CENTRAL INTELLIGENCE AGENCY

SCIENTIFIC INFORMATION REPORT

17 July 1959

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

Issued semi-monthly. Annual subscription $28.00 ($4 additional for foreign mailing). Single copy $2.75.

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

Approved For Release 1999/09/08 : CIA-RDP82-00141R000100350001-5

PLEASE NOTE

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

SCIENTIFIC INFORMATION REPORT

Table of Contents

Approved For Release 1999/09/08 : CIA-RDP82-00141R000100350001-5

I. ASTRONOMY

1. Solar Radio Emission

"Results of Observations of a Shift of the Efficient Center of Radio Emission by the Sun on 3.2 Cm Wave," by G. S. Veysig, V. F. Kushnir, and A. P. Molchanov, State Astronomical Observatory, Solnechnyye Dannyye, 1958, No 1-2, 108-110 (from Referativnyy Zhurnal -- Fizyka, No 4, Apr 59, Abstract No 8976)

Results of measurements of the shift of the efficient radio emission center of the Sun are presented graphically at the wave length of 3.2 cm for the period 4 December 1956 to 30 July 1957. The observations were carried out on a 4-meter paraboloid of the State Astronomical Institute. The errors of measurement do not exceed $\pm$ 1'.

II. CHEMISTRY

Fuels and Propellants

2. The Thermal Decomposition of Anhydrous Perchloric Acid

"The Thermal Decomposition of Anhydrous Perchloric Acid -- Part 8", by A. A. Zinov'yev and A. B. Tsentsiper; Moscow, Zhurnal Neoganicheskoy Khimii, Vol 4, No 4, Apr 59, pp 724-729

It has been established that an induction period and self-acceleration in the initial part of the process (the reaction kinetics curves have an S-shape) are characteristic for the thermal decomposition of anhydrous perchloric acid. The results obtained in the work described indicate that the reaction proceeds by a chain mechanism. It was confirmed that the process of the decomposition of perchloric acid comprises the intermediate stages indicated below:

$$HClO_4 \longrightarrow Cl_2O_7 \longrightarrow (Cl_2O_6 + 1/2\ O_2) \longrightarrow$$
$$\longrightarrow (ClO_2 + O_2) \longrightarrow (Cl_2 + O_2)$$

The activation energy necessary for the decomposition of perchloric acid was determined and found to be E = 22,200 calories per mol.

3. The Effect of Organic Catalysts in the Preparation of Sodium Hydride

"On the Preparation of Sodium Hydride," by V. I. Mikheyeva, T. N. Dymova, and M. M. Shkrabkina; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 4, Apr 59, pp 709-717

A method has been developed for the synthesis of sodium hydride from the elements based on the application as catalysts of small quantities of mineral oils and of their aromatic fractions. Intensive agitation of the reaction mixture is employed. Of the substances tested for their effectiveness as catalysts (anthracene, fluorene, phenanthrene, solidol, mineral oils and their fractions), the benzene-aromatic fraction of mineral oils was found to be best. By using the method described, sodium hydride, which is 97% pure, can be obtained. The procedure developed is recommended for application on an industrial scale. An attempt is made to explain the activating effect of the aromatic fraction of mineral oils on the reaction of the hydrogenation of sodium.

It is pointed out that development of the chemistry of inorganic hydrides and of complex boro-hydrides depends on the development of cheap methods for the production of simple hydrides, specifically sodium hydride.

4. Universal Method for a Rapid Determination of the Danger of Explosion Presented by Mixtures of Combustible Substances With Air

"Possibility of Application of the PGF-2 Gas Analyzer As a Universal Appliance for the Rapid Determination of the Danger of Explosion Presented by Different Vapor-Air and Gas-Air Mixtures," by A. N. Baratov, Central Scientific Research Institute of Fire-Fighting Defense (Protivopozharnya Oborona); Moscow, Zhurnal Prikladnoy Khimii, Vol 32, No 5, May 59, pp 1157-1159

An analysis of the critical conditions existing during thermal explosions and also a direct calculation of the theoretical temperatures of combustion confirmed that different gas-air and vapor-air mixtures burn at the same temperature when the concentration of the combustible substance corresponds to the lower limit of detonation. On the basis of this relationship, it is proposed to use the PGF-2 gas analyzer in the explosion-proof execution VZG as a universal device for the rapid determination of the danger of explosion presented by mixtures of different combustible materials with air.

The PGF gas analyzer measures the temperature difference between a reference platinum spiral and a platinum spiral mounted in a chamber where catalytic combustion of a sample of the mixture being analyzed takes place.

5. A Mechanism of the Initiation of Explosions of Liquid Substances

"The Probable Initiation Mechanism in the Explosive Decomposition of Liquids," by L. G. Bolkhovitinov, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 126, No 2, 11 May 59, pp 322-324

The assumption that explosive decomposition produced by a blow is initiated by the heating of small gas occlusions due to compression is not in agreement with experimental facts, which show that the compression of air occlusions proceeds isothermally under comparable conditions. It is more likely that minute crystals form in liquid explosives under the effect of compression and that the latent heat of fusion liberated as a result of this crystallization gives rise to local overheating in foci from which explosions start. The conditions which would result in the formation of crystals under the effect of a blow are discussed in the example of nitroglycerin. Isothermic compression followed by decompression of a liquid explosive must lead to increased sensitivity of the explosive to a blow because crystallization nuclei are formed as a result of this treatment. The fact that partly frozen nitroglycerin exhibits an increased sensitivity is in accordance with the theory advanced.

6. The First USSR Units Converting Natural Gas With Oxygen Put Into Operation

"A Saving of More Than a Million Rubles," by P. Sichkov, Chief Engineer, Lisichansk Chemical Combine; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 3 June 59, p 1

"At the Lisichansk Chemical Combine, two converters of natural gas have been put into operation. The natural gas is converted to synthesis gas for the production of methyl alcohol and isobutyl alcohol. The process is completely automatized. These are the first converters in the USSR which operate on pure oxygen.

"Production processes are being automatized by the Lisichansk chemists on an extensive scale. The process of the production of ammonium nitrate has been fully automatized. Automation of this particular department has resulted in a saving to the combine of more than a million rubles per year. The production of isobutyl oil by distillation has also been automatized.

"On the opening day of the June Plenary Session of the Central Committee CPS an experimental industrial [pilot-plant] department for the production of normal butyl alcohol by oxo-synthesis will be started at the combine."

Industrial Chemistry

7. USSR Work on Polyformaldehyde Resin

"Polyformaldehyde, a New Synthetic Material," by O. Korsunsky, Chief Specialist, State Scientific Technical Committee at the Council of Ministers USSR; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Vol 4, No 59 (514), 22 May 59, p 4

Recently, considerable progress has been made in the polymerization of aldehydes. Formaldehyde has been polymerized to a synthetic resin which exhibits stability at high temperatures and has good mechanical properties. The new, presently applied method for the polymerization of formaldehyde is based on the use of monomeric formaldehyde of a high degree of purity (close to 100%) and the application of a special, rigidly controlled process employing catalysts of the ionic type and special methods for the stabilization of the polymer.

The technological process for the production of polyformaldehyde is carried out as follows. By subjecting a 40% aqueous solution of formaldehyde to the action of alkaline or acidic agents, an intermediate polymer of the ordinary, unstable type, i.e., alpha-polyoxymethylene, is obtained. This product is filtered, washed, and dried. The alpha-polyoxymethylene is heated to produce pure monomeric gaseous formaldehyde. This formaldehyde is additionally dehydrated in special traps, and in the final state of purification, after acquiring a purity of about 100%, is conducted into the polymerization equipment. The polymerization takes place in a solvent. Aliphatic amines are most commonly used as polymerization catalysts. The polymer that has formed must be stabilized. It is treated with acetic anhydride to stabilize it. Polyformaldehyde is a synthetic resin of the thermoplastic type. Its most valuable property is retention of good operational characteristics at elevated temperatures. Its tensile strength at room temperature is 700 kgs per cm^2. Polyformaldehyde retains a high strength after considerable elevation of the temperature, i.e., under conditions when the majority of ordinary thermoplastics soften. Its tensile strength at 120° is 280 kgs per cm^2. The moisture content of the air has almost no effect on the strength of this polymer.

Furthermore, it has a high limit of fatigue strength, high transverse strength, a low residual deformation, and a low coefficient of moisture absorption. As far as creeping strength (gradual deformation as a result of prolonged application of a load) at low temperatures is concerned, polyformaldehyde is somewhat inferior to amorphous polymers (polystyrene and polymethylmethacrylate), but superior to crystalline polymers, namely, polyethylene and polyamides (i.e., it has a lower tendency to creep than the latter).

Polyformaldehyde has a surface which is slippery to the touch. Its coefficient of friction (0.1-0.3) is very low in comparison with that of steel. The static and dynamic coefficients of friction coincide and do not change with the temperature. This makes the material particularly well suited for the production of self-lubricating bearings and moving parts of machines. These characteristics, in combination with the other mechanical properties of polyformaldehyde, make it possible to produce from this material machine parts which are distinguished by a high mechanical endurance. These machine parts are suitable for operation in surroundings which differ greatly with respect to the temperature and humidity encountered. They are suitable for use in a tropical climate.

Because of the high stability of polyformaldehyde to the action of water, it is a good material for water line and water conduit fittings. Polyformaldehyde fittings for this purpose have, under ordinary conditions, a useful life of 20 years. Among the chemical properties of the new polymer, high stability towards the action of air at elevated temperatures is worth noting. Exposure to elevated temperatures up to 80° for an indefinite length of time does not result in impairment of the physical properties of the material. It can stand exposure to temperatures up to 120°

for short periods of time. As distinguished from other thermoplastic resins, polyformaldehyde has a high resistance to the action of organic solvents: it is not soluble in any of the common solvents up to a temperature of 70°. The polymer is unstable only towards the action of strong acids and alkalis.

Because it combines advantageous mechanical properties with good electrical characteristics, polyformaldehyde will be used extensively in the electrical industry. It is of importance from this standpoint that the electrical properties of the polymer are not affected to any great extent by high humidity because the absorption of moisture by it is low.

Polyformaldehyde is greatly superior to polyethylene as far as impermeability to vapors of gasoline and of hydrocarbons in general is concerned. It is also resistant to vapors of alcohol, ethers and/or esters, and solvents containing chlorine, which makes it a promising material for the production of films to be used in packaging.

Articles made of polyformaldehyde are produced on ordinary casting machines at a casting temperature of 200-225°. A comparison of polyformaldehyde with other synthetic plastics leads to the conclusion that it has the closest resemblance to polyamide resins, being inferior to capron with respect to its melting temperature (which is 175°as compared with 250° for capron) and superior to capron as far as stability towards the action of solvents and the tendency to creep are concerned.

There are reasons to believe that high-quality synthetic textile fibers can be produced from polyformaldehyde.

One of the important advantages of polyformaldehyde is its low cost. Formaldehyde, which is cheap and available in plentiful supply, forms the raw material for the production of polyformaldehyde. Preliminary calculations indicate that the price of polyformaldehyde will presumably be 2-3 times lower than that of capron.

From the standpoint of prospects for the production of polyformaldehyde, the work done at the Laboratory of Prof A. Nalbandyan at the Institute of Chemical Physics, Academy of Sciences USSR, is of importance. The work in question is concerned with the production of formaldehyde by the direct catalytic oxidation of methane contained in natural gas. The use of natural gas, rather than methane, as the initial raw material for the production of formaldehyde will make it possible to lower the cost of formaldehyde by a factor of no less than 1.5.

The characteristics of the new polymer have been investigated on a laboratory scale and at larger installations under the direction of F. Oleynik, N. Orlova, V. Lyubomilov, N. Yenikolopov, and other workers at

scientific research institutes and industrial enterprises. At present, the most important thing is to install, as soon as possible, an industrial pilot-plant department for working out definitely the technology for the production of the new material and producing it in quantities sufficient for testing in various products. This task can be accomplished in the shortest possible time by the Moscow Oblast' Sovnarkhoz, jointly with the institutes of the Plastics Administration of the State Committee on Chemistry, Council of Ministers USSR.

The production of formaldehyde can be best carried out at enterprises of the Novosibirsk Sovnarkhoz, where considerable work has already been conducted on methods for its synthesis, and also at enterprises of the Tula and Tartar sovnarkhozes, where cheap raw material for its production is available.

Interest in the production of polyformaldehyde has developed in a number of countries. Du Pont, in the US, intends to start industrial production of "delrin," a synthetic resin based on polyformaldehyde, as early as 1959. Investigation of methods for the synthesis of polyformaldehyde is also being conducted in West Germany, Japan, and other countries.

8. A New USSR Plastic

"Products Made of High-Strength SNP Material," by G. Ya. Lyandzberg, K. A. Sivograkova, and K. I. Lizalin; Moscow, Byulleten' Tekhniko-Ekonomicheskoy Informatsii, No 1, Jan 59, pp 12-13

The Institute of Polymerized Plastics at Leningrad has developed a new material supplied in the form of sheets which exhibits very advantageous characteristics. This material, designated as SNP, has a high mechanical strength, combined with stability at low temperatures, resistance to heat, and stability to chemical action. It can be readily cast, subjected to mechanical working, cemented, and polished. This material is produced by fusing SN-28 copolymer (styrene-nitrile) with SKN-26 rubber.

9. Development of Phenolformaldehyde-Rubber Pressure Molding Resins in the USSR

"Phenolformaldehyde-Rubber Pressure Molding Resins," by I. Ya. Kvitko; Moscow, Byulleten' Tekhniko-Ekonomicheskoy Informatsii, No 1, Jan 59, pp 13-15

A block-copolymer is produced from nitrile rubber and phenolformaldehyde (novolac) by stirring the two components in Werner mixer at 120-150°. Similarly to ordinary novalac resin, the copolymer obtained in this manner has the capacity to harden on addition of hexamethylene tetramine and can

be combined with fillers to produce pressure-molding powders. Pressure-molding powders of this type were originally developed in the USSR at the Scientific Research Institute of Plastics. On the basis of procedures developed at this institute in 1957, the Okhta Chemical Combine has organized the production of phenolformaldehyde-rubber pressure-molding powders bearing the designation FKP.

Resins of the type described are used extensively both in the USSR and abroad.

10. Polyamide Films

"A Remarkable Kind of Film", by A. Papernaya; Moscow Promyshlenno-Ekonomicheskaya Gazeta, Vol 4, No 59 (514), 22 May 59 p 4, column 1

Polyamide films were demonstrated by workers at the All-Union Scientific Research Institute of Film Materials and Artificial Leather. O. Vorontsova, Senior Scientific Associate at the institute mentioned, demonstrated very thin transparent films which cannot be torn and somewhat thicker films which cannot be pierced with a knife or destroyed by hammering. The last-mentioned film consists of a technical capron netting made of continuous extruded fibers which have been cemented by impregnating the netting with a polyamide copolymer. A very light, elastic, and exceedingly strong material is produced in this manner. Some reinforced polyamide films have a tensile strength of 2,000 kgs per square centimeter. Films of this type are impermeable to water and resistant to the action of oil, petroleum, and gasoline.

Polyamide films can be modified for many different applications by combining them with other polymers. Thus, by combining polyamide resin with even a small quantity of phenol resin, one may increase its tensile strength by one third. By adding to polyamides other resins, one may produce a material which is stable at temperatures down to minus 50°. A softer and more elastic polyamide resin can be obtained by combining polyamide with different grades of rubber. Films made of resins of this type are resistant to ageing. The technology of their production is very simple, according to V. Alekseyenko, director of the All-Union Scientific Research Institute of Film Materials and Artificial Leather. If films of this type which have been reinforced with a capron netting are used for the insulation of concrete tanks for gasoline, the gasoline will not seep through cracks formed in the concrete. Plastics of this type are also an excellent material for the construction of petroleum pipe lines. It is assumed that films of the type described can be used to replace the steel parts protecting guides of machine tools for metal cutting. These films will also be used as wall covers and material for curtains on passenger planes and railroad cars. Another prospective application is as a material for raincoats and tarpaulins.

Inorganic Chemistry

11. Formation by Ions of Alkali Metals of Complex Compounds With Ethylenediaminetetraacetic Acid

"Investigation of the Behavior of Potassium Ions in Solutions of Ethylenediaminetetraacetic Acid by the Methods of Ion Exchange and Application of a Potassium Glass Electrode," by V. P. Nikol'skiy, A. M. Trofimov, and N. B. Vysokoostrovskaya, Radium Institute imeni V. G. Khlopin, Academy of Sciences USSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 4, Apr 59, pp 857-861

It had been established in previous work done by A. Schwarzenbach and co-workers (Switzerland) that lithium and sodium form rather unstable ionic complexes with ethylenediaminetetraacetic acid (EDTA). No data were available on similar complexes formed by potassium or any other alkali metals besides lithium and sodium. It was assumed that if potassium forms complexes with EDTA, their stability ought to be lower than that of the corresponding lithium and sodium compounds. Using the method of ion exchange and employing the ion-exchange resins KU-2, AV-17, and Dowex-1, the behavior of potassium ions in EDTA solutions was investigated. The radioactive tracer K^{42} was used in the work described, and the potentiometric method with the use of a glass electrode having a potassium function was also applied. It was shown that under the experimental conditions employed (pH = 6-11 and a concentration of EDTA = 2.5×10^{-3} - 2.5×10^{-1} mol per liter), potassium does not form complex compounds with EDTA to any significant extent.

Nuclear Fuels and Reactor Construction Materials

12. State of Uranium and Thorium Atoms in Radioactive Minerals

"On the State in Which Uranium and Thorium Atoms Occur in Radioactive Minerals," by I. Ye. Starik and K. F. Lazarev; Leningrad, Radiokhimiya, Vol 1, No 1, Mar 59, pp 60-65

It was established that the atoms of uranium and thorium, in addition to being present in the crystal lattice of minerals, may also be present in some radioactive minerals at lattice defects in a difficultly soluble form as a result of hydrolysis or of some other process. When the radioactive elements are leached out of monazite or wiikite with salt solutions acidified to a pH = 1-2, uranium, thorium, and the rare earth elements go into solution in spite of the fact that there is no dissolution of the mineral. The process of the leaching-out of these elements by the solutions mentioned is analogous to the leaching-out of radium isotopes.

13. Trends in Uranium Hydrometallurgy

"Application of Sorption and Extraction Processes in the Hydrometallurgy of Uranium," by B. S. Kolychev; Moscow, Atomnaya Energiya Vol 6, No 5, May 59, pp 513-527

The papers on processes of adsorption and extraction in uranium hydrometallurgy which were presented at the second International Conference on Peaceful Uses of Nuclear Energy (Geneva, 1959) are reviewed. Information is given on the relative extent of application of the methods discussed in US industry. Different applications of adsorption processes, specifically new processes for the extraction of uranium by adsorption from pulps, are discussed. The two principal classes of extracting agents, i.e., organophosphorus compounds and amines, are considered, and the influence exerted by different factors on extraction processes is discussed. Examples are given of the application of adsorption and extraction processes at plants converting uranium ores. The following general conclusions are drawn:

The present trend is away from the separation of solids from liquid phases and towards the extraction of uranium directly from pulps. The RIP process, as applied in the US has not lived up to expectations because of the complexity of the equipment needed and the unsuitability for the treatment of thick pulps of the method on which the process is based. Attempts are being made to develop new processes for adsorption from pulps, as for instance, adsorption by a pulsating layer of resin.

