

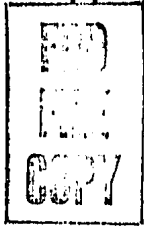
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**UNCLASSIFIED- SCIENTIFIC INFORMATION
REPORT**

8 JULY 1960

1 OF 2



CENTRAL INTELLIGENCE AGENCY

(7)

SCIENTIFIC INFORMATION REPORT



8 July 1960

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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 and is disseminated as an aid to research in the United States.

SCIENTIFIC INFORMATION REPORT

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I. ASTRONOMY

1. Radiation by Shock Waves

"Some Comments on Radiation by Shock Waves in Cosmic Conditions," by S. A. Kaplan and I. A. Klimishin, Lvov State University; Moscow, Astronomicheskii Zhurnal, Vol 37, No 2, Mar/Apr 60, pp 281-283

The heating of gas before the front of a shock wave by radiation from the latter is studied by means of the theory of light scattering in a medium with moving boundaries. Formulas for calculating the distribution in the heated zone are given, and the width of this zone is found. Formulas describe the increase in radiation intensity before the exit of the wave to the surface, due to the leakage of radiation through the overlying layers.

2. Astronomic Application of a Vacuum Prism

"Compensation of Refractive Effects by Means of a Vacuum Prism," by L. A. Panayotov, Main Astronomical Observatory, Academy of Sciences USSR; Moscow, Astronomicheskii Zhurnal, Vol 37, No 2, Mar/Apr 60, pp 336-341

The possibility of the utilization of a vacuum prism for astrometric purposes is considered. The expediency of this proposition for the study of refraction in various conditions of astrometrical observations is shown. The use of a vacuum prism in photographic astrometry will permit the compensation of differential refraction and atmospheric dispersion. The main requirements posed for the device and technical possibilities of their fulfillment are considered briefly.

II. BIOLOGY

Mycology

3. Hungary Experiments With Gibberellin

"The Career of a Mold Fungus," by Erzsebet Toth; Budapest Magyar Nemzet, 1 May 60, p 4

This article describes the discovery, in 1926, of a growth-stimulating fungus by the Formosan plant pathologist Kurosawa, and it describes the European research thereon, beginning in 1950, which demonstrated the hormonal effect of gibberellin. Treatment of spraying of seed with gibberellin is described as being especially beneficial in the growing of corn and as improving the quality of flax and hemp. In 1960, a greatly increased area in Hungary is being devoted to such experiments on flax and hemp. The Phylaxia State Vaccine Production Institute (Phylaxia Allami Oltoanyagtermelo Intezet) is now producing experimental quantities of gibberellin in crystalline and liquid form for research institutes and state farms. Gibberellin is also being used to improve grapes, tomatoes, tobacco, and fodder crops.

Dr Gabor Ubrizsy, Kossuth Prize-winning scientist and director of the Plant Protection Research Institute (Novenyvedelmi Kutato Intezet), was asked when large-scale production of gibberellin would begin. He noted that the economy of its use must first be demonstrated; spraying one cadastral yoke (1.42 acres) now costs more than 2,000 forints. The institute is now experimenting with ultrasonic and radiation treatment of the fungus to increase its production of effective material.

Radiobiology

4. Cell Radiosensitivity at Various Phases of Mitotic Activity

"On the Disturbance of Cell Division During Various Stages of Frog Development Under the Effect of Roentgen Rays," by V. I. Kheysina, Chair of Histology and Embryology, Lenin-grad Medical Institute imeni I. P. Pavlov; Moscow, Tsitologiya, Vol 2, No 1, Jan/Feb 60, pp 3-8

The author discusses the subject of cell radiosensitivity during the various stages of cell division under the effect of 2, 1,000, 10,000, 25,000, and 100,000 r and presents the following conclusions based on a literature survey and his own research:

1. After X-irradiation by 1,000 r doses, the mortality of the embryos is determined by their age -- the earlier the stage of embryonic development, the sooner the embryo dies.

2. Mitotic activity is preserved in all of the embryonic rudiments in the neurula after irradiation.

3. In only the decapitated tadpoles, mitotic activity is decreased 3-4 hours after irradiation in all the tissues except the neural tube.

4. Mitotic activity in the corneal epithelium and in the tail skin of the 5-7- and 30-day-old tadpoles was completely suppressed 3 hours after irradiation.

5. The preservation of mitotic activity in the neural tube of only the decapitated tadpoles and the mitotic activity in all the tissue in the neurula can be explained by the absence of specific differentiation in these tissues.

5. Solubility Fluctuations of Thorium and Its Compounds in Certain Media

"A Study of the Behavior of Metallic Thorium and Certain of Its Compounds in Different Media," by G. B. Bokova; Moscow, Gigiyena Truda i Professional'niye Zabolevaniya, No 1, Jan 60, pp 49-50

The purpose of this research was to study the behavior of certain practically insoluble thorium compounds (thorium fluoride and oxide) and metallic thorium in biological media (water, lactic acid, blood plasma, and gastric juice) and also in certain solvents (0.3% hydrochloric acid and 0.22% sodium carbonate) with a pH close to that of biological media.

Results of these experiments were determined by the colorimetric method and the physical emanation method with an Sg-1M electrometer.

The data obtained make it possible to consider that the activity which was determined by the emanation method can be ascribed, not only to thorium X, which is the parent substance, but also to thorium ions.

The author discusses the solubility fluctuations for these compounds, with pH and duration of contact with solvents as significant factors. Data are presented in the form of two tables and discussed.

The following are the general conclusions:

In various media, the solubility of metallic thorium is increased with a decrease in the pH of the solution. In 0.3% hydrochloric acid and in gastric juice, it is increased with an increase in the duration of contact with the solvent; but this phenomenon was not observed in the case of blood plasma.

The behavior of thorium fluoride was analogous to that of metallic thorium under the above-mentioned conditions.

Data obtained on the behavior of thorium oxide, thorium fluoride, and metallic thorium in solutions indicate that the solubility of thorium fluoride in 0.3% hydrochloric acid and in gastric juice is greater than that of metallic thorium; but in plasma and in lactic acid their solubilities are practically identical. However, the solubility of thorium oxide in these media is less than that of the above-mentioned compounds.

Miscellaneous

6. Work of Hungarian Agricultural Research Institute Reviewed

"Theory and Practice in the Work of the Agricultural Research Institute," by Sandor Rajki, Candidate of Biological Sciences; Budapest, Magyar Tudomány, Feb 60, pp 71-76

This article was written on the occasion of the tenth anniversary of the founding of the Agricultural Research Institute (Mezogazdasagi Kutato Intezet) in Martonvasar. This institute was originally under the Ministry of Agriculture, but was taken over by the Hungarian Academy of Sciences in 1953. It now works on three "Academy chief-tasks": the genetic and biological examination of breed, species, and family hybrids and of heterosis phenomena; the scientific analysis of the bread grain problem; and the study of how to increase the fodder base. Most of the research is concentrated on wheat and corn. The institute has produced four state classified endogamous hybrids of corn: Mv 5, Mv 1, Mv 39, and Mv 40. The author asserts that the hybrid corn work done at Martonvasar is as good as any in the world. In 1959, one third of Hungary's corn area was planted with Mv 5. In 1961, Martonvasar hybrid seed corn will satisfy all of Hungary's needs. In addition to increasing yields, the institute has taken the initiative in developing techniques for full mechanization of corn production. The author discusses corn and wheat experiments in considerable detail, noting that Italian wheat types (San Pastore, Fortunato, R 16, etc.) had proved to be very valuable as base stocks and that tests of Soviet wheat types (Bezostaya 4 and Skorospelka 3 b) had begun in 1959.

CPYRGHT

CPYRGHT The author writes: "From the beginning, it was clear to us that only a true theory could be the basis for successful research. Therefore, we have devoted great attention to the development of Michurin genetics.... Our vegetative hybridization research had as its goal the providing of material for a scientific recognition of the 'mechanism' of inheritance.... Buds from one plant were grafted to another.... If the characteristics of the host plant developed in the seed generation of the graft, then we had a vegetative hybrid. The vegetative hybrid incontrovertibly proves the stand of Michurin genetics regarding the essence of inheritance.... We have produced in Martonvasar vegetative hybrids of eggplant and tomato plants which tangibly prove to everyone in Hungary the truth of Michurin genetics and refute with facts the imaginings of formalistic genetics...."

In the period 1954-1959, 24 researchers from the institute took 47 study trips to the Soviet Union, China, Poland, East Germany, Czechoslovakia, Rumania, Bulgaria, Yugoslavia, the US, Austria, and Italy.

III. CHEMISTRY

Fuels and Propellants7. Synthesis of Hydrogen Peroxide From Elements in Silent Electric Discharge

"Physicochemical Investigation of the Electrosynthesis of Concentrated Hydrogen Peroxide From Its Elements; Part 1 -- The Kinetics of Electrosynthesis of H_2O_2 ," by N. I. Kobozev,

I. A. Semiokhin, and V. G. Sindukov, Moscow State University; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 4, Apr 60, pp 773-781

As compared with other methods for the production of hydrogen peroxide, the direct synthesis of this compound from the elements in a silent electric discharge has the following advantages: (1) hydrogen peroxide of a high concentration can be obtained directly; (2) a product can be synthesized which does not contain any impurities that lower its stability; (3) production of hydrogen peroxide by this method starts with a cheap raw material (water) and requires very little labor; furthermore, the process applied is simple and can be subjected to automatic control. The physicochemical data pertaining to the synthesis of hydrogen peroxide from the elements in a silent electric discharge which are contained in this article and will be published in subsequent articles were obtained in work carried out at Moscow State University in 1947-1950.

The effects of the reactor temperature on the yield and concentration of hydrogen peroxide synthesized in a silent electric discharge were determined. At 8° C hydrogen peroxide with a concentration of 80% was obtained. It was established that increasing the temperature from minus 35° C to plus 8° C has practically no effect on either the yield or the concentration of hydrogen peroxide, whereas a further increase of the temperature from plus 8° C to plus 62° C results in a sharp drop of both the concentration and the yield of hydrogen peroxide. The yield of hydrogen peroxide is 60.5% at minus 35°, 59.4% at plus 8°, and 1.3% at plus 62°. The experiments in question were carried out with a mixture containing 96.5% of H_2 and 3.5% of O_2 .

The energy of activation of the formation of hydrogen peroxide in a silent electric discharge was calculated and found to be equal to 1,200 calories per mol. This low value of the energy of activation corresponds to values obtained for the photochemical formation of hydrogen peroxide, which indicates that activation by a silent electric discharge is similar to activation by ultraviolet irradiation. The temperature factor of the

velocity of formation of hydrogen peroxide in a silent electric discharge was found to be 1.09, which is in good agreement with the value of 1.04 determined by A. L. Marshall for the photochemical synthesis of hydrogen peroxide from the elements in the presence of mercury vapor (cf Journal of the American Chemical Society, Vol 49, 1927, p 2763).

It was established that with an increase in the velocity of gas flow through the reactor, the yield of hydrogen peroxide passes through a maximum. When the velocity of flow is decreased, the total consumption of oxygen in the reaction and the consumption of oxygen for the formation of water increase.

8. Vapor-Phase Nitration of Cyclopentane Hydrocarbons

"Investigation of the Process of Vapor-Phase Nitration of Cyclopentane Hydrocarbons; Part 3 -- Nitration of Propylcyclopentane," by M. A. Peredreyeva, Ya. I. Denisenko, and S. S. Novikov, Chair of Chemistry, Artillery Engineering Academy imeni F. Z. Dzerzhinskiy; Ivanovo, Izvestiya Vysshikh Uchebnykh Zavedeniy -- Khimiya i Khimicheskaya Tekhnologiya, Vol 3, No 2, Mar 60, pp 312-315

The work reported in this paper is a continuation of an investigation on the vapor-phase nitration of cyclopentane homologs. In the preceding paper of this series, results obtained in work on the nitration of methylcyclopentane and ethylcyclopentane were described (Ya. I. Denisenko and M. A. Peredreyeva, Izvestiya Vysshikh Uchebnykh Zavedeniy -- Khimiya i Khimicheskaya Tekhnologiya, Vol 2, 1959, p 720.) In this instance the nitration of propylcyclopentane with concentrated nitric acid in the vapor phase was investigated. It was established that the principal product of the vapor-phase nitration of propylcyclopentane is the secondary nitrocompound 2-nitro-1-propylcyclopentane. A small quantity of the tertiary nitrocompound 1-nitro-1-propylcyclopentane is also formed. The effects of the reaction temperature, proportion of reacting substances, time of contact, and other factors on the yield of nitrocompounds were studied. It was established that the optimum conditions for obtaining the highest yield of nitrocompounds are as follows: a reaction temperature of 385°, a molar ratio of propylcyclopentane to nitric acid amounting to approximately 2.5, and a time of contact of about 1.2-1.3 seconds. Under these conditions a total yield of nitrocompounds reaching 76% is obtained.

The secondary nitrocompound that has been isolated is an oily liquid which is colorless on being distilled in vacuum and gradually becomes yellow as a result of exposure to light. Its boiling point is 103° at 12 mm and 131° at 40 mm. It has a characteristic odor which resembles that of nitroparaffins. It is readily soluble in concentrated caustic solutions and reacts with nitric acid, giving the distinct coloration that is characteristic for secondary nitrocompounds.

The tertiary nitrocompound, which has a boiling point of 98° at 10 mm, is a colorless oily liquid with a weak odor resembling that of camphor. It is insoluble in caustic and does not interact with nitric acid.

The amines corresponding to the two nitrocompounds and other derivatives of these compounds were prepared and characterized. The amines are colorless mobile liquids which can be distilled at atmospheric pressure without decomposition.

9. Review of N. A. Ragozin's Book on Jet Fuels

"Reaction Engine [Jet] Fuels," by A. N. Stekhun; Moscow, Khimiya i Tekhnologiya Topлива i Masel, Vol 5, No 3, Mar 60, pp 67-69

Reaktivnyye Topлива (Reaction-Engine Fuels) by N. A. Ragozin, Gostoptekhzhat, 1959, reviews briefly the physical and chemical properties of USSR and non-USSR reaction-engine fuels from the standpoint of the application of such fuels in aviation turbojet and turboprop engines. The book is subdivided into 20 small sections. The first section deals with methods of producing jet fuels. The specific characteristics of combustion in a jet engine form the subject of the second section. The following three sections compare individual types of USSR jet fuels with foreign fuels, particularly those used in the US and England. This comparison is of importance, because Soviet jet planes have to be refueled abroad and foreign jet planes are refueled in the Soviet Union. A section entitled "Fuels for Supersonic Velocities of Flight" deals with actual problems involved in the selection of fuels for supersonic flight and means of increasing the thermal stability of such fuels. The development of supersonic aircraft requires the solution of an important technical problem, viz., that of producing fuels which have a high thermal stability so that no sediment is formed in the lines supplying fuel to the engine. Under the action of the high temperatures (150-200° C) to which fuels are heated in supersonic aircraft during flight, the fuel oxidizes with the formation of resinous substances and insoluble sediment which may clog the fuel supply lines. The author gives the necessary information on the thermal stability of fuels, methods of increasing this stability, and procedures for determining it.

The book pays particular attention to one of the principal operational characteristics of reaction-engine fuels, namely, their behavior at low temperatures. This includes a discussion of methods for the determination of the points at which turbidity appears and crystallization begins. Determination of these points serves as a means of determining the filterability of fuels at low temperatures and making certain that there will be unimpeded passage of these fuels through the fuel supply

lines at temperatures below zero. USSR fuels can be used safely down to minus 60°, so that aircraft equipped with reaction engines can be operated at all geographic latitudes of the USSR under conditions prevalent in the winter. As far as low-temperature stability is concerned, USSR fuels of the grades T-1, TS-1, and T-2 are superior to the British fuel JP-IB (DERD-2482) and the French fuel Air-3405, the congelation points of which (i.e., the points at which crystallization begins) may be as high as minus 40 degrees, according to specifications.

Problems pertaining to the presence of water in the fuel and the formation of ice crystals in them are discussed in sections 13-15. Much other information of value is contained in the book: the author has succeeded in condensing a considerable amount of interesting factual material so that it can be presented on the 119 pages of the book. However, it would be desirable to have more information on the following subjects: prospects of the development of reaction-engine fuels, specifically fuels for supersonic aviation; the characteristics of new fuels developed outside of the USSR; standard fuels; the periods of time during which reaction engine fuels can be stored; expansion of the supplies of reaction-engine fuels by using products of petroleum cracking stabilized with antioxidants and metal desactivators; fuels for ram jets; ways of increasing the heat capacity of fuels by utilizing high-calorie elements [i.e., by the addition of elements with a high heat of combustion]; and the toxicity of reaction-engine fuels.

10. Solidified Liquid Gas

"Solidified Gas," by I. Il'inskaya; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, No 37 (645), 27 Mar 60, p 4, cols 5-7

Solidified liquid gas is a cream-colored porous mass resembling cheese in appearance and consistency. When ignited with a match, it burns steadily, slowly, and evenly. The flame is extinguished instantly when one blows on it. Briquettes of solidified liquid gas can be cut with a knife. The internal structure of the briquettes resembles that of a honeycomb: it consists of cells with dimensions of 5-50 microns separated from each other by solid partitions. The cells are filled with liquefied gas.

To produce this fuel, liquid butane is mixed with urea-formaldehyde resin, polyvinyl alcohol, casein, and glycerin. These substances form the cell partitions or walls. Under the action of formalin, the films forming the cell walls solidify, thus sealing in the gas. In this manner a briquette is produced which has the appearance and properties of a solid. Five percent of the briquette consists of the solid film and the rest of the fuel.

The method of producing solidified liquid gas that has been described was developed at the Institute of Mineral Fuels of the Academy of Sciences USSR. The work in question was done at the Laboratory of Chemical Treatment of Solid Fuel under the direction of Prof B. Losev, who is head of this laboratory. The gas briquettes have a high heat content. To bring a liter of water to boiling, only 4-5 grams of the gas are required. The solidified gas has a lower specific gravity than any other fuel. It can be conveniently transported and stored.

According to Losev, a special vibrating stand was erected to test the behavior of the new fuel during transportation. This stand simulates a railroad flatcar in motion. The fuel briquettes were stacked up on the test stand up to a height of 2.5 meters. Results of tests which have been carried out in this manner indicate that the solidified liquid gas fuel can be transported over distances of thousands of kilometers.

One of the advantages of solidified liquid gas fuel is that no storage facilities are required: the briquettes can be placed under a shed or stored in the open after being covered with a tarpaulin. They can be stored underground or on being submerged in water. The solidified gaseous fuel remains unchanged under any climatic conditions and burns in any weather. The solid briquettes can be easily converted into liquid fuel by means of a press. The recovered fuel is superior in its properties to the analogous liquid fuel [i.e., liquid fuel rather than liquefied gas recovered from briquettes].

Supplying of gas to settlements in newly opened virgin lands and areas in the Far North, Siberia, and the Far East will be greatly facilitated by application of the new fuel. Transportation to distant regions and storage of the fuel there will be considerably simplified: no storage tanks or tank cars will be required when this type of fuel is used.

Submerged storage facilities can be created in seas and oceans. The required quantity of briquettes fastened by means of an anchor can be stored under water without containers. Ships will not have to come into port to refuel: they will be able to obtain the necessary fuel in a bay where a submerged refueling facility has been established.

Application of solidified liquid gas eliminates the most inconvenient aspect of all internal combustion engines, namely, the necessity of using a tank filled with liquid fuel. Instead of a fuel tank, automobiles, tractors, and planes will have small regenerators. The briquettes will be fed into these regenerators by means of screw conveyers. From a regenerator of this type, the liquid gas will be conducted directly into the carburetor of the engine. One advantage of these regenerators consists in the fact that their rate of output corresponds to the velocity of the operation of the engine and is automatically controlled by the engine.

The new fuel was found satisfactory in actual use in the Antarctic. Trials by members of a scientific expedition to the Kara-Kum Desert demonstrated that the briquettes can be used at temperatures of 75° C, when iron drums filled with gasoline burst because of the high pressure that develops inside by reason of the great heat.

At present solidified liquid fuel is not yet being produced on an industrial scale; it can be obtained only in small quantities from the Institute of Mineral Fuels of the Academy of Sciences USSR. Neither Gosplan RSFSR nor the Main Administration of the Gas Industry USSR was able to say when the new fuel will be produced. Until recently the Grozny Cracking Plant produced solidified gasoline by Losev's method. It was planned to produce liquefied gas briquettes at the same plant as well. However, production of the fuel briquettes was discontinued there; soap and artificial ice are produced instead at the plant department designed for that purpose, which has been reconstructed to take care of the new production.

11. Preflame Transformations of Methane Hydrocarbons

"Preflame Transformations of Methane Hydrocarbons in an Internal Combustion Engine," by V. G. Gavrilov, Ye. I. Gulin, A. P. Pesnikov, and A. K. Tarasov, Leningrad State University; Leningrad, Zhurnal Prikladnoy Khimii, Vol 33, No 2, Feb 60, pp 421-424

Investigation of the preflame transformations of methane hydrocarbons of normal and iso-structure in the series C₆-C₈ under actual conditions encountered in an internal combustion engine indicated that in the temperature ranges of 150°-300° and 250°-400° the principal process that takes place is decomposition of the molecules of the hydrocarbons. It was found that under the conditions investigated iso-hydrocarbons are generally more stable with respect to molecular structure than normal hydrocarbons analogous to them. It was furthermore found that the relative facility of the oxidation of hydrocarbons is closely related to the degree of decomposition of their molecules under the conditions investigated. Quantitatively insignificant transformations of hydrocarbon which do not exceed 1% during compression for a period of 0.015 second still determine the subsequent course and type of total combustion of the fuels.

Insecticides

12. Insecticides Prepared at Lvov State University

"Synthesis of Acyl Derivatives of O,O-dibutylthiophosphoric Acid," by S. P. Olifirenko, N. I. Zemlyankiy, and A. M. Lylyk, Lvov State University; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 2, Feb 60, pp 579-580

In their search for new insecticides the authors sought to synthesize several acyl derivatives of O,O-dibutylthiophosphoric acid, inasmuch as there is no information in the literature on these products.

Using the results obtained earlier by Russian and Polish investigators of organophosphorus compounds and applying methods developed by these investigators, the authors succeeded in preparing the sodium salt of O,O-dibutylthiophosphoric acid. Afterwards they reacted this sodium salt with the acid chlorides of dibasic acids (succinic, glutaric, and adipic) and benzoyl chloride. Four previously unknown acyl derivatives of the acid were obtained in the form of yellow oils. The physical characteristics of these acyl compounds are listed in one table.

The authors report that these derivatives are insecticidally active.

Nuclear Fuels and Reactor Construction Materials

13. Application of Biogeochemical Methods of Prospecting to Locate Deposits of Metals Used as Nuclear Fuels and Reactor Construction Materials

"Experience Acquired in the Application of the Biogeochemical Method in Prospecting for Deposits of Rare Metals," by M. F. Kuzin, Ministry of Geology and Protection of Mineral Resources of the USSR; Moscow, Razvedka i Okhrana Nedr, Vol 25, No 11, Nov 59, pp 16-20

Results of investigations which have been conducted indicate that biogeochemical methods can be applied in prospecting for deposits of rare metals. It was established that elements such as thorium, niobium, zirconium, and possibly tantalum accumulate in plants in considerable quantities. It was discovered that aspen trees [*Populus tremula*] grow to a gigantic size and accumulate up to 0.1% of thorium in their oversized leaves when the trees are located in the vicinity of deposits of thorium and rare-earth elements. In the presence of large quantities of beryllium, rare-earth elements of the yttrium group, and lithium, certain plants

proliferate and are found in unusually large quantities. Some plants are stunted in areas adjacent to rare-metal pegmatite occurrences and characterized by an increased content of lithium in the soil.

The most urgent tasks of biochemical research from the standpoint of prospecting are simplification of methods so that their application will become less expensive, testing of different methods under different geochemical conditions, and initiation of experimental biogeochemical work in regions where marshy plains overgrown with taiga (Northern Siberian forest) or moraines and other allochthonous deposits are prevalent, i.e., in regions where conventional methods of prospecting do not ordinarily lead to satisfactory results.

14. Photolorimetric Determination of Uranium With Arsenazo Reagent

"Photolorimetric Determination of Uranium With the Arsenazo Reagent," by V. I. Kuznetsov and I. V. Nikol'skaya, Institute of Geochemistry and Analytical Chemistry, Academy of Sciences USSR; Moscow, Zavodskaya Laboratoriya, Vol 26, No 3, Mar 60, pp 266-269

A method for the photolorimetric determination of tetravalent uranium with the arsenazo reagent has been developed by the authors. This method is described in detail. A procedure for the coprecipitation of gamma quantities of uranium with crystal violet thiocyanate has been improved by adding trilon B, which makes the precipitation of uranium more selective.

15. Possibilities of Applying Nuclear Fuels in Form of Glass Fibers Reviewed in Czechoslovak Periodical

"Nuclear Fuel in the Form of Glass Fibers," by K. Iustig, Skalar a Keramik, No 2, 1959, pp 53-54 (from Steklo i Keramika, Moscow, Vol 17, No 3, Mar 60, p 42)

To increase the length of service and reduce the cost of nuclear fuel elements, it is proposed that these elements be made of glass fibers containing oxides of uranium, plutonium, or thorium.

The principal advantages of nuclear fuel in the form of glass fibers are as follows: chemical stability; thermal stability and heat resistance which make it possible to operate reactors at temperatures up to 1000°; extensive possibilities of varying the content of fissionable material and using different types of fuel; suitability for different types of reactors; facility of continuous removal of fission products by the liquid coolant and of the replacement of fuel elements; and simplicity and low cost of production.

Information is given in the literature on the possibility of producing for this purpose glass fiber that contains 50% of UO_3 . The glass may have the following composition (in percentages by weight): 29% of SiO_2 ; 1.9% of Al_2O_3 ; 5.18% of B_2O_3 ; 50% of UO_3 ; 3.3% of CaO ; 10.13% of Na_2O ; and 0.46% of K_2O . The coefficient of thermal expansion of this glass is 118×10^{-7} .

Uranium-233, uranium-235, or plutonium-239 can be introduced into this type of glass. Glass fiber containing uranium-235 has already been tested in nuclear reactors.

It has also been demonstrated that fibers for nuclear reactors can be made of glass containing up to 40% of thorium dioxide. In glass fiber containing 40% of thorium dioxide, 90% of the absorbed neutrons participate in the transformation of thorium into fissionable uranium-233. This is due to the fact that the other components of the glass have low effective cross-section of the capture of thermal neutrons.

Fuel elements consisting of glass fibers have a considerably greater thermal stability than metal fuel elements. The softening point of special glass fibers for nuclear reactors may be several hundred degrees higher than the melting point of plutonium, which is 640° . Furthermore, glass fiber exhibits a superior stability to the action of oxidizing and reducing gases and does not dissolve to any appreciable extent in boiling water.

The stability of glass fiber fuel elements to intensive irradiation with neutrons is quite satisfactory, as has been shown by experiments. There is no deterioration or melting of the glass fibers as a result of exposure to neutron radiation. Reduction of the diameter of the glass fibers has no effect on the stability of the fibers to intensive radiation.

However, with increasing doses of irradiation the tensile strength of the glass fibers decreases, at first significantly and then, after further exposure to the action of neutrons, to a relatively minor extent. The lowering of the tensile strength as a result of irradiation is due to a loosening of the structure of the fiber surface.

Glass fiber containing fissionable materials is also used as a source of high-energy radiation to be employed in carrying out some chemical processes. Glass fibers employed in radiation chemistry have a diameter of 1-10 μ and contain up to 50% by weight of uranium-233, uranium-235, or plutonium-239.

In nuclear reactors serving for power production one can use glass fuel elements having the shape of fibers, rods, tubes, etc. with a diameter of 10-1000 μ . These fuel elements are cheap. A prerequisite to the successful application of glass fibers as nuclear fuel is low flow resistance, because otherwise an undesirable drop of pressure may result in the reactor.

16. Extraction With Mixed Solvents

"The Extraction Capacity of Mixed Solvents," by V. M. Vdovenko and A. S. Krivokhatskiy; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 2, Feb 60, pp 495-497

The question of additivity in the extraction of substances from the aqueous phase by mixtures consisting of two organic solvents is discussed on the examples of nitric acid and uranyl nitrate. Nonadditivity is explained by the formation of mixed solvates of the substance being extracted.

17. Mass Transfer During Extraction With Tributyl Phosphate

"Investigation of Mass Transfer in Packed Columns During Extraction With Tributyl Phosphate (Extraction and Re-Extraction of Nitric Acid)," by A. M. Rozen, S. M. Karpacheva, S. F. Medvedev, Ye. P. Rodionov, and L. F. Kiseleva; Moscow, Khimicheskaya Promyshlennost, No 7, Oct/Nov 59, pp 627-630

The specific characteristics of extraction with tributyl phosphate in packed columns were investigated. The relationships established are expressed in mathematical terms and illustrated by tables and graphs which accompany the article. It is pointed out that tributyl phosphate diluted with other solvents is being used extensively at present as a very efficient extracting agent, particularly in nuclear technology applications.

