) published in 1956.

6. Ivan Semenovich Popov, Professor, Moscow Agricultural Academy imeni K. K. Timiryazev -- for his scientific work Kormleniye sel-skokhoz-yaystvennykh zhivotnykh (The Feeding of Agricultural Animals): ninth edition published in 1955.

7. Mikhail Petrovich Vukalovich Doctor of Technical Sciences; Vladimir Alekseyevich Kirillin Corresponding Member, Academy of Sciences USSR; and Aledsandr Yefimovich Sheyndlin, Doctor of Technical Sciences, professors of the Moscow Power Engineering Institute -- for their theoretical and experimental study of thermophysical properties of water and steam under high pressures; published in 1956 and 1958.

The Committee on Lenin Prizes on Science and Engineering under the Council of Ministers USSR announces the following winners of the 1959 Lenin prizes in scientific and technical fields and agriculture:

1. Aleksandr Andreyevich Dubyanskiy, Doctor of Geologicomineralogical Sciences; Mikhail Ivanovich Kalganov, senior scientific associate of the Institute of Geology of Ore Deposits, Petrography, Mineralogy, and Geochemistry, Academy of Scinces USSR; Semen Ivanovich Chaykin chief geologist of the Belgorodskiy Iron Ore Expedition; Mikhail Nikolayevich Dobrokhotov, chief of the expedition party; Ivan Alekseyevich Rusinovich, senior geologist of the expedition party; Nikolay Genrikhovich Shmidt, chief engineer of the Kursk Geophysical Expedition; Mikhail Ivanovich Yakovlev, former geologist of the "Kurskgeologiya" Trust -- for their discovery of and prospecting for rich iron ore deposits in the Belgorodskiy Rayon, Kursk Magnetic Anomaly.

2. Nikolay Filippovich Balukhovskiy, senior scientific associate, Institute of Geological Sciences, Academy of Sciences Ukrainian SSR; Boris Semenovich , Vorob'yev, chief geologist of the Administration of Gas and Petroleum Industry, Khar'kovskiy Sovnarkhoz; Nikolay Alekseyevich Gorev, former chief of the "Ukrneft" Union; Vladimir Romanovich Litvinov, chief geologist of the "Kharburneftegas" Trust; Leontiy Sergeyevich Palets chief geologist, Mirgorodskiy Office of Reconnaissance Drilling; Samuil Yevl'yevich Cherpah, chief geologist of the "Ukrovstokneftrazvedka Trust" -- for their discovery of and prospecting in the Shebelinskiy Gas Deposits of the Ukrainian SSR.

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3. Fedor Grigor'yevich Kirichenko, director, All-Union Selection and Genetic Institute imeni T. D. Lysenko; Pavel Panteleymonovich Luk'yanenko, head of a division, Krasnodarsk Scientific Research Institute of Agriculture -- for working out methods of selection, and development and wide use in kolkhoz and sovkhoz production of high-quality varieties of winter wheat which yield rich flour.

4. Vasiliy Stepanovich Pustovoyt, head of a division, All-Union Scientific Research Institute of Vegetable and Volatile Oil Crops -- for working out methods of selection and seed growing, development and wide use of high oil content varieties and annual renewal varieties of sunflowers.

5. Nikolay Nikolayevich Kovalev, Corresponding Member, Academy of Sciences USSR; Viktor Martovich Orgo, deputy chief designer; Yakov Stepanovich Degtyerev, Abram Yudovich Kolton, and Zel'man Markovich Gamze, chiefs of divisions of the Design Bureau, Leningrad Metallic Plant -- for their development of powerful, variable pitch-type propeller hydraulic turbine for the Volga Hydroelectric Station imeni V. I. Lenin.

6. Yakov Pavlovich Mezivetskiy, Boris L'vovich Korobochkin, Ivan aleksandrovich Rostovtsev, and Yevgeniy Filippovich Sokolov, designers of the Moscow Tool Building Plant imeni Sergo Ordzhonikidze; Mikhail Mikhaylovich, Berman, former chief engineer of the Moscow Tool Building Plant imeni Sergo Ordzhonikidze -- for their development, series production, and introduction into industry of a series of high-duty hydraulic semiautomatic duplicating-milling machines.

7. Sergey Petrovich Mitrofanov, Candidate of Technical Sciences -- for developing and broad application of a method for group production in machine building.