There is a tendency in current work to develop technological methods of treatment in which leaching is combined with extraction, so that the amount of acid used is reduced to the greatest possible extent and the degree of extraction of uranium is increased. There is, furthermore, a tendency to eliminate filtration after leaching of the ore and to replace this step with countercurrent decantation in which flocculating agents are used.

14. Chloride Complexes of Uranyl in Organic Solvents

"Formation of Chloride Complex Compounds of Uranyl in Acetone," by V. M. Vdovenko, A. A. Lipovskiy, and S. A. Nikitina; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 4, Apr 59, pp 862-865

By using the spectrophotometric method, the formation of complex compounds of uranyl in acetone which took place when hydrochlorides of pyridine and hydroxylamine were used as donors of chloride ions was investigated. It was established that UO_2Cl, UO_2Cl_2, and $UO_2Cl_3^-$ are formed. A hitherto unknown compound of pyridine hydrochloride with uranyl chloride was isolated and analyzed. The composition of this compound corresponds to the empirical formula $(C_5H_5NH)_2UO_2Cl_4$.

Because it is possible to separate Th (IV), Pa (V), and U (VI) by extraction with organic solvents from hydrochloric acid solutions, data on chloride complexes in the form of which uranium may be present in organic solvents are of importance.

15. Distribution of Uranyl Nitrate Between Aqueous Solutions and Organic Solvents

"Concerning the Problem of the Distribution of Uranyl Nitrate Between Aqueous Solutions and a Number of Ethers and Esters," by V. M Vdovenko and Ye. A. Smirnova; Leningrad, Radiokhimiya, Vol 1, No 1, March 59, pp 43-51

It was found that the distribution of uranyl nitrate between aqueous solutions and a number of ethers and esters takes place according to equations given in the text. The equilibrium constants of the distribution of uranyl nitrate between the aqueous phase and a number of the solvents tested were determined. The activity coefficients and apparent molal volumes of uranyl nitrate in some ethers and esters were also determined.

16. Dissociation Constants of Magnesium and Uranyl Oxalates

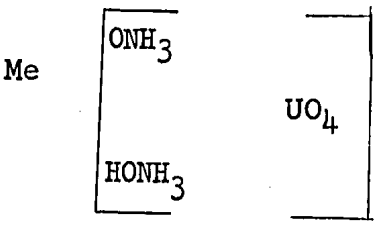
"Determination of the Dissociation Constants of Complex Oxalates of Magnesium and Uranyl With the Use of an Oxalate-Silver Electrode," by Ye. N. Tekster, L. I. Vinogradova, and B.V. Ptitsyn, Chair of General and Analytical Chemistry of the Leningrad Technological Institute of the Food Industry and Chair of the Technology of Artificial Radioactive Substances at the Leningrad Technological Institute imeni Lensovet; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 4, Apr 59, pp 764-765

The concentration constants of the dissociation of the oxalate complexes K_2 [Mg $(C_2O_4)_2$] and K_6 [$(UO_2)_2$ $(C_2O_4)_5$] were determined. The values obtained are listed.

17. Uranium-Hydroxylamine Complex Compounds

"Complex Compounds of Hexavalent Uranium With Hydroxylamine," by O. Ye. Zvyagintsev and V. A. Kuznetsov; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 4, Apr 59, pp 866-868

In work done by a number of investigators, it was established that hydroxylamine prevents precipitation of uranium in alkaline media. This property was used to separate uranium from iron, beryllium, and other elements in analytical determinations of uranium. In the work reported at present, an attempt was made to clarify the nature of the interaction between hexavalent uranium and hydroxylamine. It was established that the compound $[NH_3OH]_2\ UO_4\ \cdot H_2O$ is formed by uranyl with hydroxylamine in the pH range of 6-8. In the pH range above 8, soluble complex compounds of uranium are formed which have the constitution



where Me = an ion of an alkali metal.

Some properties of these compounds were investigated, including solubility, density, and electrical conductivity.

18. Concentration of Uranium by Adsorption on Anion Exchange Resins

"Adsorption of Uranium From Sulfate Solutions on Commercial Anion Exchange Resins," by F. Molnar, Chemical Department of the Central Physical Research Institute, Hungarian Academy of Sciences; Budapest, Magyar Kemiai Folyoirat, Vol 65, No 4, Apr 59, pp 139-142

The adsorption of uranium from sulfate solutions on some commercial anion-exchange resins was investigated. It was established that resins of a weak or medium basicity are suitable for the extraction of uranium from sulfate solutions and pulps. The AV-16 G resin was found to exhibit a high volume capacity and good desorption characteristics, and the AN-2 F resin, a high volume capacity. The strongly basic Hungarian ion-exchange resin, Mykion PA, was also found suitable, although its capacity and desorption characteristics are inferior to those of Amberlite IRA-400.

19. Dissociation of Uranium Hexafluoride by Uranium Fission Fragments

"The Dissociation of UF_6 by Uranium Fission Fragments," by V. A. Dmitriyevskiy and A. I. Migachev; Moscow, Atomnaya Energiya, Vol 6, No 5, May 59, pp 533-539

It is brought out that as a result of irradiation with neutrons, uranium hexafluoride is decomposed with the formation of lower uranium fluorides (there is apparently decomposition into UF_5 and fluorine). The rate of decomposition corresponds approximately to G = 0.5 mols/100 electron volts or 0.21 mols/hour per one kw of power generated in the gas. The dissociation of UF_6 produced by irradiation is counteracted by recombination of the dissociation products formed. As a result, a state of equilibrium between free fluorine and UF_6 is established. The position of this equilibrium depends on the intensity of irradiation. In the presence of fluorine, uranium hexafluoride is a compound which is stable towards the effects of radiation even at room temperature, when the velocity of recombination is relatively low. Uranium hexafluoride can be used as a fuel in nuclear reactors. An experimental reactor employing this compound as a fuel has actually been constructed (cf paper No 2502 by I. K. Kikoin, V. A. Dmitriyevskiy, and others, Second International Conference on Peaceful Uses of Atomic Energy, Geneva, 1958).

20. A USSR Review of the Book of J. I. Katz and G. T. Seaborg on the Chemistry of Actinide Elements

"The Chemistry of the Actinide Elements," by J. I. Katz and G. T. Seaborg, London, 1957, 508 pp, reviewed by G. V. Ellert and R. N. Shchelokov in Zhurnal Neorganicheskoy Khimii, Vol 4, No 5, May 59, pp 1217-1221

After discussing the contents of the book in considerable detail, the reviewers praise the quality of the information given by the authors and the arrangement of the subject matter in the book. They recommend translation of the book into Russian.

The following comments are made at the conclusion of the review:

"One of the authors of the book (G. T. Seaborg) is the originator of the actinide hypothesis. This has been reflected to a considerable extent in the selection of the material included in the monograph. This selection was made entirely from the standpoint of the actinide hypothesis and with the intention of substantiating it. One must emphasize, however, that the treatment of thorium, protactinium, uranium, and transuranium elements as 5 f — elements is not free of fault and that the term 'actinides' is not completely satisfactory. A number of USSR chemists incline to the opinion that there is no reason to forget the resemblance, which has been established long ago, between such elements

as thorium, protactinium, and uranium and the d-- elements of the IVa, Va, and VIa transitional subgroups of the periodic system. This resemblance is so great that there is every reason to regard transactinium elements, not only as 5 f -, but also as 6- 6 d -elements. It is obvious that this interpretation of the nature of transactinides is more useful to investigators working in the field of the chemistry of these elements than Seaborg's treatment.

"According to the authors of the book, an isotope of the element 102 (presumably 102^{251} or 102^{253}) was originally obtained at the Nobel Institute of Physics in Stockholm in the spring of 1957 as a result of joint efforts made by Swedish, British, and American physicists. The synthesis of the element was achieved by bombarding Cm^{244} with carbon ions. The element was obtained in a quantity amounting to several atoms.

"Independently of the experiments on the synthesis of nobelium carried out at the Nobel Institute, the 102 d element was synthesized in the Soviet Union by G. N. Flerov and members of his group, who bombarded Pu^{241} with an intense stream of O^{16} ions bearing a charge of 5. An exact repetition of the experiments conducted by Seaborg in Sweden led to a negative result. For this reason, the priority in the synthesis of the 102 d element belongs to Soviet physicists, and the right to name this element is reserved to them."

21. Formation of Complex Ions by Zirconium

"Investigation by the Ion-Exchange Method of the Formation of Zirconium Complexes in Solutions," by A. K. Kirakosyan and I. V. Tananayev, Institute of General and Inorganic Chemistry imeni N. S. Kurnakov, Academy of Sciences USSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 4, Apr 59, pp 852-856

Formation of complexes as a result of the interaction of zirconium sulfate with oxalic, citric, and sulfuric acids in solutions was investigated by the ion-exchange method, using the cation exchange resins KU-1 and KU-2. It was established that the rather stable dizirconyl oxalate and the complex ions

$$[Zr\ (C_2O_4)_4]^{4-} \text{ and } [Zr_2\ Cit_7]^{x-}$$

are formed, as well as unstable zirconium sulfate ions.

22. Interactions of Hafnium Dioxide With Alkaline Earth Metal Oxides at High Temperatures

"Interaction of Hafnium Dioxide With Oxides of Alkaline Earth Metals," by N. A. Godina and E. K. Keler, Institute of Silicate Chemistry, Academy of Sciences USSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 4, Apr 59, pp 884-891

It was found in the experiments described that the interaction of HfO_2 with CaO, SrO, and BaO proceeds energetically at 1,100° with the formation of compounds of the general formula $MHfO_3$. In the system HfO_2 - CaO, in addition to the compound $CaHfO_3$, solid solutions are formed in the HfO_2 region at 1,350-1,400°. There is a limited solubility of CaO in these solid solutions. The interaction of HfO_2 with MgO begins at a temperature above 1,400°, leading to the formation of solid solutions in the HfO_2 region. MgO shows a limited solubility in these solid solutions. No compounds of constant composition were found in the magnesium system.

23. Interactions of Niobium Pentachloride With the Chlorides of Potassium and Sodium in Melts

"Concerning the Problem of the Interaction of Niobium Pentachloride With Potassium Chloride and Sodium Chloride in the Molten State," by A. P. Palkin and N. D. Chikanov, Voronezh State University; Moscow, Zhurnal Neorgnicheskoy Khimii, Vol 4, No 4, Apr 59, pp 898-901

The interactions of niobium pentachloride with potassium chloride and sodium chloride were investigated by the methods of thermal analysis. The constitutional diagram of the system $NbCl_5$ — K Cl was determined. It was found that the compound $KNbCl_6$ is formed, which melts congruently and has a melting point of 396°. It was established that polymorphous transformations of this compound take place at 334° and 186°. A region of separation (formation of layers) was found in the region corresponding to a KCl content of 0.1 - 42.5 mol. percent. In addition to the results reported by I. S. Morozov and B. G. Korshunov, the existence of a liquidus curve from 0 to 50 mol % Na Cl was established in the constitutional diagram of the system $NbCl_5$ — Na Cl. Furthermore, it was established that there is a region of separation from 7.5 to 31.5 mol percent of Na Cl.

24. The Effects of Radiation on Graphite

"Radiation-Induced Changes in the Physical Properties of Some Graphites of Various Degrees of Graphitization," by Yu. N. Aleksenko and L. Ye. Kakushadze; Moscow, Atomnaya Energiya, Vol 6, No 5, May 59, pp 568-569

The effects of neutron irradiation on six samples of graphite having different degrees of graphitization were investigated. It was established that the absolute magnitude of changes in the electric and thermal resistance brought about by the effects of radiation does not show any dependence on the degree of graphitization within the limits of experimental error. The relative changes in the electric resistance and heat conductivity were found to be lower in the case of the less graphitized samples.

The curves describing the dependence of the heat conductivity on the temperature indicate that radiation defects produced in the crystalline lattice of graphite exert an action on the propagation of thermal vibrations and act as permanent dispersers of the type of crystal boundaries or impurities. The effect of radiation defects on the electrical conductivity is determined by the appearance of additional traps of carriers of the electrical current.

Swelling of the samples was not observed: radiation annealing apparently took place at the elevated temperatures (350-450°) employed.

25. Organic Moderators

"The Application of Organic Compounds As Moderators in Nuclear Reactors," by B. G. Dubovskiy and M. N. Lantsov; Moscow, Atomnaya Energiya, Vol 6, No 5, May 59, pp 563-564

Replacement of water with liquid organic compounds in water-water reactors does not result in a significant increase in the critical volume of the reactors.

A small increase in the volume of the core takes place as a result of the leakage of neutrons from the reactor. The age of neutrons in liquid organic compounds increases at a slower rate than the concentration of hydrogen nuclei. Because carbon is present in the organic liquid compounds, the neutron age in these liquids is much lower than in water at the same concentration of hydrogen nuclei. This property of organic liquids, e.g., isoamyl alcohol, suggests that it would be of advantage to use them as biological protective agents to shield nuclear reactors of small dimensions. To obtain more precise results in comparative experiments carried out on reactors employing organic liquids as moderators, it is advisable to use as fuel uranium with a low degree of enrichment.

[For additional information on organic moderators, see also item III.]

Organic Chemistry

26. On the Factors Which Influence the Direction of the Reactions Between Triarylmethyl Halides and Silver Dialkylphosphites

"The Action of Triarylmethyl Halides on Silver Dialkylphosphites," by A. Ye. Arbuzov and Ye. A. Krasil'nikova, Kazan Chemicotechnological Institute; Moscow, Izvestiya Akademii Nauk SSSR - Otdeleniye Khimicheskikh Nauk, No 1, Jan 59, pp 30-34

A. Ye. Arbuzov had previously shown that triphenylmethyl chloride and triphenylmethyl bromide react with silver dialkylphosphites in two different directions, depending on the nature of the reacting halide. The first type of reaction, that involving triphenylmethyl chloride, can be represented as follows:

$$(RO)_2POAg + ClC(C_6H_5)_3 \rightarrow AgCl + (RO)_2POC(C_6H_5)_3, \qquad (1)$$

i. e., mixed esters of phosphorous acid are formed.

The second type of reaction, that between triphenylmethyl bromide and silver dialkylphosphites, proceeds according to the formula:

$$(RO)_2POAg + BrC(C_6H_5)_3 \rightarrow AgBr + (RO)P^{O}\text{--}C(C_6H_5)_3, \qquad (2)$$

i. e., derivatives of triarylmethylphosphinic acid are formed.

The authors were anxious to learn, after studying these reactions, how silver dialkylphosphites would react with other secondary radicals. The following represents the results of their investigation:

1. The direction of the reaction between silver dialkylphosphites and triarylmethyl halides is influenced by the structure of the radicals in the dialkylphosphites, the nature of the halide and the substituent group in the nucleus.

2. The silver salts of diethyl-, diisobutyl-, diisopropyl-, and di-sec-butylphosphorous acids and triarylmethyl chloride react to yield mixed esters of phosphorous acid (1st type).

3. Silver dialkylphosphites with primary radicals react with triarylmethyl bromide to yield esters of triarylmethyl phosphinic acid (2d type).

4. Silver dialkylphosphites containing secondary radicals and triphenylmethyl bromide yield mixed esters of phosphorous acid (1st type).

5. The presence of a substituent in the aromatic ring of the halide derivative also influences the direction of the reaction; if the substituent is chlorine, the reaction proceeds according to the first type; if the substituent is a methyl group, the reaction is of the second type.

27. New Method for Preparing Diphenylphosphite

"On the Preparation of Diphenylphosphite," by A. Ye. Arbuzov and M. G. Imayev, Kazan Chemicotechnological Insititute imeni S. M. Kirov; Moscow, Izvestiya Akademii Nauk SSSR - Otdeleniye khimicheskikh nauk, No 1, Jan 59, p 171

The authors note that there are already two methods for preparing diphenylphosphite described in literature. More recently, a third method was proposed which involves hydrolysis of the acid chloride of diphenylphosphite in ether with an equivalent amount of water (M. I. Kabachnik and Yu. M. Polikarpov, Doklady AN SSSR, 115:512, (1957)).

The authors now propose a method by which large yields of very pure diphenylphosphite can be obtained. It involves the hydrolysis of triphenylphosphite with an equivalent quantity of water, followed by distillation of phenol in vacuum:

$$(C_6H_5O)_3P + H_2O \longrightarrow (C_6H_5O)_2POH + C_6H_5OH$$

The diphenylphosphite obtained by this method can be used for purposes of synthesis without further purification.

28. The Effect of Halogenated Ethers on Dialkylphosphites

"On the Problem of the Effect of Halogenated Simple Ethers on Dialkylphosphites," by A. Ye. Arbuzov and V. S. Abramov, Kazan Chemicotechnological Institute; Moscow, Izvestiya Akademii Nauk SSSR, Otdeleniye khimicheskikh nauk, No 1, Jan 59, pp 35-40

Sodium dialkylphosphites react in a normal manner with chloro- and bromomethyl ethers to form esters of methoxymethylphosphinic acid.

When the products of the reaction between bromomethyl ether and sodium dialkylphosphites are distilled without separating the sodium bromide formed in the reaction, a reaction takes place with the latter to form salts of acidic esters of methoxymethylphosphinic acid.

Silver dialkylphosphites react with bromomethyl ether to yield esters of methoxymethylphosphinic acid, whereas mixed esters, evidently, are formed in the reaction between silver dialkylphosphites and chloromethyl ether.

29. Determination of Alcohol in Chloroform and Benzene

"The Determination of Small Quantities of Ethyl Alcohol in Chloroform and in Benzene," by Chou T'ung-k'uei, Hua-hsueh Shih-chieh, 1958, 13, No 4, 175-176 (Chinese) (from Referativnyy Zhurnal -- Khimiya, No 7, 10 Apr 59, Abstract No 23132 by T. Levi)

"To determine $\leq$ 1.5% of EtOH in $CHCl_3$, C_6H_6, and in their mixtures, a method has been proposed based on esterification with the aid of phthalic anhydride (I). Twenty-five ml of 0.5 M solution of I in anhydrous pyridine are added to 25 ml of mixture in a flask used for determining the iodine number; the reaction mixture is heated on a water bath; 10 ml of water are added to it, and it is heated again for several minutes, cooled, and titrated with 0.5 n. solution of NaOH in the presence of phenolphthalein. Similarly, a control test using I is conducted, and the content of EtOH is calculated from the difference in the results of the titrations."

30. A Process for the Preparation of Insecticides Having the General Formula $(AlkO)_2P(=S)OCH_2CONAlk_2$

"A Method of Preparing Compounds With the General Formula $(AlkO_2P(=S)OCH_2CONAlk_2)$," by N. N. Mel'nikov, Ya. A. Mandel'baum, and P. G. Zaks, Authors' Certificate USSR 113170, 15 Aug 58 (from Referativnyy Zhurnal--Khimiya, No 8, 25 Apr 59, Abstract No 28729P by A. Grapov)

"Compounds with the formula $(RO)_2P(=S)OCH_2CONR_2$ are active systemic insecticides and are readily soluble in water. After 20 g of $(C_2H_5O)_2PSONa$ and .15 g of $ClCH_2CON(C_2H_5)_2$ in 100 ml of acetone are boiled for 5-6 hours, $(C_2H_5O)_2PSOCH_2CON(C_2H_5)_2$ (I) is obtained, boiling point 147°C/0.35 mm, d_4^{20} 1.3336, $n^{20}D$ 1.4800. The reaction can also be carried out in alcohols, glycols, and dioxane. In a 0.05% concentration, I produces a dosage of 0.5 mg/g, with 100% extermination at arachnoid ticks within 4 days after application."