18. Interaction of Thorium Nitrate With Phenylacetic Acid

"Physicochemical Investigation of the Interaction of Thorium Nitrate With Phenylacetic Acid," by K. N. Kovalenko and M. N. Tarasova, Rostov-na-Donu State University; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 2, Feb 60, pp 385-392

The system formed by thorium nitrate and phenylacetic acid in aqueous solutions was investigated by the methods of electrical conductivity measurements, determination of the pH, and measurements of the surface tension of the liquid phase of the system. It was established that thorium nitrate reacts with phenylacetic acid under formation of a difficulty soluble salt of the composition $(C_6H_5CH_2COO)_4 Th$. The formation of no other compound was detected.

19. Separation of Rare-Earth Elements by Method of Continuous Electrophoresis

"Separation of Rare-Earth Elements by the Method of Continuous Electrophoresis; Part 2 -- Separation With the Use of Ethylenediaminetetraacetic Acid," by V. P. Shvedov and A. V. Stepanov; Leningrad, Radiokhimiya, Vol 2, No 1, Feb 60, pp 65-67

It was established that as compared with citric acid, ethylenediaminetetraacetic acid is a better complex-forming agent to be used in the separation of lanthanides by the method of continuous electrophoresis. The conditions are given under which a mixture of the radioactive isotopes Nd^{147} , Pm^{147} , and $Eu^{152-154}$ can be separated. The mechanism of the electrophoretic separation of rare-earth elements with the application of complex-forming agents is discussed.

20. Basic Chlorides and Hydroxide of Samarium

"The Basic Chlorides and Hydroxide of Samarium," by N. V. Aksel'rud and V. B. Spivakovskiy, Institute of General and Inorganic Chemistry, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 2, Feb 60, p 347

The composition and equilibrium ionic activities of basic chlorides of samarium and samarium hydroxide were determined. Among the basic chlorides the well-defined compound $Sm(OH)_2Cl$, which has the greatest tendency to form, was subjected to the most detailed investigation.

21. Separation of Radioactive Isotopes of Rare-Earth Elements by Chromatographic Method

"Separation of Some Radioactive Rare-Earth Elements by a Chromatographic Method," by G. B. Maslova, P. P. Nazarov, and K. V. Chmutov; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 2, Feb 60, pp 357-365

The use of lactic and pyrophosphoric acids in the separation of the rare-earth elements La, Ce, Pr, Nd, Pm, and Y was studied. It was established that the application of pyrophosphoric acid ought to be of practical advantage in the chromatographic separation of rare-earth elements. The complexes formed by rare-earth elements with lactic acid were investigated. By applying the methods of potentiometric titration and ion exchange, the stability constants of the lactic complexes of some rare-earth elements were determined.

22. Separation and Concentration of Elements of Yttrium Group by Means of Complex-Forming Agents

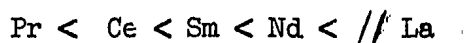
"Comparison of Different Complex-Forming Agents From the Standpoint of Their Application in Preparation of Concentrates of Elements of the Yttrium Group," by D. I. Ryabchikov and N. S. Vagina, Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, Academy of Sciences USSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 2, Feb 60, pp 356-358

Acetic, malonic, tartaric, lactic, citric, and nitrylotriacetic acid were investigated in regard to their suitability as complex-forming agents for the separation of elements of the Ho-Lu fraction. It was found that lactic and citric acids are the most suitable complex-formers among those studied.

23. Thermal Decomposition of Carbonates of Rare-Earth Elements of Cerium Subgroup

"Thermal Decomposition of Carbonates of Rare-Earth Elements of the Cerium Subgroup," by M. N. Ambrozhiy, Ye. F. Luchnikova, and M. I. Sidorova, Saratov State University imeni N. G. Chernyshevskiy; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 2, Feb 60, pp 366

The decomposition of the carbonates of lanthanum, cerium, praseodymium, neodymium, and samarium was investigated by the thermographic method. It was established that the carbonates can be arranged according to the following sequence of cations as far as their thermal stability is concerned:



24. Method for Synthesis of Iodides of Tantalum and Niobium

"Synthesis of the Iodides of Tantalum and Niobium by the Interaction of Ta Cl_5 and Nb Cl_5 with $\text{Al}_2 \text{I}_6$ and Si I_4 ,"

by L. A. Nisel'son and I. V. Petrusevich, Moscow Institute of Nonferrous Metals and Gold imeni M. I. Kalinin; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 2, Feb 60, pp 249-254

A thermographic investigation was carried out of the halogen exchange between aluminum and silicon iodides and tantalum and niobium chlorides. It was established that the reaction with niobium-pentachloride starts at a lower temperature and is accompanied by a greater development of heat than the corresponding reaction with tantalum pentachloride. It was found that by applying the reaction of a halogen exchange mentioned above, one can easily synthesize Ta I_5 and a niobium iodide the composition of which corresponds to $\text{Nb I}_{4.5-4.8}$. The application of aluminum iodide gives better results than silicon iodide.

25. East German Institute of Physical Methods of Separation

"At the Institute of Physical Methods of Separation (German Democratic Republic)," by N. M. Zhavoronkov and K. I. Sakydinskiy; Moscow, Atomnaya Energiya, Vol 8, No 1, Jan 60, pp 81-82

The Institute of Physical Methods of Separation at Leipzig (Director U. Muelenpfordt) is the principal GDR center of research and developmental work on stable isotopes. This institute was organized in 1955. It was visited by the authors of this report in September 1959 on the invitation of the German Academy of Sciences at Berlin.

The institute consists of six subdivisions: the Division of Experimental Separation by Distillation (directed by E. Krehl); the Division of Experimental Separation by Methods of Chemical Exchange (directed by K. Wetzell); the Division of the Theory of Separation Methods (directed by G. Vogt); the Theoretical Division (directed by G. Voigt); the Analytical Division (directed by G. Birkenfeld); and the Division of the Application of Stable Isotopes (directed by H. Huebner).

The problems which the divisions concerned with separation are called on to solve comprise those involved in the production of concentrates of the stable isotopes of hydrogen, boron, carbon, nitrogen, and oxygen. Installations for the separation of stable isotopes by distillation and chemical isotope exchange have been constructed at the institute. O^{18} and deuterium are produced by the distillation of water in a packed column; the concentration of heavy oxygen that is obtained reaches 4% and that of deuterium 7%. To prepare concentrates of N^{15} , isotope exchange between oxides of nitrogen and nitric acid is applied. By using this method, an enrichment of up to 10% of N^{15} is achieved. Experiments have been conducted on the enrichment of C^{13} by the distillation of carbon tetrachloride. It was established in connection with this that very pure carbon tetrachloride does not decompose in steel equipment.

Expansion of the production of stable isotopes is planned for the near future. This expansion will be accomplished by installing new equipment with a higher capacity. Among the new types of equipment installed will be one for producing B_{10} concentrates by distillation involving isotope exchange between BF_3 and the complex compound of boron trifluoride with anisole. At the Division of Experimental Separation by Distillation, interesting work has been conducted concerning the effect which the roughness of the surface of the packing has on the effectiveness of the packing. Optimum values for the roughness of the surface have been established at which the effectiveness of the packing is approximately 20% greater [than the average].

Of great importance is the work done at the theoretical divisions, the task of which is development of a theory of separation processes and calculation of separation factors by quantum-statistical methods. Work has been completed on the calculation of these factors for chemical isotope exchange by a number of carbon-containing compounds. This work is being done with the purpose of finding systems with the highest separation factors. An interesting investigation has been completed on the calculation of the efficiency of a nonadiabatic distillation column.

More than 30 tagged compounds have been synthesized at the Division of Application of Stable Isotopes.

The Analytical Division has three mass-spectrometers. One of them (of the NS-1 type) is used for the determination of deuterium concentrations, another (of the MI-1305 type) for the determination of ratios of isotopes contained in solid substances, and a third for conducting mass-spectrometric isotope analyses. Work is also being done on the development of new mass spectrometers for special applications, e.g., one with a high-frequency filter. Different types of ion sources are being investigated. Of great interest is the use of an electron photomultiplier for the determination of the intensity of spectral lines.

The Analytical Division conducts work not only for the institute, but also for all organizations in the GDR which require analyses of this type.

26. Book on Uranium Processing Reviewed

"Uranium Production Technology," by C. D. Harrington and A. E. Ruehle, reviewed by Prof B. N. Laskorin; Moscow, Novyye Knigi za Rubezhom, Seriya B. Teknika, No 5, May 60, pp 33-36

Prof B. N. Laskorin's review of the book Uranium Production Technology, by C. D. Harrington and A. E. Ruehle, Princeton, Van Nostrand, 1959, concludes as follows:

"Systematic data on the chemistry and technology of obtaining uranium compounds with purity high enough for applications in nuclear reactors are presented for the first time in technical literature. The greatest value of this work lies in its rather detailed description of American industry's experience in the field of production of metallic uranium and its compounds of high purity, as well as in a brief description of the most important recent developments to improve these processes.

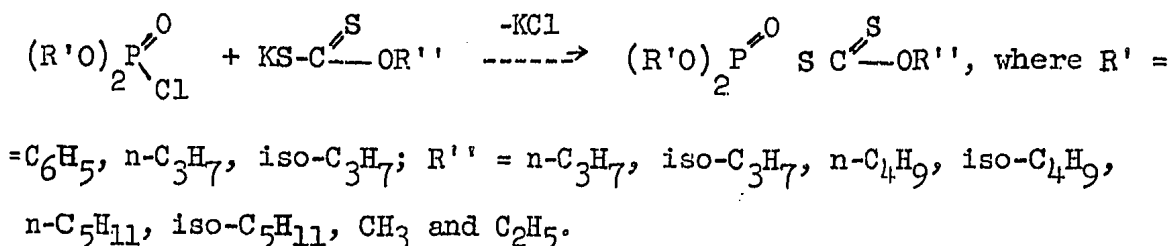
"On the whole, the book is of great interest to a wide circle of chemists and metallurgists. Translation and publication of this book in Russian is highly desirable."

Organic Chemistry27. Synthesis of Dialkylphosphatexanthogenates

"Preparation and Properties of Dialkylphosphatealkylxanthogenates," by M. S. Malinovskiy and Z. F. Solomko, Dnepropetrovsk State University; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 2, Feb 60, pp 652-653

Mixed anhydrides of dialkylthiophosphoric and xanthogenic acids of the type $(R'O)_2P(=S)-S-C(=S)OR''$ have been studied on previous occasions as insecticides. On the other hand, the dialkylphosphatexanthogenates with the general formula $(R'O)_2P(=O)-S-C(=S)OR''$ have been little studied.

The authors synthesized dialkylphosphatexanthogenates from dialkylchlorophosphates and potassium alkylxanthogenates by the reaction:



The obtained substances are yellowish oils with a weak odor; they are insoluble in water and readily soluble in the majority of organic solvents. The properties of the synthesized substances are listed in a table.

In all, 19 previously unknown dialkylphosphatexanthogenates were prepared.

28. Cyclic β -Diketone Derivatives Synthesized

"Chemistry of Unsaturated Nitro Compounds. VI. Synthesis of Derivatives of Cyclic β -Diketones," by V. V. Perekalin and K. S. Parfenova, Leningrad Pedagogical Institute imeni A. I. Gertsen; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 2, Feb 60, pp 388-393

The authors claim to be the first to have carried out the reaction of cyclic β -diketones; dimedon, indanedione-1, 3, and 2-phenylindanedione-1, 3, and 4-hydroxycoumarin (which is closely related to them) with a

number of aliphatic, aromatic, and heterocyclic unsaturated nitro compounds. A general method was found for synthesizing the various nitro and amino derivatives of cyclic β -diketones. The possibility was shown of the direct heterocyclization of several nitro products by their reduction to derivatives of pyrroline.

The authors developed further the concept concerning the optimum acidity and the maximum electron density as conditions for the successful reaction of compounds containing methylene (and methyl) groups with electrophilic reagents.

Cyclic β -diketones and their derivatives are important as pharmacologically active compounds (anticoagulants, spasmolytics, drugs with an activity similar to that of atropine) and insecticides.

29. Isomerization of Certain Barbituric Acid Derivatives

"On the Isomerization of o-Carboxy- and o-Carboxydimethoxy-benzalbarbituric Acids," by Ye. I. Chukhina, Second Moscow State Medical Institute imeni N. I. Pirogov; Moscow, Zhurnal Obshchey Khimii, Vol 30, No 2, Feb 60, pp 662-665

The authors found that as a result of the condensation of o-aldehydobenzoic or o-ianic acid with barbituric acid in pyridine, the acid benzal forms of barbituric acid are obtained, just as by condensation in an aqueous solution.

Mutual isomerization between o-carboxy-benzalbarbituric and phthalidylbarbituric acids and carboxydimethoxy benzalbarbituric and meconylbarbituric acids was established. The acid form is converted into the lactone form upon heating in an ammonia-alcohol solution, but the latter is isomerized back into the acid form in an acidic aqueous solution at room temperature.

Physical Chemistry

30. Relation Between Energy of Formation of Molecules From Free Atoms and Structure of These Molecules

"Relation Between the Energy of Formation of Molecules From Free Atoms and the Structure of These Molecules, Part 3," by V. M. Tatevskiy and Yu. G. Papulov, Moscow State University; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 4, Apr 60, pp 708-715

It is brought out that any attempt to represent the energy of formation of molecules as a sum of bond energies and energies of the interaction of bonds is based on a trend of thought which is full of inner

contradictions. Mathematically, treatment of the energy of molecules from this standpoint leads to equations which do not give anything new that is not contained in the equations of the first and second methods proposed by the authors in parts 1 and 2 of this investigation (Zhurnal Fizicheskoy Khimii, Vol 34, No 2, Feb 60, pp 241-258; No 3, Mar 60, pp 489-504; see Scientific Information Report No T-46). It is demonstrated that attempts to correlate bond energies with so-called electronic charges lead to equations which represent experimentally established relationships in a less accurate manner than the equations of the first and second methods proposed by the authors. It is pointed out that the concept of electronic charges of bonds, as employed by G. V. Bykov (cf Izvestiya Akademii Nauk SSSR, Otdeleniye Khimicheskikh Nauk, No 11, 1956, p 1342), must be regarded as purely formal and devoid of physical meaning; attempts to correlate the number of "effective charges" with bond energies conflict with quantum-mechanical concepts and equations.

Formulas derived by the first method, which correlate the energy of formation of alkane molecules with their structure, also represent in a satisfactory manner regularities pertaining to diverse physicochemical properties of the substances in question other than the energy of formation (e.g., molar volume, molar refraction, heat of evaporation, logarithm of vapor pressure, mean magnetic susceptibility, change of thermodynamic potential on formation of one mol of the substance from the elements) after the physical meaning of the constants has been changed appropriately. The results obtained can be explained on the basis of concepts in regard to types and species of C-C and C-H bonds introduced earlier by V. M. Tatevskiy (of Doklady Akademii Nauk SSSR, Vol 74, 1950, p 287; and Vol 75, 1950, p 819)

Equations based on concepts underlying the first method have been derived not only for alkanes, but also for other hydrocarbons (alkenes, alkynes, polyenes, alkylcycloalkanes, alkylbenzenes, and condensed aromatic hydrocarbons) in work done by V. M. Tatevskiy and Yu. A. Pentin. The method could be expanded to cover compounds of the composition expressed by the formula $C_nH_{2n+2-K}X_K$, where X is a monovalent substituent group. This indicates that relationships arrived at by the first and second methods can be formulated not only for hydrocarbons, but also quite generally for molecules of other organic compounds.

31. Possibilities of Application of Rhenium as Catalyst

"The Catalytic Properties of Rhenium; Part 2 -- Dehydrogenation of Cyclohexane," by A. A. Balandin, Ye. I. Karpeyskaya, and A. A. Tolstopyatova, Institute of Organic Chemistry, Academy of Sciences USSR; Moscow, Izvestiya Akademia Nauk SSSR -- Otdeleniye Khimicheskikh Nauk, No 9, Sep 59, pp 1529-1535

Catalysts consisting of rhenium deposited on activated carbon were investigated. The dependence of the activity of such catalysts and of the energy of activation of the dehydrogenation of cyclohexane on the content of rhenium in the catalyst was studied. It was found that the best catalyst, with which the smallest energy of activation is obtained, contains approximately 30% of rhenium by weight.

32. Optical Properties of Aerosol Particles Investigated

"Experimental Study of Light Scattering by Coagulating Aerosols," by O. M. Todes, V. F. Fedortsov, and A. A. Chekunov (Leningrad); Moscow, Kolloidnyy Zhurnal, Vol 22, No 1, 1960, pp 90-96

The effect of coagulation on the optical properties of aerosol particles has been investigated by the authors. The expression $\theta = \frac{\tau}{1 - \tau + 3}$ was derived to describe the changes in these properties on coagulation of the particles in a confined space and in an aerosol cloud dispersing in the atmosphere. The dispersion of the cloud in its movement in the atmosphere at some distance from the source has been shown to lead to only slight changes in the optical properties of the aerosol particles.

The theoretical equation (given above) was confirmed experimentally. Experiments were conducted with aerosols of sulfuric and phosphoric acids and fuel oil fumes. The wave length of the light subject to scattering was 0.55 and 3.4μ . The initial aerosol concentration was varied from 3.1 to 0.08 g/m³.

Radiochemistry

33. Investigation of Bubble Layers by Means of Gamma Rays

"Investigation of Bubble Layers by Gamma Ray Transmission," by Ya. G. Vinokur and V. V. Dil'man; Moscow, Khimicheskaya Promyshlennost, No 7, Oct/Nov 59, pp 619-621

In the investigation described, it was established by passing through a gas-liquid bubble layer gamma rays emitted by Co⁶⁰ that the total gas content by volume in the bubble layer can be determined by this method,

which does not involve any necessity of disturbing the layer. Changing the thickness of the walls or of other parts of the equipment within practical limits does not affect the precision of the determination. It was found that the method of transmitting gamma rays makes it possible to determine the gas content by volume in the bubble layer in any cross-section of this layer and also to establish precisely the true height of the layer.

34. Book on Radiochemistry Reviewed

Osnovy Radiokhimii (Fundamentals of Radiochemistry), by I. Ye. Starik, Publishing House of the Academy of Sciences USSR, Moscow-Leningrad, 1959, 459 pp, price 21 rubles 80 kopecks, reviewed by T. V. Malysheva; Moscow, Atomnaya Energiya, Vol 8, No 4, Apr 60,

CPYRG#1398

"This book is of special interest, because it was written from the standpoint of ideas advanced by V. G. Khlopin, founder of the Soviet school of radiochemistry, whose student and co-worker I. Ye. Starik has been for a great number of years.

"Starik's monograph gives for the first time a systematic treatment to laws governing the behavior of radioactive isotopes from the standpoint of results obtained in investigations dealing with the behavior of substances present in insignificantly small concentrations.

"The author of the book regards radiochemistry as an independent science which forms the theoretical basis for work on the utilization of nuclear energy and the application of radioactive isotopes as tracers. Particular attention is paid to problems pertaining to methods of determination and methods used in investigation. Detailed treatment is given to the state in which microquantities of radioactive isotopes are present in liquid, gaseous, and solid phases. Systematically arranged data are presented on the distribution of microquantities of radioactive isotopes in heterogeneous systems.

"A special section of the book deals with the electrochemistry of radioactive substances, a field which is of great importance from both the practical and the purely scientific point of view.

"An extensive bibliography is given at the end of every chapter.

"The book will be of use to investigators working in the field of radiochemistry and in adjacent fields of science. It can be used as a manual by students and aspirants."

Miscellaneous

35. USSR Conference on Organophosphorus Chemistry

"The Chemistry of Organophosphorus Compounds and Their Application," by Academician B. A. Arbuzov; Moscow, Vestnik Akademii Nauk SSSR, No 3, 1960, pp 103-105

The Second Conference on the Chemistry and Application of Organophosphorus Compounds was held from 26 November to 1 December 1959 in Kazan'.

The chemistry of organic derivatives of phosphorus has attracted much attention from investigators in recent times. There are many reasons to explain the intensive interest being shown in this individual field of organic chemistry. Such fundamental questions related to the theory of organic chemistry as tautomerism, intramolecular rearrangements, the addition to multiple bonds, and others have been studied on these compounds.

The discovery of the powerful physiological activity exerted by a number of classes of organophosphorus compounds has elicited intensified attention toward them by physiologists, medical specialists, veterinarians, agronomists, toxicologists, entomologists, and other representatives of the biological sciences.

Year by year the use of organophosphorus compounds grows in many different fields of industry. These compounds are being used as extracting agents for recovering and separating rare earth elements, plasticizers, high polymers, hardeners, valuable additives to lubricating oils, and flotation reagents. Very recently an entirely new field of use for organophosphorus compounds has arisen: the synthesis of phosphorus-containing polymeric materials possessing important characteristics.

The variety of interests being shown toward organophosphorus compounds is mirrored in the work of this conference, which attracted more than 400 chemists and other scientific personnel from 11 cities of this country. The conference was divided into three sections: chemical, physiological activity of organophosphorus compounds, and plant protection. In all, 122 reports were delivered at the conference.

B. A. Arbuzov reviewed the course of the development of the chemistry of organophosphorus compounds during the past 5 years. He noted great progress in this field. The results of studying ways of synthesizing organophosphorus compounds, which until recently were of theoretical interest only, have become the basis for industrial processes by which organic derivatives of phosphorus are produced. Attention to phosphines and heterocyclic compounds containing phosphorus has intensified. The

use of various physical methods to investigate the structure of organophosphorus compounds is being expanded. These compounds are being used for synthesizing other organic compounds which do not contain phosphorus [polypeptides, carotinoids]. Examples of organophosphorus compounds exhibiting physiological activity presented by the speaker were: insecticides which at a concentration $1 \times 10^{-6}\%$ ensure complete destruction of fly maggots, and compounds which possess antitumor activity. In conclusion, the speaker noted the great contribution of Soviet researchers in the chemistry of organophosphorus compounds.

Using organophosphorus compounds as an example, M. I. Kabachnik treated the central theoretical problem of modern chemistry, the effect of the structure of the molecule on its reaction capacity. Whereas in the past this effect has been considered only from the qualitative standpoint, it can now be estimated quantitatively by using Hammett's equation (with certain limitations). Using a vast amount of experimental material, the speaker analyzed the question concerning the correlation between the ionization constants of various acids of phosphorus and their structure. He showed that when the values corresponding to the sigma groups bound to pentavalent phosphorus are known, the ionization constants of oxygen acids of phosphorus and also its monothio-acids can be calculated with great accuracy. The applicability of Hammett's equation for solving problems concerning the effect of the nature of solvents on the equilibrium constant of pentavalent phosphorus acids was discussed.

The possibility was demonstrated of quantitatively estimating the effect constituents will have on the velocity of reactions and the equilibrium points corresponding to several types of organophosphorus compounds.

In a review paper, Ye. L. Gefter devoted much attention to the use of organophosphorus compounds for the industrial production of high polymers. The presence of phosphorus in polymers makes them noncombustible and in a number of cases increases their heat resistance. Polymers which contain phosphate groups are excellent ion-exchange resins, i.e., cation exchangers with a high selectivity. Some organophosphorus compounds can be used as polymerization catalysts.

The report delivered by M. Ye. Mikhel'son, E. V. Zeymal', and N. K. Fruyentov reviewed the chemical mechanism of the interaction of organophosphorus compounds with cholinesterases in connection with the fact that basically the physiological activity of the class of compounds in question is determined by their capability to inactivate cholinesterases. Several rules correlating this capability with the structure of organic derivatives of phosphorus can be understood by starting from the distribution of electrons in the molecules of such compounds. A vast amount of experimental material indicates that the physiological activity of organophosphorus compounds is due to transformations which they undergo in the organisms and their distribution between various organs and various parts of the cell.

At the chemical section of the conference attention was paid to the problem of tautomerism of organophosphorus compounds (T. A. Mastryukova, S. T. Ioffe, V. S. Vinogradova, and V. A. Gilyarov). The results of synthetic investigations found expression in many reports on the preparation of organic derivatives of various types (A. V. Kirsanov, N. N. Mel'nikov, I. F. Lutsenko, A. N. Pudovik, G. Kh. Kamay, B. A. Arbuzov, V. S. Abramov, A. I. Razumov, and others).

In contrast to the first conference on organophosphorus compounds, a great number of reports concerned the synthesis of organophosphorus compounds capable of polymerization and polycondensation (V. V. Korshak, M. I. Kabachnik, T. Ya. Medved', G. Kh. Kamay, Ye. V. Kuznetsov, and G. M. Vinokurova), and the preparation and/or production of polymers from them (V. V. Korshak, G. S. Kolesnikov, and others). P. I. Sanin reported some interesting data on the use of organophosphorus compounds as additives to lubricating oils. A. I. Kreshkov and M. G. Voronkov investigated the synthesis of compounds containing phosphorus and silicon. A special session of the chemical section was devoted to the synthesis of ethylenimine derivatives of phosphorus, especially those exerting an antitumor effect and their biological activity (A. A. Kropacheva, S. I. Sergiyevskaya, L. Kh. Protsenko, and N. P. Grechkin).

At the sessions of the section on the physiological activity of organophosphorus compounds a great deal of time was devoted to the study of interrelationships between their chemical structure and biological activity (V. A. Yakovelev, Yu. S. Kogan, I. A. Frankova, G. F. Rzhetskaya, I. V. Zaikonikova, and L. S. Afonskaya), and also to the effect of organophosphorus compounds on neuromuscular transmission (N. K. Fruyentov, V. N. Asekritova, V. V. Mozhukhina, I. M. Rakhmatullin, and V. M. Sirotkin). At a separate session the use of organophosphorus compounds for treating glaucoma (V. M. Krasnova, Z. M. Osipova, and G. I. Timinskaya) and the use of such compounds as birth-stimulating agents (L. V. Chugunova and M. A. Korchagina) were discussed. Special interest was evinced toward data on the use of organophosphorus compounds for treating experimental trichotosis of animals (I. D. Neklesova). The reports heard indicated that the study of the effects of organophosphorus compounds on biological objects has been considerably expanded in the recent past.

The investigation of the cholinergic system of insects and the mechanism of insecticidal action of organophosphorus compounds received much attention at the section for plant protection (A. K. Voskresenskaya). Some interesting data were reported on the biological action of organophosphorus compounds both on pests of agricultural crops and on plants, as well as the microflora of soils (A. M. Alekseyev). The use of these compounds will have important results for the protection of grain crops and cotton (P. V. Sazonov and Ye. N. Kozlova).

The resolutions of the conference stressed that the chemistry of organophosphorus compounds is undergoing a period of intensive growth in the USSR with particular emphasis on the chemistry of phosphorus-containing high-molecular compounds. The complaint was voiced, however, that the introduction of these valuable compounds into industrial production is very slow and only culminates in practically applied results in a few rare cases. The participants at the conference acknowledged the need to call scientific conferences on the chemistry and application of organophosphorus compounds at least once every 3 years.

The conference recommended expansion of research in the fields of biochemistry, physiology, and toxicology of organophosphorus compounds.

36. Hungarian Chemical Industry Research Reviewed

"Several Industrial and Scientific Achievements of the Inorganic Chemical Industry and Coal Chemistry Research," by Gyorgy Koranyi, Doctor of Chemical Sciences; Budapest, Magyar Tudomány, Apr 60, pp 217-224

The author traces the history of postwar Hungarian research in industrial chemistry, beginning with the founding in Veszprem of the Heavy Chemical Industry Research Institute (Nehezvegyipari Kutato Intezet) in 1949. In 1952, the author writes, the researchers moved into one of the most modernly equipped research buildings in Europe. Research facilities have continued to expand. In 10 years, the government invested 50 million forints to aid research. In its first 10 years, the institute developed and completed 180 research projects. Industrially realized achievements save the economy an estimated 5.5-6 million forints annually. The institute cooperates closely with the appropriate faculties of the Veszprem Chemical Industries University.

The author discusses various achievements of the institute's first 10 years, including work on artificial fertilizers, paint pigments, and insecticides and processing of coal and peat. In cooperation with the Mining Research Institute (Banyaszati Kutato Intezet) and under the direction of the Coal Survey Committee (Szenkataszter Bizottsag) of the Hungarian Academy of Sciences, the institute prepared a chemical survey of Hungarian black coal and of some of the more important brown coal. The author, discussing by-products of coal processing, writes: "Researchers of the institute developed an internationally unique process for extracting germanium and pyrocatechol [simultaneously]; this process will soon be realized industrially." The author then discusses the institute's work on protection against corrosion. Some of this work was done in cooperation with the Paint and Lacquer Industry Research Laboratory (Festek- es Lakkipari Kutato Laboratorium). The institute maintains nine atmospheric corrosion test stations in areas with different meteorological characteristics.

IV. EARTH SCIENCES

37. Magnetic Field Fluctuations in Turbulent Medium

"Magnetic Field and Current Density Fluctuations in Turbulent Flow of a Conducting Fluid," by G. S. Golitsyn, Institute of Physics of the Atmosphere, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 132, No 2, May 60, pp 315-318

The intensity of magnetic field pulsations in turbulent motion of a fluid was determined by the value of conductivity and turbulence intensity of the fluid. Some theoretical results were applied to the ionosphere and permitted evaluation of the altitude up to which the effect of the terrestrial magnetic field on ionospheric turbulence may be neglected. A derived equation permits a rough evaluation of pulsations of the terrestrial magnetic field near the surface produced by the turbulent flow of the lower ionosphere.