8. Mikhail Leont'yevich Novikov, -- for developing gear-drives with a new type of meshing.

9. Stepan Mikhaylovich Adyasov, chief, Moscow District of the "Stal'-montazh" Trust; Moisey Grigor'yevich Bass, chief engineer, Administration for the Construction of the Stadium in Luzhnikiy Rayon, Moscow, Aleksandr Vasil'yevich Vlasov, vice-president, Academy of Construction and Architecture USSR; Georgiy Alekseyevich Golodov, chief, Administration for the Construction of the Stadium in Luzhnikiy Rayon, Moscow; Lev Vadimovich Yeshchenko, chief, "Mosstroy No 4" Trust; Vsevolod Nikolayevich Nasonov, member of the Presidium, Academy of Construction and Architecture USSR; Vasiliy Petrovich Polikarpov, head, Sector of Sports Construction, Central Scientific Research Institute of Physical Culture; Nikolay Malakhiyevich Reznikov, chief, Division of Capital Construction formerly under the Committee for Physical Culture and Sports of the Council of Ministers USSR; Igor Yevgen'yevich Rozhin, head of Shop Number 14, Institute, "Mosproyekt"; Nikolay Nikvlayevich Ullas, chief architect, Institute of General

Planning of the Architectural-Design Administration of the City of Moscow;
Aleksandr Fedorovich Khryakov, head, Shop No 15, Institute "Mosproyekt";
Boris Vladimirovich Shchepetov, chief engineer, Shop No 15, Institute
"Mostroyekt"; Ashot Arutyunovich Etmekdzhiyan, former deputy chief of Glamosstroy
-- for completing a major city construction task of an accelerated recon-
struction of the Luzhnikov area in the City of Moscow and the formation
of a complex sports structure of the Central Stadium imeni V. I. Lenin.

10. Vasiliy Georgeovich Kanishchev, chief engineer, State Planning
Institute "Pridneprovskiy Promstroyproyekt"; Aleksandr Aleksandrovich
Kaplin, head, "Uralstal'konstruktsiya" Trust; Sergey Pavlovich Kil'dishov,
brigade leader, "Donbasstal'konstruktsiya" Trust; Petr Petrovich Kononenko,
Deputy Minister of Construction Ukrainian SSR; Klimenty Semenovich Kochanov,
head, "Vostok Metallurgmontazh" Trust; Petr Vasil'yevich Safronov, chief
engineer, State Planning Institute "Tyazhpromeliktroproyekt"; Aleksandr
Nikolayevich Svistunov, head, "Orsk Metallurgstroy" Trust; Anatoliy
Nikoforovich Stovpov, head, "Metallurgmontazh" Trust -- for developing
basic improvement in the methods of building blast furnaces in the USSR.

139. <u>State Committee on Automation and Machine Building Established Under
Council of Ministers USSR</u>

"In the Presidium of the Supreme Soviet USSR" (unsigned
article); Moscow, <u>Promyshlenno-Ekonomicheskaya Gazeta</u>,
4 Mar 59

The Presidium of the Supreme Soviet USSR, on the recommendation of
the Council of Ministers USSR, has formed a State Committee on Automa-
tion and Machine Building under the Council of Ministers USSR (Gosudar-
stvennyy Komitet Soveta Ministrov SSSR po Avtomatizatsii i Mashinostroyen-
iyu) and has named Anatoliy Ivanovich Kostousov chairman of the committee.

The Presidium also, on the recommendation of the Council of Ministers
USSR, has formed a State Scientific-Economic Council of the Council of
Ministers USSR (Gosudarstvennyy Nauchno-Ekonomicheskiy Sovet Soveta Ministrov
SSSR).

140. Two New Institutes Established in Stalingrad

"New Scientific Research Institutes" (unsigned article);
Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 6 May 59

To assist the various enterprises of the petroleum, gas, and chemistry machine building industries of the Stalingrad economic region, two institutes have been established in Stalingrad: the Scientific Research Institute of the Technology of Machine Building (Nauchno-Issledovatel'skiy Institut Tekhnologii Mashinostroyeniya) and the Scientific Research Institute of the Petroleum and Gas Industries (Nauchno-Issledovatel'skiy Institute Neftyanoy i Gazovoy Promyshlennosti).

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