Radiation Chemistry

31. Rumanian Work on the Initiation of the Oxidation of Paraffins by Gamma Radiation

"Initiation of the Oxidation of Paraffins With Gamma Radiation Emitted by Co^{60}," by I. Drimus, G. Ioanid, A. Dragut, P. Vasilescu, and V. Dumitrescu, Institute of Chemical Research at Bucharest; Bucharest, Studii Si Cercetari de Chimie, Vol 7, No 1, Jan-Mar 59, pp 79-94

The oxidation of Rumanian technical paraffins under the effect of ionizing radiation was subjected to investigation. The results of the investigation indicate that the method in question can be applied industrially and that it is more advantageous from the economic standpoint than the catalytic method applied hitherto. An investigation was also conducted on the formation of active centers in technical paraffin under the action of ionizing radiation. A tentative design of an industrial installation is proposed in which the oxidation will be initiated by prior irradiation of the paraffins.

32. Radiation Vulcanization of Copolymers Containing Fluorine

"Radiation Vulcanization of Fluorinated Copolymers," by F. A. Galil-Ogly, T. S. Nikitina, T. N. Dyumayeva, A. S. Novikov, and A. S. Kuz'minskiy; Moscow, Atomnaya Energiya, Vol 6, No 5, May 1959, pp 540-545

It is concluded, on the basis of experiments carried out with Kel-F (a copolymer of trifluorochloroethylene with vinylidene fluoride) that, although irradiation of rubber-like fluorocopolymers, as such, results in the formation of elastomers with inferior physical and mechanical characteristics, elastomers with good technical characteristics can be obtained if copolymers of this type are combined with fillers and then irradiated. The surface activity of the filler exerts a marked effect on the characteristics of the elastomers that are produced. The best characteristics are exhibited by radiation-vulcanized elastomers which contain channel carbon black. They are superior to ordinary peroxide elastomers so far as resistance to heat aging, stability to the action of solvents, and stability with respect to static deformations are concerned. As distinguished from polytetrafluoroethylene and polytrifluorethylene, rubber-like copolymers of the Kel-F type are cross-linked as a result of the action of ionizing radiation. The degree of cross-linking of fluorocopolymers depends on their composition, the dose of radiation, and the medium in which irradiation was carried out. Presence of oxygen contributes to a higher degree of cross-linking.

33. A Method for the Determination of the Surface of Minerals by Radioactivity Measurements

"A Radioactivity Method for the Determination of the Surface of Minerals" by Ye. P. Petryayev; Leningrad, Radiokhimiya, Vol 1, No 1, Mar 59, pp 105-108

A new method for the determination of the surface of minerals is proposed. This method, which is based on a comparison of the degrees to which radium isotopes (Ra and Th X) are leached out, was used for the determination of the surface of monazite. It was found that the radioactive elements are leached out from a large internal surface, in addition to the external surface.

34. Method for the Separation of Carrier-Free Radioactive Isotopes of Indium

"Methods for the Separation of Carrier-Free Radioactive Isotopes; Part 5 -- Benzolyacetonates of Indium and Cadmium and an Extraction Method for the Separation of Radioactive Isotopes of Indium With Benzolyacetone," by N. P. Rudenko and I. Stary; Leningrad, Radiokhimiya, Vol 1, No 1, Mar 59, pp 52-59.

The extraction of indium and cadmium by solutions of benzoylacetone in chloroform, benzene, and carbon tetrachloride was investigated. The influence exerted by the pH of the aqueous phase and the effect of the concentration of benzoylacetone in the organic solvent were studied. The values of the coefficients of distribution of the neutral benzoylacetonates of indium and cadmium between the solvents mentioned above and the aqueous phase were established. By using two methods, the association constants of the complexes of indium and cadmium with benzoyl acetone were determined. A method was developed for the separation of the carrier-free radioactive isotope of indium from irradiated cadmium. The isolated radioactive indium was radiochemically pure. Expressions are derived which make it possible to evaluate the possibilities of the extraction of elements as affected by a number of variables.

35. The Behavior of Microquantities of Radioactive Zirconium in Solutions

"The State of Microquantities of Radioactive Elements in Solutions; Part 5 -- State of Zirconium in Solutions of Nitrates," by I. Ye. Starik, I. A. Skul'skiy, and A. I. Yartov; Leningrad, Radiokhimiya, Vol 1, No 1, Mar 59, pp 66-76.

It follows from the results obtained in the work described that zirconium, when present in concentrations of the order of 10^{-11} gramatoms per liter in aqueous solutions of HNO_3, $NaNO_3$, Ba $(N_3O)_2$, and Th $(NO_3)_4$, is in the ionic state up to pH = 4. At pH values higher than 4, colloidal solutions of zirconium hydroxide are formed. The formation of colloids of zirconium in the region of pH = 1.6 - 4.0, which is caused by adsorption of the zirconium on various impurities present in the solution, is reduced by polyvalent cations and can be suppressed by a thorough purification of the water. The extent of adsorption of zirconium ions on quartz and filter paper changes symbatically with changes in the potential of the surface of adsorbents.

36. Behavior of Niobium Present in Microquantities in Aqueous Solutions

"The State in Which Microquantities of Radioactive Elements Occur in Solutions; Part 4 -- The State of Niobium in Aqueous Solutions," by I. Ye. Starik and I. A. Skul'skiy; Leningrad, Radiokhimiya, Vol 1, No 1, Mar 59, pp 77-81

Results of the investigation of the dependence of the adsorption of niobium by quartz on the pH of the solution and also ultrafiltration and centrifuging of solutions containing microquantities of niobium showed that niobium is in the ionic state in nitric acid solutions at pH values lower than 2. In the range above pH=2, true colloidal solutions of niobium are formed. Electrophoresis of acidic solutions indicated that at pH values lower than 2, both positively charged and negatively charged niobium ions are present.

37. Chemical Behavior of Radioactive Phosphorus Formed by the Bombardment of Sulfur With Neutrons

"The Problem of the Chemical State of Atoms Formed As a Result of Nuclear Transformations; Part 3," by A. N. Nesmeyanov and I. Tsifka; Leningrad, Radiokhimiya, Vol 1, No 1, Mar 59, pp 82-85

It was established in the experiments described that atoms of radioactive phosphorus which form as a result of the irradiation with neutrons of solutions of carbon disulfide in benzene or chlorobenzene, substitute hydrogen or chlorine atoms in the benzene nucleus, forming derivatives of mono-, di-, and triphenylphosphine. The fraction of radioactive phosphorus present in the form of derivatives of monophenyl phosphine increases with the extent of dilution of the carbon disulfide with benzene or chlorobenzene.

38. Separation of Mo^{99} From Irradiated Uranium Oxide

"The Chemical Behavior of Mo^{99} Formed by Slow-Neutron Fission in Uranium Oxides," by L. V. Shiryayeva and Yu. M. Tolmachev; Moscow, Atomnaya Energiya, Vol VI, No 5, May 59, pp 528-532

The separation of Mo^{99} from irradiated samples of U_3O_8 and UO_2 by volatilization produced by heating in vacuum at a temperature of 400-1200° in an argon current is discussed. The dependence of the degree of separation of Mo^{99} on the temperature and the duration of heating were determined. On the basis of the interrelation between the logarithm of the magnitude of separation of Mo^{99} and the inverse absolute temperature established for some sections of the curves, the activation energies of the removal of Mo^{99} from the grains of the uranium oxides were calculated.

39. Radioactivation Procedures for the Determination of Beryllium

"The Radioactivation Method for the Determination of Beryllium," by Kh. B. Mezhiborskaya; Moscow, Atomnaya Energiya, Vol 6, No 5, May 59, p 567

Procedures for the radioactivation determination of beryllium with the application of the (gamma, n) reaction are described. Sb^{124} is used as a source of gamma radiation. Two variations of the analysis are applied: direct count of neutrons or activation of an indium detector. On the basis of the author's experience, the direct count of neutrons is more convenient in laboratory determinations.

Data on the sensitivity of the method are given.

III. ELECTRONICS

Automation and Computers

40. Extending the Usefulness of Analog Computer Matrices

"Construction of Electric Matrices for Integration of Difference and Differential Equations," by G. Ye. Pukov; Novocherkassk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Elektromekhanika, No 2, 1959, pp 3-10

Electric matrix-analogs are widely used for the solution of a number of problems in the fields of elasticity theory, aerodynamics, hydrodynamics, underground pressure, construction mechanics, etc.

The peculiarity of most commonly used first order matrices is that the voltage (current distribution in the matrix sets up spontaneously in a manner similar to the distribution in a simulated physical system (that is without any assistance on the part of the operator or any servomechanism). The article describes the theory and assembly of the second order electric matrices for integrators of difference and differential equations of relatively high order of stipulated boundary conditions. The electric analogs with second order matrices, having automatic feedback, are classed as devices now called self-regulating systems.

This study disclosed that it is possible to widen somewhat the field of application of electric matrices, especially for integration of difference and differential equations, which should not necessarily be a simple analog of any of the equations describing an electric circuit.

Satisfactory results were obtained from the preliminary experiments conducted on a matrix integrator model, as applied to the solution of second degree equations.

41. Computers for the Control of Technological Processes

"Development of Computer Technology in the Seven-Year Plan," Prof F. Mayorov, Doctor of Technical Sciences; Moscow, Sovetskaya Aviatsiya, 8 Apr 59, p 3

The "Mars-200" is an example of a computer built in the USSR for the control of a technological process. It automatically controls the temperature, pressure, humidity and other parameters of a technological process with the help of sensing devices distributed on various parts of the circuit signaling the occurrence of breaks in the process. The "Mars-200" substitutes for tens to hundreds of expensive control-measuring devices and prints the indications of the sensing devices in digital form.

Another example of the utilization of computers for automation and control circuits in the USSR is a system of automatic control of trains known as the "automatic engineer" which permits the train to be handled according to a given program and determines the most advantageous route for the train's motion, distribution of fuel, etc.

42. Construction of Computers Not Held as Problem Confronting Industrial Automation

"Technical Progress and Computers," by Academician A. Dorodnitsyn; Moscow, Pravda, 29 May 59, p 3

The writer stated that the problem of automation of the chemical, oil, and metallurgical industries as well as of the railroad system and electrical power industry is difficult not because of the required construction of computers, but because of the required study of the technological processes and compilation of their mathematical description.

43. Traffic of Cities Possible to Control Automatically

"Cybernetic Traffic Light," (unsigned article); Moscow, Pravda, No 165(14924), 14 Jun 59, p 3

A cybernetic traffic light is being demonstrated in the pavilion "Transportation of the USSR." The assembly controls movement on crossroads independently, without the intervention of a human. The assembly depends on the principle of reflex-logical motion.

[For additional information on computers, see Mathematics.]

Communications

44. Recent Radio Equipment Development

"To Improve the Operation of Radio Communications, Radio Broadcasting, Television and Wire Broadcasting Equipment," (unsigned article); Moscow, Vestnik Svyazi, No 5, May 59, pp 1-2

"Automatized radio-transmitting equipment is now in different stages of development at various scientific research organizations and industry. Unattended two-program VHF-FM radio stations, low-power television-relay equipment and automatized power supply centers have already been designed.

Another example of the utilization of computers for automation and control circuits in the USSR is a system of automatic control of trains known as the "automatic engineer" which permits the train to be handled according to a given program and determines the most advantageous route for the train's motion, distribution of fuel, etc.

42. Construction of Computers Not Held as Problem Confronting Industrial Automation

"Technical Progress and Computers," by Academician A. Dorodnitsyn; Moscow, Pravda, 29 May 59, p 3

The writer stated that the problem of automation of the chemical, oil, and metallurgical industries as well as of the railroad system and electrical power industry is difficult not because of the required construction of computers, but because of the required study of the technological processes and compilation of their mathematical description.

43. Traffic of Cities Possible to Control Automatically

"Cybernetic Traffic Light," (unsigned article); Moscow, Pravda, No 165(14924), 14 Jun 59, p 3

A cybernetic traffic light is being demonstrated in the pavilion "Transportation of the USSR." The assembly controls movement on crossroads independently, without the intervention of a human. The assembly depends on the principle of reflex-logical motion.

[For additional information on computers, see Mathematics.]

Communications

44. Recent Radio Equipment Development

"To Improve the Operation of Radio Communications, Radio Broadcasting, Television and Wire Broadcasting Equipment," (unsigned article); Moscow, Vestnik Svyazi, No 5, May 59, pp 1-2

"Automatized radio-transmitting equipment is now in different stages of development at various scientific research organizations and industry. Unattended two-program VHF-FM radio stations, low-power television-relay equipment and automatized power supply centers have already been designed.

Automatization is now applied on a wide scale to a number of city radio-relay lines. However, the volume and tempo of building unattended equipment, including that for complex automatization of radio enterprises, is inadequate.

"The reconstruction of transmitter PK-2 at the Oktyabr'skiy transmitting center, done by its own operating personnel, may serve as an example of a valuable contribution to the experience of equipment modernization.

"Special attention should be paid in the future to the improvement of the sound quality of radio-broadcasting stations and radio-relay links. Although VHF broadcasting is now in wide use, the utilization of such a form of broadcasting is not always possible due to the low-quality indexes of the channels used by the VHF-FM stations. For the same reasons, certain long-wave and medium-wave radio stations also operate with low quality indexes. Therefore, the development of a network of wide-band channels is of great importance.

"The production of the SVR-ADU equipment and KRU-40 radio-centers was delayed; the development of new demountable tubes has been postponed many years. The new two-program VHF-FM radio stations are not produced fast enough; and the name holds true for equipment using the 10,000-cycle hand channels, radio receivers for radio-centers using the VHF-FM band, inexpensive popular radio receivers (including battery sets) for the reception of VHF-FM programs, and some other types of equipment."

Components

45. Variable Parameters Systems

"Investigation of a Regenerative Oscillatory System With Periodically Variable Parameters," By V. V. Migulin and Yu. N. Pashin, Moscow State University; Moscow, Radiotekhnika i Elektronika, No 5, May 59, pp 821-831.

This work was devoted to the study of resonance phenomena in a regenerative oscillatory system with periodic changes in the tube's transconductance. By the method of slowly changing amplitudes, an expression for forced oscillations of steady amplitude was obtained. It was shown that in such a system, depending on the percent modulation of the parameters, it is possible to realize either parametric generation, or parametric regeneration.

Depending on the conditions of operation, redistribution of the effect of the two different means of regeneration (direct and parametric) takes place. An expression for the system's amplification factor due to the parametric regeneration is derived.

Parametric excitation of oscillations of first, third, and fifth regions of instability were achieved experimentally. The tube 6SA7, with a wider range of transconductance variation, was used in the experimental circuit.

The experimental investigation was found to be in good agreement with conclusions from theoretical analysis.

46. Plug-in Selective Relays

"Plug-in Type Code Relays," by S. M. Barskiy and D. M. Zektser; Moscow, Vestnik Elektro-Promyshlennosti, No 5, May 59, pp 16-18

A new series of plug-in code relays (KDRSh) have been developed for use in remote control, telemetering, and telesignaling systems where quick replacement of one relay by another is important.

These relays are manufactured in four models:

The KDRSh-1 is a quick-acting relay with a non-split magnetic circuit; it has up to five contact pins each with one to three spring sets (total number of springs not exceeding seven).

The KDRSh-1M has not more than three contact pins.

The KDRSh-5M is a slow-acting relay with bifurcated magnetic circuit and has from one to five pins.

The KDRSH-6M is a slow-acting relay with one to four pins.

These relays are designed for operation at dc voltages of 6, 12, 24, 48, 110 and 220 volts.

The time delay of these relays varies from 2 to 1,125 milliseconds, operating with a precision of ± 25% of the rated value at a temperature of +20°C. The maximum permissible current is 2 amperes. These relays can perform up to 5 million connections without requiring any adjustment of the contacts.

47. Thermocouple Hygrometer

"New Automatic Condensation Hygrometer," by N. P. Fateyev; Leningrad, Trudy Glavnoy Geofizicheskoy Observatorii, No 83, 1958, pp 3-19

The Institute of Semiconductors, Academy of Sciences USSR, developed the technology for manufacturing thermocouples with $Z \approx 1.7 \cdot 10^{-3}$ deg $^{-1}$ and a guaranteed temperature reduction of up to $\Delta T_{max} = 60^{\circ}$ at $T_0 = 328^{\circ}$. On this basis, various designs of microcondensers were worked out for use in a new recording hygrometer, described and illustrated in this article.

Among other components, the new hygrometer uses a microthermistor of the MT-54 type prepared at the Agrophysics Institute of the Academy of Sciences USSR. The resistance of this thermistor varies from 1,000 to 30,000 ohms in a temperature range of plus 30 to minus 60 degrees. The time constant in still air is 1.5 seconds; the power dissipation in air is minus 20 to minus 30 microvolts.

In June 1956, the first series of comparative observations with the new hygrometer and a standard psychrometer were conducted a positive (up to plus 30 degrees) and negative (down to minus 13 degrees) temperatures. The difference of the indications of the hygrometer and psychrometer, in all cases except one, did not exceed 4 percent, while in 50 cases it was 0-2 percent.

In November and December 1956, the second series of parallel observations was conducted in both positive and negative (down to minus 10 degrees) temperatures. The maximum divergence of the indications of the hygrometer and the psychrometer did not exceed 7 percent; in the majority of cases it was around 2 percent.

The accuracy (0-2 - 0.3 degree) of the temperature control for the mirror surface is not as great as can be obtained by the use of a balanced circuit for the photoelectric device for measuring the thickness of the condensate with a phase-sensitive output, which regulates the direction of change of the thickness of the condensate in relation to a specified level, and a more complex push-pull magnetic amplifier circuit to feed the thermocouple, a method described by Barett Herndon (Journ. of Met., Vol 8, No 1, 1951).

Instruments and Equipment

48. Generators of Discontinuous Oscillations

"Analysis of Discontinuous Oscillation Generators With the Aid of Amplitude Characteristics," by V. V. Grigorin-Ryabov; Moscow, Radiotikhnika i Elektronika, No 5, May 59, pp 765-776

To assist the problem of analysis of relaxation osciallators, the latter can be visualized as a combination of a nonlinear active four-terminal network and a linear two-terminal network with a negative feedback, containing all reactive elements of the relaxation oscillator. Such a representation of a relaxation oscillator has permitted the formulation of a general theory applicable to a large group of widely used oscillators. Amplitude characteristics of a nonlinear four-terminal network can be utilized to obtain a more precise quantitative relationship between the components of a relaxation oscillator, thus permitting a more thorough understanding of the essence of the physical processes in oscillators, and prediction of new and more efficient operating conditions.

It was shown that with the aid of an active nonlinear four-terminal network having a s-shape amplitude characteristic it is possible to obtain relaxation as well as harmonic oscillations.

Radar

49. Radar Detection of Fluctuating Targets

"Radar Detection of 'Fluctuating Targets' in Presence of a Background of Correlated Noises, (Part I. Coherent Pack of Signals)," by L. A. Vaynshteyn; Moscow, Radiotekhnika i Elektronika, No 5, May 59, pp 735-744

The article presents a theoretical investigation for optimum radar detection of coherent packs of signals reflected from a "fluctuating target," i.e., signals subject to fluctuations due to small changes in orientation of intricate-shape targets. Detection takes place in the presence of normal noises having intraperiod (for the duration of each signal) and interperiod (for the duration of the whole pack of signals) correlation. The probability factor was calculated and optimum intraperiod and interperiod processing of useful signals and noise at the receiver input were examined.