V. ELECTRONICS

Communications

38. Three-Dimension Television

"Experimental Installation for Three-Dimension Color Television," by V. Dzhakoniya; Moscow, Radio, No 4, Apr 60, pp 29-30

Stereoscopic color television equipment was developed and built for experimental purposes at the Television Laboratory of the Leningrad Electrical Engineering Institute of Communications imeni M. A. Bonch-Bruyevich under the direction of Prof P. V. Shmakov.

The three-dimensional color television images are obtained by utilizing the principle of separate transmission of two images televised from two different points. These two images, called a stereo-pair, differ from each other by some horizontal parallax. These stereo-pairs, when properly reproduced at the receiving end of the installation, will form a realistic three-dimensional image. The transmission of left and right frames of the stereo-pair is carried out either simultaneously on the two channels or on one channel in sequence. A "scanning beam" camera is used at the transmitting end of the installation, which is designed for sequential transmission of stereo-pair frames and simultaneous transmission of the tri-color television image. Two scanning tubes are used at the receiving end, which operate in sequence. Switching of the scanning tubes can be actuated either after each frame, after each field, or after each line. Masked color television tubes were used to obtain a color stereoscopic image at the receiving end. Matching of the left and right image was accomplished with the aid of a semitransparent mirror, and the separation of the stereo-pair was accomplished with the aid of a polarizing film. The films were mounted in front of the tubes in such a manner that the planes of polarization are mutually perpendicular.

The first stereoscopic color-television was demonstrated on 10 December 1959. A fairly realistic three-dimensional effect was obtained.

39. Improving Efficiency of Time-Division Multiplexing

"Improving Efficiency of Time-Division Multichannel Systems,"
by G. A. Levin, B. R. Levin, V. I. Ayzenberg, and V. S. Rozanov;
Moscow, Elektrosvyaz', No 5, May 60, pp 10-16

In modern multiplex communication systems utilizing time-division of channels there exists a certain possibility for more efficient utilization of interval duration. In existing multichannel, pulse-modulation communication systems, the duration of the channel interval is constant and is independent of the level of the transmitted signal. The change of channel interval duration in compliance with the instantaneous values of the transmitted signal can, therefore, be utilized to increase the number of channels in the communication system. Thus, to increase the efficiency of the pulse-modulated, multichannel communication system, the former practice of constant channel interval duration must be repudiated.

The information parameters in this method are represented by the time intervals separating the channel sequence pulses. This method of information conveyance is called the pulse-interval modulation system. The pulse-interval modulation method is applicable to telephone communications, as well as to other systems of communications.

The author is planning to publish another article on the subject of pulse-interval modulation in the near future.

Components

40. Focusing of Electron Beam in Traveling-Wave Tube

"Optimal Focusing of Electron Beam at the Input-Wave-Guide Junction in a Traveling-Wave Tube With Periodic Magnetic Field," by A. L. Igritskiy, Leningrad Electrical Engineering Institute imeni V. I. Ul'yanov; Leningrad, Zhurnal Tekhnicheskoy Fiziki, No 4, Apr 60, pp 413-423

A method for calculating the trajectory of electrons in the junction region of the input wave guide in a traveling-wave tube is presented. A new method for decreasing the electron-beam waviness in the region of the junction is explained. It is claimed that this method is far superior to the presently used method.

The study of focusing of the electron beam at the junction with the input wave guide in a traveling-wave tube has resulted in the development of a new method for determination of the optimal configuration of the magnetic field at the junction with the input wave guide. The study also revealed that the magnetic field in the junction region can act as a "transformer" of the transverse section of the electron beam, permitting a decrease, an increase, or constancy of the cross-section of the beam at the output of the junction region.

A method for calculating the size of the electromagnet needed to maintain the desired magnetic field in the junction region is presented.

Computers

41. East German and Czechoslovak Computer Work Described

"Construction and Use of Analogue Computers in the GDR and Czechoslovakia," by Istvan Fenyo; Budapest, Magyar Tudomány, Feb 60, pp 95-96

This article describes a trip to East Germany and Czechoslovakia taken by the author, under the auspices of the Hungarian Academy of Sciences, to study the theory of and construction methods for analogue computers. He found that Hungary was behind these two countries in construction, use, and theory of analogue computers. He blames this backwardness, not on lack of ability, but on lack of interest and support.

He spent most of his time when in East Germany in the Institute for Machine Calculation (Institut für Maschinelle Rechentechnik), which belongs to the Technical University (Technische Hochschule) in Dresden and which is led by Professor Lehmann. This institute takes up four complete floors and has nearly 50 workers. The author describes it as being very well equipped. At this institute, they are building two fast-operating digital computers (both almost completed) and one slow, small-capacity machine for didactic purposes. Among the analogue computers, the author found "most interesting" an algebraic equation solver designed and built by H. Adler, who was trained in the Soviet Union. The elements so far completed can solve eighth degree equations. It is built on the transformer principle and can define roots with a precision of 3 decimal places. Another analogue computer is being built in the institute which can solve equation systems with 10 unknowns.

Another faculty of the Dresden Technical University has built an electronic integrator which has been produced in several units for industrial enterprises. A faculty in the Illmenau electrotechnology

college has developed an analogue, purely electronic, differential analyzer named the "EARI" which makes possible a fast solution of linear and nonlinear differential equations. The operation time of this machine is 25 and 100 microseconds per operation. It uses a repeater, and the result curve appears on the screen for a cathode ray tube. This college is also developing a differential analyzer for a German optical factory.

The author praises the teaching practices of the Dresden Technical University where students are encouraged to use the calculators and computers put at their disposal.

CPYRGHT

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It was the author's impression, after visiting Prague, that: Czecho-slovakia is even ahead of the Germans in this field." And he adds: "It is impressive merely to list the machines which can be seen in the Cybernetics and Automation Institute; they have two digital computers of their own construction, an electromechanical differential analyzer, an electronic differential analyzer, a partial differential equation solving net, a transformer equation system solver, and three different kinds of machines delivering stochastic processes.... Some of these are produced for industry, and all are in operation."

Instruments and Equipment

42. Frequency Characteristics in Infralow Frequency Range

"Device for Determining Frequency Characteristics in the Infralow Frequency Range," by A. A. Vavilov and A. I. Solodovnikov, Leningrad Electrical Engineering Institute imeni V. I. Ul'yanov; Leningrad, Izvestiya Vysshikh Uchebnykh Zavedeniy, Priborostroyeniye, No 4, 1959, pp 19-27

Theoretical and experimental methods for analyzing the dynamic frequency characteristics of various automatic control systems have recently become of great practical significance.

At the Chair of Automation and Telemetry of the Leningrad Electrical Engineering Institute, a new instrument was designed capable of determining with high precision the amplitude and frequency characteristics of the first harmonics for various systems of automatic control, operating either with direct current or with 400-500-cycle carrier frequency. A low-frequency oscillator and a measuring circuit comprise the basic components of this device. The measuring circuit consists of an input unit (for checking the sensitivity of the instrument), a frequency modulator, a voltage amplifier, demodulators, frequency dividers, rotating transformers, and null-type phase and amplitude meters.

The capability and specifications of this instrument are as follows: it is capable of determining first-harmonics frequency characteristics for every component in the system; the low-frequency oscillator voltage varies from 0 to 100 v; frequency of sinusoidal oscillations and modulation frequency of the carrier frequency at the oscillator output are 0.02-50 cycles; input resistance of the measuring circuit is one megohm; the ranges of voltage measurement at the input and output of the investigated system are 1, 5, 10, 50, 100 and 250 v; and instrument error in determining the first-harmonics frequency characteristics with respect to phase is $1-2^\circ$ and with respect to amplitude is 2%. The power requirement of the instrument, when fed from a 220-v, 50-cycle power line, is about 350 w.

43. Improved Method for Measuring Phase Differences

"Measurement of Small-Phase Differences of Two Sinusoidal Voltages," by R. G. Karpov, Ryazan Radio Engineering Institute; Moscow, Priboiy i Tekhnika Eksperimenta, No 1, Jan/Feb 60, p 57-58

The author proposes a device and method for measuring small-phase shifts which eliminate to a great extent many of the errors inherent in oscillographic measuring instruments.

The two voltages being examined (input and output voltages of an apparatus) pass through decoupling cathode followers to two circuits which shape short pulses at the moment the sinusoid passes through zero. Two sequences of pulses are obtained which are then mixed and led to a modulator tube. To the deflection plates of this tube are applied sinusoidal voltages, shifted in phase by 90° , from a standard audio generator. The frequency of the generator is then increased until the bright markers on the screen of the circular scanning tube coincide, giving $\phi = T_{st} \frac{360^\circ}{T}$,

where T_{st} is the period of oscillations of the standard generator and T is the period of the voltage being studied.

44. Instrument for Studying Low Frequency Processes

"Instrument for Measuring Spectra and Correlation Functions of Low-Frequency Processes," by V. A. Zverev and Ye. F. Orlov, Scientific Research Radiophysics Institute of Gorkiy State University; Moscow, Priboiy i Tekhnika Eksperimenta, No 1, Jan/Feb 60, p 50-57

The instrument based on the principle of optical multiplication and integration is used to measure spectra and correlation functions of random low frequency processes.

The device consists of a light source which illuminates two parallel film strips on which the signals are recorded. The light passes through the film to a bank of photoelements, the current through which is thus proportional to the amount of light admitted through the films. A measuring device and oscillograph are used to observe and record the correlation functions and signal spectra.

Materials

45. Effects of Nuclear Radiation on the Generation of Current by Semiconductor Couples

"Investigation of the Generation of an Electromotive Force in the System Uranium-Semiconductor Irradiated in a Nuclear Reactor," by Yu. K. Gus'kov, A. V. Zvonarev, and V. P. Klychkova; Moscow, Atomnaya Energiya, Vol 8, No 1, Jan 60, pp 72-75

Thermocouples consisting of U_3O_8 and a metal oxide functioning as an n-semiconductor (BaO , TiO_2 , MgO , and Al_2O_3) were investigated. U_3O_8 functioned as the p-semiconductor. Gold or copper was used as material for the p-semiconductor electrode, and magnesium or titanium, as that for the n-semiconductor electrode. The methods used for preparing the thermocouples (vacuum sputtering, etc.) are described. To establish whether or not the fission of uranium has an effect on the generation of the electromotive force, a couple in which the uranium oxide had been enriched with U^{235} to the extent of 10% was compared with a couple in which natural uranium was used. Aluminum oxide was employed as the n-semiconductor in both cases. It was found that the use of enriched uranium resulted in an effect 15 times greater than that produced by the couple with natural uranium. In addition to the semiconductors mentioned above, oxides and sulfides of beryllium, nickel, molybdenum, tungsten, zinc, and copper were investigated qualitatively. Generation of an electromotive force was observed with all of these semiconductors. The best combination proved to be that consisting of U_3O_8 and magnesium oxide. The calculation carried out indicated that 0.01% of the energy generated by splinter elements formed by the fission of uranium is transformed into electric power in U_3O_8 - MgO couples.

46. Thermomagnetic and Galvanomagnetic Effects in Indium Antimonide

"Thermo- and Galvanomagnetic Effects in Indium Antimonide," by D. Kh. Amirkhanova; Baku, Izvestiya Akademii Nauk Azerbeydzhanskoy SSR - Seriya Fiziko-Matematicheskikh i Tekhnicheskikh Nauk, No 1, Apr 60, pp 45-56

This paper reports results of an investigation of the longitudinal and transverse Nernst-Ettingshausen effect and galvanomagnetic effects in p- and n-InSb in the range of 77-400°K at magnetic field strengths up to

2600 Oersted. The dependence of the thermomagnetic effects on the intensity of the magnetic field in the impurity conduction region for p-InSb is explained on the basis of a two-hole model. The fact that phonon involvement (dispersion by phonons) exerts an influence on the thermomagnetic effects in the vicinity of 77°K was established. On the basis of the theory of thermomagnetic effects in the case that $u\hbar/c \gg 1$, the obtained dependence of the Nernst-Ettingshausen field, on the temperature both in the region of impurity conduction and intrinsic conduction is explained. It is shown that in the temperature range investigated, the current carriers in InSb are dispersed chiefly at acoustic vibrations of the crystal lattice.

47. Procedure Which Eliminates Formation of Twins During the Growing of Aluminum Antimonide Crystals

"Twinning of Aluminum Antimonide," by M. S. Mirgalovskaya and I. A. Strel'nikova; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 4, Apr 60, pp 985-986

When single crystals of semiconductors are grown from melts, there is often formation of twins. Twinning is undesirable because the formation of twins affects the electrical properties of the semiconductor crystals, making them unsuitable for use in electronic appliances. Investigation of twinning in AlSb crystals established that when crystal growth is in the $\sqrt{110}$ direction, there is almost always formation of twins. Twins also form when the crystal is grown in the $\sqrt{112}$ direction. If the crystals are grown in the $\sqrt{111}$ direction, twins as a rule do not form. This result is in agreement with E. Billig's idea to the effect that single crystals of silicon which are grown by drawing from a melt should be pulled out in such a manner that there is a minimum angle between the $\sqrt{111}$ planes and the direction of the growth of the crystal. The conclusions made with respect to the growing of Al Sb crystals apparently also apply to Ga Sb and In Sb crystals.

48. Dependence of the Vapor Pressures of Zinc and Cadmium Selenides on the Temperature

"Saturated Vapor Tensions of Solid Zinc and Cadmium Selenides" by I. V. Korneyeva, V. B. Sokolov, and A. V. Novoselova, Moscow State University; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 2, Feb 60, pp 241-245

The temperature dependence of the vapor tensions of zinc selenide and cadmium selenide was determined. On the basis of the data determined, the optimum conditions for the deposition of films of these compounds by

evaporation in vacuum can be found. These two compounds are used for the production of luminescent screens, photoresistances, etc. The compounds in question are sensitive to X-rays and to alpha and beta radiation. They may prove of importance in work on the transformation of nuclear energy into electric energy, in the development of solid photomultipliers, and in the construction of selenium rectifiers containing intermediate layers of cadmium selenide.

49. Investigation of the Structural Changes in Some Magnetic Alloys by the Method of Determining the True Heat Capacity

"Investigation of the Structural Changes in Some Magnetic Alloys by the Method of Determining the True Heat Capacity," by Yu. D. Tret'yakov and K. G. Khomyakov; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 2, Feb 60, pp 410-414

The temperature dependence of the true heat capacity of the magnetic alloys ANKO-1 and ANKO-2 was determined after hardening and tempering. It was established that the tempering of the hardened alloys is accompanied by a number of exothermic and endothermic effects. An attempt is made to explain the nature of these effects.

The composition of ANKO-1 is 18% Ni, 10% Al, 12% Co, and 6% Cu (balance consists of Fe), and of ANKO-2, 20% Ni, 9% Al, 15% Co, and 4% Cu (balance consists of Fe).

50. New Semiconductor Compound

"A New Intermetallic Semiconducting Compound," by Ya. A. Ugay and T. N. Vigutova, Voronezh State University; Leningrad, Fizika Tverdogo Tela, Vol 1, No 12, Dec 59, pp 1786-1789

At chemical interaction of Na with Sb, the intermetallic compound NaSb is formed simultaneously with Na_3Sb_3 . By analyzing the properties of this compound, its constitutional diagram, and the scheme of formation of chemical compounds, the conclusion is made that NaSb is a semiconducting compound with a forbidden zone of 0.9 ev.

51. New Semiconductor

"On a New Semiconducting Compound in the System In-Sb-Te," by N. A. Goryunova, S. I. Radautsan and G. A. Kiosse, Moldavian Affiliate, Academy of Sciences USSR; Leningrad, Fizika Tverdogo Tela, Vol 1, No 12, Dec 59, pp 1858-1860

The results of investigations of the section InSb-InTe in the ternary system In-Sb-Te are reported. A new compound, In_4SbTe_3 , was revealed having the structure of rock salt and a lattice period $a = 6.128 \pm 0.003 \text{ \AA}$. Preliminary tests of the electrical properties of the new compound indicated its semiconducting character. The substances (5 alloys) were synthesized by fusion of 99.99% pure components in evacuated quartz ampules at 720-750°C.

The authors cite the absence of mention of compounds of this type in previous literature on the subject and state that great interest is attached to the fact that on the basis of two compounds with different crystal lattices, a third compound is formed which has another high form of symmetry.

52. Fluctuations of Conductivity in Ge

"Temperature Dependence of Low-Frequency Fluctuations of Conductivity in Germanium," by M. I. Kornfeld and D. N. Mirlin, Institute of Semiconductors, Academy of Sciences USSR; Leningrad, Fizika Tverdogo Tela, Vol 1, No 12, Dec 59, pp 1866-1868

To clarify the nature of low-frequency fluctuations of conductivity in semiconductors (the "excess" noise), the temperature dependence of this phenomenon was studied on a single crystal of germanium. It was found that the highest intensity of low-frequency fluctuations occurs at the temperature range corresponding to the transition from impurity conductivity to the intrinsic conductivity of germanium. The value of low-frequency fluctuations increases with applied voltage much faster than the linear law.

53. Photoconductivity of CdS

"Influence of Mechanical Surface Treatment on the Aspect of Fine Structure of Spectral Curves of Photoconductivity in Cadmium Sulfide Crystals," by Ye. F. Gross and B. V. Novikov, Physics Institute, Leningrad State University; Leningrad, Fizika Tverdogo Tela, Vol 1, No 12, Dec 59, pp 1882-1884

Tests were conducted to find the influence of surface treatment of CdS crystals on the spectral distribution of photoconductivity at a temperature of 77°K. It was found that even at slight surface treatment, the

maxima of photoconductivity shift, forming false maxima; the long-wave false maximum broadens and shifts lengthwise with further surface treatment. Simultaneously, the value of photoconductivity in the short-wave region decreases noticeably. The general photoconductivity decreases with more surface treatment. An explanation of this behavior may be found by considering the nonphotoactive exciton annihilation and enhanced recombination of charge carriers in the vicinity of the defective surface.

54. Electric Properties of p-Ge and Si

"Influence of Deformation on the Electric Properties of p-Germanium and Silicon," by G. Ye. Pikus and G. L. Bir, Institute of Semiconductors, Academy of Sciences USSR; Leningrad, Fizika Tverdogo Tela, Vol 1, No 12, Dec 59, pp 1828-1840

Using the previously deduced analysis of the energetic spectrum of holes in a deformed lattice of the germanium type (ibid., No 11, 1959), the variation of conductivity, Hall's constant, and the resistance in a magnetic field at uniform deformation are computed by the authors.

Wave Propagation and Antennas

55. Automatic Recorder of Antenna Directivity

"Device for Plotting and Automatic Recording of the Directivity Pattern of a Superhigh Frequency Antenna;" by Ye. A. Vorob'yev, Ye. A. Petrov, G. G. Tennison, and N. N. Filipov, Leningrad Institute for Precision Mechanics and Optics; Leningrad, Izvestiya Vysshikh Vchebnykh Zavedeniy, Priborostroyeniye, No 4, 1959, pp 152-154

In 1958-1959, the authors of this article developed a device for taking (with a high degree of precision) an automatic recording of the directivity pattern of superhigh frequency antennas. The device is capable of recording an antenna directivity pattern having a main lobe width of only a few minutes.

In this device, the tested transmitting antenna is fixed rigidly on a horizontal table of a rotating stand, which permits changing the inclination angle of the main lobe in a range of $\pm 15^\circ$ in the vertical plane. The antenna is rotated in the horizontal plane at a rate of 1° per min. At some distance from the stand is located the recording unit of the device, consisting of a receiving antenna with an attenuator, first detector, instrument amplifier, second detector with cathode follower, and an improved ink recorder. The recording tape moves at a variable speed of

60 to 20,000 mm per hr. The speed of carriage movement along the full width of the tape can be adjusted to 8, 2.15, and one sec. The scale of recording on the tape can be varied from 1 to 330 degrees per mm, depending on the directivity pattern of the tested antenna.

The described device is very convenient in conducting multiple recordings of directivity pattern for adjusting and tuning experimental antennas both under laboratory and field conditions. The error of directivity pattern recording does not exceed 1° .

56. Field Intensity Indicator for Circular Wave Guides of Large Cross Section

"Field Indicator for Circular Wave Guides," by M. V. Persikov, Yu. N. Kazantsev, and A. I. Kozelev; Moscow, Elektrosvyaz', No 5, May 60, pp 38-44

Extensive research has been conducted recently on propagation of electromagnetic waves of H_{11} and H_{01} mode in large circular wave guides, the dimensions of which are considerably greater than the wave length. The principal disturbances in long wave guides with large cross section are the formation of parasitic waves. Before such wave-guide lines can be practically utilized, it is necessary to determine the field propagation, not only along the axis of the wave guide, but also in the direction transverse to the axis.

The transverse field intensity indicator used in this investigation consisted of a circular wave-guide section with special couplings at both ends and provision for rotation of the whole joint about the longitudinal axis, while maintaining a tight junction between current-carrying surfaces. Longitudinal movement of the joint section is provided by an expanding coupling, operated with a micrometer screw. In a 50-mm circular wave guide, the coupling aperture for the indicator is 6 mm in diameter, and in 18-mm circular wave guides, the coupling aperture is 3 mm in diameter. The cavity resonator is executed in the form of a bent section of a standard rectangular wave guide with two tuning plungers.

The described indicator permits determining distribution of field along the transverse section of the wave guide close to its metal surface for a system with one or several modes of propagating waves. Utilizing the method of harmonic analysis, it is possible to determine the modes of waves in the wave guide, provided their total number does not exceed 8.

With the aid of this indicator, it is possible to measure the coefficient of reflection from the nonuniformities of the wave guide, if the level of the parasitic waves is about 40 decibels below the level of the operating wave.

VI. ENGINEERING

Electrical Engineering

57. Magnetic-Paste Insulation

"Magnetic Paste for Electrical Machinery," by V. A. Troitskiy, Power Engineering and Automation Institute, Academy of Sciences Uzbek SSR; Tashkent, Izvestiya Akademii Nauk Uzbek SSR Seriya Tekhnicheskikh Nauk, No 1, 1960, pp 19-26

Recent improvement in production methods for synthetic resins has been favorably reflected in the manufacturing technology of electrical machinery. The introduction of these new resins will manifest itself, not only in improvement of magnetic and insulating properties, but also in radical changes of design in electrical machinery. It is possible now to prepare a high-grade magnetic paste on the basis of the new synthetic resins. Such a magnetic paste upon drying will change to a magnetic plastic, which serves as a magneto-dielectric material with good insulating, water-proof, and acid proof properties.

The magnetic permeability of such a material varies over a wide range, depending on the method of preparation. A magnetic paste was prepared from a mixture of iron powder and BF-2 glue at the Laboratory of Automatized Electric-Drive of the Institute of Power Engineering and Automation, Academy of Sciences Uzbek SSR. The dependence $B = f(H)$ is almost rectilinear, i.e., the paste is saturated with difficulty even when its magnetic permeability is considerably poorer than that of the steel. These pastes have very low eddy current losses, and their magnetic permeability depends on the grade of powder and resin used and on the pressure applied during their casting and solidification.

The production of miniature and small-size electric machinery has been tremendously simplified by the introduction of the magnetic insulating paste.

58. Electromagnetic Powdered-Metal Clutches for Automatic Speed Controls

"Reversing System for an Automatic Speed Control Utilizing Electromagnetic Powdered-Metal Clutches," by T. A. Glazenko; Moscow, Elektrichestvo, No 4, Apr 60, pp 21-26

The linearity of performance characteristics, low magnetizing power requirements, fast response to acceleration, small dimensions, and weight make electromagnetic powdered-metal clutches highly desirable in systems of automatic control.

The article discusses the problem of calculating the static and dynamic characteristics of a reversing system for speed control with the aid of electromagnetic powdered-metal clutches. The powdered-metal clutches for servomechanisms and automatic control systems generally operate under conditions of slip. The ratio of torque to magnetic flux (or induction) in the gap of the clutch is somewhat erratic, which is explained by the mechanical hysteresis in the powdered-metal composition. The reversing system of an automatic speed control utilizing a powdered-metal electromagnetic clutch is made up of the following units: driving motor, actuating mechanism, tachometer, two excitation windings for the two powdered-metal clutches, and a common amplifier. Experimental investigation was carried out with two systems of automatic controls incorporating electromagnetic powdered-metal clutches, one controlled with dc signals and the other with ac signals. The low moment of inertia of the driven section of the powdered-metal clutch is explained by its construction in the form of a hollow cylinder. The clutch excitation windings are sectionalized and are tapped to 3 slip rings. The connection of auxiliary windings through germanium diodes permits elimination of separate transformers and rectifiers, which would otherwise be required since the power supply is drawn from a 400-cycle source. The rated torque at the clutch is 14 kg - cm, and the speed of the driving section of the clutch is 1,070 rpm. The time constant of the clutch-winding excitation is 0.0075 sec. The range of speed control is 1 to 50.

Electromagnetic powdered-metal clutches are recommended for use in servo systems and speed-control in the case of slowly fluctuating loads.

Marine Engineering

59. Use of Flaps to Assist Rise of Hydrofoil Ship Onto Its Foils

"An Approximate Determination of the Inertial Characteristics of Hydrofoil Ships," by V. G. Pavlenko and A. M. Polynin, Novosibirsk Institute of Engineers of Water Transport; Novosibirsk, Izvestiya Sibirskogo Otdeleniya Akademii Nauk SSSR, No 2, 1960, pp 22-29

The most important characteristics of the inertial properties of a hydrofoil ship, from a practical point of view, are the path and time of rise onto the foils (up to the separation of the hull from the water) and the path and time of deceleration to full stop, when the screw is stopped or reversed.

Much less depth of water is required for the ship riding on hydrofoils than for the ship at rest on the water. The dimensions of the deep-water portion of a hydrofoil anchorage depend on the path of the ship as it rides up onto the foils when starting and as it lowers onto the hull when coming to a stop.

The basic method of determining these paths is considered here. The effectiveness of using flaps to speed the rise onto the foils is also discussed.

Mechanical Engineering

60. Inertia-Induced Motion of Gyroscope on Vibrating Platform

"Influence of the Inertia of the Cardan Frame on the Motion of a Gyroscope Mounted on a Vibrating Platform," by D. S. Pel'por, Moscow Higher Technical School imeni N. E. Bauman; Leningrad, Izvestiya Vysshikh Uchebnykh Zavedeniy, Priborostroyeniye, Vol 2, No 5, 1959, pp 58-62

Laboratory tests on gyrocompasses for so-called vibrational stability have shown that the natural rate of precession of a gyroscope mounted on a vibrating platform depends on the position and layout of the instrument on the platform. Such tests have also shown that the natural rate of precession of a gyrocompass is essentially influenced by the angular vibrations of the platform, which practically always occur in real vibration stands, although the amplitude of these vibrations generally does not exceed several minutes of arc.

If a gyroscope which is locked in a Cardan suspension represents an absolutely rigid system, if its center of gravity coincides with the point of intersection of the axis of the Cardan suspension, and if friction is absent in the bearings, then the forward motion of the platform on which the gyrocompass is mounted will have no influence on the laws of its motion.

The angular motion of the platform, however, forces the Cardan frame toward the angular motions and, through the reactive moment originating in the Cardan suspension, produces a forced motion, the precession of the gyroscope (Pel'por, D. S., Nauchnyye Doklady Vyshey Shkoly, No 3, 1958; No 4, 1958).

If the frequency of the angular vibrations of the platform is close to the frequency of nutational vibrations of the gyroscope, then, in accordance with a formula given here and in keeping with experimental data, the rate of precession produced by the inertia of the frame of the Cardan suspension reaches a very considerable value, even when the amplitude of the vibrations of the platform are on the order of several minutes of arc.

61. Tilt of Gyroscope During Nutation

"On the Question of the 'Tilt' of a Gyroscope on a Cardan Suspension During Nutation," by S. S. Tikhmenev, Moscow Higher Technical School imeni Bauman; Leningrad, Izvestiya Vysshikh Uchebnykh Zavedeniy, Priborostroyeniye, Vol 2, No 5, 1959, pp 63-67

Neglecting the moments of friction in the axes of the suspension, the author presents a method of calculating particular angular moment during nutation in a rectangular system of coordinates representing the Cardan suspension. The rate of rotation of the system around this axis (in the direction of the axis of the suspension) of the outer frame of the rectangular Cardan suspension, determined on the basis of the formulas given here, coincides fully with the rate of "tilt" (word originally used by V. N. Drozdovich, Izvestiya Vysshikh Uchebnykh Zavedeniy, Priborostroyeniye, No 3, 1959) of a gyroscope determined by Professor Pel'por (Nauchnyye Doklady Vyshey Shkoly, No 3, 1959).

62. Stability of a Heavy Gyroscope During Veering

"On the Stability of a Heavy Gyroscope During Veering," by V. N. Skimel', Kazan Aviation Institute; Leningrad, Izvestiya Vysshikh Uchebnykh Zavedeniy, Priborostroyeniye, Vol 2, No 5, 1959, pp 68-71

The problems of the relative motion of a gyroscope are of particular interest, since a rigorous solution of them is becoming more and more necessary. The motion of a heavy gyroscope in the axes of inertia (Lagrange case) has been investigated fully. This article presents an attempt at a rigorous study of the stability of the equilibrium position of the axis of a heavy gyroscope during veering: The fixed point of the gyroscope moves at a constant rate along a circumference lying in the horizontal plane.

63. Influence of Vibration on Clockworks

"Experimental Investigation of the Influence of Vibration on the Running of Clocks," by Z. M. Aksel'rod, Leningrad Institute of Precision Mechanics and Optics; Leningrad, Izvestiya Vysshikh Uchebnykh Zavedeniy, Priborostroyeniye, Vol 2, No 5, 1959, pp 80-90

A description is given of laboratory equipment and a method of studying the influence of vibration on the running of clockworks. The various factors which govern the influence of vibration are discussed, as well as the types and degrees of influence on the various parts and functions.

The results obtained are considered applicable to the development and improvement of new types of clockworks which must operate under conditions of vibration.

VII. MATHEMATICS

Differential Equations64. Potentials for Semiharmonic Equations Analyzed and Generalized

"Concerning the Potentials for a Semiharmonic Equation of the Fourth Order," by O. I. Panich; Moscow, Matematicheskiy Sbornik, Vol 50 (92), No 3, Mar 60, pp 335-368

The theory of boundary value problems for semiharmonic equations and also for elliptic systems has attracted the attention of mathematicians during the recent past. This is not difficult to understand if one takes into account the great theoretical and practical significance of these problems; it is sufficient, for example, to mention the problems of hydrodynamics and the theory of elasticity.

In the work of I. N. Vekua, "Concerning Metaharmonic Functions" (Trudy Tbilisskogo Matem. In-ta, Vol 12, 1943, pp 105-166), an exhaustive theory of the simplest problems for semiharmonic equations was given; for example, it was required to solve the equation

$$\Delta^m u + a_1 \Delta^{m-1} u + a_2 \Delta^{m-2} u + \dots + a_m u = 0$$

for the boundary conditions

$$u|_S = \phi_0, \Delta u|_S = \phi_1, \Delta^2 u|_S = \phi_2, \dots, \Delta^{m-1} u|_S = \phi_{m-1}.$$

The functions $\phi_0, \phi_1, \phi_2, \dots, \phi_{m-1}$ are given. As was proven in the above-mentioned work, the solution of this problem reduces to the solution of m Dirichlet problems for equations of the form

$$\Delta v - k_i^2 v = 0 \quad (i = 1, 2, \dots, m),$$

where k_i^2 are the roots of the characteristic equation

$$p^m + a_1 p^{m-1} + a_2 p^{m-2} + \dots + a_m = 0.$$

Analogously, the boundary value problem

$$\frac{\partial u}{\partial n}|_S = \psi_0, \frac{\partial \Delta u}{\partial n}|_S = \psi_1, \dots, \frac{\partial \Delta^{m-1} u}{\partial n}|_S = \psi_{m-1}$$

reduces to m Neuman problems for the equations

$$\Delta v - k_i^2 v = 0 \quad (i = 1, 2, \dots, m).$$

For the case of two independent variables, I. N. Vekua gave a general theory for linear boundary value problems based on the methods of the theory of analytical functions and on the theory of singular integral equations with kernels of the Cauchy type. The fundamental works in this region are the monographs of I. N. Vekua (Novyye metody resheniya ellipticheskikh uravneniy [New Methods of Solving Elliptic Equations], Gostekhizdat, Moscow-Leningrad, 1948) and N. I. Muskhelishvili, (Singulyarnyye integral'nyye uravneniya [Singular Integral Equations], Gostekhizdat, 1946).

The concept of a generalized solution, introduced by S. L. Sobolev, proved to be extremely useful. The introduction of this concept permitted one to widen the class of functions in which a solution was sought and permitted one to apply the methods of functional analysis to the theory of differential equations. The fundamental idea of this course is presented in the monograph of S. L. Sobolev (Nekotoryye primeneniya funktsionalnogo analiza v matematicheskoy fizike [Several Applications of Functional Analysis in Mathematical Physics]. Izd. IGU, Leningrad, 1950.

However, in the author's opinion, the problems concerning the existence of solutions in the classical sense and concerning methods of obtaining these solutions are not without interest. Of special interest is the transfer of the methods of the theory of potentials to equations of an order greater than the second. Until recent times, only for a small circle of the problems considered were potentials successfully found, with the help of which the corresponding boundary value problem led to regular integral equations of the Fredholm type of the second kind. To the works of this group belong, for example, the work of F. K. G. Odqvist, "Concerning Boundary Value Problems of the Hydrodynamics of Viscous Fluids" (Math. Zeitschr., Vol 32, No 3, 1930, pp 329-375), in which potentials for a linearized Navier-Stokes system were found; linearization was conducted by means of a simple rejection of the non-linear terms. C. W. Ossen, in his monograph on hydrodynamics, Neuere Methoden and Ergebnisse in der Hydrodynamik, III (Recent Methods and Results in Hydrodynamics, part 3), utilized integral equations of the Fredholm type of the first kind when he investigated the problem concerning solvability of these equations.

In more recent times, Z. Ya. Shapiro, ("First Boundary Value Problem for Elliptical Systems of Differential Equations," Matem. sb., Vol 28 (70), 1951, pp 55-78) and Z. Ya. Shapiro, ("On One Method of Reducing Boundary Value Problems for Systems of Differential Equations of the Elliptic Type to Regular Integral Equations," Ukr. Matem. Zhurnal, Vol 5, No 2, 1953, pp 123-151) proposed a general method giving the possibility of finding potentials which are especially adapted for a given boundary value problem and with the help of which the problem leads to a regular system of integral equations of the Fredholm type of the second kind.

At the conclusion of his work, Ya. B. Lopatinskiy cited an integral representation for the so-called first boundary value problem for the biharmonic equation

$$\Delta^2 u = 0, \quad u|_S = f_1, \quad \frac{\partial u}{\partial n}|_S = f_2.$$

The integral representation has the following form (in the three-dimensional space):

$$u(P) = \frac{1}{2\pi} \iint_S \mu(Q) \frac{\cos^2 \theta(P, Q)}{R(P, Q)} dS_Q + \frac{3}{2\pi} \iint_S \lambda(Q) \frac{\cos^3 \theta(P, Q)}{R^2(P, Q)} dS_Q.$$

However, this system appearing in the work of Ya. B. Lopatinskiy, "Concerning One Method of Reducing Boundary Value Problems for a System of Differential Equations of the Elliptic Type to Regular Integral Equations" (Ukr. matem. zhurnal, Vol 5, No 2, 1953, pp 123-151), was not presented exactly; the author indicates specifically how this inaccuracy occurs. It is necessary to note that the mentioned inaccuracy does not lessen the value of Lopatinskiy's work. The method of finding the potential proposed by Z. Ya. Shapiro and developed by Ya. B. Lopatinskiy is very valuable and opens a large perspective.

In the present paper, the biharmonic potentials introduced by Ya. B. Lopatinskiy for the three-dimensional case, as well as their analog for the planar case, are studied. Thereafter, the results are generalized for an arbitrary polyharmonic equation of the fourth order. The problems concerning the limiting values of these potentials, of their normal derivatives of the Laplace operators, and the normal derivatives from the Laplace operator are investigated.

65. Result of Differential Equations Transferred to Integral Equations

"Concerning the Growth of Solutions of One Class of Systems of Integral Equations of the Volterra Type," by E. I. Gol'dengershel', Odessa Pedagogical Institute; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Matematika, No 6 (13), Nov/Dec 1956, pp 38-43

M. A. Rutman, in his works "Operator Equations in Partially Ordered Spaces and Several Qualitative Theorems for Linear Differential Equations With Partial Derivatives," (UMN, Vol 12, No 1, 1957, pp 234-238) and "Investigation of the Growth and Boundedness Criteria for the Solutions of Several Systems of Linear Differential Equations With Partial Derivatives" (Tr. III Matem. s'ezda, Vol 2, 1956, pp 118-119), proved

that the order of growth of the solutions coincides with the order of growth of the right sides and the boundary values for a wide class of systems of linear differential equations if the right sides and boundary values have sufficiently great orders of exponential growth.

The purpose of the present work is to transfer this result to one class of systems of integral equations having the form:

$$\begin{aligned} \Phi(x_1, x_2) - \int_0^{x_1} K_1(x_1, x_2, y_1) \Phi(y_1, x_2) dy_1 - \int_0^{x_2} K_2(x_1, x_2, y_2) \Phi(x_1, y_2) dy_2 \\ - \int_0^{x_1} \int_0^{x_2} K_{12}(x_1, x_2, y_1, y_2) \Phi(y_1, y_2) dy_1 dy_2 = f(x_1, x_2), \\ 0 \leq \begin{matrix} x_1 \\ x_2 \end{matrix} \leq \infty. \end{aligned}$$

66. Solutions of System of Linear Differential Equations of the Hyperbolic Type Studied

"On the Asymptotic Representations of Solutions of a System of Linear Differential Equations of the Hyperbolic Type Containing a Small Parameter," by I. I. Markush, Kiev Pedagogical Institute imeni Gor'kiy; Kiev, Doklady Akademii Nauk Ukrainy SSR, No 1, Jan 60, pp 17-21

An asymptotic solution is obtained for the equation

$$\begin{aligned} A(\tau, x, \epsilon) \frac{\partial^2 u}{\partial t^2} = B(\tau, x, \epsilon) \frac{\partial^2 u}{\partial x^2} + \epsilon C_1(\tau, x, \epsilon) \frac{\partial^2 u}{\partial x \partial t} + \\ + \epsilon C_2(\tau, x, \epsilon) \frac{\partial u}{\partial x} + \epsilon C_3(\tau, x, \epsilon) \frac{\partial u}{\partial t} + \epsilon C_4(\tau, x, \epsilon) u + \\ + \epsilon \sum_{j=1}^N G_j(\tau, x, \epsilon) e^{i \theta_j} \end{aligned}$$

with initial conditions

$$u(0, x) = \Phi(x), \quad u_t(0, x) = \Psi(x),$$

and boundary conditions

$$a_1(\tau, \epsilon) u_x(t, 0) + a_2(\tau, \epsilon) u_t(t, 0) + a_3(\tau, \epsilon) u(t, 0) = 0,$$

$$a_4(\tau, \epsilon) u_x(t, 1) + a_5(\tau, \epsilon) u_t(t, 1) + a_6(\tau, \epsilon) u(t, 1) = 0,$$

in the case in which the characteristic of the matrix B_0 are different and positive and ϵ is a small parameter whereby $\tau = \epsilon t$, $0 \leq \tau \leq L, \Phi(x), \Psi(x)$; $u = \{u_1, u_2, \dots, u_n\}$ are n-dimensional vectors and $A(\tau, x, \epsilon)$, $B(\tau, x, \epsilon)$, $C_i(\tau, x, \epsilon)$ ($i = 1, 2, 3, 4$), $a_q(\tau, \epsilon)$ ($q = 1, 2, \dots, 6$) are square matrices of the n^{th} order; $G_j(\tau, x, \epsilon)$ are n-dimensional vectors which have the representation:

$$A(\tau, x, \epsilon) = E + \sum_{s=1}^{\infty} \epsilon^s A_s(\tau, x), \quad B(\tau, x, \epsilon) = B_0 + \sum_{s=1}^{\infty} \epsilon^s B_s(\tau, x),$$

$$C_i(\tau, x, \epsilon) = \sum_{s=0}^{\infty} \epsilon^s C_{is}(\tau, x), \quad a_{q1}(\tau, \epsilon) = \sum_{s=0}^{\infty} \epsilon^s a_{q1s}(\tau) = \sum_{s=1}^{\infty} \epsilon^s a_{q2s}(\tau),$$

$G_j(\tau, x, \epsilon) = \sum_{s=0}^{\infty} \epsilon^s G_{js}(\tau, x)$ ($i = 1, 2, 3, 4$; $q_1 = 1, 4$; $q_2 = 2, 3, 5, 6$; $j = 1, 2, \dots, N$); E is the unit matrix, and B_0 is a constant matrix.

The designations $u_t(t, 0) = \frac{\partial u}{\partial t} \Big|_{x=0}$, $u_t(t, 1) = \frac{\partial u}{\partial t} \Big|_{x=1}$, $u_x(t, 0) =$

$\frac{\partial u}{\partial x} \Big|_{x=0}$, and $u_x(t, 1) = \frac{\partial u}{\partial x} \Big|_{x=1}$ were employed above.

Depending on the values assumed by the functions $k_j(\tau)$ ($j = 1, 2, \dots, N$), two cases are considered:

(1) the "resonance" case when, with certain values of $\tau \in [0, L]$, one or several functions $k_n(\tau)$ ($n = 1, 2, \dots, r$; $1 \leq r \leq N$) may become equal to one of the numbers $\lambda_{im} \omega$ ($i = 1, 2, \dots, p$; $m = 1, 2, \dots$);

(2) the "nonresonance" case, when the functions $k_j(\tau)$ differ from the numbers $\lambda_{im} \omega$ throughout the interval $\tau \in [0, L]$.

67. Periodic Solutions of Nonautonomic Systems of Differential Equations

"On the Problem Concerning Periodic Solutions of Non-autonomic Systems in the Case of an Isolated Originating Solution," by Yu. A. Mitropol'skiy and O. B. Lykova, Corresponding members of the Academy of Sciences Ukrainian SSR; Kiev, Doklady Akademii Nauk Ukrainiskoy SSR, No 1, Jan 60, pp 3-6

A system of differential equations is considered having nondifferentiable terms in the right side corresponding to perturbing forces.

The existence is proved of a unique stable solution of the system in the region of a stable isolated periodic solution of the originating system.

Differential Operators

68. Closure of Differential Operators

"Concerning the Closure of Certain Differential Operators," by L. S. Dashnits, Odessa Technological Institute; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Matematika, No 6, Nov/Dec 59, pp 44-47

During investigation of boundary value problems of the form

$$h(y) = \lambda m(y),$$

$$u_j(y) = 0 \quad (j = 1, 2, \dots, n),$$

where $h(y)$ and $m(y)$ are differential expressions and $u_j(y)$ are bounding functions, one is obliged to consider differential operators having a region of definition described by boundary conditions, the number of which exceed the order of the differential expression and which contain derivatives, the order of which is greater than the order of the differential expression. These operators are not closed. In the present work, a theorem is proved indicating how to find a closure for these operators.

The author referred to his two previous works, "Concerning Several Boundary Value Problems Associated With Paired Differential Operators" (Zap. matem. otd. fiz.-mat. fak., KhGU i Khar'kovsk matem. obshch-va, Vol 25, No 4, 1957) and "Concerning a Complete System of Finite-Dimensional Invariants in the Spaces of Paired Differential Operators" (Tr. Odessk, tekhnologich. in-ta, Vol 6, 1954, pp 163-169).

Motor Diads and Tensors

69. Motor Diads and Tensors of Mizes

"On the Motor Diads and Tensors of Prof. R. Mizes," by P. N. Osipov, Kiev Technological Institute of the Food Industry; Kiev, Doklady Akademii Nauk Ukrainskoy SSR, No 1, Jan 60, pp 7-12

R. Mizes, in his two papers published in Zs. fuer Ang. Mathem u Mech., Vol 4, No 2, and Vol 4, No 3, 1924, was the first to introduce motor variables of the second degree, that is, motor diads and tensors. The variables of R. Mizes, however, have a great shortcoming. In particular, they contain four times as many components as compared with the dual components of the motor diads considered by the author and twice as many as compared with scalar components. This complication in R. Mizes' theory of motor diads and their application is due to his faulty definition of the basic concept of motor algebra, namely, the concept of a unit motor. He introduced two unit motors, neither of which can represent the general form of a motor.

The author of the present paper proved in 1939 that a motor of the most general form may be represented as the product of the bimodulus $\hat{a} = a + \epsilon a_1$ of motor \hat{a} and its ortmotor $\hat{a}^0 = a^0 + \epsilon r \chi a^0$, i. e. $\hat{a} = \hat{a} \hat{a}^0$.

Such a concept of a unit motor makes it possible to simplify the theory of motor diads and their applications considerably.

Numerical Analysis70. Partial Sums of Fourier Series for Almost-periodic Functions

"Several Estimates for the Deviations of the Partial Sums of Fourier From Almost-Periodic Functions," by Ye. A. Bredikhina; Moscow, Matematicheskiiy Sbornik, Vol 50 (92), No 3, Mar 60, pp 369-382

The results of the paper refer to the almost-periodic functions, indicated by Fourier, which do not have limit points at finite distances.

We will assume that the Fourier series of an almost-periodic function $f(x)$ is described by the following form:

$$f(x) = \sum_{k=-\infty}^{\infty} A_k e^{i\Lambda_k x} \quad (\Lambda_0 = 0; \Lambda_k < \Lambda_{k+1} \text{ for } k = 0, 1, 2, \dots; \lim_{k \rightarrow \infty} \Lambda_k = \infty; \Lambda_{-k} = -\Lambda_k; |A_k| + |A_{-k}| \neq 0 \text{ for } k \neq 0).$$

$$\lim_{k \rightarrow \infty} \Lambda_k = \infty; \quad \Lambda_{-k} = -\Lambda_k; \quad |A_k| + |A_{-k}| \neq 0 \text{ for } k \neq 0.$$

We denote the sequence $\{\Lambda_k\} (k=1, 2, \dots)$ by $L(f)$.

We set

$$R_\lambda(f) = \sup_x \left| f(x) - \sum_{|\Lambda_k| \leq \lambda} A_k e^{i\Lambda_k x} \right|,$$

$$E_\lambda(f) = \inf_{F(z) \in B_\lambda} \left[\sup_x |f(x) - F(x)| \right],$$

where B_λ is the class of entire functions of degree $\leq \lambda$, bounded on the real axis. In section 2 of this paper, the relationship between the deviations of the partial sums of a Fourier series from an almost-periodic function which, as indicated by Fourier, do not have finite limit points and the best approximations of this function by entire functions of a finite degree is established; that is, estimates of the form

$$R_\lambda(f) \leq \Phi(\lambda) E_\lambda(f)$$

are given where $\Phi(\lambda)$ is a function of λ , defined by a sequence of the type $L(f)$. The generalized theorem of A. Lebesgue (see I. P. Natanson, Konstruktivnaya teoriya funktsiy [Constructive Theory of Functions], Gostekhizdat, Moscow-Leningrad, 1949, pp 193-194) is contained in these estimates for the almost-periodic case.

In section 3, new sufficient criteria for uniform and absolute convergence of the Fourier series for almost-periodic functions are given. The results of the author (Ye. A. Bredikhina, "Concerning the Best Approximations of Almost-Periodic Functions by Entire Functions of Finite Order," DAN SSSR, Vol 117, No 1, 1957, pp 17-20) are also strengthened relative to the best approximations of almost-periodic functions represented by lacunary series and entire functions of finite order.

VIII. MEDICINE

Bacteriology

71. Colloidal Properties of Aerosols

"Certain Colloidal-Chemical Properties of the Bacterial Aerosol," by V. V. Vlodavets; Moscow, Voyenno-Meditsinskiy Zhurnal, No 3, Mar 60, pp 82-84

CPYRGHT

"The origination and distribution of air-borne infection is possible only when there is a sufficient concentration of viable pathogenic bacteria which have not lost their virulence in the air, and when this air is inhaled by persons who are susceptible to the given infection. The colloidal properties of a bacterial aerosol, i.e., of microorganisms suspended in the air, have a substantial effect on the spread of air-borne infections. Such factors as the lengths of time the microorganisms remain in the air, their concentration, dissemination, and penetration into different branches of the human respiratory tract depend entirely on the colloidal properties of the bacteria suspended in the air.

"As is known, bacterial cells can be found in the air either in connection with dust particles, or inside droplets of liquid. We speak of the first instance as the dust phase of a bacterial aerosol, and the second as the droplet phase of an aerosol.

"A special chamber was constructed for experiments with the droplet and dust phases of a bacterial aerosol; *Staphylococcus albicans* (which is found in the air of living quarters, is stable under environmental conditions, and is closely connected with the human organism as an inhabitant of the skin and nasal passages) was used as an experimental model.

"After the dispersal of a bacterial suspension of *Staphylococcus*, prepared in an 0.85% solution, the concentration of the *Staphylococcus* aerosol was maintained for the longest period of time when the humidity was low, whereas an increase in humidity accelerated the process of eliminating the bacterial droplets from the air. This process was especially pronounced when the relative humidity of the air was 90%. The acceleration of the process of freeing the air of bacteria is explained by the fact that when the humidity of the air is increased, the rate of evaporation of the water of the bacterial droplet is slowed down. As a result of the slowed evaporation at high humidity, the size of the droplets is decreased more slowly than when the humidity is moderate or low. According to Stokes' Law, the rate of precipitation of aerosol particles and droplets is directly proportional to their size.

But since bacterial droplets are larger at high humidity than at low and moderate humidity, they also precipitate more quickly. This process is particularly noticeable during the first 30 minutes after the creation of a bacterial aerosol, which was noted in special experiments.

"Three series of experiments were performed at low, moderate, and high humidity in a study of the behavior of bacterial aerosols in the dust phase. In all cases, a significantly more rapid decrease in the concentration of Staphylococcus was noted in the air in the dust phase experiments than in experiments on the droplet phase. This is explained to a great extent by the fact that the particles of a bacterial dust are dispersed less than bacterial droplets.

"No essential differences in the rate of precipitation of particles of the Staphylococcus bacterial dust were noted in experiments with low and moderate humidity; however, a relatively rapid decrease in the concentration of the Staphylococcus aerosol was observed in the experiments with high humidity. This process began immediately after the dispersal of the bacterial dust and was particularly noticeable in experiments which lasted for 30 minutes, and in which the basic mass of Staphylococcus was precipitated during the first 10 minutes after the generation of the aerosol. The high rate of precipitation of Staphylococcus bacterial dust particles at high humidity can be explained by the hygroscopic nature of dust and by the increase in the process of coagulation of dust particles, since there is a great possibility of separate humid particles combining to form larger particles on collision.

"The precipitation of a great number of bacteria during the first minutes after the generation of an aerosol is an indirect indication that microorganisms in the dust phase of a bacterial aerosol are combined with dust particles, chiefly with larger particles. However, single Staphylococci (an average of 0.04% of the initial concentration) are detected in the air of the chamber 8 hours after the generation of the bacterial aerosol. This makes it possible to suppose that single bacteria in the dust phase of a bacterial aerosol might not be combined with dust particles, or with only very small, possibly submicroscopic particles which do not affect the rate of precipitation of the bacteria.

"Ninety-six experiments with the natural microflora of the laboratory air were carried out to study the electric charge of the dust phase. The electric charge was determined with the aid of an apparatus which we built with electrodes placed vertically. A Petri dish was attached to these electrodes, and a direct current of 3,000-3,500 v was supplied. The distance between the electrodes was 10 cm, and an electric field of 300 v/cm was established between them, in which the particles carrying an electric charge (including bacterial particles and droplets) were attracted to the electrode with the opposite charge.

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"As is known, bacterial cells carry a negative electric charge in an electrolytic solution. But this is not true under atmospheric conditions. If the number of bacteria which was determined on the positive electrode, i.e., negatively charged bacteria, amounts to 100%, then the number of bacteria with a positive charge is 123.3%. In other words, for every five positively charged bacteria in the air of the laboratory, there must be four negatively charged bacteria. The predominance of the positive charge was observed in studies of such frequently encountered microorganisms as *Sarcina aurea* and *Staphylococcus albicans*. A negative charge predominated in the air in other groups of microorganisms (molds, *Actinomyces* and grampositive, and sporogenous bacilli).

"The electric charge of *Staphylococcus albicans* in the droplet phase of an aerosol was studied in the experimental chamber. Samples were taken within an hour after the dispersal of *Staphylococcus* to ensure stabilization of the aerosol. It was established that two thirds of the *Staphylococcus* bacterial droplets had a negative electric charge, and one third, positive. Air samples which were taken within 5 and 10 minutes after dispersal of the *Staphylococcus* suspension gave contradictory results, which was probably caused by the acquisition of triboelectric charges (friction charges) established when the bacterial suspension was dispersed.

"In a study of the penetrability of a gauze mask with respect to the droplet phase of a bacterial aerosol, it was noted that the *Staphylococcus* bacterial droplets borne by a current of air at high speed were not completely held back by 2, 4, 6, and even 8-layer gauze masks, although the mask was far less penetrable when the number of layers was increased. The effectiveness of filtration of the air was very significantly increased on increasing the number of layers from two to four. The effectiveness of the gauze mask was considerably augmented by decelerating the speed of the air current. The effectiveness of the mask was sharply increased by the insertion of a porous, 3-5-mm layer of cotton into a two-layer gauze mask. The obligatory condition for this process is uniform distribution of the cotton over all surfaces of the mask; if the layer of cotton is unevenly distributed, a 'window' through which a large number of bacterial droplets pass with the air current is formed.

"On the basis of these experiments, it is possible to recommend that medical personnel use a four-layer gauze mask since it is much more effective than a two-layer mask. It should be mentioned that a mask with more than four layers hampers work to a great extent and can hardly be recommended for practical use. In cases in which special caution is required, such as in operations in neurosurgical clinics and also in long, cavitary operations, the gauze mask should be worn with the cotton layers. These masks are conveniently worn on a small wire frame suggested by A. P. Nikolayev and L. M. Margolina; the frame enhances the efficiency of the mask and inhibits breathing to a lesser extent."

Contagious Diseases

72. Case of Cutaneous Anthrax From Accidental Exposure

"Human Cutaneous Anthrax After the Accidental Subcutaneous Introduction of Second Tsenkovskiy Vaccine," by A. I. Baysburd, Stalinabad City Infectious Disease Hospital; Stalinabad, Zdravookhraneniye Tadzhikistana, No 1, Jan/Feb 60, pp 40-41

A case of anthrax in a veterinary worker who had been accidentally punctured with a needle containing second Tsenkovskiy vaccine, which is never administered to humans, is reported. The vaccine, which was being used for cattle immunizations, was series 26, prepared in 1956 at Kaluzhskaya Biofabrika. The needle penetrated the skin to a depth of 4 cm, and the victim received approximately 0.1 ml of vaccine.

After treatment of the wound with tincture of iodine, the patient returned to work but developed cutaneous anthrax symptoms (which are described) after a 4-day incubation period. In addition to symptomatic therapy, he was given penicillin and 100 ml of antianthrax serum. He continued to improve and was discharged from the hospital in good condition on the 32d day. The diagnosis was not verified bacteriologically.

Epidemiology

73. Eradication of Anthrax in Ukrainian SSR

"Methods of Eradicating Anthrax," by A. S. Korotich, I. D. Netrebko, and V. M. Suponitskaya, Kiev Scientific Research Institute of Epidemiology and Microbiology; Kiev, Vrachebnoye Delo, No 12, Dec 59, pp 1303-1304

This report presents the results of an analysis of statistical, epizootiological and epidemiological data on anthrax collected in the Ukrainian SSR from 1946 to 1958; the authors attempted to determine the dynamics of the infection of humans and animals with this disease. As shown in an accompanying table, a decrease in the human incidence indexes was found to correspond with a decrease in the animal incidence indexes. The analysis also showed that one case of human anthrax occurred for every 7.5 cases of the disease in animals during the 13-year period. This figure is higher than those observed in studies of other zoonoses (brucellosis, rabies, and foot-and-mouth disease).

The following procedures are recommended for the eradication of anthrax in the Ukrainian SSR.

Antianthrax vaccination of all susceptible animals in "stationary unfavorable points: (no infection of humans was reported where there was a 100% immune stratum among animals).

In cases of forced slaughter, all contact with corpses should be prohibited before inspection by a veterinarian.

Supervision of prophylactic inoculations and revaccinations carried out in threatened areas should be improved.

The sanitary-epidemic service must make certain that the soil and reservoirs are not contaminated; observance of the regulations for the disposal of animal corpses is extremely important.

Attention should be paid to the prevention of infection from hides and products of animal origin; all hides should be examined for the presence of B. anthracis by the precipitation reaction.

Sanitary-epidemic institutions should reinforce their work on selecting population groups and making immunizations according to indications.

The diagnosis of anthrax in humans should be improved; the majority of cases reported during the period studied were not substantiated by bacteriological investigations.

The authors conclude that the careful observance of the measures suggested should lead to a decrease in the number of cases and finally to the complete eradication of human anthrax in this area.

Immunology and Therapy

74. Cutaneous Antibrucellosis Vaccination

"The Cutaneous Method of Inoculation Against Brucellosis"
(unsigned article); Moscow, Meditinskiy Rabotnik, 15 Apr
60, p 4

CPYRGHT

"An All-Union Conference on Problems of the Specific Prophylaxis and Therapy of Brucellosis has been held. The results of the use of a new cutaneous method of prophylactic inoculations developed at the Institute of Regional Pathology, Academy of Sciences Kazakh SSR, and the Central Asiatic Institute were presented.

CPYRGHT

"This method makes it possible to simplify and to facilitate prophylactic inoculations, and to achieve a significant decrease in the incidence of brucellosis among humans. The conference approved and recommended the method for widespread introduction into medical practice."

75. Autoimmunization Discussed

"Contemporary Ideas About Autoantigens," by V. A. Parnes; Moscow, Patologicheskaya Fiziologiya i Eksperimental'naya Terapiya, Vol 4, No 2, Mar/Apr 60, pp 78-88

In this extensive survey of Soviet and foreign literature on autoimmunization, Parnes discusses research ranging from 1904 to 1958. The article is divided into two sections: "The Mechanism of Autoimmunization" and "Autoimmunization Produced by Different Tissues."