Calculation for false alarm probability and conditions for true detection with two-channel and one-channel receivers forming an alternate period difference permit comparison of the effectiveness of detection of steady and fluctuating targets in the presence of highly correlated noise.

Wave Propagation

50. Phase-Front Fluctuations of Radio Waves Over Surface of the Sea

"Fluctuations of Phase Fronts During the Propagation of 10-Centimeter Radio Waves Over the Surface of the Sea," by A. V. Men', S. Ya. Braude and V. I. Gorbach, Institute of Radio Physics and Electronics, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 125, No 5, 11 Apr 59, pp 1019-1022

On the grounds that an investigation of the fluctuations of the amplitude and phase of radio waves is necessary both for a treatment of the statistical theory of propagation and for a study of the physical processes occurring in the troposphere, this article describes an experimental study of the fluctuation of phase fronts under conditions at sea. Measurements were

made at a wave length of 10 centimeters with vertical polarization in the summer-fall (July-September) and fall-winter (October-December) periods on a sea route 33 kilometers long within the limits of the "illuminated" zones of "semishadow" and "shadow." The transition from one zone to the other was made by varying the height of the transmitter antenna among fixed levels of 9, 18, and 35 meters above the water.

A differential method was used which afforded the possibility of measuring the fluctuation of the phase differences of an electromotive force excited in a series of receiving antennas, in order to determine the value and degree of decorrelation of the fluctuation of the wave front at separated points. To this end, six receiving antennas, each 4 meters high, were positioned along a straight line perpendicular to the direction of propagation, 15-20 meters above the surface of the water, and at fixed intervals of 2, 5, 10, 20 and 100 meters with respect to the reference antenna. Each measurement was made for two adjacent intervals at the same time, and in order to calculate the influence of the transients in the subsequent measurements, one of the intervals of the previous measurements was duplicated. The length of the measurement for each pair of intervals was 5-10 minutes; the entire course of the fixed intervals was traversed in 30 minutes for each of the three transmitter heights.

The apparatus provided a means of measuring the phase fluctuation in a frequency range of 0.01 - 100 cps. In addition, it was possible to filter and separate the low-frequency (less than 0.3 cps) and high-frequency (over 0.3 cps) spectral components, so-called "slow" and "fast" fluctuations.

The measurements indicate that, with rare exceptions, the fluctuations of phase differences have a normal distribution. However, the observed fluctuations are only conditionally relevant to stationary random processes (particularly "slow" fluctuations during maximum intervals and antenna heights). Various cases were noted of a fluctuation of the phase differences of signals. A dependence of the intensity of the fluctuations on the interval spacing between antennas was evident in all the experiments. Considerably greater diversity was observed, however, in the character of the altitude dependence, which, consequently, was used as a basis for the classification of the experiments.

It was found that all the measurements could be divided into the following four general groups:

(1) A quasistationary standard type of phase fluctuations, representing the majority of cases and characterized by a monotonic decrease of intensity of fluctuation with increased transmitter height (on the average, inversely proportional to height). There is a similar dependence on height during the propagation in a local isotropic troposphere over a flat surface of separation. The measurements in this group showed an especially high stability and good recurrence of both the intensity and of the spectral composition of the fluctuations. A "saturation" of fluctuations with large intervals (over 30 meters) indicates a considerable decorrelation of the phase fluctuations of signals in the spaced antennas. It is characteristic that the decorrelation of "slow" fluctuations takes place later than that of the "fast" ones. For this reason, the influence of the high-frequency part of the spectrum of the phase fluctuations is greatest in the case of small intervals, which indicates a deformation of the spectrum of the fluctuations with a change of interval between the receiving antennas. The spectral composition also depends on the height of the transmitting antennas. Decreasing the interval between antennas and increasing the heights of the antennas leads to a comparative broadening of the spectra. In all cases there was a tendency toward an abrupt decrease of spectral density with increased frequency. About 90-95 percent of the energy of the fluctuations usually was distributed within a band about 5 cps wide.

(2) A nonstationary standard type of fluctuation, characterized by abrupt random fluctuations. Here, essential changes of character and intensity of the phase fluctuations were noted in repeated measurements, and even in single measurements. However, the general dependences and characteristics, on the average, were qualitatively similar to those of the first group. The first and second groups accounted for about 70 percent of the summer, and over 90 percent of the winter, experiments.

(3) An anomalous type of phase fluctuations. Measurements of this group were characterized by an abrupt variance from the standard type of dependence on height at such times when the intensity of the fluctuations increased monotonously with increased height, or was at a maximum. The anomalousness of the dependence on height appears especially strong for "slow" fluctuations; "fast" fluctuations, as a rule, showed a greater stability of characteristics.

(4) Fluctuating "flashes," unusually brief increases of the intensity of the fluctuations. The peculiar character of the phase and amplitude fluctuations observed during such "flashes" suggests that they are caused not by the anomalous increase of the fluctuation value of the dielectric permeability of the medium, but rather by the change of the average refraction along the route, resulting in an interference minimum at the point of reception. This is also confirmed by theoretical investigations within the framework of geometric optics.

In the case of all these groups, the variations of the intensity of the fluctuations were, from one measurement to another, on a level with the change of character of the dependencies, while the fluctuations were greatest at minimum intervals. The instability of the values of the fluctuations of the phase differences during a decrease of the intervals between antennas may be explained by the increases during this time of the dependence of them on the coefficient of correlation of the fluctuation of phases, a value which is determined by the change of the "scale of heterogeneity."

Since the instability of phase fronts is directly connected with the state of the media, a comparison between the measured fluctuations and the average meteorological conditions along the route is interesting. An increase of the velocity of the wind and of the agitation of the sea usually was accompanied by an increase of intensity of the phase fluctuations. Fluctuations decreased in intensity during an increase of radio refraction and during cloudy and rainy weather. The greatest fluctuations were observed during clear weather, when the sea and air were calm.

Miscellaneous

51. Recent Soviet Patents in the Field of Electronics

"Electrical Equipment," (unsigned article); Moscow, Byulleten' Izobreteniy, No 8, 1959, pp 13-29

Class 21a ^{1}, 31_{31}, No 119198. E. A. Narusbek. "Storage Cathode-Ray Tube for Reproduction of Color Image"

Class 21a^{1}, 36. No 119199. Ye. I. Firsov. "Circuit for Connecting Mechanical Register to Electronic Computer"

Class 21a^{2}, 18_{01}. No 119202. V. M. Gerasimenko. "Phase-Sensitive Rectifying Device"

Class 21a^{2}, 1804, No 119204. K. P. Polov. "Method of Compressing of Audio-Signal Dynamic Band"

Class 21a^{4}, 14_{01}. No 119207. N. S. Fusik. "Method of Current Modulation in the Transmitter Antenna"

Class 21a^{4}, 48_{75}. No 119208. V. I. Zhitomirskiy and Ye. N. Men'chukov. "Frequency Division Circuit"

Class 21c, 45_{02}. No 119215. N. A. Filippov. "Device for Remote Control and Telesignalization"

Class 21c, 47_{01}. No 119216. K. I. Kharazov, "Relay Device for Distribution of Current Pulses"

Class 21e. 36_{10}. No 119260. V. M. Shteyn. "Method of Measuring Transient Processes"

Class 21g, 13_{15}. No 119271. Yu. R. Nosov. "Junction Type Semiconductor Diode With Thin Base"

Class 21g, 34. No 119275. V. F. Shmatchenko. "Two-Band Electromechanical Filter of Intermediate Frequency"

IV. ENGINEERING

52. Equations for Nose Cone Subjected to Arbitrary Load

"Calculation of an Orthotropic Conical Shell for an Arbitrary External Load by the Method of V. Z. Vlasov," by V. A. Sibiryakov, Moscow Aviation Institute; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Seriya Aviatsionnaya Tekhnika, No 2, 1959, p 72-82

Equations for calculating a conical shell of the type used in a rocket nose cone and subjected to an arbitrary, nonaxiosymmetric load are obtained. The general Theory of V. Z. Vlasov (Obshchaya Teoriya Obolochek (General Theory of Shells,) Gostekhixdat, 1949) is used to determine the stress and deformation state of an orthotropic conical shell. Of the external moments, only the transverse bending moments are considered, starting from the hypotheses of the theory concerning orthotropic, semi momentless shells of medium length.

53. Strength of Triple-Layer Wing Panels Studied

"Certain Problems Concerning the Strength of Triple-Layer Plates With Light Filler," by I. S. Golubev, Moscow Aviation Institute; Kazan', Izvesitya Vysshikh Uchebnykh Zavedeniy, Seriya Aviatsionnaya Tekhnika, No 2, 1959, pp 62-71

Problems concerning the strength of triple-layer plane panels used as structural elements in a wing are considered. Approximate expressions for determining the displacements and stresses acting on a wing and panel are found from an analysis of the deformed state of the wing and panel. Expressions are derived for the limiting bearing capacity of the triple-layer panel when the stability loss has a symmetric or skew-symmetric form. The theoretical relationships obtained are compared with experimental.

54. Bending of Cylindrical Shell With Large Rectangular Opening

"Experimental Investigation of a Framed Circular Cylindrical Shell With a Large Rectangular Opening Subjected to a Concentrated Bending Load," by S. I. Galkin, V. V. Kabanov, and S. S. Lyashenko, Novosibirsk; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Seriya Aviatsionnaya Tekhnika, No 2, 1959, pp 49-61

The results of an experimental study of the stress state of a framed cylindrical shell with a large rectangular opening are given. The shell is subjected to a concentrated bending force. Data was

obtained on the normal and tangential stresses in the casing and in the stringers, in both the open and closed parts of the shell. The experimental data is compared with calculated values. The construction of the shell and the test methods are described in detail.

55. Matrix Method for Determining Oscillations of Helicopter Blades

"Determining the Forms and Frequencies of Bending-Torsional Oscillations of a Helicopter Blade With the Aid of Matrices," by M. B. Vakhitov, Kazan' Aviation Institute; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Seriya Aviatsionnaya Tekhnika, No 2, 1959, pp 39-48

The equations for the bending-torsional oscillations of a helicopter blade are determined in matrix form. It is stated that the matrix method developed in the article will be most effective in determining overtones of limiting oscillations and the joint oscillations of jet helicopter blades carrying concentrated masses.

56. Brief Method for Calculating Flow Around Bodies of Revolution

"Flow of an Incompressible Fluid Around Bodies of Revolution," by K. P. Strashinina, Leningrad Military-Mechanical Institute; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Seriya Aviatsionnaya Tekhnika, No 2, 1959, pp 33-38

Flow around a body with convex angles and axial symmetry is calculated by a method which is said to avoid the voluminous calculations of the method of characteristics. Attention is concentrated on flow at the bend and beyond, rather than on the cone section of the body.

57. Simple Method for Calculating Air Bearings

"Calculation of the Supporting Force of a Sliding Air Bearing in the Absence of Rotation," by I. V. Mirolyubov and V. M. Shashin, Moscow Aviation Institute; Kazan', Izvesitya Vysshikh Uchebnykh Zavedeniy, Seriya Aviatsionnaya Technika, No 2, 1959, pp 25-32

A "simple and sufficiently precise" method is given for calculating the supporting force of an air suspension in a sliding air bearing. The method takes into account local variations in the air supply.

58. Body of Revolution With Given Velocity Profile Constructed

"Construction of a Body of Revolution on the Basis of an Imposed Velocity Distribution," by O. M. Kiselev, Kazan' State University; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Seriya Aviatsionnaya Tekhnika, No 2, 1959, pp 20-24

The following problem is considered: to find the form of a simply connected body of revolution subjected to an unbounded, axially symmetrical potential flow of an incompressible fluid such that the velocity distribution over the surface of the body is expressed by given functions of x

$$v = F(x). \qquad -B \quad x \quad B$$

It is assumed that the x-axis coincides with the axis of revolution, that the origin is at the center of the body chord of length 2B, and that F(x) is a non-negative, single-valued continuous function which can take on the value zero at the points $x = \pm B$.

The problem is reduced to finding an analytic function $z = f(\zeta)$ which maps the diameter of a unit circle K with center at the origin of an auxiliary plane conformally onto the profile L in the z-plane. L here is the profile in z-plane of a meridianal cross section of the body and is symmetric relative to the z-axis.

The formulas derived are used to solve one example.

59. Flow of Gas Jet Over Cone

"Spread of a Turbulent Jet of Incompressible Fluid Over the Surface of a Cone," by Ye. I. Katin, Leningrad Military-Mechanical Institute; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Seriya Aviatsionnaya Tekhnika, No 2, 1959, pp 12-19

The parameters of the flow of a gas jet over the surface of a cone are determined analytically. The absence of friction between the gas and cone is assumed since it was found that friction exerts an influence on only 6 percent of the total thickness of the flow. An experimental study of the process is described and the results are given. Good agreement was found with the theory.

60. Theory Developed for Flow Around Baffle in Jet Engine

"Structure of the Turbulent Plane-Parallel Trail Behind a Baffle," by I. V. Bespalov and B. G. Khudenko, Moscow Aviation Institute; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Seriya Aviatsionnaya Tekhnika, No 2, 1959, pp 3-11

Exchange processes in the trail behind a baffle used as a flame stabilizer in the combustion chamber of a jet engine are studied. The results of an experimental study are given and a theory of the exchange processes is developed, based on a physically exact representation of the flow structure.

61. Simplified Method of Processing Aerial Photographs With Zeiss Stereoplanigraph

"The Absolute Orientation of a Model in the Stereoplanigraph of Zeiss-Jena," by V. Kratky, Brno, Czechoslovakia; Berlin, Vermessungstechnik, No 5, May 59, pp 113-118

Since the literature on the main problem of aerophotogrammetry, the absolute mutual orientation of the 3-dimensional model, rarely mentions the absolute orientation method, this article, on the assumption that the most favorable method is that suggested by Rube ("A Simple Aid to Absolute Orientation," AVN, No 24, 1940), suggests the use of the optical-mechanical method of absolute orientation, particularly in connection with the Zeiss (Jena) stereoplanigraph.

Describes procedure for manipulating and operating the Zeiss device in conjunction with a minimum of computations, thereby simplifying and accelerating the handling of aerial photographs. The conventional steps, determination of the scale and of the horizontal, are followed, but with special variations. Although specifically devised for the Zeiss stereoplanigraph, the method is suitable for use with other instruments.

62. Miniature Internal Combustion Engine

"Microengine," by Yu. Novosel'tsev; Moscow, Tekhnika Molodezhi, No 5, May 59, p 5

"Engineer Boris Sergeyevich Blinov has successfully solved a very difficult problem. As a result of years of his labor, a 1.5 hp pocket type engine was developed.

"How did the inventor succeed in obtaining such a power? The main factors contributing to development of such power are: high degree of precisely regulated compression, high speed of rotation and efficient cooling. The Blinov engine makes 6,800 rpm. The fuel consumption (ordinary solar oil) is about 300-315 g per hp-hr, which is good performance for such a system. The change in the degree of compression is obtained with a lever and eccentric bushing, which lift the engine shaft, thus permitting the piston to enter deeper into the cylinder....

"The inventor did not limit himself to this model only; he has built a new 2.5 hp model. It consumes up to 400 g of fuel per hp-hr, which is slightly greater than that for its "older brother." It weighs only 90 g more than the 1.5 hp engine.

"This engine, as well as the 1.5 hp engine, can operate for 80 hrs before reversal of the sleeve, after which it can run for another 45-50 hrs. After this an overhaul and sleeve replacement is needed.

"At present, there are only carefully tested models of these marvelous engines. Mass production of these engines should be speedily organized. Industry and the population will need millions of such engines at the earliest possible date."

V. MATHEMATICS

63. Equivalence of Algorithms

"On One Class of Address Algorithms," by V. S. Korolyuk and A. A. Letichevskiy, Institute of Mathematics and Computing Center of the Academy of Sciences, Ukrainian SSR; Kiev; Doklady Akademii Nauk Ukrainskoy SSR, No 2, Feb 59, p 116-119

The paper deals with the equivalence of algorithms in the class of address algorithms, the description of which utilizes only the operations "segregation of the contents of the address" and "carry-over by address." An algorithm is constructed for the checking of the equivalence of two given address algorithms.

64. New Programs for the Calculation of Finite Differences

"New Programs for the Calculation of Finite Differences on Punch-Card Machines," by M. I. Rappoport; Moscow, Vychislitel'naya Matematika, No 3, Jul 59, p 186-189

An example is given of calculating finite differences of the sixth order by a program for the T-5 tabulator which requires fewer devices, simpler adjustment of the machine, and in the majority of cases, a smaller number of intermediate steps.

65. Statistical Control of Quality of Production

"Method of Sequential Statistical Control for Determining Quality of Production," by Ya. M. Benderskiy, Institute of Mathematics, imeni V. I. Romanovskiy, Academy of Sciences, Uzbek SSR; Tashkent, Doklady Akademii Nauk Uzbek SSR, No 4, Apr 59, pp 3-6

In the work by M. I. Eydel'nant, which appeared in Izvestiya AN UzSSR, seriya fiz.-mat. nauk, No 3, 1957, a problem of statistical control is considered. It is related to the fact that, in practice, during quality control in agricultural production one proceeds as follows: if the mean value of some indicator (x) satisfies the condition $\bar{x}_0 < L$, then solution A_1 is accepted; if however, $\bar{x}_0 \geq L$, then solution A_2 is accepted, where $\bar{x}_0$ denotes the general mean and L denotes an earlier given number.

A_1 and A_2 are the solutions concerning definition of a quality from a given batch, and its estimate, respectively. This problem was solved for observed, defined conditions emanating from probabilities such that $\bar{x}_{1,2} \geq L$ for $\bar{x}_1 < L$, where $\bar{x}_{1,2}$ is the mean value of the indicator, defined according to the basic choice of the volume n_1 and the additional choice of the volume n_2. The mean value of the indicator is $\bar{x}_1$, defined according to the choice of the volumn n_1.

In the present work a more general case is considered; namely, when the indicator depends on one of the k given qualities according to the mean value of some quantitative indicator of a batch of production.

66. Approximation of Continuous, Periodic Functions by Trigonometric Interpolation Polynomials

"Concerning an Estimate of the Approximations in the Mean of Continuous Periodic Functions by Trigonometric Interpolation Polynomials," by A. Kh. Turetskiy, Belorussian State University imeni V. I. Lenin; Tashkent, Doklandy Akademii Nauk Uzbek SSR, No 4, 1959, pp 7-11

A. F. Zolin, (DAN Uzbek SSR, No 2, 1958, p 17) proved the following two propositions for trigonometric interpolation polynomials of the n-th order

$$T_n(f,\theta) = \sum_{i=0}^{2n} f(\theta_i)\, t_i(\theta)$$

having the equidistant nodes

$$\theta_i = \frac{2\pi i}{2n+1} \quad (i=0, 1, \ldots, 2n),$$

where $t_i(\theta) = \dfrac{\sin(2n+1)\frac{\theta - \theta_i}{2}}{\sin\frac{\theta - \theta_i}{2}}$ are fundamental polynomials of interpolation:

(1) the fundamental polynomials are mutually orthogonal in the interval $(0, 2\pi)$, that is,

$$\int_0^2 t_i(\Theta)\, t_k(\Theta)\, d\Theta = 0 \quad \text{for } i \neq k;$$

(2) if $f(\Theta)$ is a continuous, periodic function, then

$$\int_0^{2\pi} [f(\Theta) - T_n(f,\Theta)]^2\, d\Theta \leq 8\pi\, E_n^2,$$

where the E_n are the best approximating functions of $f(\Theta)$ by trigonometric polynomials of the n-th order.