In the first section, the following three hypotheses of the mechanism of autoimmunization are presented: (1) the phenomenon is caused by the alteration of antigens normally inherent to tissues of an organism which, as a result of trauma or other causes, is modified to such an extent that its separate components become foreign to the organism and thus become able to effect the production of antibodies; (2) autoimmunization is a pathological process connected with the accumulation in the blood stream of antigens not normally in contact with the immunogenesis system of the organism in the early ontogenetic period, and which therefore cause a responsive immunological reaction -- the production of antibodies; (3) autoimmunization is an intensive physiological process of the production of antibodies to components of the cells and tissues of the organism, and is determined by pathological conditions. These three hypotheses are discussed in detail.

In the second section, the author considers autoimmunization brought about by connective tissue, tissues of the brain, the peripheral nervous system, iris, skin, and heart, and by other tissues and cells.

The major conclusions presented follow.

1. The tissues of an organism can acquire autoantigenic properties under certain definite conditions, such as: the formation of complexes of normal proteins with viruses, bacteria, toxins, and certain therapeutic and other substances; denaturation of proteins by cold, trauma, burns, etc.; a disturbance of certain enzyme systems and the accumulation of unsplit products in the blood stream; a disturbance in the penetrability of the cell membranes, or their injury, with a resulting output of intracellular, especially intranuclear, material and its accumulation in the blood; a disruption of the intracellular synthesis of proteins.

2. Autoimmunization arises not spontaneously and not without cause, but is always brought about by an exogenous action on the organism.

3. Autoimmunization is always pathological; it never occurs under normal physiological conditions.

4. Autoimmunization creates conditions for the onset of a chain reaction in the organism.

5. The production of antibodies in the organism is not always sufficient to initiate the chain reaction.

6. The complex antigen-antibody, if it cannot be dissolved, can be deposited in the tissues in the form of a precipitate, resulting in disturbance of cell division, tissue metabolism, etc.

7. Which autoantibodies (circulating or connected with tissue) cause damage to the tissues is not clear for most of the autoimmune processes.

8. The experimental study of the role of antibodies in the autoimmunization process with the aid of homologous and heterologous cytotoxic sera were successful.

9. The possibility of the appearance of isoantibodies should be excluded by corresponding control experiments in all investigations of autoantibodies in serum, but autologous animal tissue is the best antigen for detecting them under experimental conditions.

10. The question of whether autoimmunization is a cause or a result of disease does not seem to be a valid one; autoimmunization is always brought about by a definite cause, but in its turn is an important pathogenetic factor in a number of diseases: autoimmune cytopenias, disseminated encephalomyelitis, chronic thyroiditis, and in a number of forms of chronic nephritis, hepatitis, in cirrhosis of the liver, collagen diseases, amyloidosis, sympathetic ophthalmia, burns, etc.

The study of the role of autoimmunization in malignant neoplasms including leucosis progressing as a complex chain reaction which encompasses and alters many physiological mechanisms, is considered to be especially important.

76. Central Nervous System Antigens Studied

"Specific Antigens of the Central Nervous System," by A. V. Sokolov, Zaporozh'ye State Institute for the Advanced Training of Physicians imeni Maxim Gor'kiy; Moscow, Patologicheskaya Fiziologiya i Eksperimental'naya Terapiya, Vol 4, No 2, Mar/Apr 60, pp 23-26

The author briefly discusses the work of other investigators on the problem of antigens which are specific for different branches of the central nervous system, and attributes previous inconclusive and contradictory results to the fact that only the complement fixation reaction, not highly sensitive for detecting tissue antigens, was used.

The method employed by the author was developed by L. A. Zil'ber; freshly prepared protein fractions (nucleoproteids) obtained from dog brain and spinal cord were used to sensitize guinea pigs (doses are shown in tables accompanying the article). A desensitizing dose of the second antigen (which exceeded the sensitizing dose of 5-8 times) was given subcutaneously and then intravenously after 21-22 days. The effectiveness of desensitization was tested in most of the experiments by the administration of a second intravenous dose of second antigen, and then a resolving dose of the same antigen to which the animal had been sensitized. The resolving dose was given only if the last introduction of desensitizing antigen did not produce anaphylactic shock, or if shock was weakly manifested. The severity of shock was evaluated by a four-step scale ranging from no reaction to fatality.

After reviewing the results of the experiments, the author presents the following conclusions.

1. The antigenic specificity of the cerebral cortex and spinal cord can be determined by L. A. Zil'ber's anaphylaxis method.
2. The gray matter of the cerebral cortex and spinal cord contains different antigens.
3. To obtain clear results in the demonstration of specific tissue antigens by the method of anaphylaxis with desensitization, it is necessary first to determine the optimum sensitizing, desensitizing, and resolving doses of antigens.

Pharmacology and Toxicology

77. Comparative Action of Certain Ganglioblocking Drugs

"Comparison of the Ganglioblocking and Curarelike Action of the Diiodide of 3,4-dithiahexane-1,6-bis-Trimethyl Ammonium and Hexonium," by M. D. Mashkovskiy and B. A. Medvedev, Laboratory of Pharmacology, All-Union Scientific Research Chemicopharmaceutical Institute imeni S. Ordzhonikidze, Moscow; Moscow, Byulleten' Eksperimental'noy Biologii i Meditsiny, Vol 49, No 4, Apr 60, pp 66-70

A comparative study was made of the effect of hexonium, the diiodide of 3,4-dithiahexane-1,6-bis-trimethyl ammonium (dithiahexonium), and the diiodide of 4,5-dithiaoctane -1,8-bis-trimethyl ammonium on the sympathetic and parasympathetic ganglia and on neuromuscular transmission. The investigations established that hexonium when used as a ganglioblocking agent is about three times more effective than are dithiahexonium and its dithiaoctane analogue; dithiahexonium and its dithiaoctane analogue are considerably more effective than hexonium in their action on neuromuscular transmission; dithiahexonium and its dithiaoctane analogue differ only slightly in their effect on ganglia; both are considerably more toxic than hexonium.

78. Effect of Cholinolytics on Organism

"Pharmacology of Central Cholinolytics," by P. P. Denisenko, Institute of Experimental Medicine, Academy of Medical Sciences USSR; Moscow, Vestnik Akademii Meditsinskikh Nauk SSSR, Vol 15, No 2, Feb 60, pp 20-30

Investigations have been conducted on the action of diphacil, aprophen, diazil, methyldiazil, methyldiphacil, pentaphen, tropacin, and others, a group of preparations known as central cholinolytics because of their effect on the cholinoreactive systems. On the basis of their chemical structures, these preparations are complex esters of aromatic acids and amino alcohols, or their derivatives. The investigations established that: central cholinolytics possess a two-phase action; in small doses they intensify and in large doses depress conditioned reflex activity; there is antagonism between central cholinolytics and cholinomimetics; the central cholinolytics possess the property of preventing or completely removing the effects of cholinomimetics; and that antagonism between the central cholinolytics and anticholinesterase preparations, such as phosphacol, eserine, and others exists, with the advantage being in favor of the cholinolytics. Clinical data established that the central cholinolytics can be beneficially used in the therapy of patients suffering from

alarm-depression conditions to potentiate the effect of aminazine or to replace it in cases in which it is found to be ineffective. It was established that they can be used with positive results in the therapy of ulcerous conditions, and to potentiate the action of soporific and anesthetic drugs. The use of the central cholinolytic preparations is recommended in cases in which it is necessary to modify the level of synaptic transmissions of impulses in different links of the nervous system, particularly in the cerebrum.

79. Atropinelike Effect of Some Cereals

"Cholinolytic Properties of Aqueous Extracts of Toxic Cereals (Which Wintered Under Snow and Were Harvested in the Autumn-Winter Season)," by M. D. Nazarov, Tr. Izhevskovo Med. In-ta (Works of the Izhevsk Medical Institute), 1958, 17, 370-376 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 8, 25 Apr 60, Abstract No 11611, by I. El'man)

CPYRGHT

"Cereal crops which wintered under snow (millet, buckwheat, wheat, rye, and oats) acted as mydriatics and induced either the complete cessation or reduction of contractions and a decrease in the tonus of the intestine whether applied to the whole organism or to isolated organs. Aqueous extracts of the wintered crops had a cholinolytic effect. In experiments on the pupil of the eye, they displayed an antagonistic effect in relation to pilocarpine and physostigmine, an effect which is characteristic of atropine; in experiments on the intestine, they were antagonistic to barium chloride and acetylcholine. The cholinolytic action of the extracts may be explained by the presence of atropinelike substances in the wintered crops."

80. Effect of Barbiturates on Cerebral Activity

"Experimental Investigation of the Effect of Barbiturates on the Activity of Cerebral Asparaginase and Glutaminase," by L. I. Miloslavskaya, Sb. Nauchn. Tr. Ryazansk. Med. In-ta (Collection of Scientific Works of the Ryazan Medical Institute), 1959, 6, 30-36 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 7, 10 Apr 60, Abstract No 10097, by I. El'man)

CPYRGHT

"Cerebral asparaginase activity in albino rats is normally equal (per one milliliter of the homogenate) to 11 gamma, and that of glutaminase to 21.16 gamma. In the course of medically induced sleep produced by the subcutaneous injections of medinal, the activity of asparaginase and glutaminase is considerably reduced; asparaginase activity is particularly

affected. In anesthesialike sleep induced by the injections of sodium amytal and medinal, a sharp depression of asparaginase and a slight depression of glutaminase activities is noted."

81. Effect of Pharmacological Substances on Organism

"Effect of Pharmacological Substances on the Functional Mobility of Different Links of the Reflex Paths," by Prof V. V. Zakusov, Active Member of Academy of Medical Sciences USSR, Institute of Pharmacology and Chemotherapy, Academy of Medical Sciences USSR; Moscow, Vestnik Akademii Nauk SSSR, Vol 15, No 2, Feb 60, pp 14-20

Cats were used in experiments conducted to determine the effect of several groups of pharmacological substances on the functional mobility of the separate links of the reflex paths which are utilized in the transmission of stimuli. The first group of the preparations consisted of cholinergic drugs, including tubocurarine chloride, acetylcholine, proserine, nicotine, sparteine, diphacil, hexonium, and a number of others. All have been found to modify the level of lability of the upper cervical ganglion, making the transmission of stimuli difficult; the degree of the modification and its duration varied with the drugs, depending on their chemical structure.

The second group of substances consisted of anesthetics, including the following derivatives of barbituric acid: barbamil, medinal, hexenal, and thiopental. The third group comprised analgesic drugs, among them morphine, urethan, and others. Like the first group, these two groups also modified the lability of the ganglia, inhibiting the transmission of stimuli. It was established also that the parameter of lability can be used as a criterion for the determination of the functional state of the links of the reflex paths when affected by different pharmacological substances.

82. Resistance to Organophosphorus Insecticide Induced in Mice

"Body Reactions to Repeated Action of Thiophos in Experiment," by N. K. Byalko, Institute of Labor Hygiene and Occupational Diseases of Academy of Medical Sciences USSR; Moscow, Gigiyena Truda i Professional'nyye Zabolevaniya, No 3, Mar 60, pp 44-48

In this work, the author has shown the possibility of developing resistance to thiophos by repeated small doses. White mice were used in the experiment.

During the first 2-4 weeks, thiophos was administered in doses of one, 3, 5 and 10 mg/kg of body weight. It was found that the repeated administration of thiophos was accompanied by a slowing down of the weight-gain of the animals and by depressed activity of the cholinesterase enzyme of the brain and liver. Concurrently with the gradual decline in the activity of the cholinesterase, a progressive resistance to this preparation could be noted: the animals acquired the ability to tolerate toxic doses of thiophos that would be lethal to normal mice.

83. Intoxication by Disinfestation Agent

"Intoxication by Granozan," by B. V. Gosudarskaya-Kuznetsova; Moscow, Fel'dsher i Akusherka, Vol 25, No 3, Mar 60, pp 43-44

Granozan or NIULF No 2 is poisonous to humans and animals. Its composition is as follows: 2.5 percent of one percent ethylmercury chloride, 47.4 percent of talc, and 0.6-11.2 percent of mineral oil. The preparation is widely used in the treatment of seeds for the control of pests which infest agricultural plants. Intoxication may occur at the time the insecticide is being prepared, or when it is used in seed treatment. The initial symptoms are headaches, difficulty in breathing, a metallic taste in the mouth, abdominal pains, general debility, a rise in temperature, disordered speech, and frequent and uncontrolled urination. Therapy consists of eliminating the poison from the system, the administration of sodium hyposulfite, and vitamins. Prophylactic measures consist of teaching the personnel to handle the poison properly and with caution. Therapy under hospital condition normally takes about 54 days, a period necessary to completely eliminate the poison from the system.

84. Chronic Mercury Intoxication

"Investigation of the Sulfhydryl Groups of Blood Serum Proteins in Experimental Chronic Mercury Intoxication," by V. A. Shalimov, Sb. Nauchn. Tr. Ryazansk. Med. Inst (Collection of Scientific Works of the Ryazan Medical Institute), 1959, 6, 37-45 (from Referativnyy Zhurnal ... Khimiya, Biologicheskaya Khimiya, No 7, 10 Apr 60, CPYRGHT Abstract No 10227, by I. El'man)

"The content of SH-groups in blood serum proteins decreased as a result of chronic mercury intoxication. The decrease reached a value of 31.6 percent between the 90th and 120th day of the intoxication by large doses of mercuric chloride. The decrease in the quantity of free SH-groups in blood serum proteins is due to their being blocked by mercury ions, as well as disturbance of the biological synthesis of proteins, and their destructive modifications."

85. Chronic Intoxication by Cadmium Compounds

"Changes in Blood Serum Content of Proteins and Their Functional Groups in Chronic Intoxication by Cadmium Compounds," by I. V. Shcherbakova, Sb. Nauchn. Tr. Ryazansk. Med. In-t (Collection of Scientific Works of the Ryazan Medical Institute), 1959, 6, 50-56 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 7, 10 Apr 60, Abstract No 10223, by I. El'man)

CPYRGHT

"Chronic intoxication of rabbits by cadmium salts reduced the blood content of Hb by 11.11-48.4 percent below normal content. The quantity of erythrocytes was decreased in most cases. Erythrocyte precipitation increased to 12 millimeters an hour instead of the normal 1.4-2.5 millimeters per hour. The color indicator at the end of the intoxication reached a value of 31.79 percent as compared with the normal value. The amino nitrogen content in the blood serum proteins of the experimental rabbits decreased by 3.6-23.2 percent, while the content of residual nitrogen increased from 73.54 to 207.2 percent. The quantity of the carboxylic groups increased during the first days of the intoxication, and then gradually decreased by 22.3 to 54.4 percent as compared with the normal quantity. The content of the SH groups in the intoxicated animals decreased by 49.7-92.6 percent."

86. Intoxications by Ethylbenzene, Styrol, and Diisopropylbenzene

"Experimental Data on Acute and Subacute Intoxications by Ethylbenzene, Styrol, and Diisopropylbenzene," by A. S. Faustov, Tr Voronezhsk. Med. In-ta (Works of the Voronezh Medical Institute), 1957, 29, 7-9 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 8, 25 Apr 60, Abstract No 11716, by T. El'man)

CPYRGHT

"In experiments carried out on animals it was established that when the poisons were introduced into the organism through the gastrointestinal tract, the toxicity of ethylbenzene was considerably greater than that of styrol; when introduced by inhalation, styrol had a considerably greater toxic effect than ethylbenzene. When the poisons were introduced into the organism by subcutaneous injection, they produced a picture of intoxication which was characterized by weakly expressed and slowly developing symptoms of poisoning; fatal results from lethal doses, as a rule, occurred considerably later than death from the poisons received through the respiratory organs or the gastrointestinal tract. The values of threshold concentrations for styrol and diisopropylbenzene were within the limits of 0.5-1.0 milligram per liter, and for ethylbenzene, 0.5-2.0 milligrams per liter."

87. Chronic Intoxication by Zinc Compounds

"Effect of Chronic Intoxication by Zinc Compounds on the Functional Groups of Tissue Proteins," by A. Ye. Klimentovskaya, Sb. Nauchn. Tr. Ryazansk. Med. Inst. (Collection of Scientific Works of the Ryazan Medical Institute), 1959, 6, 15-29 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 7, 10 Apr 60, Abstract No 10225, by I. El'man)

CPYRGHT

"In chronic intoxication by zinc compounds, the amine group content of blood proteins decreased by 30 percent, carboxylic groups by 25 percent, and SH-groups by 20 percent in the experimental animals. The total protein content decreased, while that of the residual nitrogen considerably increased, indicating an intensified process of the decomposition of tissue proteins."

88. Effect of Phenylisopropylamine Derivatives on the Organism

"Connection Between the Chemical Structure and the Pharmacological Properties of a Number of Phenylisopropylamine Derivatives. 1. Aliphatic Derivatives," by J. Hano, M. Wilimowski, and J. Gieldanowski, Arch Immunol. i Terap. doswiadc. (Poland), 1959, 7, No 1, 77-93 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 8, 25 Apr 60, Abstract No 11615, by the authors)

CPYRGHT

"Pharmacological investigations of the effect of the following seven alkyl derivatives of phenylisopropylamine (phenamine; Ph) on different animals were conducted: 1-phenyl-3-methylaminopropane (I); 1-phenyl-3-ethylaminopropane (II); 1-phenyl-amino-propylaminopropane (III); 1-phenyl-1-methyl-aminopropane (IV); 1-phenyl-1-ethylaminopropane (V); 1-phenyl-1-propylaminopropane (VI); and 1-phenyl-1-heptylaminopropane (VII). It was established that (I), (II), and (III) when subcutaneously injected into mice in doses of 0.0001 gram per kilogram body of weight, differing from Ph, acted as relaxants and not as stimulants. In doses of 0.005 gram per kilogram of body weight, (I), (II), and (III) act as anesthetics. In doses of 0.0001-0.001 grams per kilogram of body weight (IV), (V), (VI), and (VII) act as stimulants. The activity of (VI) was equal to that of Ph. An anesthetic effect was produced also by (IV), (V), (VI), and (VII) when administered in doses of 0.005 gram per kilogram of body weight. (VI) reduced the duration of sleep induced in rats and mice by veronal, sodium amyral (barbamil), and chloral hydrate. The rest of the preparations had no effect on the action of the soporific drugs. (I), (II), and (III) potentiated the depressing effect of morphine and eicodal (tecodin) on the respiratory centers of rabbits; (IV), (V), (VI), and (VII) were found to be antagonistic to morphine and eicodal. (VI), similarly to Ph,

had a pressor effect; all the other preparations produced a depressing effect. None of the preparations possessed the property of peripheral sympathomimetic action. (IV) was found to be closest to Ph in similarity of action."

89. Effect of Phenothiazine Derivatives on Organism

"Effect of Some of the Phenothiazine Derivatives on Respiratory Phosphorylation in the Cardiac Muscular Tissue of a Rabbit," by A. M. Zubovskaya, Laboratory of Biochemistry at the Institute of Pharmacology and Chemotherapy, Academy of Medical Sciences USSR, Moscow; Moscow, Byulleten' Eksperimental'noy Biologii i Meditsiny, Vol 49, No 4, Apr 60, pp 60-63

The results are reported of the investigations conducted to determine the effect of mepazine, fenegan, and promazine on the processes of respiration, and phosphorylation linked with it in the homogenates of the cardiac muscle of a rabbit. The investigations established that promazine in a concentration of $0.8 \cdot 10^{-3}M$ depressed respiration, and either increased or retained at a normal level phosphocreatine formation; mepazine in a concentration of $0.8 \cdot 10^{-3}M$ depressed respiration and stimulated the formation of phosphocreatine; differing from the others, fenegan in a concentration of $0.8 \cdot 10^{-3}M$ depressed respiration and the formation of phosphocreatine. In high concentrations, particularly those above $1,2 \cdot 10^{-3}M$, fenegan has a greater depressing effect on phosphorylation than on respiration. None of the preparations either depress creatininase or activate the adenosine triphosphatase.

90. Effect of Colamine on Organism

"Effect of Colamine on Phosphorus Metabolism in Rams," by G. V. Kalamyán and G. V. Barsegyan, Izv. M-vo s. kh. Arm. SSR, (News of the Ministry of Agriculture Armenian SSR), 1959, No 1, 69-74 (from Referativnyy Zhurnal Khimiya. Biologicheskaya Khimiya, No 7, 10 Apr 60, Abstract No 9141, CPYRGHT by V. Barun)

"In chronic experiments carried out on rams which received colamine intravenously in doses of 60 milligrams per kilogram of body weight on a background of radioactive phosphorus (10 microcurie per kilogram of body weight in the form of $Na_2HP^{32}O_4$), it was established that colamine induced an increase in the general radioactivity of the phosphorus in the tissues, as well as in its fractions. In acute experiments, the increase in the activity of P32 in the organs was sometimes doubled. An increase in the radioactivity of the phospholipids in the liver, intestines, and kidneys was noted. The activity of adenosine triphosphate in the liver and heart noticeably increased."

91. Action of Neuroplegic Substances in Burn Shock

"Effect of Neuroplegic Substances on the Activity of Alkaline Phosphatase on the Rat's Liver Under Conditions of Burn Shock," by G. Fest, T. Fest, and S. Almashi, Scientific Research Station, Academy of Rumanian People's Republic, Tyrgu-Muresh; Moscow, Byulleten' Eksperimental'noy Biologii i Meditsiny, Vol 49, No 4, Apr 60, pp 78-81

White rats were used in the experiments carried out to determine the effect of chlorpromazine or a mixture of chlorpromazine, fenergan, and dolantin on the activity of the alkaline phosphatase in a rat's liver under conditions of burn shock. The animals were divided into three groups: a control group which suffered burns but received no preliminary treatment; an experimental group which suffered burns having received preliminarily chlorpromazine; and an experimental groups which was treated with a mixture of chlorpromazine, fenergan, and dolantin before the burns were inflicted. All the animals were killed 6 hours after the burns were inflicted, and the activity of the alkaline phosphatase in the liver was histochemically studied. It was found that in the control animals alkaline phosphatase activity was sharply increased; the increase was markedly reduced in the animals which were treated with chlorpromazine; the increase of the phosphatase activity in the animals which were treated with the mixture of chlorpromazine, fenergan, and dolantin was negligible.

92. Iprazid, Antidepressant Drug

"Iprazid -- A Preparation for the Therapy of Diseases of the Central Nervous System," by S. S. Liberman, All-Union Scientific Research Chemicopharmaceutical Institute imeni S. Ordzhonikidze; Moscow, Meditsinskaya Promyshlennost' SSSR, Vol 14, No 4, Apr 60, pp 51-52

Iprazid, 2-isopropyl-1-isonicotinoyl hydrazine, was synthesized by M. N. Shchukina and T. P. Sycheva at the All-Union Scientific Research Chemicopharmaceutocal Institute imeni S. Ordzhonikidze. It is a white crystalline powder, readily soluble in water, and has a melting point of 112-114 degrees. Iprazid was found to be effective in psychoses in which aminazine, reserpine, and other neuroplegic drugs are ineffective. It is particularly effective when applied in the therapy of depression states with a manic-depressive psychosis. Positive results have been obtained also when it was used in the therapy of schizophrenia with a dominating depression syndrome. Therapy must be carried out under observation of a physician as the drug may produce some side-effects, such as hypotension, loss of sleep, as well as hepatic disturbances. These can be avoided by regulating the dosages of the drug.

93. Gordecyn, New Antibiotic

"Gordecyn, a New Antibiotic Isolated From Barley Seed," by N. V. Novotel'nov and I. S. Yezhov, Nauchn. Dokl. Vyssh. Shkoly, Biol. N (Scientific Reports of the Higher School of Biological Sciences), 1959, No 3, 178-182 (from Referativnyy Zhurnal --- Khimiya, Biologicheskaya Khimiya, No 7, 10 Apr 60, Abstract No 9228, by S. Shapovalova)

CPYRGHT

"Gordecyn, a new antibiotic substance, has been isolated from the beer industry waste water in which barley was soaked. To remove the proteins, tannins, and other substances from the water in which the barley was soaked, the water was treated with a saturated solution of lead diacetate and then with a solution of Na₂SO₄. The antibiotic was then adsorbed with activated charcoal and washed with ethyl alcohol. The alcohol was then distilled under a vacuum and the residue treated with ether; the ether was then removed under vacuum at room temperature, and the antibiotic was obtained in the form of an oily liquid, amber in color, and with a mixed odor of honey and the rye bread crust. The yield of the antibiotic is 0.004 percent by weight of the air-dried barley.

"The antibiotic is readily soluble in ether and ethyl alcohol; it is poorly soluble in water. When hydrolyzed with hydrochloric acid, a brown waxlike precipitate is formed. The filtrate reduces Fehling reagent. Rhamnose and galactose have been found in the filtrate. Apparently, the active principle of the antibiotic is a glucoside of a steroid nature. The isolated antibiotic possesses a wide spectrum of antibacterial action similar to that of mycoacidin."

94. Quinine Bond With Cobalt

"Complex Compounds of Alkaloids With Mineral Salts, by E. Vascautanu and V. Jurka, An. Stint. Un. Iasi (Rumania), 1958, Sec. 1, 4, No 2, 201-206 (from Referativnyy Zhurnal --- Khimiya, Biologicheskaya Khimiya, No 5, 10 Mar 60, Abstract No 7175, by the authors)

CPYRGHT

"It was found that quinine binds more cobalt than do quinidine and cinchonine. In the opinion of the authors, this may affect the cobalt content in the organism when quinine is used for therapeutic purposes."

95. Galanthamine in Therapy of Paralyzes

"Galanthamine Promises to Overcome Paralyzes," by Gaetano Lisi; Rome, L'Unita, 20 Apr 60, p 3

Galanthamine, an anticholinesterase preparation, is being successfully used in the therapy of muscular affections and paralyzes caused by such diseases as poliomyelitis, neuritis, polyneuritis, and others. It was found to be particularly beneficial when applied in conjunction with physical therapy.

96. Chinese Medicine

"Some Medicinal Plants Used in Chinese Medicine," by I. I. Gerasimenko, All-Union Scientific Research Institute of Medicinal and Aromatic Plants; Moscow, Meditsinskaya Promyshlennost' SSSR, Vol 14, No 4, Apr 60, pp 54-57

Chinese medicine with its long history of development now has about 2,000 medicinal preparations, about two thirds of them being of plant origin. These medicinal plants can be divided into three groups: (1) the pharmacopeial group which consist of about 66 species of plants from which drugs of the so-called European Medicine type are prepared; (2) plants which are utilized in traditional medicine for therapeutic purposes and which are not officially recognized; and (3) plants of ancient Chinese medicine; this is a large group consisting of about 1,500 species of plants, and is officially recognized in the country. The medicinal qualities of the plants used in traditional medicine are now being studied at the Institutes of Traditional Medicine, organized in a number of cities. A number of plants which are now being used for the preparation of drugs to be used in the therapy of hypertonia, diabetes, cardiovascular diseases, and which are sources of sedative drugs, steroid compounds, bactericidals, and volatile oils are mentioned.

97. Hungarian Medical Therapy Conference Brings Foreign Praise

"Foreign Medical Professors Recognize Achievements of Our Drug Research," by "r.f."; Budapest, Magyar Nemzet, 30 Apr 60, p 3

A Hungarian medical therapy conference was held on 29 April 1960; 50 papers were read and 100 delegates from 20 countries participated. Soviet Professor Anichkov reported on tranquilizing drugs which affect the central nervous system; Professor Zakusov reported on new Soviet medicines which dilate the coronary arteries of the heart; Polish Professor Askanas reported on his experiences with the Hungarian

blood-vessel dilation compound Nitropenton; and West German Professor Marquardt dealt with the question of examining and using preserved blood. Hungarian Academician Bela Issekutz read a paper on the history of Hungarian drug research and Prof Imre Bach reported on his clinical experiences with a new medicine for heart and kidney diseases, Hypothizid.

The author of the article asked several foreign participants for their opinions on Hungarian drug research. Professor Kryushova, chief of the neurology clinic of the Leningrad institute of the Academy of Sciences USSR, spoke of Hungarian work with "great appreciation." She spoke of her good results with Mydeton and Andaxin, apparently of Hungarian manufacture, and she said that there is in general a good opinion of the Hungarian drug industry in the Soviet Union. Professor Savnik, director of the Ljubljana Oncology Institute, also spoke highly of the conference. He reported good results in use of the Hungarian Degranol in treating cancer; he praised its low toxicity, and he said that the introduction of the medicine in tablet form would be desirable. West German Professor Marquardt especially praised the Hungarian chemists in connection with their work in synthesizing biologically interesting materials.

Physiology

98. Chinese Study Histochemical Changes in Ovaries of Mice

"Histochemical Observations of the Female Reproductive Organs of the Mouse at Different Stages of the Estrous Cycle, IV. Ovaries," by Yu I (于 一), Department of Experimental Morphology, Chinese Academy of Medical Sciences, Peiping; Peiping, Chieh-p'ou Hsueh-pao (Acta Anatomica Sinica), Vol 4, No 3/4, Dec 59, pp 120-131

The ovaries of virgin albino mice at various stages of the estrous cycle were used for this study, which was conducted under the supervision of Prof Chang Tso-kan. As in the author's previous reports of the series, the techniques used were as follows: Methyl green-pyronin stain was used to demonstrate ribonucleic acid (RNA); Feulgen's test, to demonstrate desoxyribonucleic acid (DNA); McManus' improved periodidic acid test and the PAS test, to differentiate glycogen and other polysacchrides; cobalt sulfide and lead sulfide, to test alkaline phosphatase and acid phosphatase activity, respectively; and Sudan black, to locate lipids.

The author's observations and conclusions are summarized below.

Nucleic Acids

The ova in the primary follicles give deeper DNA stain than those in the larger follicles. The cytoplasmic RNA in the germinal epithelium increases in estrus and early metaestrus. The RNA in the egg cytoplasm increases in the growing follicles and decreases in the larger and matured follicles. The lutein cells in the growing corpus luteum are rich in cytoplasmic RNA during metaestrus. The degenerating lutein cells, on the other hand, contain little RNA. The interstitial cells formed by the atretic follicles are rich in RNA during estrus.

Glycogen

The interstitial cells and lutein cells are rich in glycogen. The glycogen granules in the former increase during estrus and those in the latter increase with the growth of the follicles. The follicular cells in the small and medium follicles are rich in PAS positive substance. In the larger follicles, the PAS positive substances are mainly in the cells bordering the follicular cavity. The follicular liquid exhibits strong PAS reaction. The eggs in the small and atretic follicles give a more intense PAS reaction. The reaction in the lutein cells increases with the development of the corpus luteum.

Phosphatases

The activity of the alkaline and acid phosphatases in the theca folliculi is more intensive than in any other part of the ovary. These enzymes are more active in the egg and follicular cells of the small and medium follicles than in the primary and matured ones. The follicular cells in the atretic follicle give a stronger reaction than the normal follicle. The activity is more intensive in the secreting and growing lutein cells than in the degenerating ones. In the interstitial cells, the activity is weak during proestrus and strong during metaestrus and dioestrus.

Lipids

Lipids or Sudan black granules can be located in the germinal epithelium and in follicular, lutein, and interstitial cells. The granules in the eggs of the primary and small follicles are localized at one side of the eccentric nucleus. They become scattered in the medium and large follicles. The follicular cells contain very few lipid granules and the follicular liquid is free from them. On the other hand, the thecal cells contain many large granules. Both the eggs and the follicular cells in the atretic follicles are rich in lipid granules. The granules in the lutein cells are fine and numerous during metaestrus and dioestrus. They become bigger and then disappear in the degenerating corpus luteum. The theca cells in the mouse ovary never actually form lutein cells and remain outside of the basement membrane of the corpus luteum. The interstitial cells contain many small granules during metaestrus and estrus. The granules become bigger and fewer during proestrus and estrus.

The author's current address is given in a footnote as:
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Public Health, Hygiene, and Sanitation

99. Effect of Physical Exercises on Organism

"Physical Exercises as a Means of Increasing the Resistance of the Organism to the Unfavorable Effects of the Environment. Report 1. Increase in Resistance to Hypoxemia, Toxic Substances, and Diseases," by Prof and Doctor of Medical Sciences N. V. Zimkin and Doctor of Medical Sciences A. V. Korobkov; Moscow, Teoriya i Praktika Fizicheskoy Kul'tury, Vol 23, No 4, Apr 60, pp 270-275

The general effect of physical exercises on the organism and the role played by such exercises in raising the nonspecific resistance of the organism to unfavorable factors in the environment are discussed in the article. According to data obtained, the authors state, physical exercises increase the resistance of the organism to the effects of such poisons as trichlorethylene and other toxic substances, and factors in the environment which produce hypoxemia.

100. Mortality Rate in Vinnitsa

"The Level of General Lethality in Certain Diseases," by L. A. Averbukh, Department of Organization of Public Health, Ukrainian Scientific Research Institute of Communal Hygiene; Kiev, Vrachebnoye Delo, No 4, Apr 60, pp 405-410

This article says that the results of the author's study of reports for 1955, made available by the city of Vinnitsa, showed that the general lethality level recorded was 0.5% among patients of all ages and 0.6% among adult patients. Higher lethality was noted among male patients in the majority of diseases, the exceptions being rheumatism, improper metabolism, allergies, mental disturbances, and vascular diseases of the brain.

The following diseases had the highest level of lethality: rheumatism (18.1%); diseases of the hemopoietic system (10.0%); vascular diseases of the brain (6.0%); congenital defects in general development (5.6%); angina pectoris (5.4%); rheumatic heart disease (3.3%); hypertension (3.1%), and diabetes (3.0%). It was also found that the lethality level in adult patients was higher than in elderly patients.

101. Leninism in Public Health

"Lenin's Ideas and Concepts on the Development of Soviet Public Health," by K. F. Duplenko; Kiev, Vrachebnoye Delo, No 4, Apr 60, pp 337-343

According to this article, the principles on which Soviet culture and the Soviet public health service are based were formulated by Marx and Lenin long before anyone envisioned the great October Socialist Revolution in Russia. Since 90 years has passed since the birth of V. I. Lenin, the Soviet medical intelligentsia considers it an honor and a duty to go on record as aiming to make V. I. Lenin's dream of a truly Soviet public health system a practical reality.

The Communist theory of public health differs from the public health theory that prevails in the capitalist countries. For example, the reactionary theory of English philosopher and sociologist Herbert Spencer suggested that there should be no interference by the government in public health service to the population. The only interference that he thought should be permitted was from philanthropic individuals or organizations. Such a theory has been quite convenient for the ruling classes of a capitalist society. It relieves the bourgeoisie and the state from the responsibility of rendering aid to the poverty-stricken and ill, and of reducing the high mortality rate among millions of unfortunates. That is why the Spencerian "theory" and various other versions of it, such as racism and eclectic "theories" of health, are so widely publicized in the capitalistic countries.

The insolvency of such "theories" became more and more evident with the emergence of the Marxist philosophy. Marxism showed in a scientific manner that the health of the workers reflects the political system they live under as well as the methods used in various industries. Lenin expanded the scientific hypotheses of Marx and Engels and showed in his book The Development of Capitalism in Russia that the health of the great mass of the population depends directly on the method used in producing goods and services. He proved that the development of socialist culture and the maintenance and improvement of the health of the great mass of people can be achieved only by the liquidation of capitalism and by placing all power and means of production in the hands of the working class.

Lenin's ideas and concepts found their reflection in the program formulated by the Communist Party. A decree dealing with the length of a working day and the distribution of time during working hours was promulgated only 2 days after the Soviets gained control of the government. This decree and other decrees were compiled and incorporated into a code of labor laws which was approved at the fourth session of the All-Union Central Executive Committee, 31 October 1922.

A broad national program of social measures was inaugurated in November 1917; health insurance was approved on 22 December 1917. An unemployment insurance law had been passed somewhat earlier.

The Soviet of People's Commissars RSFSR also passed an all-embracing social security law and proclaimed state ownership of the entire network of medical establishments, all pharmaceutical establishments, storehouses of drugs, and medical instruments and equipment. It also issued a decree nationalizing health resorts, converting them into sanatoriums for workers. All these and other measures, based on principles proposed and expanded by Lenin and the Communist Party, laid the groundwork for the organization of an orderly national system of health protection with free medical aid accessible to all.

Lenin's keen understanding of the medical needs of the population has resulted in the establishment of a public health service system which is superior to any system existing in capitalist countries.

Z. P. Solov'yev wrote in 1940 that the Soviet Union inherited from the old regime a hypocritical and bureaucratic medical machine which was indifferent to the needs of the population.

Lenin thought that it was important to have a sufficient number of people trained to eventually replace the liberally minded bourgeois element inherited from old Russia. He foresaw a mighty force emerging from the ranks of the great mass of the Soviet population which would eventually form the backbone of the Soviet public health service.

Lenin was in favor of a strong, centralized administration of medical aid which would include health insurance and the protection of mothers and children. In his speech, delivered at the Second All-Russian Congress of Medical and Sanitation Workers, Lenin pleaded to have all resources mobilized to fight epidemics. He stated that physicians should proceed hand in hand with teachers and agriculturists to create a new Russia: cultured, clean, well fed, and healthy.

Z. P. Solov'yev delivered the main speech at the All-Russian Conference on the Reforming of Higher Medical Education. The conference was held 10-12 June 1924. Solov'yev stated the party policy that the students in higher medical schools be given instruction in Marxist-Leninist principles to understand the role of Soviet medicine in building a socialist society.

The rapid pace of economic expansion in the country indicated that the higher medical schools should undergo further reorganization. This reorganization was ordered by a decree of the Central Executive Committee of the USSR and the Council of People's Commissars issued on 23 July 1930. This decree provided that all students in higher medical schools receive training not only in theoretical knowledge but also in practical application of that knowledge.

A study of human physiology and pathology was begun soon after the October Revolution. Preventive medicine began to emerge and to acquire a new meaning under a socialist system.

Convincing proof of the success of the Soviet health service is ~~demonstrated~~ by the fact that the average length of life in the USSR is double that of prerevolutionary Russia, and child mortality only one seventh of that before the revolution. The mortality rate in the RSFSR is 7.5 per 1,000 people and the mortality rate in the Ukrainian SSR is 7.3 per 1,000 people. The annual population increase in the USSR is more than 3.5 million.

Soviet medical scientists have made great progress even though not all of them have yet completely assimilated the theoretical principles of dialectic and historical materialism, the Communist world outlook, the principles of "partyism," and the physiological teachings of I. P. Pavlov and Michurin biology.

102. Chinese Advances in Public Health

"The Victory of the Chinese People," by T'an Chih, deputy director of Institute for Advanced Training of Medical Personnel, and Yen Yueh, instructor; Moscow, Meditinskiy Rabotnik, 22 Apr 60, p 4

The article cites the successes achieved by the Chinese Public Health Service since the formation of the People's Republic of China. Such diseases as cholera, smallpox, plague, and kala-azar have been mainly eliminated. An intense struggle for the control of malaria is in progress. At the end of 1959, the country had 390,000 medical establishments. The hospitals and sanatoriums had 570,000 beds, almost nine times the number in 1947. About 30,000 hospitals, 152,000 public health points, and 106,000 maternity homes have been opened in the rural communes. About 90,000 future medical specialists are now being trained in the Medical and Pharmaceutical Higher Schools of Education, and about 159,000 students are being trained in the secondary medical schools. This means that a basic system of public health has already been established in the country.

103. Public Health Facilities in Czechoslovakia

"Public Health in People's Czechoslovakia," by I Floygar, Minister of Health of Czechoslovak Republic, Prague; Moscow, Meditsinskiy Rabotnik, 10 May 60, p 4

Medical assistance to the people of Czechoslovakia has been considerably expanded in the past 15 years. More than 30 establishments for the treatment of children's diseases have been founded; maternity wards in the hospitals have been expanded, and new maternity hospitals have been built; vaccinations against poliomyelitis, pertusis, and tetanus are being carried out on a mass scale; the new methods of therapy for scarlet fever have reduced mortality from this disease to zero; mortality from tuberculosis in children up to 15 years of age has declined from 29.5 to one in 100,000 of the population; the life span of males has been increased to 68 years, and of females to 72 years, according to 1958 data.

The number of physicians has grown until there is now one physician for each 610 people. New hospitals will be built in Prague, Brno, Bratislava, and other cities and settlements. Facilities for the control of air, water, and soil pollution are being expanded. The manufacture of drugs will be increased 50 percent by 1965. Efforts are being made to control tuberculosis which still affects a considerable segment of the adult population. Steps are being taken also to develop means for the control of such diseases as neoplasms, rheumatism, cardiovascular affections, and others.

Radiology

104. Brain Tissue Sensitivity to Ionizing Radiation Traced Through Carbohydrate-Phosphorus Metabolism

"The Metabolism of Labile Phosphorus Compounds of the Brain During Whole-Body X Irradiation," by L. S. Cherkasova and V. G. Remberger; Minsk, Doklady Akademii Nauk BSSR, Vol 4, No 3, Mar 60, pp 129-131

The purpose of the research described was to study the condition of carbohydrate-phosphorus metabolism in the brain during the development of the various stages of acute radiation sickness. As a basis for this study, the authors traced the fluctuations occurring over a 4-month period in the brain tissue content of glucose-1-phosphate, glucose-6-phosphate, fructose-6-phosphate, fructose-1-6-diphosphate, phosphotrioses, phosphopyrroacemic acid, ATP, creatine phosphate, and lactic acid after whole-body X irradiation of rabbits by 700 r.

According to the authors, the data obtained verify the marked sensitivity of brain tissue to ionizing radiations. Results obtained on the disturbances in carbohydrate-phosphorus metabolism in the brains of highly organized animals exposed to ionizing radiation effects afford new theoretical basis for understanding the biological effect of ionizing radiations. On the other hand, the development of metabolic disturbances in brain tissue is an important pathogenetic link in the over-all response reaction of the whole organism to the effect of ionizing radiation.

105. Symptoms of Radiation Shock Analogous to Those of Neuroreflex and Traumatic Shock

"The Development of Radiation Shock During Acute Radiation Trauma (Experimental Study)," by I. N. Kruk, Chair of Faculty Surgery, Kiev Medical Institute, and Chair of Faculty Surgery and Chair of Normal Physiology, Vinnitsa Medical Institute; Kiev, Novyy Khirurgicheskiy Arkhiv, No 2, Mar/Apr 60, pp 96-101

Radiation shock is an extremely pressing problem; however, work involving the development of radiation shock or death from it has been meager.

With this situation in mind, the author decided to study whether or not changes characteristic of shock develop during the period of the initial reactions in acute radiation trauma. Studies of 20 rabbits included the following: change in the hemoglobin content, change in the erythrocyte count, change in the leukocyte count, change in the ratio between the fluid part of the blood and its solid residue, change in arterial pressure and respiration, change in circulation rate, and changes in the volume of circulating blood and changes of a pathomorphological nature.

The author presents the following conclusions.

A comparison of the essential symptoms appearing during the period of radiation shock with those of neuroreflex shock, and especially with symptoms of traumatic shock, showed that these symptoms are analogous.

During radiation shock, as during traumatic shock, the phasic nature of the course of shock is noted: decreased arterial pressure, a protracted circulation rate, a decreased volume of circulating blood and its dilution, spasm of peripheral vessels, seepage of blood into internal organs, plethora, dystrophic and necrobiotic processes, and the pronounced disruption of respiration.

106. Radiotherapy Recommended as Initial Phase in Treating Malignant Bone Tumors

"Radiation Therapy of Malignant Bone Tumors," by S. A. Pokrovskiy, A. M. Semenova, and P. Ya. Nekrasov, Kiev Scientific Research Roentgeno-Radiological and Oncological Institute; Kiev, Novyy Khirurgicheskiy Arkhiv, No 2, Mar/Apr 60, pp 89-96

The authors discuss the treatment of malignant bone tumors, which to date has been inadequately studied, and give the case histories of seven patients of a total of 57 who were under observation and treatment for malignant bone tumors of various sites.

For 2 years, the Kiev Roentgeno-Radiological and Oncological Institute has used the combined method for treating malignant bone tumors, which consists of an initial, massive, combined irradiation (roentgen and telegamma therapy) followed by surgical intervention.

Radiation therapy as the first phase of this method of combined treatment is well tolerated and is justified in that it provides temporary improvement, alleviates pain, decreases the size of the visible tumor, improves the function of the malignant extremity, and, in a significant portion of cases, inhibits malignant growth and psychically prepares the patient for the subsequent surgical intervention.

107. Ascorbic Acid Content of Organs During Acute Radiation Sickness

"Ascorbic Acid Content of the Organs of Guinea Pigs Subjected to a Single X-Irradiation," by Z. Ya. Dolgova, Chair of Biochemistry, Semipalatinsk Medical Institute; Moscow, Voprosy Meditsinskoy Khimiya, Vol 6, No 2, Mar/Apr 60, pp 166-168

The purpose of the research described was to study the distribution of ascorbic acid in the organs of guinea pigs, i.e., animals incapable, as man is, of synthesizing this vitamin after the effect of lethal doses of X irradiation.

A study of the data obtained and a review of varied literature on this topic indicate the favorable effect of ascorbic acid on the course of radiation sickness and make it possible to postulate that the development of radiation reaction depends, to a certain extent, on the saturation of an organism by ascorbic acid.

The authors present the following conclusions.

A single whole-body X irradiation of guinea pigs by 600 r leads to a decreased ascorbic acid content in the brain, adrenals, testes, spleen, and small intestines.

On the basis of the data obtained, it is possible to assume that the disruption of ascorbic acid metabolism which arises due to the effect of irradiation can be significant in the development of radiation injury.

108. Chinese Study Histochemical Effects of X Irradiation

"The Histochemical Effects of X Irradiation On the Spleen and Lymph Nodes," by Chang Ju-t'ing, (張汝亭), Institute of Experimental Medicine, Chinese Academy of Medical Sciences; Peiping, Chieh-p'ou Hsueh-pao (Acta Anatomica Sinica), Vol 4, No 1/2, Jul 59, pp 11-25

This paper presents the details of experiments undertaken to observe the histochemical changes which take place in the spleen and lymph nodes during the destruction and regeneration of cellular elements following a lethal dose of X-radiation. It was hoped that the study would yield more information on the mechanism of radiation injury and postirradiation regeneration.

Albino mice were subjected to single exposures of whole body X-irradiation. Eighty-two mice received 800 roentgens; and 62 mice, 500 roentgens (150 kv, 13 ma, 0.3 mm Al, TSD 30 cm, 43.4 r/min). It was established that 800 r was far above the minimum lethal dose (LD_{50/30}) for the 20-24--gram white mice, whereas 500 r was slightly below the LD_{50/30}. At intervals of one, 2, 4, 8, and 15 hours and one, 2, 4, 6, 9, 12, 16, 20, 27, 34, and 45 days following irradiation, the spleen and lymph nodes of the animals were removed and prepared for histochemical observation and comparison with the corresponding sections of the control animals.

The author's observations, which are summarized below, are discussed in the light of corroborating as well as conflicting conclusions of other scientists as reported in the literature. Their significance in the search for drugs which protect against radiation injury is noted.

The author found that:

1. The ribonucleic acid and desoxyribonucleic acid contents of the spleen and lymph nodes showed initial decreases 8 hours after irradiation and reached their lowest levels on the second day. The first

postirradiation rise in the nucleic acid level was observed on the fourth day, and recovery was almost complete on the 20th day. This fluctuation in the nucleic acid content was most marked in the lymphocytes. Next, in descending order of importance, were the reticulocytes, serous cells, macrophages, and megakarocytes.

2. Increased acid phosphatase activity, which began 2 hours after irradiation and reached its peak sometime between the first and sixth days, was most marked in the reticulocytes and macrophages, but was also noted in yellow marrow lymphocytes.

3. There was only a slight increase in alkaline phosphatase activity. It was seen in the perisplenular lymphocytes and smooth muscle cells which surround the accessory spleen. No change in alkaline phosphatase activity was noted in the lymph nodes.

4. The glycogen content of cells in the spleen and lymph nodes were only slightly affected by radiation. A slight drop was exhibited in the megakarocytes after 15 hours, but the normal level was restored by the 16th day.

5. Sulfhydryl groups in the spleen, and specifically in the red marrow erythrocytes, dropped rapidly and immediately after irradiation, but the normal level was restored on the first day. Other parts of the spleen and the lymph nodes were not affected in this respect.

6. The intensity and duration of histochemical changes were in direct proportion to the radiation dose received by the animals.

A footnote gives the author's current address: Department of Histology and Embryology, Second Military Medical University, Shanghai. Elsewhere in the journal, the university's street address is given as Hsiang-yin-lu, Chiang-wan, Shanghai (上海江湾翔殷路).

The author acknowledges the help of professors Chang Yun (張鑒) and Chang Tso-kan (張作幹) of the Department of Experimental Morphology, Chinese Academy of Medical Sciences, Tung-tan San-t'iao (東單三條), Peiping.

Surgery

109. Soviet Surgeons

"Successes of Soviet Surgery," by Prof N. Krakovskiy; Moscow, Meditinskiy Rabotnik, 22 May 60, p 2

The article speaks in general terms of the successes achieved by Soviet surgery, mentioning four outstanding Soviet surgeons: A. A. Vishnevskiy, P. A. Kuprianov, Ye. N. Meshalkin, and B. V. Petrovskiy. All attained considerable successes in the field of cardiac surgery.

Vishnevskiy was the first surgeon in the Soviet Union to perform an operation on a "dry" heart with the help of an apparatus designed at the Scientific Research Institute of Experimental Apparatuses and Instruments.

P. A. Kuprianov, an outstanding Soviet scientist, successfully performed a number of operations on congenital stenoses of the pulmonary artery, as well as on other cardiac defects. He has also done a great deal of research on anesthesiology, particularly on methods of potentiating anesthesia with hypothermia.

Ye. N. Meshalikh, the youngest of the group, developed new and original methods of surgical interference in cases of a number of congenital and acquired cardiac defects.

B. V. Petrovskiy, another outstanding Soviet surgeon, developed an original method for the surgical therapy of cardiac aneurism. He is also the head of a clinic of plastic surgery.

110. Organization of Department for Burn Therapy

"On the Organization of Work at the Special Department for the Therapy of Patients With Burns," by Prof I. S. Kolesnikov, Doctor of Medical Sciences V. N. Sheynis, and Candidates of Medical Sciences B. S. Vukhrayev and V. I. Filatov, Hospital of the Surgical Clinic, Military-Medical Order of Lenin Academy imeni S. M. Kirov; Moscow, Vestnik Khirurgii imeni I. I. Grekov, Vol 84, No 4, Apr 60, pp 128-132

The article describes the organization of facilities and work at the special department for the therapy of burns organized at the Military-Medical Order of Lenin Academy imeni S. M. Kirov. The department accepts patients from all over the country. It includes a clinic with 50 beds,

and biochemical, pathophysiological, pathomorphological, and microbiological laboratories. It is also equipped with bath facilities which play such an important part in burn therapy. Specially trained personnel are in charge of the department. Considerable research, in addition to therapy, is being carried out.

Virology

111. Infectious Nature of Viral Nucleic Acids Studied

"Infectious Properties of Nucleic Acids of Viruses," by V. I. Tovarnitskiy and T. I. Tikhonenko; Moscow, Uspekhi Sovremennoy Biologii, Vol 49, No 1, Jan 60, pp 19-36

This article is a survey of Soviet and foreign work on viruses from 1935 to 1959, with particular emphasis on the infectious properties of viral nucleic acids (DNA, RNA). The bibliography consists of 76 references, of which seven are Russian. The article is subdivided into the following three sections: (1) the infectivity of nucleic acids of plant viruses; (2) experiments on the isolation of infectious DNA from bacteriophages; and (3) the infectivity of nucleic acids of animal and human viruses.

The plant virus studies are devoted primarily to the tobacco mosaic virus. Information on T-2 and T-4 bacteriophages is considered in the phage section. The following pathogens are discussed in the section on human and animal viruses: equine encephalomyelitis, Mengo encephalomyelitis, West Nile encephalomyelitis, encephalomyelitis of mice, the neurotropic virus of Semliki Forest, Murray Valley encephalitis, foot-and-mouth disease, and poliomyelitis. Tumorigenic viruses are also mentioned in the last section.

Miscellaneous

112. 1961 Moscow Biochemistry Congress Announced

"International Biochemists Congress in Moscow" (unsigned editorial note); Karlsruhe, Atompraxis, No 4/5, 1960, p 199

An International Congress of Biochemistry will be held in Moscow 10-16 August 1961. The following symposiums are scheduled:

1. Biopolymers: Molecular Structure and Biochemical Activity

2. Functional Biochemistry of Cell Structures
3. Biochemistry of Evolution
4. General Mechanisms of the Effect and Specific Inhibition of Enzymes
5. Methods of Oxidation Involving Phosphorylation and Methods of Oxidation Which Do Not Involve Phosphorylation
6. Mechanism of Photosynthesis
7. Main Mechanisms and Ways of Biosynthesis
8. Biochemical Technology in the Food Industry

Among the individual additional sections which will convene is the section on "Radiation Effects On Biochemical Processes."

113. M. Ya. Nikitin, New Deputy Minister of Health USSR

"Chronicle" (unsigned article); Moscow, Meditsinskiy Rabotnik, 15 Apr 60, p 4

The Council of Ministers USSR has confirmed M. Ya. Nikitin for the positions of Deputy Minister of Health USSR and chief of the State Sanitary Inspector of the USSR. In addition, Nikitin was appointed a member of the Collegium of the Ministry of Health USSR.

The report adds that V. M. Zhdanov, the former Deputy Minister of Health, "has been freed of these obligations in connection with his transfer to other work."

114. Production of Drugs and Medical Instruments

"More Medicinal Preparations," by V. Labzin, chief specialist of Chemicopharmaceutical Industry of Gosplan RSFSR; Moscow, Meditsinskiy Rabotnik, 13 May 60, p 2

A considerable increase in the production of drugs and medical equipment is envisaged for the Seven-Year Plan. The production of such drugs as antibiotics, analgin, papaverine, pyramidon, insulin, adrenocorticotropic hormone, and antitubercular preparations will be greatly increased. Seventeen new plants for manufacturing medicinal preparations will be constructed; the production facilities of 58 existing plants will be expanded. The following are being constructed: a chemicopharmaceutical

plant at Stalinsk; drug manufacturing plants at Kurgan, Penza, and Novosibirsk; and vitamin-producing plants at Bolokhov and Belgorod. A plant for manufacturing medical instruments and equipment is being built at Tumen. In addition, it is planned to construct a chemico-pharmaceutical plant at Usol'ye-Sibirsk, a plant for manufacturing electromedical and radiological equipment at Tomsk, a plant for manufacturing hospital equipment at Kurgan within the next 5 years. The author is critical of some plants which failed to fulfill the 1959 plan.

115. Developments in Field of Radioelectronics

"On the Eve of Radio Day," by Engr V. Rodionov; Moscow, Medit-sinskiy Rabotnik, 5 May 60, p 3

The discovery of radio which was reported by Aleksandr Stepanovich Petrov on 7 May 1895, was the first link in a chain of important developments. Today radioelectronics is used to navigate planes and ships; and in radiogeodesy, radiometerology, radiospectroscopy, and radioastronomy. Modern physics uses radioelectronics in accelerators of charged particles, including the synchrotron; electronic computers; space satellites; and communications equipment. A wide complex of radioelectronic apparatuses is now being utilized in biology and medicine. Among these are the electrocardiographs, encephalographs, electromyographs, and a number of other apparatuses which, by oscillographing the biocurrents of the organism, make it possible to detect the smallest deviations from the normal. The vectorcardiograph, a recently developed apparatus, makes it possible to study more fully the magnitude and direction of the cardiac biocurrents. The brain televisor which makes it possible to observe changes in the brain on the screen of an oscillograph is of considerable interest to medicine. Among the electronic machines used in therapy are those which are used in hypothermia, ultrasonics, and electrostimulation. At present, radioelectronics is also widely utilized in surgery.

116. Leninism in Medicine

"The Significance of Lenin's Ideas for the Development of Natural Sciences, Particularly Medicine," by L. G. Dobrovolskiy, Candidate of Philosophical Sciences, and L. S. Mikhno, Candidate of Medical Sciences; Kiev, Vrachebnoye Delo, No 4, Apr 60, pp 343-348

The authors report that the number of Soviet people studying dialectic and historical materialism is gradually increasing. It is evident that Leninist ideas have had a vigorous effect on the development of philosophy and natural science in the Soviet Union. It is impossible to find an area of scientific knowledge which has not felt the stimulating influence of V. I. Lenin's doctrine.

One of Lenin's main hypotheses is that science possesses unlimited power not only to control the laws of nature, but also the mechanism of the development of thought and society. V. I. Lenin proved that attacks directed against science by ideological apologists are not just isolated instances of a reaction of misguided "searchers for truth"; they bear a definite characteristic of the pursuit of some specific interest of the bourgeoisie.

Lenin exposed not only the spiritual bankruptcy of the bourgeoisie, a class which is supposed to be predestined to dominate, but he also showed that the efforts of scientists to promote scientific discoveries can definitely lead to liberation of the toiling masses.

It is recognized that the objective of the study of medical science is the human body. Man's environment must be studied by all physicians of every specialty. Dialectic understanding of the role that environment plays in the development of a human organism makes it possible to conclude that the aim of clinical research is to study the individual's reactions under definite environmental conditions.

Marxist-Leninist teachings about the relationship between the environment and the human organism supplies the key to the proper understanding of physiological processes that take place both in a healthy and in a morbid organism. A study of conditions producing morbidity and consideration of environmental factors, including social, receive free expression under conditions of Soviet reality. This turned the attention of medical personnel not only to the treatment of morbid conditions, but also to the prevention of disease.

The most important hypothesis concerning the wholeness of a living organism, well substantiated by Engels, found its reflection in the works of the most outstanding scientists of the Soviet Union. Interest in a

patient as a whole and in coordinated medical care is essential to adequate patient care. In preventive medicine, physicians must take into consideration all peculiarities of the environment in which a human being may find himself.

The victory of the above-mentioned trend, based on the materialistic dialectic, gave great stimulus to the development of Soviet medical service. In practice, however, it is a mistake to overemphasize the patient as a whole and to undervalue conditions in a limited area of the body. Improper or primitive handling of the patient as a whole may lead sometimes to underestimation of a limited area. In surgery, one cannot afford to underestimate the value of the theory of the totality of an organism and the role played by its environment.