These results, obtained by A. F. Zolin, are sub-cases of two theorems indicated below. They are a transfer of the known theorems concerning algebraic interpolation polynomials, the nodes of interpolation of which are roots of polynomials of an orthogonal system in the formula of trigonometric interpolation.

The general formula of trigonometric interpolation

$T_n(f,\Theta) = \sum_{i=0}^{2n} f(\Theta_i)\, t_i(\Theta)$ is considered, where $\Theta_i (i=0, 1, \ldots, 2n)$ are arbitrary points of the segment $[0, 2\pi]$,

$$t_i(\Theta) = \frac{A_{n+\frac{1}{2}}(\Theta)}{2 \sin \frac{\Theta - \Theta_i}{2} A'_{n+\frac{1}{2}}(\Theta_i)},$$

$A_{n+\frac{1}{2}}(\Theta) = A \prod_{i=0}^{2} \sin \frac{\Theta - \Theta_i}{2}$, and A is an arbitrary constant multiplier different from zero.

The following theorems are the results of the present work:

Theorem 1. The trigonometric polynomial $A_{n+\frac{1}{2}}(\Theta)$, of half an integral order, $n+\frac{1}{2}$, and orthogonal on the segment $(0, 2\pi)$ according to the weight $p(\Theta)$ to any trigonometric polynomial of order $n+\frac{1}{2}$, has $2n+1$ different, simple zeros on $[0, 2\pi)$. Any function $p(\Theta)$, as usual, is assumed nonnegative and summable on the interval $(0, 2\pi)$ and is transformed to zero save only on a set of measure zero.

Theorem 2. If Θ_i $(i=0, 1, \ldots, 2n)$ are zeros from the segment $[0, 2\pi)$ of the $n+\frac{1}{2}$ - th order polynomial $A_{n+\frac{1}{2}}(\Theta)$ orthogonal on $(0, 2\pi)$ according to the weight $p(\Theta)$ to any polynomial of half an order $\leq n - \frac{1}{2}$, and

$$T_n(f, \Theta) = \sum_{i=0}^{2n} f(\Theta_i)\, t_i(\Theta)$$ is a trigonometric polynomial

of half an integral order n, interpolating a continuous and periodic function $f(\Theta)$, at the nodes Θ_i, then

$$\int_0^2 p(\Theta)\,[T_n(f, \Theta) - f(\Theta)]^2\, d\Theta \leq 4E_n^2 \int_0^2 p(\Theta)\, d\Theta,$$

where E_n is the best approximation of $f(\Theta)$ by trigonometric polynomials of the n-th order.

VI. MEDICINE

Aviation Medicine

67. Human Heart Contractions Radioed

"Recording the Rate of Heart Contractions via Radio in a Freely Moving Human Subject," by V. V. Rosenblat and L. S. Dombrovskiy, City Therapeutic and Physical Culture Dispensary; Sverdlovsk, Fiziologicheskiy Zhurnal SSSR imeni I. M. Sechenov, No 6, Jun 59, pp 718-724

The authors of this article discuss the use of a portable device called a "radiopul'sofon" which, they claim, permits the recording of the rate of heart contractions by radio in a freely moving human subject performing his normal duties. This device was shown at the 12th annual International Congress of Sports Medicine held in Moscow on 3-4 June 1958. Schematic diagrams and graphs of the device are shown on pages 719, 721, 722, and 723 of the text. These diagrams and graphs are described in detail.

The authors of this article also state that modern physiology endeavors more and more to coordinate the results of experiments conducted in various laboratories under simulated conditions. Experiments conducted in a laboratory make it possible to carry on investigations under strictly uniform conditions and to identify the connections that may exist between various phenomena. However, it is important, particularly in the field of applied physiology, to coordinate the results of studies which are conducted under laboratory conditions with results obtained from the reactions of a living organism to some influence existing in nature. On the basis of this, it is quite important to find research methods in the physiology of work and play, in the physiology of agricultural animals, and in the development of physiological questions in astronautics and aviation medicine which will make it possible to observe the various functions of a human subject freely moving in a natural environment. Since new discoveries in radiotechnology have been playing an important role in the application of new methods, it is expected that "radiopul'sofon" will contribute much toward expanding the sphere of scientific medical research.

Epidemiology

68. Winds Instrumental in Transmission of a Tularemia Outbreak

"The Significance of Winds in Reinforcing a Transmissive Outbreak of Tularemia and in Distributing It Beyond the Limits of a Natural Focus," by V. G. Pilipenko, Scientific Research Anti-Plague Institute of the Caucasus and Trans-Caucasus; Moscow, Zhurnal Mikrobiologii, Epidemiologii, i Immunobiologii, Vol 30, No 3, Mar 59, pp 41-46

An outbreak of tularemia which was distributed throughout six rayons of Groznenskaya Oblast in the summer of 1955 is discussed in this article, which gives a percentage breakdown of the different types of tularemia observed and includes topographical information. According to the article, 90 percent of the cases occurred in three of the rayons. Although a higher incidence was noted in villages located near the central part of the focus, other factors also influenced the distribution of the cases. The villages in which high incidence was reported were located in the path of prevailing winds from the east, northeast, and southeast. It is suggested that the winds could have facilitated the mass migration of mosquitos from the center of the focus, thus increasing the number of transmissive infections. A footnote mentions that two B. tularense cultures were isolated from Anopheles and Aedes mosquitos at the Kizlyarskiy Department Laboratory during this outbreak; three cultures were also isolated from a mixture of blood-sucking diptera, which included 120 Culex mosquitos, and one midge.

The article includes maps, charts, and tables, and the location of each village is discussed in detail.

The following conclusions are presented on the basis of this study:

"1. An outbreak of tularemia in Groznenskaya Oblast in 1955 was primarily of a transmissive nature. Distribution of cases was noted over wide areas surrounding the focal area.

"2. A high incidence was noted in villages located close to the central part of the tularemia focus on the side opposite the direction of the prevailing winds.

"3. A case of the ulcerous-bubonic form of tularemia far from the natural focus substantiated the possibility that the winds carried mosquitos infected with the tularemia pathogen far beyond the limits of the focus."

69. Experimental Preservation of Tularemia Pathogen in Agricultural Products

"The Duration of Preservation of the Tularemia Pathogen in Agricultural Products," by A. P. Semenova, Rostovskaya Oblast Sanitary-Epidemiological Station; Moscow, Zhurnal Mikrobiologii, Epidemiologii, i Immunobiologii, Vol 30, No 5, May 58, p 139

"The purpose of this research was to determine the survival time of the tularemia pathogen in agricultural products under conditions which approximated a natural situation--in granaries and warehouses of the southern rayons of the oblast. The experiments were performed by direct infection of the products with B. tularense cultures, and by infection with mice which had died of experimental tularemia. Infection was done with virulent strains isolated from water rats in 1955. The infected products were kept at a temperature which corresponded to the temperature at different times of the year--summer (18-24° C), spring (10-17° C), and winter-spring (2-10° C). The experiments showed that the survival time of the tularemia pathogen in various agricultural products (grain, fodder, and industrial crops) depended on the temperature of preservation and on the type of infected substrate. The maximum rate of survival at 2-10° C fluctuated from 42 (for millet) to 120 (for wheat) days. This rate is not the maximum and can be extended by decreasing the temperature of preservation. The possibility of preserving the viability of B. tularense for 21 days in experiments on sick animals was verified at the same time."

70. Chinese Study Blood Feeding Habits of Mosquitoes

"Studies on Vectors of Japanese B Encephalitis Virus in Peking II. Studies on the Blood Feeding Habits of Common Species of Mosquitoes," Liu Chung-yuan, et al, Department of Virology, Chinese Academy of Medical Sciences; Peiping, K'un-ch'ung Hsueh-pao (Acta Entomologica Sinica), Vol 9, No 1, Jan-Mar 59, pp 51-64

"By utilizing the preciptin-test the blood specimens of the freshly engorged mosquitoes were tested with anti-human, bovine, horse, pig, goat, dog, chicken, and duck sera. The reactions showed that Culex pipiens var Coquillett feeds most frequently on human beings; Giles feeds most frequently on horses (including asses and mules), next on cows and pigs and much less often on human beings; Wiedmann and Theobald feed mostly on cows."

Hematology

71. Yugoslav Scientists Obtain Rh Serum From Plants

"First Serum Artificially Obtained From Plants," by M. S.; Belgrade, Borba, 7 Jun 59, p 5

The Bureau for Blood Transfusion (Zavod za transfuziju krvi) in Belgrade has decided to reward the persons who were the first to obtain a certain quantity of serum -- a reagent for confirming Rh blood groups -- by artificial means from plants. Aleksandar Mitrovic, a graduate of medicine, obtained this reagent after experimenting for 3 years. Although not fully certain of the outcome of his experiments, Mitrovic injected 3 years ago human blood group O erythrocytes into the trunks of ten plants. During the experiments the plants reacted by some losing their leaves, some perishing and some continued to live. After a month, sap from the living plants was extracted, and by this procedure 7.5 liters of serum -- reagent -- were obtained.

The results of a very sensitive method of testing performed on several hundred different samples of human blood have shown that this extract behaves in the same way as reagent obtained from humans. The serum obtained from plants (despite the positive results of the tests made in Belgrade) will be sent for testing and study to scientists of some of the countries of Europe and America.

Immunology and Therapy

72. Experimental Tularemia Vaccination Before and After X-Irradiation

"Vaccinal Tularemia Infection in Guinea Pigs Under Conditions of Radiation Injury," by A. S. Shevelev, Chair of Microbiology and Chair of Roentgenology and Radiology, Smolensk Medical Institute; Moscow, Byulleten' Eksperimental'noy Biologii i Meditsiny, Vol 47, No 5, May 59, pp 60-64

In the introduction to this article, the author states:

"It is known that ionizing radiation causes a decrease in the resistance of the organism with respect to pathogenic microorganisms. There are also indications of the fact that irradiation can enhance the virulence of pathogenic and nonpathogenic bacteria already in the organism. In connection with this, a question arises concerning the effect of ionizing radiations on the infection process brought about by the introduction of live vaccines: does an aggravation of the vaccinal infection, and in particular a reversal of the vaccine strain, occur under conditions produced by radiation injury? This problem is extremely pressing.

"Vaccinal tularemia infection is a suitable model for the experimental study of this problem. As is known, the B. tularense vaccine strain has residual virulence when introduced to white mice, however, it produces a benign infection in guinea pigs, rabbits, and humans. Earlier, we established that x-irradiation causes a sharp decrease in resistance to the B. tularense vaccine strain. A similar decrease is observed following the action of sublethal doses of X-rays, and becomes greater with an increase in the radiation dose; this effect can be noted in cases in which the animals are irradiated both before and after infection."

In the research described in this article, the author attempted to determine whether the vaccinal tularemia infection in guinea pigs, which are less sensitive to B. tularense vaccine strain, is aggravated when accompanied by radiation injury. The characteristics of vaccinal tularemia infection under the effects of different doses of ionizing radiations were also studied.

The methodology is described in detail, and results of the experiments are discussed in the text and summarized in tabular form.

The data obtained confirmed the fact that upon the introduction of live bacteria of the B. tularense strain, irradiation has a more sharply pronounced effect on the allergic reconstruction of the organism than on the production of antibodies. Evidently, upon introduction of live bacteria, the mechanisms which provide for allergic reconstruction of the organism are more radiosensitive than the mechanisms which determine the production of antibodies. Although suppression of the process of development of infection allergy is expressed more in the case of irradiation carried out 24 hours before infection, it is also observed upon irradiation 24 hours after the introduction of the vaccine strain. Ionizing radiation has absolutely no effect on the formation of antibodies when the animals are irradiated 24 hours after infection, and causes insignificant suppression of antibody formation only in certain instances when irradiation is performed 24 hours before the introduction of bacteria.

73. Effect of Ionizing Radiations on Immunity

Vliyaniye Ioniziruyushchikh Izlucheniy na Immunitet (The Effect of Ionizing Radiations on Immunity), by Prof V. L. Troitskiy, and M. A. Tumanyan, Medgiz, Moscow, 1958; reviewed by Prof P. N. Kiselev, and Al. A. Smorodintsev in Meditsinskaya Radiologiya, Vol 4, No 5, May 59 pp 91-93

This book by Troitskiy and Tumanyan reviews pertinent data from literature and from the authors' personal research, and contains important theoretical and practical information on radiobiology, immunology, and infection pathology. The book is divided into two main parts, and has a bibliography of pertinent Soviet and non-Soviet literature.

Chapter I of Part I discusses the natural resistance of organisms to infections, causative agents connected with the development of infectious processes in irradiated organisms, and disturbances of various protective mechanisms under the effect of ionizing radiations. The authors state that ionizing radiation disturbs the natural immunity of organisms with respect to a number of bacterial infections. This is characterized by the intense multiplication of the pathogens at the portal of entry by their penetration through tissue and lymphatic barriers into the blood, and consequently into various organs of irradiated organisms.

Chapter II discusses the causes for the increased sensitivity of irradiated organisms to the causative agents of various infections both of autogenic and exogenic origin, and postulates that ionizing radiations modify, injure, and destroy both the cellular and humoral protective mechanisms of organisms. The authors emphasize the significant role of properdin in the antimicrobial protection of organisms.

Chapter III is called "Radiation Bacteremia," although it could have been called Autoinfection in Radiation Sickness, since bacteremia is only one of the symptoms of the autoinfectious processes which develops as a result of penetrating radiations. Numerous examples quoted demonstrate that bacteremia develops not only as a result of increased permeability in the walls of the intestinal tract, but also as a result of the sharp suppression the entire complex of the protective antimicrobial mechanisms.

Chapter IV discusses the development of latent infections in irradiated organisms. Experimental data is based on the authors' personal research on monkeys infected with bacillary dysentery. The authors present the following conclusions; "The ulcers in the large intestines examined at autopsies of Hiroshima and Nagasaki victims were essentially sites of chronic dysentery which became aggravated under the effect of radiation."

Chapter V discusses the topic of "Experimental Data on Chemotherapy in Radiation Sickness," in which antibiotics and homogenates of the spleen and bone marrow tissue are used in treating rabbits and monkeys, not so much for radiation sickness, but for the inevitable autoinfectious complications which ensue. The antibiotics used were levomycin, biomycin, streptomycin, and penicillin. The book is criticized for presenting excessive details of the development of radiation sickness in each experimental monkey individually.

The second Part II of the book contains the following chapters:

Chapter I presents material on the effect of ionizing radiation on acquired immunity and the process of immunogenesis. The problem of the formation of antibodies in irradiated animals, and the current concept which explains the disturbance of the process of immunity and the suppression of antibody formation during acute radiation sickness are discussed.

Chapter II contains a summary of pertinent literature and personal experimental material which shows that the mechanism of the action of ionizing radiation on immunity proceeds in two phases; i. e., a brief initial phase of sensitivity to radiation, and then a prolonged phase of resistance to radiation. The authors postulate that "The synthesis of antibodies after an impulse which emanates from radiosensitive tissue occurs in those tissues which are either resistant to the effects of radiation or which retain after irradiation a certain number of intact cells sufficient for the formation of antibodies." This fact explains the basis of the selective effect of radiation on the process of antibody formation in instances where only the initial radiation decreases the process of antibody formation.

In general, the book presents the essential bases for the mechanisms leading to disturbed natural immunity and disturbed processes of immunization due to the effect of ionizing radiations. These disturbances inevitably lead to increased susceptibility to infections as a result of which the organism becomes an arena for various infectious, and especially autoinfectious, processes. Autoinfection is regarded as one of the chief causes for fatal outcomes in radiation sickness; various means of treating these infectious complications are enumerated.

74. Characteristics of Skin Allergic Reactions in Irradiated Animals

"Characteristics of Skin Allergic Reactions to Bacterial Allergens in Irradiated Animals," by G. M. L'vitsyna; Moscow, Meditsinskaya Radiologiya, Vol 4, No 5, May 59, pp 12-17

The article reports the conclusions which were drawn from a study conducted to determine the characteristics of allergic skin reactions which develop against a background of radiation sickness in animals vaccinated against tuberculosis, brucellosis, and tularemia.

Tests were conducted on guinea pigs and rabbits subjected to external irradiation by 100, 200, and 500 r from X-rays, and to internal irradiation by radioactive polonium (0.1 millicuries/kg). The animals were vaccinated against tuberculosis, brucellosis, and tularemia at various periods before and after irradiation. Results are illustrated in a diagram and in a table which shows the relationship between the intensity of skin allergic reactions of guinea pigs vaccinated befor irradiation and the dose value of X-rays, and the relationship between the appearance [in percentages] of nonspecific reactions in guinea pigs and the dose of X-rays at various periods of radiation sickness.

The author presents the following conclusions:

"1. After a single X-ray irradiation of guinea pigs by 100, 200, and 500 r doses both before and after vaccination with live vaccines (BCG, tularemia, and brucellosis), skin allergic reactions did not disappear.

"2. During the period of the most pronounced symptoms of radiation sickness, an intensification in specific skin allergic reactions in 57% of the vaccinated guinea pigs was noted. The intensification of specific skin allergic reactions depended on the appearance of nonspecific allergic reactions in irradiated guinea pigs.

"3. Nonspecific skin allergic reactions were observed with the same frequency in vaccinated, irradiated guinea pigs and in irradiated animals without any preliminary sensitization, after a single X-ray irradiation. The greatest number of these reactions appeared under the effect of lethal X-ray doses (200, and 500 r).

"4. Repeated X-ray irradiation of vaccinated guinea pigs (five and ten times with a 50 r dose) cause a suppression rather than an intensification of the intensity of the specific skin allergic reactions.

"5. In acute affections of guinea pigs by polonium (0.1 millicuries/kg), a sharp suppression of specific skin allergic reactions was observed.

"6. In rabbits, suppression of skin allergic reactions developed even after a single X-ray irradiation by 800 r."

75. Immunoprophylaxis of Tularemia

"The Problem of Active Immunoprophylaxis of Tularemia," by A. I. Panaiotti, Yartsev Department of Health; Moscow, Zhurnal Mikrobiologii, Epidemiologii, i Immunobiologii, Vol 30,
 No 5, May 59, p 139

"The purpose of the investigation was to examine the question of the duration of inoculation immunity against tularemia and of expedient intervals for revaccination. An analysis of corresponding data showed that inoculations against tularemia began in large numbers in Yartsevskaya Rayon in 1947, and that 21,000 persons had been vaccinated by 1951; a definite immune stratum was formed in the population. A decrease in the incidence of tularemia, which was practically eradicated for 11 years although the disease continued to be reported in other rayons of the oblast, verified the presence of this stratum. Upon testing the reaction to the intracutaneous introduction of tularin to 153 persons 4-6 months after inoculation, the presence of immunity was observed in 98% of them.