In characterizing the crisis that physics faced by the end of the 19th Century and at the beginning of the 20th Century, V. I. Lenin showed that dialectical materialism could have prevented this crisis. Lenin showed in his Materialism and Empiricriticism how physics could have developed much more rapidly. Physics eventually not only unlocked the secrets of the microparticles composing the atom, but contributed also to the greater development of other sciences, including medicine.

The united effort of representatives of all sciences is necessary to solve the complicated problems confronting medicine, and to free man from various diseases. The works of V. I. Lenin should serve as a guiding light toward achieving this goal. Lenin's teachings must always be the center of attention of Soviet medical workers and of the workers whose interest lies in preserving the health of the Soviet population.

117. Importance of Leninism in Natural Science

"The Everlasting Ideas of Leninism -- An Effective Weapon in the Defense of Materialism in Natural Science," by D. A. Biryukov; Leningrad, Fiziologicheskiy Zhurnal SSSR, imeni I. M. Sechenov, Vol 46, No 4, Apr 60, pp 379-380

This article says that the recognition of an interrelationship between philosophy and science is one of the most basic principles on which the progress and development of modern natural sciences depends. Materialistic and idealistic philosophies tackle this problem in two diametrically opposite ways.

V. I. Lenin pointed out in his work, Materialism and Empiricriticism, "that a need exists for materialistic philosophical theorization, and the ability to utilize properly the mechanism of human thinking. A scientist who does not know how to use the mechanism of human thinking correctly

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is destined to remain a mediocre, confused philosopher who is incapable of imparting to the results of his experiments anything which reflects their significance. It is useless for modern scientists to attempt to evade the philosophical problems in natural science. V. I. Lenin stated that a scientist must adhere to the Communist Party line.

The crisis in natural science that existed when V. I. Lenin wrote his treatise still exists today. As natural science approaches the period of rapid growth in our time, this crisis becomes more aggravated because individual scientists, particularly those in capitalistic countries, are still unable to overcome the causes of this crisis and are incapable of discarding metaphysical materialism and accepting dialectical materialism.

Attempts of many bourgeois ideologists to show that the philosophical ideas of Lenin have become obsolete have been fruitless. Although attitudes and opinions have been changing, the philosophical tendencies of the bourgeois ideologist remain essentially reactionary. They are changing their disguise, however. For example, many representatives of religious and idealistic tendencies have become converted to the idea that there exists no conflict between science and religion.

The acceptance of the peaceful coexistence of capitalism and socialism is not diminishing the intensity of the ideological struggle.

Lenin's ideas are the source of philosophical and methodological inferences. The foremost of them is his theory of reflection, which proposes to solve the principal questions of the relationship of the psychic and the physical, matter and consciousness, to the evolution of the common characteristics of living matter, from excitability to the laws of higher nervous activity developed and confirmed by I. P. Pavlov and his school. Philosophically founded interrelationships of organisms and their environment served as a basis for the development of Pavlovian and Michurinist teachings.

V. I. Lenin showed that biological, chemical, and physical mechanisms represent concrete manifestations of universal laws of a single, dialectically evolved, and infinitely varied material world.

Modern achievements in science, the greatest progress in chemistry, physics, and biology are the newest natural scientific material which confirms Lenin's idea of variability and inexhaustible diversity in the movement of all forms of matter and of all objective laws of the development of nature.

The 21st Congress of the CPSU stressed the increasing role of science in the evolution of modern society and its significance for the successful building of Communism in the USSR.

The whole essence of Leninism passionately and implacably affirms that the reactionary basis of idealistic philosophy is an impediment to successful progress along this honorable and enlightened path. Lenin's ideas are the mainspring of inspiration for this struggle between two world outlooks, two ideologies, and can serve as a springboard for the exposure of modern revisionism and of all multiform species of bourgeois reactionary ideology.

IX. METALLURGY

Physical Metallurgy

118. Apparatus for Measuring the Electric Resistance of Alloys at High Temperatures

"An Installation for Measuring the Electric Resistance of Alloys at High Temperatures," by V. P. Yelyutin, A. K. Natanson, V. I. Shulepov, and S. I. Yudkovskiy, Moscow Steel Institute imeni I. V. Stalin; Moscow, Zavodskaya Laboratoriya, Vol 26, No 3, Mar 60, pp 344-346.

A special apparatus has been designed by means of which one can measure the electrical resistance of cermet samples at temperatures up to 2000-2500°. Samples of dimensions from 1 X 6 X 20 mm to 10 X 15 X 40 mm can be used. Molybdenum leads (wire electrodes) which are welded to the sample are used, and the measurements are carried out in an argon atmosphere. Platinum-platinum + rhodium thermocouples (at temperatures up to 1700°) or tungsten-rhenium thermocouples (W + 5% Re - W + 20% Re) are employed for measuring the temperature. The resistance is measured by a compensation method. Attempts to use an alternating current for determining the resistance were unsuccessful because the strength of the alternating current must be at least 2-3 amperes, so that additional heating of the samples takes place. The equipment described was used for investigating phase transformations in alloys of the Ni - Al - Be ternary system. It was tested by conducting measurements in the low-temperature range on samples of hardened nimonic and of titanium produced by the iodide method and measurements in the high-temperature range up to 2500° on samples of pure molybdenum. The results obtained were found to be in good agreement with those published in the literature. The errors at high temperatures did not exceed 3%.

119. Method for the Determination of Rhenium and the Analysis of Rhenium-Titanium Alloys

"Determination of Rhenium by the Differential Spectrophotometric Method," by T. M. Malyutina, B. M. Dobkina, and Yu. A. Chernikhov, State Scientific Research and Design and Planning ("Proyektyny") Institute of the Rare Metal Industry, Moscow, Zavodskaya Laboratoriya, Vol 26, No 3, Mar 60, pp 259-263

The spectrophotometric method of determining rhenium according to D. I. Ryabchikov and A. I. Lazarev with the use of thiourea as a reagent is described. Application of this method in connection with procedures developed by the authors of the article for the analysis of rhenium-titanium alloys is discussed.

120. Quaternary System Consisting of the Fluorides of Lithium, Sodium, Potassium, and Calcium

"The Quaternary System Consisting of the Fluorides of Lithium, Sodium, Potassium, and Calcium," by G. A. Bukhalova and V. T. Berezhnaya, Rostov-on-Don Engineering and Construction Institute; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 2, Feb 60, pp 456-468

The constitutional diagram of the quaternary system Li, Na, K, Ca // F was investigated in detail by the fusibility method. It is pointed out that fluorides of monovalent and divalent metals are acquiring increased importance in the chemical technology of nonferrous metals as salt melts for the electrochemical production and refining of such metals and also as fluxes for the welding and remelting of alloys.

121. Properties of Nickel-Chromium-Tungsten Alloys

"Properties of Alloys of the Ternary System Nickel-Chromium-Tungsten," by P. B. Budberg and K. I. Shakhova, Institute of Metallurgy imeni A. A. Baykov, Academy of Sciences USSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 2, Feb 60, pp 415-420

The electrical conductivity, hardness, hot hardness, and aging of alloys in the system nickel-chromium-tungsten were investigated along sections parallel to the nickel-chromium side at constant contents of tungsten amounting to 5, 10, 20, and 30%.

It was established that the electric resistance of the alloys grows as the chromium content increases, reaching a maximum in regions of the ultimate saturation of the ternary solid solution. Investigation of the electrical conductivity of annealed and hardened alloys confirmed data obtained earlier by the authors concerning the changing solubility of chromium and tungsten in the ternary nickel solid solution depending on the temperature. It was established that tungsten strengthens the alloys of the system to a much greater extent than chromium both at room and elevated temperatures.

in Acids of Titanium, Zirconium, Niobium, and Tantalum

Resistance and Methods for the Analysis of Nitrides of Titanium, Zirconium, Niobium, and Tantalum," by O. I. Popova and G. T. Kabannik, Institute of Powder Metallurgy, Cermets, and Special Alloys, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 5, No 4, Apr 60, pp 930-934

The solubilities of TiN, ZrN, NbN, and TaN in acids were determined, as well as their solubilities in caustic and mixtures of caustic with hydrogen peroxide. It was established that the greatest resistance to the action of the solvents in question is exhibited by TaN and the least by ZrN. The results of the investigation have been applied in the development of methods for the dissolution of samples of the nitrides for analysis. Procedures are given for the analysis of the nitrides in question.

123. Determining Impurities in Nickel and Nickel Alloys

"Determination of Calcium and Magnesium in Nickel and Nickel Alloys," by A. S. Andreyev, A. N. Novikov, and F. Cherny, Trudy Leningradskogo Politekhnicheskogo Instituta (Works of the Leningrad Polytechnic Institute), No 201, 1959, pp 46-50 (from Referativnyy Zhurnal -- Metallurgiya, No 1, Jan 60, Abstract No 2025)

There were 2-10 grams of the alloy dissolved in aqua regia; the solution was evaporated until dry and separated with tungstic and silicic acid. The filtrate was neutralized with NH_4OH ; 2-4 grams of urotropine were added; the mixture was heated; and hydroxides of iron and aluminum were filtered off. For a preliminary separation of calcium and magnesium in the form of phosphates, ammonium hydroxide was added to the filtrate; the filtrate was heated; and the calcium and magnesium were precipitated with a solution of ammonium phosphate. The solution was filtered for 4 hours, and the residue was dissolved in HCl; and the NH_4OH was precipitated with Br_2 for the elimination of PO_4^{3-} and manganese. In the filtrate, the nickel was precipitated with dimethyl glyoxime, and the calcium and magnesium were determined. The separation of the mixed cathodes in one operation was done by precipitating them in the form of complex rhodanide pyridines. After the separation of the silicic acid, the filtrate was neutralized with soda, brought to a boil, and cooled, and 20 milliliters of a 20-percent solution of KSCN was added. Then a 20-percent

aqueous solution of pyridine was added until precipitation ceased, and the material was passed through a Buechner funnel. The magnesium in the filtrate was determined by the photolorimetric method with titan yellow; the calcium was determined indirectly by a complex method of measurement.

124. Chemical Stability of Titanium

"Study of the Chemical Stability of Titanium," by I. Z. Kozlovich and N. D. Artem'yeva, Trudy Leningradskogo Tekhnologicheskogo Instituta imeni Lensovet (Works of the Leningrad Technological Institute imeni Lensovet), No 50, 1959, pp 260-273 (from Referativnyy Zhurnal -- Metallurgiya, No 1, Jan 60, Abstract No 1867)

The corrosion stability of titanium was studied under atmospheric conditions and in aggressive chemical media. Titanium has a high resistance to corrosion in the Leningrad industrial atmosphere, tap water, the cold and hot water in Neva, the water of the Gulf of Finland, chlorides and alkalies of weak and medium concentration at room temperature, NH_3 , and HNO_3 vapors, aqua regia, and dilute solutions of H_2SO_4 and HCl . Titanium is completely unstable in the Glover and nitrosyl concentrates and the gases of the Nevskiy Chemical Plant. Neither agitation of the corrosive media nor preliminary quenching and annealing of the specimens showed any appreciable influence on the rate of corrosion.

125. Age-Hardening of Complex Alloys as an Atomic Mechanism

"On the Atomic Mechanism of Age Hardening of Complex Alloys," by I. L. Mirkin, Byulleten' Instituta Metallokeramiki i Spetsial'nykh Splavov AN USSR (Bulletin of the Institute of Powder Metallurgy and Special Alloys, Academy of Sciences Ukrainian SSR), No 3, 1958, pp 3-26 (from Referativnyy Zhurnal -- Metallurgiya, No 1, 1960, Abstract No 1418)

The kinetics of the origination of the new phase in highly alloyed substances is examined in connection with the problem of obtaining high-temperature materials. Poisson's formula is used to investigate the probability of the occurrence of a fluctuation of concentration in accordance with the composition of the stable phase, in many cases the separation of the solid solution (formation of cementite and alloyed carbides in steel, σ -phase in chromium-nickel austenitic steel, of the α' -phase in alloys of the Nimonic type). Atomic interactions are not taken into account. The analysis shows that alloying with a new component may abruptly change both the rate of formation of new phases and their growth, both as a result of the reduced probability of a fluctuation of concentration and as a result of the reduced thermal mobility of the atoms,

the first factor being of predominant influence in the majority of cases. In a discussion of the work, it is pointed out that the calculations used provide only an appraisal, since they do not account for a number of conditions peculiar to real solid solutions. It is further admitted that there is some doubt as to the validity of the principle of viewing the appearance of phases having the composition of a stable phase, since the formation of a new phase may proceed through a number of intermediate phases with stepwise transitions from the composition of the original solution to that of the final solution. The latter condition can considerably alter the kinetics of the process of phase separation.

126. Mechanical Properties of Silicon at Various Temperatures

"The Mechanical Properties of Silicon at Various Temperatures," by Ye. M. Savitskiy and V. V. Baron, Trudy Instituta Metallurgii AN SSSR (Works of the Institute of Metallurgy, Academy of Sciences USSR), No 3, 1958, pp 191-194 (from Referativnyy Zhurnal -- Metallurgiya, No 8, Aug 59, Abstract No 18191)

A study was made of the influence of temperatures from 20 to 1,350 degrees centigrade on the mechanical properties of monocrystalline and polycrystalline silicon. The latter contained considerable impurities, primarily iron (0.6 percent), distributed along the grain boundaries. The monocrystalline silicon contained almost no impurities (0.01% aluminum, 0.01% calcium, 0.01% magnesium). The microhardness of polycrystalline silicon at 20 degrees centigrade is 660 and 570 kilograms per square millimeter, respectively. As the temperature is increased to 1,100 degrees centigrade, the hardness of silicon drops at a steady rate. During compression-strength tests at 20 degrees centigrade, silicon becomes brittle; the compression strength of polycrystalline silicon is 6.8 kilograms per square millimeter, and of monocrystalline silicon, 17.7 kilograms per square millimeter. The maximum compression strength is reached at 800 degrees centigrade; above 800 degrees, it decreases at a steady rate, as in the case of a metal. Both at 20 degrees and at 1,000 degrees centigrade, the tensile strength of polycrystalline silicon is relatively low; specimens ruptured without plastic deformation. The tensile strength of polycrystalline silicon increases twofold (from 2.2 to 4.6 kilograms per square millimeter) in the temperature range of 20-1,000 degrees centigrade. Monocrystalline silicon differs from polycrystalline silicon by its higher ductility and lower strength at high temperatures. The authors conclude that silicon can be subjected to deformation (by pressing or rolling) with large degrees of reduction at 1,350-1,360 degrees centigrade.

127. Thermal Fatigue of Steel

"A Study of the Thermal Fatigue of Steel," by Ye. A. Mamontov, Uchenyye Zapiski Leningradskogo Gosudarstvennogo Pedagogicheskogo Instituta imeni A. I. Gertsen (Scientific Notes of the Leningrad State Pedagogical Institute imeni A. I. Gertsen), Vol 148, 1958, pp 243-254 (from Referativnyy Zhurnal -- Metallurgiya, No 8, Aug 59, Abstract No 18046)

A study was made of the physical mechanism of thermal fatigue in tempered St-30 steel specimens 10 millimeters in diameter and 5 millimeters high. The specimens were subjected to periodic heating and cooling, for which a 500-kilocycle hf-generator was used. Up to 300 heating cycles were employed. Four temperature regimes were used, with maximum temperature of the cycles of 250-800 degrees centigrade. The cooling was done on a solid metallic plate bathed in running water at 8-10 degrees centigrade. Both metallographic and roentgenographic methods were used. It is shown that, during cyclic heating, the ferrite and perlite grains grow. As a result of a great drop of temperature within the confines of one relatively large grain, its growth is extremely heterogeneous, causing a breakdown of the grain into fine particles. The degree of fragmentation of the crystals increases at an increased temperature gradient. The magnitude of the forces which lead to a breakdown of the grain is proportional to the temperature gradient, and its dependence on the thermal impulse is insignificant. Such forces distort the lattice and lead to the nonhomogeneous deformation of the grain, i.e., to distortions of the second type which are reduced to a certain degree at the high test temperature. The action of the forces which distort the grain also results in the emergence of distortions of the third type, but, since they are localized in volumes which are smaller than the dimensions of the crystals, these forces are completely relieved because of the extensive mobility of the atoms. The thermal forces conditioned by the heterogeneous heating of the grain at the moment of each thermal impulse deform it to such a degree that microcracks, which are not healed by diffusion processes, are produced in several parts of the crystallite. As the number of heatings is increased, the number of microcracks increases; they are transformed into macrocracks, and the specimen ruptures.

128. Age-Hardening of Aluminum Alloys

"On the Age-Hardening of Aluminum Alloys," by V. M. Bereziani, Metallurgii institutis shromebi Sakartvelos SSR Metsniyerebata Akademiya, Trudy Instituta Metallurgii, Akademii Nauk Gryzinskoy SSR (Works of the Institute of Metallurgy, Academy of Sciences Georgian SSR), No 9, 1958, pp 89-96 (from Referativnyy Zhurnal -- Metallurgiya, No 8, Aug 59, Abstract No 17957)

On the basis of experimental data on Al-Cu and Al-Cu-Mg alloys, information was obtained on the physicochemical mechanisms involved in the age-hardening of metal alloys. The phases which are produced during natural and artificial age-hardening are considered to be a series of successive transformations of compounds; the process of recovery is treated as a dissociation of the chemical composition. For processes occurring within the solid solution, the concentration or degree of supersaturation is just as important as the elasticity of dissociation in reactions involving gaseous media.

129. Influence of High Pressure on Solids

"The Influence of a High Pressure on Certain Physical Properties of a Solid," by K. P. Rodionov, Trudy Instituta Fiziki Metallov Ural'skiy Filial AN SSSR (Works of the Institute of the Physics of Metals, Ural affiliate, Academy of Sciences USSR), No 20, 1958, pp 273-282 (from Referativnyy Zhurnal -- Metallurgiya, No 8, Aug 59, Abstract No 17886)

The article presents a survey of the theoretical and experimental work of the institute in the field of the physics of high pressure.

130. Cementation Method of Producing Metallic Rhenium

"Separation of Rhenium From Solutions by the Cementation Method," by B. N. Zuyev and O. A. Suvorova, Trudy Instituta Metallurgii i Obogashcheniya, AN KazSSR (Works of the Institute of Metallurgy and Ore Concentration, Academy of Sciences Kazakh SSR), No 1, 1959, pp 102-114 (from Referativnyy Zhurnal -- Metallurgiya, No 8, Aug 59, Abstract No 17253)

A study was made of the kinetics of the cementation of rhenium with zinc and iron. It was found that the cementation rate is determined by the rate of diffusion of the reagents to the reaction site and of the

reaction products away from the site. It was also found that rhenium can be dislodged by zinc from weak solutions of perrhenates (0.015-0.12 grams of Re per liter) in satisfactory amounts, but the process requires large expenditures of zinc and acid. The conditions were established which guarantee complete precipitation of the rhenium during separation onto iron filings. The acidity of the solution was about 0.06 gram-mol/liter H_2SO_4 ; temperature, 18 deg cent; solution, stirred at 60 revolutions per minute; and pH of the solution was about 1.5 with excess iron. A method was devised for dissolving the cemented precipitates which guarantees that high concentrations of rhenium and clean mixtures of solutions will be obtained.

The cementation process makes it possible to extract rhenium from waste waters and other industrial discharges.

131. Kinetics of Niobium Reduction With Carbon

"Kinetics of the Reduction of Niobium Pentoxide With Carbon in a Vacuum," by G. P. Shveykin, Trudy Instituta Khimii Ural'skiy Filial AN SSSR (Works of the Institute of Chemistry of the Ural Affiliate, Academy of Sciences USSR), No 2, 1958, pp 57-62 (from Referativnyy Zhurnal -- Metallurgiya, No 8 Aug 59, Abstract No 17248)

A study was made of the kinetics of reduction of Nb_2O_5 with carbon black, coal fines, and coke fines in the temperature range of 1,000-1,300 deg cent. It was found that the rate of reduction depends to a considerable degree on the nature of the carbon reducing agent and the manner in which it is mixed with the Nb_2O_5 . The production of intermediate compounds of niobium (NbO_2 , NbC_x , NbC_xO_y) is due to the fact that the rate of reduction changes stepwise. The activation energy expended in the reduction of Nb_2O_5 by means of carbon black amounts to 64,000 calories per gram molecular weight, and by means of coal fines, 82,500 calories per gram molecular weight.

132. Intermediate Compounds During Niobium Reduction

"Concerning the Intermediate Compounds of Niobium During the Reduction of Niobium Pentoxide With Carbon," by G. P. Shveykin, Trudy Instituta Khimii Ural'skiy Filial AN SSSR (Works of the Institute of Chemistry of the Ural Affiliate, Academy of Sciences USSR), No 2, 1958, pp 51-56 (from Referativnyy Zhurnal -- Metallurgiya, No 8, Aug 59, Abstract No 17247)

Certain intermediate compounds produced during the process of reduction of Nb_2O_5 with solid carbon were investigated. The initial materials which made up the standard specimens were Nb_2O_5 (99.8% Nb_2O_5), metallic niobium (99.77% Nb), and acetylene black. The intermediate reaction products were studied by comparing the X-ray diagrams of the reduction products with those of standard specimens containing niobium. The reduction was in vacuum at 1,200 deg cent. The intermediate products were found to be NbO_2 and NbC_x . An interaction between NbO_2 and NbC_x was observed at 1450-1500 deg cent in vacuum, resulting in a solid solution of, for example, the composition $NbC_x'O_y'$.

133. Thermal Limits of Ductility of Copper-Nickel Alloys From Impact Tensile Tests

"The Ductility of Certain Copper-Nickel and Nickel Alloys Under Dynamic Load," by A. A. Presnyakov and U. K. Duseymaliyev, Trudy Instituta Yadernoy Fiziki Akademii Nauk Kazakhskoy SSR (Works of the Institute of Nuclear Physics, Academy of Sciences Kazakh SSR), No 2, 1959, pp 74-77 (from Referativnyy Zhurnal -- Mekhanika, No 3, 1960, Abstract No 4061)

Results are given of measurements of the maximum reduction of area of the transverse section of polished cylindrical specimens during impact tensile tests in the temperature range of 20-1,100 degrees centigrade. The temperature intervals at which "ductility collapses" are given for four copper-nickel alloys.

134. Carbon Redistribution During Annealing of Stainless Steel

"Redistribution of Carbon During the Annealing of Chromium-Nickel Stainless Steel," by B. I. Bruk, and V. V. Nyrkovskaya, Metallovedeniye, (Metals Science), 2d edition, Leningrad, 1958, pp 65-73 (from Referativnyy Zhurnal -- Metallurgiya, No 8, Aug 59, Abstract No 18705)

The autoradiographic method was used to study the distribution of carbon in an austenitic stainless steel (19.3 percent chromium, 10.1 percent nickel, and 0.07 percent carbon) after quenching at 1,100 degrees centigrade and tempering at 600 degrees centigrade in the course of 6, 100, and 1,000 hours. A study was also made of the influence of titanium on the nature of the distribution of carbon after hardening at 1,360 degrees centigrade. Carbon-14, which was introduced into the samples by holding them for an extended period in radioactive BaCO₃ at 950 degrees centigrade, was used as an indicator. After the specimens were quenched at 1,100 degrees centigrade, the autoradiograms showed a uniform distribution of carbon. A 6-hour tempering at 600 degrees centigrade, which increased the tendency toward intergranular corrosion in the 18-8 steel, did not change the character of the autoradiogram. This can be explained by the circumstance that the concentrated layer of carbon which is formed is not thick and does not cause a blackening of the autoradiogram. A calculation showed that the width of the boundary zone enriched with carbon after 6 hours holding at 600 degrees did not exceed 5×10^{-5} millimeters. The amount of carbon which is diffused toward the austenitic grain boundaries, under the indicated annealing conditions, is equal to several thousandths of the amount of carbon contained in ordinary steel. Increasing the tempering period to 100 hours, particularly to 1,000 hours, revealed the development on the autoradiogram of distinct areas of darkening at the boundaries of austenitic grains. Autoradiograms of a chromium-nickel steel containing titanium and of the cross section of bimetallic specimens obtained by fusing 18-8 steel on sheets of low-carbon steel, one of which contained 0.67 percent titanium, showed that titanium greatly inhibits the process of diffusion of carbon and the formation of chromium carbides.

Production Metallurgy

135. Casting of Intricate Tools of High-Speed Steel

"Medium-Tungsten Nickel-Containing High-Speed Steel for an Intricate Cast Tool," by K. A. Bessonov, Trudy Khimiko-metallurgicheskogo Instituta Zapadno-Sibirskogo Filiala AN SSSR (Works of the Chemical-Metallurgical Institute of the Western Siberian Branch of the Academy of Sciences USSR), No 11, 1958, pp 57-66 (from Referativnyy Zhurnal -- Metallurgiya, No 1, Jan 60, Abstract No 1583)

Data are given on the hardness, microstructure, carbide composition, and cutting properties of a cast tool made of high-speed steel R-9N3, containing 0.8 percent carbon, 8.5-9.0 percent tungsten, 3.5-4.0 percent chromium, 1.5-2.0 percent vanadium, 2.5-3.0 percent nickel, 0.1 percent titanium, and 0.001 percent boron. Comparative tests under manufacturing conditions indicated that the average tool-life of cast R-9N3 steel cutting tools is 1.5-2.0 times that of forged R18 steel tools.

136. Problem of Producing Large Polished Sheets of Stainless Steel

"On the Problem of Producing Large Polished Sheets of 18-8 Type Steel," by V. G. Borisenko and S. A. Bozhko, Technicheskko-Ekonomicheskiiy Byulleten' Sovnarkhoza Zaporozhskogo Ekonomicheskogo Administrativnogo Rayona (Technical-Economic Bulletin of the Sovnarkhoz of the Zaporozhskiy Economic Administrative Region), No 7, 1958, pp 15-18 (from Referativnyy Zhurnal -- Metallurgiya, No 8 Aug 59, Abstract No. 18416)

In the production of large polished sheets of 1Kh18N9T, the removal of metal during the first polishing of the semifinished sheet (cold rolled to 1.5 x 1,000 x 2,000 millimeters) must guarantee complete removal of the rolling defects, since a homogeneous surface at this point makes it possible to reduce the number of subsequent reductions. The use of water glass as a binder in the preparation of wide abrasive strips impairs the surface condition of the polished sheets. Checking of the microsurface of the sheet with portable profilometers after each polishing operation and basing further polishing operations on the obtained data are expeditious. Since the granulation of industrial batches of abrasive powders is not always in accordance with GOST standards, it is recommended that each batch be checked by screen tests, and separated into different fractions when necessary.

137. Behavior of Acid-Resistant Austenitic Steels During Welding

"Weldability of Austenitic Steels Which Are Stable in Phosphoric Acid," by Yu. I. Kazennov and L. P. Kolosova, Trudy Vsesoyuznogo Nauchno-Issledovatel'skogo i Konstruktorskogo Instituta Khimicheskoy Mashinostroyeniya, (Works of the All-Union Scientific-Research and Design Institute of Chemical Machine Building), No 26, 1958, pp 82-106 (from Referativnyy Zhurnal -- Metallurgiya, No 1, Jan 60, Abstract No 942)

The weldability of a purely austenitic steels (Kh23N3MZDZ, Kh23N27M2T, and Kh23N28MZDZT), 2.5-13 millimeters thick which are resistant to phosphoric and nitrososulfuric acids, is discussed. It is shown that these steels undergo considerable reactions during welding and short periods of isothermal heating as a result of their increased tendency toward intergranular corrosion. It is recommended that heats of steel which, after a 10-minute annealing at 700 degrees centigrade, are not inclined toward intergranular corrosion be used for the preparation of welded sections. In a number of melts of the tested steels, a restabilization against intergranular corrosion was noticed after a relatively short period (20 minutes to 50 hours) of heating in the temperature range of 650-800 degrees centigrade. The presence of molybdenum and tungsten in these steels and in welded joints had no stabilizing effect. The metallurgical properties of various forms of weldability of these steels are examined. Data were obtained on the transition of the alloying elements, the susceptibility of joints to intergranular corrosion, and the tendency of joints to form heat cracks. It is shown that the formation of cracks begins to accelerate as the carbon content increases and then reduces as the amount of carbide eutectic becomes of sufficient proportion to "heal" the microcracks.

138. Importance of Technology of the Strength of Aluminum Sections

"Study of the Distribution of Endurance Characteristics of Structural Aluminum Alloys in Connection With the Technology of Their Manufacture," by S. V. Serensen, M. N. Stepnov, V. P. Kogayev, and Ye. V. Giatsintov, Trudy Moskovskogo Aviatsionnogo Tekhnologicheskogo Instituta (Works of the Moscow Aviation Technological Institute), No 35, 1958, 124 pp (from Referativnyy Zhurnal -- Metallurgiya, No 8, Aug 59, Abstract No 18335)

This work examines the methods employed in fatigue tests designed to obtain the distribution of the endurance indexes of aluminum alloys to establish the influence of technological factors (pressing, heat treatment, straightening, etc.) and of structural configuration on the mechanical properties of deformed aluminum alloys.

The discussion includes:

1. methods of processing statistical data;
2. fatigue testing methods (including configuration and method of preparing test samples);
3. results of tests on fatigue and static properties of structural shapes of aluminum alloys V-95 and D-16.