This attested to the effectiveness of active immunization against tularemia; however, upon testing of the population over 7 years of age, a positive reaction was obtained in only 42%, i. e., 57.4% had lost immunity. The author explains the aforementioned situation by the fact that after the primary inoculation carried out in 1951 and partial revaccination in 1953, inoculations were not performed and immunity was lost. These data led the author to conclude that revaccination at intervals of 2, 3, and 4 years is not expedient, but that a second vaccination should be performed after an interval of not more than 5 years."

76. Serum Therapy of Botulism

"A Case of Botulism Treated With Anti-Botulinus Serum Diatherm-3," by S. Ye. Shapiro and I. A. Konstantinova, Khabarovskaya Infection Hospital; Moscow, Zhurnal Mikrobiologii, Epidemiologii, i Immunobiologii, Vol 30, No 5, May 59, p 138

"A case in which anti-botulinus serum was used to treat a disease which occurred after the ingestion of canned fish is described. The illness began within 10 hours, but developed slowly, and the patient entered the hospital on the third day with symptoms of general weakness, heartburn, and diplopia. His condition declined in the hospital; manifestations of intestinal paresis dominated the clinical picture of the disease, and cardiovascular disturbances were moderately pronounced. Types A and B anti-botulinus serum purified by the Diatherm-3 method was used for therapy along with the usual pathogenetic agents. The serum was introduced twice-on the 3rd and 5th days of the disease. The total dose of serum introduced was 200,000 AE. After the introduction of serum, a serum reaction in the form of rather wide-spread urticaria was noted. The administration of serum produced a slow but distinct therapeutic effect. The patient was discharged on the 23d day practically healthy."

77. Antibiotics in the Therapy of Ehrlich's Ascitic Carcinoma

"Effect of '23-21' and '1779', two Antibiotics, on Ehrlich's Carcinoma in Mice," by Hsu Ping, Wu Te-cheng, Liu Ming-chang, Chu Chun-chin, and W. Kurilowicz, Sheng-yen Sheng-wu Hsueh-pao, Acta biol. exptl sinica (China), 1957, 5, No 4, 525-534 (from Referativnyy Zhurnal--Biologiya, No 7, 10 Apr 59, Abstract No 42233, by L. A. Menshikova)

"The antibiotics '23-21' and '1779' belong to the actinomycin group. When administered intraperitoneally the DL_{50} of 23-21 for mice is 452 gamma per kilogram of body weight and that of 1779 -- 745 gramma per kilogram of body weight. The intraperitoneal administration of 23-21 in doses of 250, 125, 62, or 31 gamma per kilogram of body weight for a period of 18 days produced no deviations from the normal in the mice. An experiment with 1779 conducted under analogous conditions and administered in doses of 176, 88, or 44 gamma per kilogram of body weight per day also produced no toxic effects. Larger doses of both antibiotics killed the mice; a sharp decrease in the weight of the spleen was noted. When inoculated into healthy animals, Ehrlich's ascitic carcinoma cells, after being in contact with 23-21 and 1779 (8 gamma per milliliter) in a refrigerator, failed to develop tumors. The intraperitoneal injection of 23-21 in daily doses of 50 gamma per kilogram of body weight prolonged the life of the mice for six days. 1779 administered in daily doses of 25 to 50 gamma per kilogram of body weight exhibited a stronger cytostatic action, increasing the life of the cancerous mice for 15 days as compared with control animals, and inhibited an increase in the weight of the animals. The antibiotic 23-21, in a dose of 100 gamma per kilogram of body weight, and 1779, in a dose of 50 gamma per kilogram of body weight given daily depressed the growth of Ehrlich's carcinoma transplants. The bibiography contains 32 references."

78. Effect of Vitamin A on Ehrlich's Carcinoma

"Effect of Vitamin A on the Growth of Ehrlich's Carcinoma," by A. Vileisis, Tr Kaunassk. med in-ta (Works of the Kaunas Medical Institute), 1957, 5, 255-265 (from Referativnyy Zhurnal --Biologiya, No 7, 10 Apr 59, Abstract No 32263, by the author)

"Mice inoculated with Ehrlich's carcinoma (675 mice in the experiment) were kept on diets to which vitamin A was added. The control animals were given autoclaved food. The tumors regressed in 29 percent of the animals receiving vitamin A (100 experimental mice); in the remainder of the animals of this group, the weight of the tumors equaled 1.73 percent of the weight of the animals as against 19.48 percent in the animals of the control group. The longevity of the experimental mice, however, was equal to 27.2 to 44.4 days (depending on the method of the experiments) as against of 39.8 days for the control animals."

Approved For Release 1999/09/08 : CIA-RDP82-00141R000100350001-5

79. Effect of Bacterial Toxins on Sarcoma 180 Cultures

"Effect of Bacterial Toxins on the Culture of Sarcoma 180 Grown on a Chorio-Allantoic Membrane," by J. Koziorowska and A. Czarnomska, Nowotwory (Poland), 1958, 8, No 1, 45-50 (from Referativnyy Zhurnal--Biologiya, No 7, 10 Apr 59, Abstract No 32252, by F. L. Mayzil)

"Studies were conducted on the effect of bacterial toxins on tumorous tissue. The filtrate of Serratia marcescens (1) was introduced into the chorio-allantoic membrane of a hen's embryo simultaneously with sarcoma No 180 cultivated on the same membrane in one series of experiments, and on the fifth day after inoculation of the tumor in another series of experiments. Microscopic examinations conducted in all the experiments disclosed foci of necrosis, and a considerable decrease in mitoses in the tumorous tissue than in the control tissue preparations. The antitumor effect of the toxin became noticeable only after a network of blood vessels was formed in the tumorous tissue, and depended apparently on the injury to these vessels and on the antimitotic properties of the toxin. Analogous results were obtained previously when the effect of (1) on sarcoma 180 in the organism of animals was being determined. It may be assumed, therefore, that the method of utilizing tumors cultivated on a hen's embryo is fully acceptable in testing the antitumor action of chemotherapeutical preparations."

80. Effect of Garlic on Tumors

"Effect of Garlic on the Growth of Transplanted Tumors," by A. Matukevicius and S. Nausedaite, Nauchn. tr. stud. Kaunassk. med. in-ta (Scientific Works of the Students of the Kaunas Medical Institute), 1957, 36-40 (from Referativnyy Zhurnal--Biologiya, No 7, 10 Apr 59, Abstract No 32259, by S. A. Syrkina-Kruglyak)

"The effect of a 20 percent infusion of garlic (1) subcutaneously administered for a period of 5 to 7 days to mice inoculated with Ehrlich's carcinoma, and to rats inoculated with sarcoma M-1 was studied. Under the effect of (1), tumors failed to grow, remained soft, rapidly curdled, and did not penetrate the bones, while tumors having a solid consistency and proliferation in the spinal column and femur were noted in the control animals."

81. Review of a Pamphlet on Malignant Tumors

O Prirode Zlokachestvennykh Opukholey (On the Nature of Malignant Tumors), by R. Ye. Kavetskiy, Academician of the Academy of Sciences Ukrainian SSR; K. P. Balitskiy, Candidate of Medical Sciences; and N. M. Turkevich, Candidate of Biological Sciences (Kiev); Moscow, Znaniye Publishing House, 1959, 32 pp

The pamphlet, published by the All-Union Society for the Dissemination of Political and Scientific Knowledge, presents in simple concise language the basic concepts on malignant tumors, the theories of the reasons of their origin, the factors which make their development possible, the role which the nervous system plays in the development of neoplasms, and the methods of prophylaxis and therapy. The pamphlet has a table of contents, a brief preface in which the objectives of the pamphlet are stated, several brief chapters on the nature of malignant tumors, their development, prophylaxis, and therapy and a conclusion in which the authors express the opinion that a cancerous growth which is diagnosed early can be successfully treated. In the matter of early diagnostics, the authors contend, great successes have been attained in the Soviet Union. The Oncological Institutes organized in Moscow, Leningrad, Kiev, and other centers are playing a vital role in the struggle for the control of cancer. Great contributions have been made by the laboratories and institutes engaged in research work. The Red Cross and the Red Crescent Societies have been instrumental in organizing the anticancer campaign throughout the country. The bibliography contains 13 references.

82. Toxicological Data on Some Organophosphorus Insecticides

"On the Relationship of the Toxicity of Certain Organophosphorus Insecticides to Their Chemical Structure," by Yu. S. Kagan, Gigiyena Truda i Prof. Zabolevaniya 1958, No 5, pp 7-15 (from Referativnyy Zhurnal -- Khimiya, No 8, 25 Apr 59, Abstract No 28696 by A. Grapov)

"The lethal doses (LD_{50} in mg/kg) of the following organophosphorus compounds were determined for mice by internal administration, for rabbits by application on the skin in average lethal concentrations (in mg/l), and for cats and rats by inhalation, were found to be as follows.

	For Mice	For Rabbits	For Cats and Rats
thiophos	35	50-100	--
metaphos	14	50-200	--
methylsystox (mix. of isom.)	70	75-100	--
systox (mixture of isomers)	75	200	0.015-0.02
systox (thiono isomer)	12	100	--
systox (thiolo isomer)	5.8	5	--
$(CH_3O)_2P(S)SC_2H_4SCH_3$	23	50-100	0.02-0.025
$(CH_3O)_2P(S)SC_2H_4SC_2H_5$	37	100	0.02-0.025
$(C_2H_5O)_2P(S)SC_2H_4SCH_3$	1.7	--	--
$(C_2H_5O)_2P(S)SC_2H_4SC_2H_5$	4.8	5	0.01-0.014
$(C_2H_5O)_2P(S)SC_2H_4SC_3H_7$	10	--	--
$(C_2H_5O)_2P(S)SC_2H_4SC_4H_9$	23	--	--
$(iso\text{-}C_3H_7O)_2P(S)SC_2H_4SCH_3$	55	--	--
$(iso\text{-}C_3H_7O)_2P(S)SC_2H_4SC_2H_5$	100	--	--

	For Mice	For Rabbits	For Cats and Rats
(iso-C3H70)2P(S)SC2H4SC4H9	280	---	--
(CH30)2P(S)SCh2CH=CClCH3	350	--	--
(C2H50)2P(S)SCH2CH=CClCH3	250	--	--
(iso-C3H70)2P(S)SCH2CH=CClCH3	800	--	--
(C2H50)2P(S)OCH2CH=CClCH3	300	--	--
(C2H50)2P(0)SCH2CH=CClCH3	250	--	--
(C2H50)2P(0)OCH2CH=CClCH3	100	--	--
"foskfakol"	1.3	--	--
carbophos	50	1000-2000	--
acetylcarbamide	17.5	20	--

The maximum tolerable doses for mice were determined for the 0,0-dialkyl-S, β-alkylmercaptoethyldithiophosphates groups. An attempt was made to analyze certain regularities of the relationship of the toxicity to the structure in a series of esters of the thio- and dithiophosphoric acids."

83. Investigation of the Toxicity of Some Fungicides

"Toxicity of Some Calcium Salts of Dithiocarbaminocarboxylic Acids," by J. Kubistova, Pracovni lekar.. (Czechoslovakia), 1956, 8, No 4, 260-262 (from Referativnyy Zhurnal -- Biologiya, No 21, 10 Nov 58, Abstract No 9[illegible], by I. V. Sanotskiy)

"The DL_{50} of the calcium salts of dithiocarbaminoacetic acid (451 milligrams per kilogram body weight), dithiocarbaminopropionic acid (376 milligrams per kilogram body weight), dithiocarbaminoglutaric acid (363 milligrams per kilogram body weight), and dithiocarbaminoindolylpropionic acid (46 to 87 millgrams per kilogram of body weight), used as fungicides, was determined by the intravenous administration of these compounds in physiological solution to 255 male mice. The toxicity of the compounds increased with an increase in their molecular weight. The toxicity of all the salts under investigation was found to be higher than the toxicity of CS_2 which was administered in emulsion "A" with water (1:20, 694 milligrams per kilogram body weight). When CS_2 was combined with aminoacids, its toxicity rose considerably (64 times when reacted with tryptophan)."

84. Acute Intoxication by Ye-605

"Analysis of 20 Cases of Acute Intoxication by Ye-605," Chang Li-shen, Ma Chung-lin, Chunghua neyke Tsachdzhi (China), 1957, 5, No 4, 328-330 (from Referativnyy Zhurnal -- Biologiya, No 21, 10 Nov 58, Abstract No 98613, by Kao T'ien-san)

"Ye-605 (thiophos; parathion; o,o-diethyl-o-p-nitrophenyl phosphate (1) is widely used as an insecticide in agriculture. The inhalation of (1) produces intoxication, the degree of which depends of the duration of contact with the insecticide. Six workers were engaged in work with Ye-605 for a period of 3 days; three of them developed acute intoxication accompanied by headaches, nausea, and disturbance in the nervous system. Symptomatic therapy was used with the addition of atropine, O_2, and sodium bicarbonate."

85. Effect of Dichlorobutene on the Organism

"Some Data on the Effect of Dichlorobutene on the Organism of Animals," by V. Ye. Mkheyan, Sb. tr. Byuro gl. sudebno-med. ekspertizy i Kafedry sudebn. med. Yerevansk. med. in-ta (Collected Works of the Main Bureau of Forensic Medicine Evaluation, and Chair of Forensic Medicine, Yerevan Medical Institute), 1957, No 2,377-388, (from Referativnyy Zhurnal -- Biologiya, No 7, 10 Apr 59, Abstract No 32758)

"In chronic intoxication by dichlorobutene the central nervous system, the vascular system, the respiratory organs, the reproduction organs, the liver, and the thyroid gland are mainly affected. When locally applied, dichlorobutene causes strong cutaneous irritation, which is manifested by inflammation and ulceration."

86. Superphosphate Toxicity

"Experimental Investigation of the Toxicity of Superphosphate," by S. Pallade, M. London, A Roventsa, I. Grumberg, Rev. igiena microbiol. si epimeiol. (Rumania), 1956, No 1, 80-88 (from Referativnyy Zhurnal -- Biologiya, No 7, 10 Apr 59, Abstract No 32765, by E. M. Shteynbaum)

"Experiments carried out on rabbits established that superphosphate produced acute intoxication in the animals, while apatite, which contains a large quantity of fluorine, produced only chronic intoxication. This is explained by the fact that the fluorosilicates which superphosphate contains are readily soluble, while the calcium fluoride which apatite contains is poorly soluble in water and gastric juice. The defluorination of superphosphate improves working conditions and enhances its value as a fertilizer. Fluorine obtained as a result defluorination may be utilized in industry."

87. Effect of Yperite on the Blood Flow

"The Blood Flow Rate in Rabbits in Yperite Intoxication," by L. F. Supron, Sb. Nauchn. Rabot Belorussk. In-t usoversh. vrachey A Collection of Scientific Works of the Belorussian Institute for the Advanced Training of Physicians), 1958, 1, 283-289 (from Referativnyy Zhurnal -- Biologiya, No 7, 10 Apr 59, Abstract No 32740, by the author)

"Yperite, subcutaneously administered to rabbits in doses of 25 to 35 milligrams per kilogram of body weight, produces moderate intoxication. The blood flow rate in such cases is sharply decelerated during the first three-five-eight days following intoxication, and in most cases is not restored to normal within 2 months. The author asserts that the disturbance in the blood flow in cases of yperite intoxication is due to the injuries caused to the vascular vessels and the cardiac muscle."

88. Methylthiouracil in Carbon Tetrachloride Intoxication

"The Protective Action of Methylthiouracil on the Secretory Function of the Liver in Animals Intoxicated by Carbon Tetrachloride," by St. M. Milcu, L. Vaisler, E. Costiner, Studii si cercetari endocrinol. Acad. RPR (Rumania), 1956, 6, No 3-5, 561 (from Referativnyy Zhurnal -- Biologiya, No 7, 10 Apr 59, Abstract No 32743, by E. M. Sheynbaum)

"Chronic hepatic intoxication by CCl_4 was produced in four dogs having cholecystic fistulas; the CCl_4 was administered to the animals in doses of 0.1 milliliters per kilogram body weight. Two of the animals simultaneously received methylthiouracil in doses of 80 milligrams per kilogram body weight. Bile secretion decreased considerably (32.1 - 54.5 percent) [sic] in the animals intoxicated by CCl. The secretory function of the animals which simultaneously received methylthiouracil was not affected. In one of the dogs, the secretory function increased by 27 percent. It is assumed that methylthiouracil does not act unfavorably on the parenchyma of the liver and may be clinically applied in cases of hyperthyroidism with hepatitis."

89. Relationship Between the Pharmacological Properties and the Chemical Structure of Some Ganglioblocking Drugs

"Dependence of the Pharmacological Properties of Ganglioblocking Substances -- Derivatives of Quaternary Ammonium Bases -- on their Chemical Structure," by M. L. Tarakhovskiy; Kiev, Fiziologichnyy Zhurnal, Vol 5, No 2, Mar/Apr 59, pp 237-245

This article is a report on the results of experiments which were conducted to determine the pharmacological activity and ganglioblocking properties of a series of aliphatic and aromatic derivatives of tetraethyl

ammonium, and penta- and hexamethylene-bis-trimethyl ammonium. White mice were used in the experiments to establish the toxicity of the preparations. Cats, dogs, rabbits, frogs, and other animals were used in acute experiments to establish the central and peripheral N-cholinolytic action of the compounds mentioned. The experiments revealed a definite relationship between the pharmacological activity and the chemical structure of the preparations. The substitution of heavy aliphatic radicals for one, two, or three methyl groups on each nitrogen atom of hexamethylene-bis trimethyl ammonium, increased the toxicity of the preparations and reduced their ganglioblocking activity. It was also determined that the structure of the anion as well as that of the cation plays an important role in the activity of the gangliolytics -- derivatives of quaternary ammonium bases. The data which were obtained, the author writes in conclusion, indicate that knowledge of the chemical structure of the cholinolytics and the ability to carry out controlled changes in their structures opens new perspectives for their successful application in medical practice.

90. Effect of Some Poisonous Substances on Impulse Transmission

"On the Effect of Some Industrial Poisons on the Mechanism of Nervous Impulse Transmission in the Upper Cervical Sympathetic Ganglion. Report 1. Acute Experiments Using Hydrogen Sulfide, Ethylene, and Propylene on Healthy Animals," by V. M. Medvedev, Laboratory of the Physiology of Labor, Ufa Scientific-Research Institute of Hygiene and Occupational Diseases; Moscow, Bulleten Eksperimentalnoy Biologii i Meditsiny, Vol 47, No 4, Apr 59, pp 79-81

Cats were used in experiments which were performed to determine the effect of hydrogen sulfide, ethylene, and propylene on the synaptic transmission of nervous impulses, particularly in the sympathetic nervous system. The experiments established that a perfusion of hydrogen sulfide in concentrations of 0.2 to 0.5 milligrams per milliliter of Ringer-Locke's solution has a stimulating effect on ganglionic elements. This effect can be removed by the addition of atropine to the perfusion solution in a concentration of $1:10^6$. In higher concentrations, 0.6 to one milligram per milliliter of the Ringer-Locke's solution, hydrogen sulfide has a depressing effect on the upper cervical sympathetic ganglion. This effect may be removed by cocaine. Ethylene and propylene when introduced into the artery which feeds the upper cervical ganglion slowly depress the synapses of the sympathetic nervous system. This effect may also be removed by cocaine. It is noted that the depressing effect of hydrogen sulfide, ethylene, and propylene is expressed to a greater degree in relation to the humoral, rather than to the electrical transmission of the nervous impulse.

91. Ritalin-- a Psychomimetic Drug

"Ritalin-- a New Psychomimetic Drug," by J. Dobry, V. Vondracek, Ceskosl. psychiatr. (Czechoslovakia), 1958, 54, No 2, 88-93 (from Referativnyy Zhurnal-Biologiya, No 21, 10 Nov 58, Abstract No 98492)

"Ritalin administered in doses of 20-60 milligrams a day to 11 psychic and nervous patients produced improvement in five of the patients suffering reflex depression, neuroses, and neurastenia with depression components."

92. Role of Histamine in Wound Healing

"On the Effect of Histamine on the Healing of Wounds," by R. Kosak and P. Stern, Acta pharmac. jugosl. (Yugoslavia), 1958, 8, No 2, 47-50 (from Referativnyy Zhurnal-Biologiya, No 7, 10 Apr 59, Abstract No 32746, by the authors)

"The authors have already experimentally established that inflammatory processes in histamine-deficient skin heal better and more quickly than do inflammatory processes in skin having a normal histamine content. In such cases, granulations increase and there is improved vascularization. There are fewer necroses than in the controls. In these investigations, the experiments conducted on guinea pigs with experimental traumas of the skin in the cervical area (where the skin is rich in histamine) and in the femoral area (where the skin content of histamine is smaller) revealed that the healing process was slower in the first case then in the second case."

93. Effect of Phenergan on Histamine

"On the Antihistamine Activity of Phenergan and N-(diethylaminoacetyl) and N-(diethylaminopropionyl) of Phenothiazine," by A. Teitel, V. Stroescu, M. Russu, Fiziol. norm. si patol. (Rumania), 1958, 5, No 4, 337-340 (from Referativnyy Zhurnal-Biologiya, No 7, 10 Apr 59, Abstract No 32464, by the authors)

"In experiments conducted on guinea pigs anesthesized by urethan and given histamine in aerosol form, phenergan (one milligram per kilogram body weight) completely protected the animals from the effects of histamine for a period of 6-7 hours. Both derivatives of phenothiazine (20-30 milligrams per kilogram body weight) exhibited antihistamine activity only for a period of 4-6 hours."

94. Effect of Phenargan on Inflammatory Processes

"On the Local Action of Phenargan in Nonspecific Inflammatory Affections of the Mucosa of the Stoma," by A. Filipescu, Stomatologia (Rumania), 1958, 5, No 1, 45-47 (from Referativnyy Zhurnal-Biologiya, No 7, 10 Apr 59, Abstract No 32466, By E. M. Sheynbaum)

"Phenergan was successfully used (100 milligrams to 10-20 grams of glycerine) in erythematous, ulcerous, and ulcerous-necrotic gingivostomatitic and aphthous cases (25 cases in all). The pain-relieving action set in rapidly and was more expressed when a smaller quantity of glycerine was used; the anti-inflammatory action set in within 24-48 hours. The cavity was preliminarily washed with weak antiseptic solutions (hydrogen peroxide, chloramine, potassium permanganate). The preparation is contraindicated in cases involving excitation, insomnia, and neurovegetative disturbances."

95. New Drugs

"New Medicinal Preparations," by the Main Administration of the Drug Industry, Tatarskaya ASSR; Kazan, Kazanskiy Meditsinskiy Zhurnal, Vol 40, No 2, Mar/Apr 59, pp 114-115

"Gualuronidase, an enzyme obtained from the testis of oxen, alleviates and accelerates the penetration of drugs into inflamed tissue and the absorption of plasma and various solutions administered subcutaneously or intramuscularly. One milligram of the dried enzyme is dissolved in one milliliter of twice distilled water and injected either subcutaneously or intramuscularly (0.5 to 2 milligrams). The solution is prepared immediately before its administration."

"Antihistamine is a drug indicated for use in cases of urticaria, drug-induced skin eruptions, angioneurotic edema, serum sickness, some types of bronchial asthma, migraine, Meniere's syndrome, arthropathy, psoriasis, eryhtema nodosum, pruritus (also in hepatitis), and others. It is contraindicated in cases involving chronic nephritis. Antihistamine is produced in the form of a dragee containing 0.05 of the preparation [sic]. It is administered in a dose of one dragee three times a day. The dose is then reduced. Inasmuch as the preparation may cause a decrease in perception, sleepiness, and a feeling of fatique (sharply expressed in some persons), the preparation should not be prescribed for outpatients, especially those whose work requires concentrated attention."

"Alphadril is a preparation manufactured in the form of a dragee, each containing 0.5 of the drug [sic]. Indications and precautions are the same as those for antihistamine. It is administered in doses of one dragee three times a day during the first few days, or in doses of one to two dragee a day from the initiation of therapy. The dragee should be swallowed without being chewed."

"Suprastine is a preparation manufactured in the form of tablets, each containing (0.025 of the preparation) [sic] or in ampoules (0.02 of the preparation [sic] in one milliliter). Indications are the same as those for antihistamine and alphadril. It is administered in doses of one to two tablets three times a day at meal time. Intramuscularly, it is administered in doses of one ampoule; when a rapid effect is needed, it may be administered intravenously, but only if under clinical observation."

"Myoxyl is prescribed as an antispastic drug for the control of spasms having different etiologies (particularly in tetanus and parkinsonism), and for the removal of postoperative muscular spasms. It is manufactured in the form of tablets, each containing 0.25 of the drug [sic]. It is administered in doses of two to four tablets three to five times a day, with consideration given to the patient's sensitivity. The tablets are to be swallowed without chewing. Control of the functions of the liver, kidneys, and blood picture is indicated in the course of the therapy."

"Pyrabutole is produced in the form of a dragee containing 0.125 of phenylbutazone and pyramidon. It acts on the central nervous system having a pain-relieving, temperature-reducing, and anti-inflammatory effect. It depresses diuresis and delays the secretion of some drugs from the organism (especially morphine, mecadine, and others). Its use is contraindicated in older persons, in circulation deficiency, and in renal and hepatic disorders. It should be administered in doses of two dragee two to three times a day. It is to be swallowed without chewing."

96. Shortcomings in Production of Medicinal Substances

"Chemistry in Debt to Medicine," by Academician A. Bakulev, Deputy of the Supreme Soviet USSR; Moscow, Izvestiya, 7 Jun 59, p 3

The article is critical of the chemicopharmaceutical industry for its failure to keep pace with the scientific developments of recent years. It cites several outstanding examples of the industry's failure to manufacture, on a mass scale, newly synthesized drugs and preparations. Among them are "diocide." a preparation used for washing surgeons' hands and for the rapid

sterilization of instruments, and cortisone, an antirheumatic drug. The reasons for these shortcomings are many, including: (1) failure of the chemical industry to provide the pharmaceutical industry with the necessary materials for the manufacture of the new drugs; (2) failure of the sovnarkhozes to pay attention to the needs of the pharmaceutical industry; (3) failure of a number of plants to launch the manufacture of new drugs because it may interfere with the fulfillment of their original production plans; (4) failure to construct new plants for the ever expanding drug manufacturing industry. There is need for the greater production of such chemical compounds as amino acids, vitamins, synthetic hormones, and other biologically active substances, reagents, and strains. In conclusion, the author expresses the hope that the next plenum of the Central Committee CPSU will give careful consideration to the problem of the chemicopharmaceutical industry, and that conditions and means will be created to provide the people with the necessary drugs.

Physiology

97. Reaction of Dogs to Loud Noises

"Respiratory Reaction to Loud Sound," by I. I. Golodov, Chair of Normal Physiology, Military Medical Academy imeni S. M. Kirov; Leningrad, Fiziologicheskiy Zhurnal SSSR imeni I. M. Sechenov, No 6, Jun 59, pp 688-697

The author of this article states that the results of experiments on four dogs revealed that these animals reacted temporarily rather strongly to one loud rattling sound lasting 2 minutes. This reaction was accompanied by a considerable rise in pulmonary circulation and a decrease in the CO_2 concentration in the alveolar air by 1.02% to 1.46%. The respiratory reaction of the animals to a loud rattling sound and the decrease in the CO_2 content in the alveolar air evidently play a protective role and are among many protective mechanisms which prepare the organism to face danger.

Adaptation to the effects of the sound was apparent in three dogs. By the fifth experimental session, the response of these dogs to the same irritant was reduced to about one half its original magnitude. The respiratory response to noise was not significantly reduced in one of the dogs.

The magnitudes and patterns of respiratory responses to loud sound and the degree of adaptation to an auditory stimulus were shown to differ: they depend mainly on the type of nervous system of each animal.

Public Health, Hygiene, and Sanitation

98. Methods of Determination for Solid Aerosols

"Filtering Effectiveness of Some Fiber Materials for Analytical Methods of Determining Solid Aerosols," by K. Spurny and M. Polydoroca, Pract. lek (Czechoslovakia), 1958, 1, 17-25 (from Meditsinskiy Referativnyy Zhurnal, Series 4, Vol 111, No 4, Apr 59, p 21)

"The results of the investigations which were conducted to determine the effectiveness of different paper (Vattman and Shleykher-Shul brands) and fiber filters (from fiber glass, selenite, basalt, cellulose, and asbestos) to retain aerosols are reported. The observations were carried out in a Davis dust chamber in which solid aerosols were formed. Dust samples were obtained by means of an interceptor which was connected to the filters being tested and to a 100-percent effective membrane ultrafilter. The speed with which the air passed through the interceptor varied from 1.5 to 10 meters per minute. Dust retention on the filters was determined by gravimetric methods. Data on the fractional and dispersal filtering effectiveness of the different filters are presented. The most suitable filters were those made from glass and basalt fibers, and the membrane ultrafilters."

Radiology

99. Reciprocity of Radiation Sickness and Infectious Processes

"Morphological Changes in Experimental Leptospirosis in Irradiated Guinea Pigs," by R. V. Petrov and V. V. Shikhodyrov; Moscow, Meditsinskaya Radiologiya, Vol 4, No 5, May 59, pp 20-23

The authors discuss the various views and theories and the contradictory results of research on the interrelationship between the characteristics of the course of infectious processes in radiation sickness, and the reciprocal intensification or counteraction between these two pathological processes. With this view in mind, the authors conducted experiments to determine the morphological changes which arise as a result of the combination of radiation sickness and leptospirosis. Tests were conducted on three groups of guinea pigs: (1) noninfected animals which were irradiated with 200 r, (2) nonirradiated animals infected with leptospirosis, and (3) animals which had been both irradiated and infected. The results of the experiments were as follows:

"1. Irradiation of guinea pigs by 200 r produced acute radiation sickness which, in 15 days, proved to be 50% lethal; an autopsy showed changes characteristic of acute radiation sickness.

"2. The intraperitoneal administration of a culture of L. icterohaemorrhagiae in 0.05-0.5 ml amounts to guinea pigs caused a light form of the sickness which to the death of some of the animals within 19-60 days. Animals sacrificed on the 9th to 10th day of the sickness showed insignificant morphological changes in the form of poorly expressed icterus in injured cellular tissue, dystrophic changes in the liver, and hypertrophy of the lymphatic apparatus of the spleen.

"3. Analogous infection of irradiated guinea pigs led to the death of all the experimental animals in 9-14 days, and an autopsy showed more intensely developed pathological changes due to both leptospirosis and to acute radiation sickness."

100. Simultaneous Ionizing Radiation and Low Temperature Effects on Carbohydrate Metabolism

"Metabolic Processes In Muscle Tissue During Simultaneous Effects of Low Temperature and Ionizing Radiation," by Yu. K. Ledentsov, Tr. XX Godichn. Nauchn. Sessii Sverdl. Med In-ta (Works of the 20th Annual Scientific Session of the Sverdlovsk Medical Institute), Vol 22 1957, pp 93-95 (From Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 5, 10 Apr 59, p 114, Abstract No 5725, by I. Elmon)

"Under the effect of low temperature, the glycogen content in the muscles of rats fell to 207 mg % (in the controls the value was 482 mg %), while under the simultaneous effects of irradiation and low temperature the glycogen content in the muscles of the animals fell to 236 mg %; it rose with the development of radiation sickness, and on the 10th day it equaled 357 mg %. This is evidently connected with its synthesis from noncarbohydrate components. The lactic acid content in the muscles of irradiated animals was within the limits of physiological fluctuations."

101. Changes in Serum Protein Fractions During Radiation Sickness

"A Study of the Protein Fractions of the Blood During Radiation Sickness and Its Therapy," by V. P. Moiseyeva, Compilation, Aktual'ni. Vopr. Perelivaniya Krovi (Current Problems of Blood Transfusion), Vol 6, Leningrad, 1958, 63-70 (From Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 5, 10 Mar 59, p 114, Abstract No 5733, by I. Elman)

"In rabbits and dogs subjected to irradiation, sharp changes were noted in the fractional composition of their blood serum proteins on the 4th to 7th day after irradiation. These changes included a decreased albumin content, an increased globulin content, and a decreased A/G coefficient. The increase in the content of the globulin fraction in rabbits resulted from a rise in the alpha- and beta-globulins, while in dog serum it was due to a rise in alpha$_2$-globulins (from 8 to 24-37% relative. In the blood of irradiated animals the quantity of the alpha$_3$-globulin, which is found in the blood of healthy animals in insignificant quantities, increased."

102. Changes in Protein Metabolism of Brain Tissue After Gamma-Irradiation

"Certain Changes of Protein Metabolism in Brain Tissue Following the Effect of Gamma-Irradiation by Co^{60}," by M. S. Osipova, Tr. In-ta Vyssh. Nerv. Deyatel'nosti AN SSSR, Ser. Patofiziol. (Works of the Institute of Higher Nervous Activity, Academy of Sciences USSR, Pathophysiology Series), 4, 1958, pp 266-270 (From Referativnyy Zhurnal--Khimiya, Biologicheskaya Khimiya, No 5, 10 Mar 59, p 113, Abstract No 5722, by Elman)

"The proteolytic activity of the enzymes in the brain tissue of rats subjected to irradiation by small doses of Co^{60} (50 r each for a period of 7 days) decreased. Following a single irradiation of the brains of rabbits by a 2,000 r dose, a decrease in proteolysis within 20 minutes, and an increase within 1 1/2 hours after the irradiation were noted. Following a single general irradiation of guinea pigs by 1,500-2,000 r, a rise was noted in the proteolytic activity of the enzymes of the brain within 20 minutes."

103. Adrenalectomy- and Total X-Ray Irradiation-Induced Changes in Carbohydrate and Protein Metabolism in Rats

"Concerning the Problem of the Role of the Adrenals in Certain Metabolic Disturbances in Irradiated Organisms," by B. M. Grayevskaya and R. Ya. Keylina, Division of Biochemistry, Central Scientific Roentgeno-Radiological Institute, Ministry of Health USSR; Moscow, Meditsinskaya Radiologiya, Vol 4, No 3, Mar 59, pp 21-24

The aim of this research was to study certain changes in carbohydrate and protein metabolism in irradiated animals caused by a disturbance in the functional activity of the adrenals. Work was conducted on rats, and details of methods used are given; graphs accompany the article.

Results indicated that total irradiation by sublethal (500 r) and lethal (1,000 r) doses of X rays suppresses the hormonal function of the adrenals; the glucose level in the liver falls from the normal value of 1,839 mg % to 377 mg %. Adrenalectomy produces similar results but to a lesser degree, i.e., the glucose level falls to 639 mg %. The intensity of phosphorylation of glycogen in the hepatic tissue of adrenalectomized and irradiated animals decreases by 20% and 65%, respectively. No other effects were noted following the irradiation of adrenalectomized animals, and changes in the processes studied did not exceed those due to adrenalectomy alone.

X-ray irradiation intensified the activity of the proteinases of the liver and spleen and adrenalectomy intensified autolytic processes, but to a lesser degree, i.e., amino nitrogen rose after X-ray irradiation by 96 and 81%, while after adrenalectomy it rose by 12 and 36%. No other effects were noted following the irradiation of adrenalectomized animals.

The author concludes that in vivo irradiation sharply supresses the hormonal function of the adrenals, and especially of the adrenal cortex. The removal of the adrenals noticeably weakens the intensity of proteolytic processes and supresses phosphorylation in the tissues of irradiated animals.

104. Irradiation Effects on Luminescence of DNA-Complex Compounds

"Luminescence of Desoxyribonucleic Acid Isolated From Tissue of Irradiated Animals," by G. P. Toropova and A. L. Pozdnyakov; Moscow, Meditsinskaya Radiologiya, Vol 4, No 3, Mar 59, pp 57-60

The aim of this research was to study the fluorescence of the complex fluorochrome compounds (fluorescent dyes such as acridine orange, and aurophosphine) combined with desoxyribonucleic acid (DNA) which was isolated from the intestinal walls and hepatic tissue of rabbits after various periods of irradiation by 1,100 r of X rays.

Results indicate that the irradiation of animals by lethal doses of X rays causes changes in the physicochemical properties of DNA, which is evidenced by an increased in the intensity of DNA fluorescence in the presence of fluorochromes. The increase in DNA fluorescence, as well as the changes in its chemical composition (16% decrease in nitrogen, 6% decrease in phosphorus, and 7% decrease in desoxpentose) occur immediately, within 3 hours after irradiation, attaining their maximum within 6 hours, and subside with the restoration of the chemical composition of the DNA molecule.

In the liver, the nitrogen content decreases to a lower value, and restoration is slower; this corresponds with a greater intensity of luminescence than that seen in the intestines; restoration also proceeds at a slower rate.

The correlation of the period of maximum luminescence with the period of maximum chemical changes in the DNA molecule indicate a relationship between increased luminescence and increased destructive processes in the DNA molecule.

105. Cytological Study of Deleterious Effects of Ionizing Radiation on Monkeys

"Characteristics of the Effects of Ionizing Radiation on the Nuclear Apparatus of the Sex Cells of Male Monkeys," by G. G. Tinyakov, and M. A. Arsen'yeva, Institute of Biophysics, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 122, No 4, 1 Oct 58, pp 589-592

Cytological studies of spermatogenesis in a total of 13 male monkeys (Macaco mulatta Rhesus) used as controls (seven were 4-7 years old and six, 2-9 years old) and irradiated with doses of 150, 400, and 450 r were conducted at the Sukhumi Medico-Biological Station, Academy of Medical Sciences USSR.

Details of the experimental preparation of more than 500 histological sections and other pertinent information are included. Results showing cytological changes such as inversions, translocations, aberrations, and other chromosome rearrangements were as follows:

1. Monkeys irradiated with 150 r of X rays and sacrificed 2 years later displayed up to 5% changes in the anaphase stage of mitosis.

2. Monkeys irradiated with 450 r and sacrificed 2 years later displayed up to 6% changes in the anaphase stage of mitosis.

3. Monkeys irradiated with 400 r (which is essentially equal to 450 r) and sacrificed as early as 11 days after irradiation displayed up to 28% changes in the anaphase stage of mitosis.

The authors consider that these results indicate that a portion of the chromosome reorganizations that arise as a result of irradiation may be retained, yielding various new reorganizations over a long period of time and possibly all through the subsequent life of an organism. Consequently, it is incorrect to assume that normal fertility will be completely restored and the cytogenetic effect of irradiation will be removed because of reparative processes occuring over a long period of time after irradiation.