139. Cold Working of Stainless Steel After Brief Heating

"On the Influence of Thermal Working on the Structure and Properties of High-Temperature Alloys of the KhN80T Type," by A. I. Sidnikhin, Trudy Kuybyshevskogo Aviatsionnogo Instituta (Works of the Kuybyshev Aviation Institute), No 7, 1958, pp 195-208 (from Referativnyy Zhurnal -- Metallurgiya, No 8, Aug 59, Abstract No 17975)

A study was made of the influence of abrupt periods of heating and cooling during cold-working on the structure and properties of an alloy EI437B. A parallel study was made of the influence of repeated heatings and coolings at reduced rates. The test specimens were square hot-rolled bars 12 x 12 x 70 millimeters and cylinders 21 millimeters in diameter and 220 millimeters long. Abrupt temperature changes were produced by dipping the specimens in a saline bath at 1,280 degrees centigrade or by quenching in water at temperatures of 1,080, 1,130, 1,200, 1,220, and 1,280 degrees centigrade, after holding for different periods at each temperature. The repeated heatings were carried to the point where recrystallization begins, followed by cooling in air. The microstructure of polished cross sectional microsections of the alloy was revealed with a reactive compound (4 grams CuSO_4 , 20 cc HCl, 20 cc H_2O) after age-hardening by heating at 750 degrees centigrade for 16 hours and quenching in air.

It was discovered that all the peculiarities of behavior on the part of the boundary zone within the alloy were associated with an accumulation of dislocations at the grain boundaries during the heating preceding the quenching. The accumulation of relatively static dislocations causes an influx of alloying atoms from the depths of the crystals, resulting in a pressure relief around the dislocations. The withdrawal of the dislocations from the grain boundaries during quenching may reduce or increase the capacity of the boundary to move, depending on which stage of formation of the boundary layer it produces. The fact that a fundamental redistribution of the dislocations in the lattice is necessary for the initiation of a secondary recrystallization was confirmed. For the alloy the temperature of 1,080 degrees centigrade was a threshold, above which there was

an intensive diffusive migration of the dislocations. For this reason, the heating of abruptly quenched alloys below this temperature does not guarantee conditions for the movement of boundaries, and heating above this temperature creates conditions for a secondary recrystallization. The rate of heating during hardening has no significant influence on the structure of the alloy.

140. Automation of Nickel Production

"Automating the Control and Regulation of the Technological Process of Obtaining Nickel by the Carbonyl Method," by A. M. Verblowski and B. Ya. Krasil'shchik, Sbornik Tekhnicheskoy Informatsii Proyektного i Nauchnogo Instituta "Gipronikel" (Collection of Technical Information of the Design and Research Institute "Gipronikel"), No 4/5, 1958, pp 77-85 (from Referativnyy Zhurnal -- Metallurgiya, No 8, Aug 59, Abstract No 17246)

A report is given of experimental work on the testing of methods and equipment for controlling and regulating the process of nickel production by the carbonyl method, using semi-industrial equipment. Schematic diagrams and operational descriptions are given for the equipment designed for this purpose.

141. Pressure Working of Molybdenum and Molybdenum Alloys

"Technology of Pressing and Forming Molybdenum and Its Alloys," by N. I. Korneyev, I. G. Skugarev, and S. B. Pevzner, Obrabotka Splavov Davleniyem (Pressure Working of Alloys), Moscow, 1958, pp 69-79 (from Referativnyy Zhurnal -- Metallurgiya, No 8 Aug 59, Abstract No 1857B)

The ductility and resistance to deformation of molybdenum and its alloys are discussed. A technology is described for shaping molybdenum and its alloys. Work pieces of molybdenum and its alloys (compressor and turbine blades, thin-walled tubes, etc.) are pressed, with a 70-percent deformation at 1,600 degrees centigrade, into bars, then into shaped semifinished work, and then into final shape. Alloys which are preliminarily deformed by the method of repeated omnidirectional compression have higher ductility and permit upsetting of 65-70 percent without breakdown. An intermediate high-temperature annealing is necessary in order to prevent rupture. In the pressing of rods with a deformation of 75-80 percent at 1,600 degrees centigrade, the resistance to deformation is 80-120 kilograms per square millimeter. The resistance to deformation of preliminarily pressed and annealed bars during upsetting with a 30-45 percent deformation and a temperature of 1,400 degrees

centigrade amounts to about 15-20 kilograms per square millimeter. The semifinished products are heated under vacuum, neutral atmosphere (H_2 , Ar_2 , etc.), as well as in water glass baths. A lubricant consisting of a mixture of vitreous and graphite types is recommended, since it has heat-insulating properties and retards cooling.

142. Forming of Steel and Alloy Sheet for Aircraft Industry

"Technological Peculiarities in Forming of Sheets of Aviation Steel and Alloys," by Yu. P. Davydov, I. G. Kovalev, and G. V. Pokrovskiy, Obrabotka Splavov Davleniyem (Pressure Working of Alloys), Moscow, 1958, pp 103-119 (from Referativnyy Zhurnal -- Metallurgiya, No 8, Aug 59, Abstract No 18569)

The article discusses the special technological procedures involved in the forming of, and the forming of indexes for, austenitic chromium-nickel steel and magnesium-titanium-aluminum alloys used in the aircraft industry. The composition of the lubricants used in forming such sheets is also discussed.

143. Precision Forging of Turbine Blades

"Technology of Precision Forging of Blades," by N. I. Korneyev, I. G. Skugarev, Ya. Ya. Grannikov, A. S. Aleshin, N. Ya. Talyzin, P. M. Bashin, M. I. Shemel'v, and Ye. A. Baranova, Obrabotka Splavov Davleniyem (Pressure Working of Alloys), Moscow 1958, pp 5-24 (from Referativnyy Zhurnal -- Metallurgiya, No 8, Aug 59, Abstract No 18560)

A technology was established for forging the blades of aviation equipment out of alloy EI437A on a 5-ton hammer press and a 2,500-ton crank press. The forging method affords a saving of 130 kilograms of alloy per production unit, a saving of 100 hours of rated time per production unit, the release of 44 metal-working machine tools, and a saving of cutting tools.

144. Rolling Iron, Nickel, and Copper Powders Into Strip

"Production of Metal Strip by the Method of Rolling Powder in Rollers," by G. I. Aksenov and Yu. N. Semenov, Trudy Gor'kovskogo Politeknicheskogo Instituta (Works of the Gor'kiy Polytechnic Institute), Vol 14, No 4, 1958, pp 62-75 (from Referativnyy Zhurnal -- Metallurgiya, No 8, Aug 59, Abstract No 18421)

Results are given of an experimental production of metallic strip by rolling type AM iron powder and carbonyls, PM2 copper and NP nickel, and carbonyls. The rolling was done on two specially designed stands with a power supply of 2 and 10 kilowatts. The technology included: (1) rolling the powder into strip, (2) sintering, (3) cold rolling, and (4) annealing. The fact that the rolling method should guarantee both minimum porosity and required ductility was taken into account. Iron and nickel strip was annealed at 1,000-1,100 degrees centigrade, and copper strip, at 900-1,000 degrees centigrade (far in excess of the temperature at which annealing begins for an ordinary strip of the particular metal). Before the cold working, the edges of the strip were trimmed 6-7 millimeters on each side to avert the formation of cracks resulting from the excessive (by comparison with the regular metal strip) porosity. Two samples of sintered nickel powder, size 0.34 millimeter (8 percent porosity), rolled with reductions of 41 and 85 percent without intermediate annealing, had edge cracks several tenths of a millimeter and one millimeter deep, respectively.

Cold rolling improved both tensile strength and ductility. The purity of the powder has a definite influence on the mechanical, particularly the ductile properties of the strip. Absorbed H₂ has an influence on the mechanical properties of rolled nickel powder strip. Experimental nickel strip, prepared from powder, was produced with laboratory equipment by continuous rolling and annealing. The sintered strip was rolled into bundles weighing up to 25 kilograms and, after the edges had been trimmed, was rolled cold on four-roller stands with working rollers 170 millimeters in diameter (at the "Krasnaya Etna" mill). The annealing was done in cupola furnaces. Out of porous nickel strip 0.5-0.54 millimeter thick, nonporous strip 0.3, 0.2, and 0.1 millimeter thick were rolled, the mechanical properties of which satisfied the technical specifications of GOST 2170-49. The thickness tolerances amounted to plus-minus 0.005 millimeter.

145. Electrolytic Deposition of Nickel-Molybdenum Alloys

"Some Questions of the Mechanism of Electrolytic Deposition of Nickel-Molybdenum Alloys," by A. I. Krasovskiy, Trudy 4-go Soveshchaniya Po Elektrokhimii 1956 (Works of the Fourth Conference on Electrochemistry 1956), Academy of Sciences USSR, Moscow, 1959, pp 530-535 (from Referativnyy Zhurnal -- Metallurgiya, No 1, Jan 60, Abstract No 1917)

The manner in which the equilibrium portion of the deposition potential of molybdenum changes as a result of an alloying of the molybdenum with nickel was studied by measurements of the emf in a mixed melt of KCl and LiCl containing 4 mol percent of Na_3MoO_4 . The electrodes were made of molybdenum and a nickel-molybdenum alloy. It was found that the electromotive force of the element decreases with increased molybdenum content. The overvoltage during the coprecipitation of molybdenum, nickel, and H_2 was studied by analyzing all the polarization curves. The curves were plotted for freshly prepared electrolytes contained 0.34 mol of citric acid or 0.21 mol of Na_2SO_4 , at pH values of 4, 6, 8 and 10 (addition of NH_4OH), and various concentrations of sodium molybdate. The measurements were made at 20 degrees centigrade in a specially designed cell. It was shown that increased molybdate concentration in the electrolyte strongly influences all electrochemical reactions which take place at the cathode: (1) The rate of H_2 coprecipitation increases; (2) the rate of coprecipitation of nickel at potentials greater than 100 millivolts reaches a maximum at a molybdate concentration of 1.6×10^{-2} mol; (3) at this molybdate concentration, the rate of molybdenum coprecipitation likewise reaches a maximum. It was shown that with increased molybdenum content in the alloy, the change of the nonequilibrium portion of the potential becomes considerably greater than the change of the equilibrium portion. The difficulty involved in the coprecipitation of molybdenum is connected with the high overvoltage required for its deposition.

146. Electron Radiography of Heavy Metal Sections

"Defectoscopic Inspection of Great Thicknesses With the Aid of a Betatron," by A. A. Vorob'yev, V. I. Gorbunov, and V. N. Titov, Tomsk Polytechnic Institute; Moscow, Izvestiya Vysshikh Uchebnykh Zavedeniy, Mashinostroyeniye, No 5, 1959, pp 195-202

A scientific-research study aimed at developing a practical method of electron radiography for heavy steel parts with the aid of a betatron has been carried out over the past several years at Tomsk Polytechnic Institute. The basic characteristics of betatrons built at the Tomsk Polytechnic Institute suitable for electron radiography are presented in this

article. The betatrons designed at the Tomsk Polytechnic Institute are capable of accelerating electrons to 25 Mev. The electron injection circuit utilizes the discharge of a pulse-forming line through a thyatron and the primary winding of a pulse transformer. The accelerated electrons are directed upon the target with the aid of a magnetic field induced by the current in the biasing winding. Sealed-off porcelain chambers able to impart acceleration of 25 Mev to electrons were designed in 1958 at the Tomsk Polytechnic Institute.

The technical specifications of the 25-Mev betatron are as follows: size of electromagnet -- 1580 X 1150 X 870 mm; weight of the magnetic circuit -- 3,900 kg; weight of copper winding -- 350 kg; power supply to electromagnet -- 7 kw; voltage across the secondary winding -- 6,300 v; reactive power of the capacitors -- 1,000 kvar; maximum density of magnetic flux in equilibrium orbit -- 4,130 gauss; maximum density of magnetic flux in the center of the gap -- 11,000 gauss; voltage of electron injection -- 40 kv; and radiation intensity at one meter from target -- 15 roentgen per min.

The small dimension of the focal spot obtained with a betatron permits a very sharp radiographic picture of an examined steel part of great thickness.

Miscellaneous

147. Future Exploitation of Rare Metals of Central Kazakhstan

"Status and Promise of Production of the Rare Metals of Central Kazakhstan," by G. I. Lyudorovskiy, Proizvoditel'nyye Sily Tsentral'nogo Kazakhstana (Production Forces of Central Kazakhstan), Vol 1, 1958, pp 65-69, discussion pp 133-141 (from Referativnyy Zhurnal -- Metallurgiya, No 8, Aug 59, Abstract No 17062)

Central Kazakhstan is rich in molybdenum and tungsten. The main deposits of these metals are listed. The ores of this region are hard to concentrate; technical-economic calculations of the optimal degree of concentration of ores, however, show that high-percentage concentrations are not necessary for the ferroalloying industry. Three basic grades of ore must be established for ferromolybdenum and ferrotungsten for use in the production of steels of low, medium, and high content of molybdenum and tungsten. Depending on the production volume of steels with various contents of these elements, production scales must be established for low, medium, and high percentage concentrates and ferroalloys of the corresponding grades.

X. PHYSICS

Low-Temperature Physics

148. Neutronographic Research With a Cryostat

"A Cryostat for Neutronographic Research at Hydrogen and Helium Temperatures," by V. S. Kogan, B. G. Lazarev, G. S. Zhdanov, and R. P. Ozerov, Physicochemical Institute imeni Karpov; Moscow, Kristallografiya, Vol 5, No 2, Mar-Apr 60, pp 320-321

A cryostat of new design was constructed for neutronographic research at temperatures of liquid hydrogen and helium. The structure of solid isotopes of hydrogen (H_2 and D_2) was studied at 10 to 12° K. The results for deuterium correspond to an X-ray analysis carried out at 4°2 K. Neutronograms of solid H exhibited not too high maxima on a background of considerable noncoherent scattering. The number and position of these maxima proved to be different from a system of X-ray interferences obtained for hydrogen at 4°2 K by W. H. Keesom et al. (Comm. Phys. Univ. Leiden, 209d, 1930).

Nuclear Physics

149. Angular Energy Distribution of Gammas

"Angular Energy Distribution of Gamma Rays Scattered in Water and Iron," by Yu. A. Kazanskiy; Moscow, Atomnaya Energiya, Vol 8, No 5, May 60, pp 432-440

A study of the most detailed characteristic of the process of multiple scattering of gamma rays and of angular energy distribution was undertaken for contributing to computations of weakening of gamma radiation in complex geometric conditions. Angular energy distribution of gamma rays from a Co-60 source in water and in iron were measured in conditions of semi-infinite geometry and it was established that these distributions have a maximum in the vicinity of energy corresponding to a single scattering at a minimum of angle. It is shown that the angular intensity distribution exhibits exponential behavior, while the exponential coefficient depends linearly on the atomic number of the medium. The energy distribution of intensity was compared with the computation by H. Goldstein and J. Wilkins (Calculation of the Penetration of Gamma Rays, New York, 1956)

150. Mean Number of Secondary Neutrons

"Derivation of the Mean Number of Secondary Neutrons per Fission From the Mass Distribution of the Products," by Yu. A. Zysin, A. A. Lbov, and L. I. Sel'chenkov; Moscow, Atomnaya Energiya, Vol 8, No 5, May 60, pp 409-412

The method of computation of the mean number of secondary fission neutrons $\bar{\nu}$ from the curves of distribution of fission fragments against masses is discussed. The accuracy order of the method is evaluated. It is shown that if the curves of fragment distribution against their masses can be studied in detail, $\bar{\nu}$ may be determined by this method with sufficient accuracy. The values of $\bar{\nu}$ are computed for various cases of fission of Th-232, U-233, U-235, U-238, Pu-239, Am-241, and Cf-252. The results are analyzed and compared with results derived by other methods. For the cases of fission of U-233 and U-235 by thermal neutrons, the partial values of $\bar{\nu}_m$ are computed.

151. Photofission of U-238 and Th-232

"The Mean Numbers of Prompt Neutrons Produced in Photofission of Th-232 and U-238 by Gamma Rays From the F-19 (p, α γ) O-16 Reaction," by L. I. Prokhorova and G. N. Smirenkin; Moscow, Atomnaya Energiya, Vol 8, No 5, May 60, pp 457-459

The mean number of prompt neutrons emitted at one photofission of U-238 and Th-232 by gammas from the reaction F-19 (p, α γ) O-16 was measured. The reaction was realized by irradiating a CaF₂ crystal by 2.6 Mev protons. The gamma spectrum was composed of three lines: 6.13, 6.9, and 7.1 Mev, the last two lines 3.2 times more intensive than the first. The mean gamma-ray energy producing fission in U-238 and Th-232 was 6.7 Mev. The measurements were carried out on a Van-der-Graaff electrostatic generator. The results of the research showed that at photofission of U-238 and Th-232 the deformation of fragments is stronger than at fission by neutrons.

152. New Isotopes of Sb

"Beta and Gamma Spectra of Isotopes Sb-113 and Sb-115," V. L. Chikhladze, D. Ye. Khulelidze, and I. P. Selinov, Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 4, Apr 60, p 1353

Recently I. P. Selinov et al. (Atomnaya Energiya, 5, 6, 660 (1958)) discovered new isotopes of Sb-113 and Sb-115. Beta and gamma spectra of these isotopes were studied on a double lens beta spectrometer. The positron Sb-113 spectrum appeared to have two components with upper limits 1.85 ± 0.02 and 2.42 ± 0.02 Mev. The upper limit of the Sb-115 positron spectrum equals 1.51 ± 0.02 Mev.

153. New Isotopes

"The existence of New Isotopes of Light Nuclei and the State Equation of Neutrons," by Ya. B. Zeldovich; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 4, Apr 60, pp 1123-1131

The limits of stability (relative to nucleon emission) of light nuclei are considered. The existence (in the sense of stability with respect to decay with nucleon emission) of the following nuclei is predicted: He^8 , Be^{12} , O^{13} , $\text{B}^{15,17,19}$, C^{16-20} , N^{18-20} , Mg^{20} . The possibility of existence of heavy nuclei consisting of neutrons only is considered. This problem is reduced to that of a Fermi gas with resonance interaction of the particles. The energy of such a gas is proportional to $\omega^{2/3}$ where ω is its density. The accuracy of the calculations is not sufficient for determination of the sign of the energy and for solving the physical problem concerning neutron nuclei.

154. Plasma Properties

"Rotational Magneto-Mechanical Effect in Low-Pressure Plasma," by V. L. Granovskiy and E. I. Urazakov, Moscow State University, Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 4, Apr 60, pp 1354-1355

It has been shown by W. H. Bostik et al (Phys. Rev., 97, 13 (1955)) that in the positive gas column under low-pressure rotational motion around the axis of the column should occur upon superposition of a longitudinal constant magnetic field. This effect was tested by the author by introducing a thin plate into the gas column. Deflection of

the plate was observed. The rotational motion may be produced by ion and electron diffusion in the magnetic field perpendicular to this field and in the direction of the concentration gradient. In a cylindrical plasma the concentration gradient is directed radially while the diffusion currents should move azimuthally in opposite directions. The quantities of motion are not equal and impart to the gas a rotational motion.

155. Equation for Plasma

"Relativistic Kinetic Equation for a Plasma, II," by Yu. L. Klimontovich, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 4, Apr 60, pp 1212-1221

The equation chain for relativistic distribution functions previously obtained (ibid, 37, 735, 1959) is used to deduce a second approximation relativistic kinetic equation for a plasma. A kinetic equation in which only retarded interaction of charged particles is taken into account is first derived. In a particular case this equation is identical to that derived by Belyayev and Budker (DAN, 107, 807, (1956)). The Fokker-Planck relativistic equation for a plasma in which account is made of retarded interaction of the particles and excitation of plasma oscillations by nonequilibrium charged particles is also considered.

156. Cosmic Ray Fluctuations

"Large Cosmic Ray Fluctuations in the Stratosphere," by A. N. Charakhch'yan, V. F. Tulinov, and T. N. Cherakhch'yan, Physics Institute imeni Lebedev, Academy of Sciences USSR, Institute of Nuclear Physics, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 4, Apr 60, pp 1031-1036

The energy spectrum of an additional proton flux which was more than 20 times the normal value was derived on the basis of stratosphere measurements. The exponent of the differential spectrum is equal to 6.0 in 120-170 Mev energy range. It is suggested that these protons are due to corpuscular beams with frozen magnetic fields emitted during the solar chromosphere flare on 10 May 1959.

157. Proton Injector

"A 600-kev Proton Injector for a Linear Accelerator," by Yu. N. Antonov, L. P. Zinov'yev, and V. P. Rashevskiy; Moscow, Atomnaya Energiya, Vol 8, No 5, May 60, pp 454-456

To increase injection current of the 10-Bev synchrotron of the Joint Institute for Nuclear Research, it was attempted to realize selection and focusing of an ion source and to accelerate the beam to 600 kev. Work on an ion source of gas discharge plasma with double contraction of the plasma pinch (M. von Ardenne, Tabellen der Elektronen-physik und Ultramikroskopie, [Electron Physics and Ultramicroscopy Tables], 1957) and the use of oscillations of arc electrons was carried out. The source first devised in NII-5 (Scientific Research Institute No 5) was further developed in the Laboratory of High Energies of the Joint Institute with the cooperation of NII-5 associates V. M. Blagoveshchenskiy, T. I. Gutkin, and Yu. V. Kursanov. The parameters of the source are given. The evaluation of the divergence of the beam at the linear accelerator input is $3 \cdot 10^{-3}$.

158. Electron Emission in Synchrotron

"Coherent Electron Emission in a Synchrotron," by M. S. Rabinovich and L. V. Iogansen, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 38, No 4, Apr 60, pp 1183-1187

Electromagnetic interaction of electrons in a synchrotron is considered with account of the shielding action of the chamber walls on bunches of arbitrary shape. The effect of these forces on the electron phase motion and size of the bunch is estimated.

159. Book on Research Reactors Reviewed

Naval Research Laboratory Research Reactor, Part 4, Control System, by M. P. Young and G. F. Wall, reviewed by V. V. Korolev; Moscow, Novyye Knigi za Rubezhom, Seriya B. Tekhnika, No 5, May 60, pp 15-16

Engr V. V. Korolev, after examining the content of a US publication, Naval Research Laboratory Research Reactor, Part 4, Control System, by M. P. Young and G. F. Wall, Washington, Naval Research Laboratory, 1959, concludes as follows:

"The greatest value of this book is in the fact that for the first time, although rather briefly, it discusses jointly the engineering problems relating to the design and operation of the control-system instrumentation of a nuclear reactor.

"This book might be useful to Soviet specialists, as well as teachers and students in this field. Translation of this book into Russian is considered expedient."

160. Hungarian Production of Isotopes and Research Equipment

"Hungarian Physics Researchers Produce Isotopes in a Nuclear Reactor and Develop Equipment for Fundamental Research" (unsigned article); Budapest, Nepszava, 5 May 60, p 8

On the first anniversary of operation of the experimental nuclear reactor of the Central Physics Research Institute (Kozponti Fizikai Kutató Intézet), Gyozo Verle, director of the reactor department; Istvan Kiss, director of the nuclear chemistry laboratory, and Dezso Kiss, deputy director of the nuclear physics laboratory, spoke at a meeting of the "Eotvos Lorand" Physics Association about the functioning of the reactor, work in the production of isotopes, and reactor-physics research.

Since 1 January, a quantity of isotopes with a total radiation of 12 curies, which consisted of 15 different compounds, making a total of 120 preparations, was delivered to the Isotope Distribution Institute. Of this, 80 percent was used for therapeutic purposes and smaller portions for research, industrial, and agricultural purposes. This quantity already meets the national demands for isotopes having a half-life of less than 10 days. The article notes that yttrium-90 is produced only in England, Holland, and Hungary. The atomic reactor is also used for various fundamental nuclear physics research projects, and the need to develop suitable equipment for this arose. A slow-neutron spectrometer, with which the energy distribution of neutrons produced by the reactor is determined, is finished. A neutron diffraction meter for use in solid state physics research has been constructed, and a suitable spectrometer for measuring the energy of gamma radiation was developed.

161. Operation and Applications of Hungarian Nuclear Reactor Described

"A Visit to the One-Year Old Atomic Reactor," by Laszlo Ujlaki;
Budapest, Nepszabadsag, 1 May 60, p 16

On the occasion of the first anniversary of the Csilleberc nuclear reactor, the author called on the scientists in charge of the Csilleberc reactor and the directors of the Central Isotope Distribution Institute (Kozponti Izotopeloszto Intezet) to ask them about their experiences. Chief Engineer Gyozo Verle [Werle?] reported on the operation of the reactor. Since the hot cells were put into use on 1 January 1960, the reactor has been run on a regular monthly schedule. It is operated for 100 hours the first week and about 90 hours the second week, continuously day and night; maintenance is performed during the third week of each month; and the reactor is operated the fourth week, during the 12 hours of the day, according to the requirements of the physicists. In the one year that it has been in operation, the reactor has been started 123 times and has been in operation a total of 1,663 hours. The core now has 34 fuel-element bundles, but as operation continues this number will be raised to 51. Sixty-four persons operate the reactor plant; operation is performed in four 6-hour shifts, six men per shift. The remainder are maintenance and service personnel. The personnel were given a 4-month course in reactor physics and radiation safety.

Lenard Pal, scientific deputy director, described the operation of the reactor. Arpad Veres, deputy director of the Isotope Distribution Institute, reported that the Csilleberc reactor can now supply all domestic requirements for iodine-131 and colloidal gold-198, used for medical purposes. Agricultural experts are also using the reactor to study radiation-produced changes in seeds. The National Atomic Energy Committee (Orszagos Atomenergia Bizottsag) established the Isotope Distribution Institute to keep track of the quantity of radioactive materials in the country. The article concludes: "The Csilleberc

reactor ensures 20-25 percent of our so-called 'open isotope' needs and this proportion will increase over the years to come."

"The Experimental Reactor Already Supplies the Country With Short Half-Life Isotopes" (unsigned news item); Budapest, Magyar Nemzet, 5 May 60, p 3

Three researchers from the Central Physics Research Institute (Kozponti Fizikai Kutato Intezet) visited the Lorand Eotvos Physics Society (Eotvos Lorand Fizikai Tarsulat) and reported on the first year's experiences with the institute's experimental reactor. Gyozo Werle, chief of the reactor plant, reported on the operation of the reactor. [His report is essentially the same as is attributed above to Gyozo Verle,

probably the same man.] Istvan Kiss, chief of the nuclear chemistry laboratory, reported on the results of isotope manufacture, which began on 1 January 1960. The reactor has produced isotopes in an amount satisfying the country's need for isotopes with half-lives of less than 10 days. Other types of isotopes can be more easily obtained abroad, the article says.

Miscellaneous

162. Hungarian Dissertations in Nuclear and Astrophysics

"Reports of the Scientific Qualifications Committee" (unsigned);
Budapest, Magyar Tudomány, Feb 60, p 103

CPYRCHT The article includes the following citations:

"The Scientific Qualifications Committee has qualified Lenard Pal as Doctor of Physical Sciences on the basis of his dissertation, titled 'Probability Calculation Theory for Chain Reactions Taking Place in Atomic Reactors.' His opponents were Academicians Pal Gombos, Lajos Janossy, and Alfred Renyi.

"The Scientific Qualifications Committee has qualified Ivan Almar as Candidate in Physical Sciences on the basis of his dissertation, titled 'A Quantitative Analysis of the Atmosphere of the B2 Giant Star Gamma Orionsis.' His opponents were Gyorgy Marx, Doctor of Physical Sciences, and Lorant Dezso, Candidate in Physical Sciences."

XI. MISCELLANEOUS

163. Change of Relationship Between Slovak Academy of Sciences and the Czechoslovak Academy of Sciences

"Adjustment of Relations Between SAV and CSAV," (unsigned article); Bratislava, Rude Pravo, 13 Apr 60, p 2

The 13th general assembly of the SAV (Slovenska akademie vied, Slovak Academy of Sciences), held in Bratislava on 12 April 1960, considered the new changes in the relationship between the SAV and the CSAV (Ceskoslovenska akademie ved, Czechoslovak Academy of Sciences) and the future tasks of science in Slovakia. A delegation from the CSAV, led by Academician Jan Filip, Vice Chairman of the CSAV, participated in the assembly. The assembly paid its respects to the late Julius Hronec and Ladislav Derer, academicians of the SAV.

Academician Andrej Siracky, Chairman of the SAV, delivered the main address. He stated that as a result of the change-over to the new, higher stage of organization of Czechoslovak political and economic life, it is necessary to improve the organization of scientific research work. The objective is to implement the proposition that Czechoslovak science and research be directed by one supreme institution, the Czechoslovak Academy of Sciences. The Slovak Academy of Sciences is an inseparable part of the Czechoslovak Academy of Sciences and remains as the highest national and regional institution in Slovakia. The new relationship between the SAV and the CSAV is concerned with strengthening the position of the SAV among the people because the all-round help of Czech science and the direction of the scientific effort from one center will assure the development of the scientific departments which are not adequately developed, such as physics, cybernetics, etc. The membership of the SAV and the CSAV will be gradually merged. CSAV members who are working in Slovakia and those members of the SAV who have not been elected CSAV members will make up the membership base of the SAV.

The activity of organs in the academies, including general assemblies, CSAV presidiums, SAV presidiums, and CSAV and SAV sections, will also be changed. The network of work centers of the CSAV and SAV will be reorganized to form a uniform system with coordinated activity. SAV organs will also have a very important function in the solution of national scientific research tasks, in addition to assuring the specific needs of the development of scientific departments and work centers in Slovakia.

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