Since monkeys are very close to humans, on the basis of evolution, one may postulate that ionizing radiation can cause identical disturbances in the sex cells of man and other mammals. The disturbances may be in the form of deformities, abortions, sterility, and other pathological phenomena.

106. Heroin Alleviates Radiation Sequelae in Embryos of Irradiated Mothers

"The Protective Effect of Heroin on the Embryos of White Mice After Total Irradiation of the Mothers," by F. B. Shapiro; Moscow, Meditsinskaya Radiologiya, Vol 4, No 3, Mar 59, pp 39-42

The aim of this research was to determine the effectiveness of heroin for protecting white mice embryos against penetrating radiation due to a single total irradiation of the mothers.

The experimental animals received 1.5 mg of heroin subcutaneously 5 minutes before their irradiation by 200 r from Co^{60}. This dose was selected because it does not produce radiation sickness, but it does cause 100 % death of the embryos. Two tables present data on the effects of irradiation with and without the protective effect of heroin on the 9th and 12th days of pregnancy (in mice, the period of organogenesis is between the 6th and 13th days of pregnancy).

The author compares the results of a background of heroin with a background of hypoxia (5% oxygen, and 95% helium) on radiation effects and notes that, regardless of the mechanism producing hypoxia (heroin, also produces hypoxia by depressing the excitability of the respiratory centers), the decrease in the level of oxidation processes at the moment of irradiation exerts a favorable effect on radiation sequelae in the mammalian embryos.

The author concludes that heroin administered before irradiation protects the embryos of irradiated mice; decreases the number of prenatal, neonatal, and postnatal deaths; normalizes the growth of animals which were irradiated during their embryogenesis; and reduces abnormalities.

107. Protection From Acute Radiation Sickness by Bone Marrow and Spleen Transplants

"Therapy of Acute Radiation Sickness Utilizing the Bone Marrow and Spleen Transplantation Method Under Experimental Conditions," by Prof A. G. Karavanov, Candidate of Medical Sciences, V. A. Revis, and M. Ya. Shleyfer, Clinic of Faculty Surgery, Kalinin Medical Institute and Regional Clinical Hospital; Moscow, Vrachebnoye Delo, No 1, Jan 59, pp 45-51

Experiments were conducted to determine the protective effect of clear homoplastic transplantations of bone marrow and spleen (taken from healthy animals) on rabbits irradiated with minimum lethal doses of X rays (700-800, and 1,100 r).

Homoplastic transplants of bone marrow were performed 24 hours after general X-ray irradiation, and symptoms of radiation sickness such as leukopenia, thrombopenia, body weight loss, temperature reactions, and survival rate were determined. Analogous tests were carried out with spleen transplants.

Results proved that the course of acute radiation sickness in both experimental groups treated with bone marrow and spleen was milder, blood changes were not as profound, weight loss was lower, temperature readings were not as high, the recovery period set in sooner, and the survival rate was greater; i.e., of the 23 irradiated but nontreated controls, only 5 survived; of the 34 experimental animals similarly irradiated treated with bone marrow 31 survived; and of 21 treated with splenic tissues, 16 survived.

CPYRGHT The author makes the following conclusions:

"1. The biological method of protecting rabbits from acute radiation sickness by the transplantation of bone marrow and spleen 24 hours after general irradiation by X rays proved effective.

"2. The transplantations of bone marrow against acute radiation sickness proved to be somewhat more effective than the transplantations of splenic tissue.

"3. The rooting or regeneration of the tissue transplanted did not occur."

108. Different Mechanism Possibly Explains the Effect of Strong Doses of Radiation

"The Influence of the Strength of a Radiation Dose on the Biological Effect," by L. B. Koznova; Moscow, Meditsinskaya Radiologiya, Vol 4, No 5, May 59, pp 48-52

Numerous experiments and clinical observations have shown that the biological effect of radiation on living animals depends not only on the magnitude of the dose used, but also on its distribution, with time as a factor. In view of the theoretical interest of the problem of the influence of large doses of radiation on the biological effect, the author attempted to study this problem more thoroughly.

Tests were conducted on a total of 768 rats irradiated with doses of 390-1,300 r of X rays, and the results are plotted in a graph which presents in percentages the ratio of animal deaths against the magnitude of the dose (390, 520, 650, 780, 910, and 1,300 r administered at the rate of 130 r/sec, and 1.3 r/sec. The points form two flattened, S-shaped curves. A table summarizes the number of deaths and the duration of life of the experimental animals irradiated with these different X-ray doses. The author makes the following conclusions:

"1. After a general X-ray irradiation of the rats by doses of 130 r/sec (7,800 r/min), and 1.3 r/sec (78 r/min) at a definite dose range (390-780 r), there was a tendency toward a decreased biological effect of the radiation at high magnitudes.

"2. It is possible to postulate from this data that in the high dosage range (910 r and higher), the effect of the dose of radiation is subordinate to a different mechanism.

"3. A further study of this problem lies in the scope of statistical authenticity of the observations and their interpretations from the standpoint of concepts pertaining to the primary processes of the interaction of radiations with tissues."

109. Luminescence Microscopy in the Diagnosis and Evaluation of Radiation Injuries

"Luminescence Microscopy of Peripheral Blood After X-Ray Irradiation," by M. Ya. Khodas; Moscow, Meditsinskaya Radiologiya, Vol 4, No 3, Mar 59, pp 44-48

In recent years, bone marrow luminescence microscopy has been used extensively for the early diagnosis and evaluation of the severity of experimental radiation sickness. The author studied the significance of using peripheral blood for the early diagnosis and evaluation of the severity of radiation injuries. A solution of acridine orange in a 1:10,000 dilution, and 30-minute contact with blood mixed with fluorochrome proved to be optimum conditions for the luminescence microscopy of peripheral blood. Tests were conducted on rats and dogs over a period of 18 days.

Results proved that the irradiation of rats with 100, 200, 800, and 1,000 r X-ray doses produced qualitatively identical results; i.e., the number of leukocytes producing a green color decreased, and the number producing yellow, orange, and red colors increased. These changes have a definite specificity, and the rate of their onset and intensity is directly proportional to the dose of irradiation.

Additional tests on 13 dogs irradiated by 600 r indicated a parallelism between leukopenia and the decreased percentage of cells producing a green color after irradiation; this parallelism reflected the severity of radiation injuries. Such changes were not found in leukocytes during anoxia, or following thermal burns over 15 % of the body. There were no spontaneous shifts in the leukocytes.

The author concludes that luminescence microscopy of the peripheral blood may be used for the early diagnosis and evaluation of the severity of radiation injuries under experimental conditions.

110. Certain Problems of Radiation Safety on the Atomic Icebreaker Lenin

"Certain Problems of Radiation Safety on the Atomic Icebreaker Lenin," by A. I. Burnazyan, I. D. Kamyshenko, and Yu. G. Nefedov; Moscow, Meditsinskaya Radiologiya, Vol 4, No 4, Apr 59, pp 70-72

During the processes of designing and constructing the icebreaker Lenin, a number of problems had to be resolved, such as the arrangement of the atomic reactors and the apparatus connected with them in the immediate vicinity of the working and living quarters, the crew's uninterrupted stay on the icebreaker for long periods at sea, the necessity of recharging the reactors periodically, the performance of maintenance and deactivation work, and the collection and removal of radioactive wastes formed during the processes of operation and maintenance.

With regard to the resolution of these problems specifically connected with the operation of the icebreaker, and also in accordance with the recommended permissible limits of radiation in effect in the USSR and the permissible limits of the concentration of radioactive substances in the air and water, certain hygienic criteria guaranteeing safe working conditions for the crew of the icebreaker and preventing the contamination of the external environment were determined. During the operation of the atomic-powered equipment, a basic unpleasant situation for the personnel is the possibility of external gamma and neutron irradiation. The arrangement of the atomic reactors and of all the equipment connected with them in a separate (central) compartment hermetically isolated from the rest of the ship and reliable biological protection which was established on the icebreaker will reduce to 0.005-0.015 rep the amount of irradiation the personnel working with the reactors will be exposed. In addition, monitoring of the reactors and apparatus in the central compartment has been almost completely automatized and can be performed by remote control. Also, the presence of personnel in the central compartment will be limited to a few minutes per watch, as a result of which the irradiation level will be further minimized.

Due to possible leakage of water from the first circuit of the reactors into the chambers of the central compartment, radioactive gases and aerosols may be formed. To prevent the possibility of radioactive air spreading about the ship, a special automatic ventilation system not connected with the other systems was installed in the central compartment, guaranteeing, from the hygienic viewpoint, a rapid air exchange in these chambers and a positive exhaust over intake ratio. The air which is

removed from the central compartment is discharged through a hollow mast at a height of about 20 meters above the deck. In addition, the air coming from the steam generating unit is subjected to preliminary purification by special antiaerosol filters.

To prevent the spreading of possible radioactive contamination by the personnel servicing the central compartment, entrance into and exit from this compartment is possible only through special sanitary passages. These sanitary passages provide dressing and shower rooms, dosimetric posts, and closets for work clothes. On entering the central compartment for work, personnel leave their ordinary clothing in separate check rooms and receive a set of special clothing and shoes. With the presence of radioactive contamination in the central compartment, especially radioactive gases and aerosols, the personnel will be supplied with special plastic suits (type LG-2) which have a forced supply of pure air, and which will provide reliable protection of the body surface from contamination by radioactive substances and will exclude the possibility of these substances' entering the body. On leaving the central compartment, dosimetric assays of the special work clothes and the body for possible radioactive contamination will be conducted in the sanitary passages, after which the special work clothes will be taken off. However, a worker on whom radioactive contamination is detected will be subjected to sanitary treatment and only after a second dosimetric assay may he put on his civilian clothes and leave the sanitary passages.

Thus, the sanitary passageway divides the icebreaker into two zones: the restricted zone (the zone of possible contaminations) and the unrestricted zone (uncontaminated zone) which includes all the rest of the icebreaker.

For deactivating and laundering the special work clothes and plastic suits, one of the sanitary passages is equipped with a specially designed laundering machine. Waste water containing radioactive substances (coming from the sanitary passages and from the special laundry), water flowing from the coolers of the first circuit, deactivation water coming from the central compartment, and water from other sources of contamination is collected in special cisterns with a capacity of 3, 10 and 25 cubic meters where it is kept for periods necessary for the decay of a large portion of the short-lived radioactive substances. The cistern with a capacity of 10 cubic meters is used for collecting the radioactive water from the first circuit and is equipped with measures required for biological protection.

Waste water containing radioactive substances coming from the cistern can be transferred into special floating containers or may be discharged from the ship. However, before being discharged from the ship the more radioactive water is subjected to purification by special filters and is diluted 500 times. The concentration of radioactive substances in the water discharged from the ship will not exceed 5×10^{-9} Curies/l, and it will be discharged at a distance of at least 2 km from shore.

To facilitate complete deactivation in the chambers of the central compartment, these chambers were finished and the equipment coated with stainless steel, special lacquers, and plastic materials which are easily cleaned of contamination by radioactive substances. Decontamination is effected by special acids and alkaline compounds which give a high degree of purification.

It is advantageous to use the steam of the third circuit for household use and for heating the living quarters of the icebreaker since, if there is damage to the steam generators and leakage of a certain amount of the heat transfer agent from the first circuit into the second occurs, the third circuit remains free from radioactive substances.

The dosimetric control system on the icebreaker provides for supervision over all types of radiations and possible means of their affecting the crew. Stationary and portable dosimeters make it possible to reliably check the level of gamma and neutron fields, the presence of gaseous and aerosol activity in the chambers of the central compartment, the air which is discharged through the hollow mast, and the blower ventilation system. In addition, a check is provided on the level of radioactivity in the waste water discharged from the icebreaker and the degree of radioactive contamination on the decks and equipment. There is also an individual check on personnel working in the central compartment. Dosimetric equipment is located at a central desk, where a dosimetrist is constantly on duty. The chambers of the central compartment are equipped with warning lights and audio signals which automatically switch on when the radiation level in this area or in any area on the icebreaker exceeds the permissible radiation limit.

The authors state that during the operation of the atomic icebreaker Lenin, basic hygienic prerequisities with regard to radiation will be attained by the following measures:

1. Reliable protection from the reactors.

2. Isolation of the reactor chamber by means of an automatic system of ventilation and by designating restricted and unrestricted zones connected by sanitary passages.

3. A system in which the steam from the third circuit is used for household necessities and for heating purposes aboard the icebreaker.

4. A system of dosimetric control encompassing all possible action of ionizing radiation on the crew.

5. Strict observance of special instructions by the personnel.

6. A system of waste removal which excludes the possibility of discharging any water from the ship which contains radioactive substances in concentrations which exceed the permissible limits.

III. Characteristics of Beta Radiation in Work With Metallic Uranium and Certain Hygienic Problems

"Concerning the Characteristics of Beta Radiation in Work With Metallic Uranium," by O. S. Andreyeva and M. I. Lebedev; Moscow Meditsinskaya Radiologiya, Vol, 4, No 5, May 59, pp 58-62

During the heating and melting of metallic uranium, a significant change in the intensity of its beta radiation takes place. In view of this fact a number of hygienic problems arise, the most important of which are the following: The evaluation of the intensity of beta radiation emitted by various samples of metallic uranium immediately after its melting (smelting) and at various periods afterwards; the evaluation of the intensity of beta radiation of the slag in which by-products of uranium fission may be concentrated; symptoms of possible contamination by beta-active aerosols of uranium entering the air during operations of melting, working cast uranium in enclosed rooms, and many others. This research is an attempt to resolve some of these problems.

Data are presented in the form of four tables: (1) values obtained by measuring beta radiation during work with samples of metallic uranium obtained after melting and cooling, (2) determination of beta radiation from slag samples, (3) investigation of beta radiation from metallic uranium following the screening of fabric used as material for work clothes (at one m distance), and (4) determination of beta-active products of uranium fission in the air. The results are summarized as follows:

"The authors report new data on the change in the intensity of beta radiation in the casting of uranium as a result of redistribution of beta active products of UX_1^{234} and UX_{11}^{234} decay and an increase in surface beta activity in thermal treatment.

"As a result of the experiments performed it has been established that freshly made bars of metallic uranium containing slag residue may be the source of beta irradiation (60-160 beta-particles/cm^2/sec.) for the workers. In the immediate vicinity of the surface of the metal (0.3-0.4), the radiation intensity reaches 200-570 beta-particles/cm^2/sec. After cleaning the surface of the bars and removing the slag, the activity dropped 40-60%.

"Data have also shown the possibility that beta-active products of uranium decay may enter the slag and become a potential irradiation hazard. Slag activity diminishes by 50% in 3-5 weeks, which corresponds to the period of UX_1^{234} half-life, (Th^{234}) - T=24.5 days.

"Special attention should be paid to the authors' data on the possibility that beta-active products of uranium decay may enter the body along with dust. The activity of air filters was assessed on a "B" type device. The amount of beta active aerosols on the premises was within the limits of 8.3×10^{-13} to 6.2×10^{-13} curies/l."

CPYRGHT The authors recommend the following measures for improving sanitary conditions: "Sanitary-prophylactic measures must consist of the mechanization of the process of removing slag from castings and the use of emergency equipment for the prevention or reduction of beta irradiation of workers. All operations involving work with metallic uranium and slag, and also wastes containing radioactive products which seem to be sources of dust, should be performed in enclosed boxes or booths equipped with individual suction facilities. In cases of necessity for performing work over a long period of time and in close proximity to freshly made castings of metallic uranium, measures should be taken to protect the eyes and hands by using plexiglass shields, goggles, and gauntlets made of closely woven fabrics or leather, or its substitute. Rationally organized measures can efficiently protect workers from the effect of ionizing radiation and can create safe labor conditions during work with metallic uranium."

112. Artificial Heart Displayed

"Artificial Heart" (unsigned article); Moscow, Pravda, 14 Jun 59, p 3

"An apparatus used to produce blood circulation artificially has been put on display in the Zdravookhraneniye i Meditsinskaya Promyshlennost' (Health Service and Medical Industry) Pavilion of the (Soviet) Exposition. This apparatus is able, without human intervention, to perform the function of the heart and lungs during intracardiac surgery on a heart from which the blood has been drained. Both the heart and the lungs are completely cut off from the blood circulation system while the operation is in progress.

"Another device, an artificial kidney, temporarily replaces the real kidney in cases when it either ceases to function or when its functions are upset as result of poisoning."

113. Heart Surgery Discussed

"One Thousand Operations on the Heart," by A. Reyskaya; Moscow, Pravda, 22 May 59, p 6

A Pravda correspondent states that several years ago the first attempts were made by a Soviet surgeon to resort to surgery in correcting heart defects. Operations were then performed in the First Moscow City Hospital. A well-equipped new building now stands adjacent to this hospital. Heart surgery is performed every day in this new building, in which the Institute of Thoracic Surgery of the Academy of Medical Sciences USSR is also housed. A. N. Bakulev, holder of the Lenin Prize and one of the pioneers of Soviet surgery, was responsible for organizing this institute. Within the past 3 years this institute grew into an important scientific and therapeutic center. Almost 1,000 heart operations were successfully performed at this center.

Specialists from Vietnam, Rumania, the US, Czechoslovakia, and Bulgaria have been recent visitors at the institute. Chinese interns are practicing here at present.

The new building has a capacity for 265 patients; it has seven sections, each specializing in surgery of different diseases of the heart as well as of the lungs and esophagus. Each patient is examined in a special compartment equipped with special instruments. Blood circulation is examined in the isotope laboratory with the aid of tracer atoms which are injected into the patient's blood. Recordings of heart sounds are made and the biochemical composition of the blood and its oxygen content are studied in other laboratories of the institute.

The instruments by which the central organ of blood circulation are controlled were conceived by physicians in cooperation with engineers. Soviet instruments used in suturing blood vessels and the heart are known the world over. Surgeons have at their disposal nylon and other synthetic material for making artificial blood vessels and apparatuses for blood transfusion and for artificial blood circulation. Until recently medicine had no knowledge of any method of stopping the sudden onset of fibrilation during an operation. A special device called a defibrillator is now being used.

With new discoveries, surgeons resort to heart surgery with greater daring in many and varied morbid heart conditions. Anything new is tested initially on animals in laboratories set up specially for this purpose.

A difficult operation was performed recently by Soviet surgeons with the aid of visiting English doctors. To correct congenital heart disease, it was necessary to stop the heart for several minutes. The operation was performed with the aid of a new apparatus which produces artificial blood circulation. This apparatus was invented by Prof D. Milrouz. After the heart began to function normally, the apparatus was switched off. The operationwas successful. A. N. Bakulev, scientific director of the institute and president of the Academy of Medical Sciences USSR, and Prof D. Milrouz congratulated each other and expressed the hope that scientists of both countries will continue to cooperate in their efforts to prolong human life.

The correspondent further reports that A. N. Bakulev stated that surgeons have recently learned how to repair defective mitral valves. Simultaneous reparations of defective mitral and aortal valves are now being successfully performed. A number of other surgical methods have been developed for correcting serious cardiovascular defects. Surgery has been successful in cases of coronary insufficiency, which often leads to infarction.

Many physicians who come to the institute to see operations performed sit in offices which have television receivers equipped with large screens. Transmitters are built in special lamps over the operating table.

114. Role of Shock in Cerebrocranial Traumas

"Intracranial Traumas and Shock," by F. Musil and V. Mastnym, Rozhledy chir. (Czechoslovakia), 1958, 37, 1, 18-21 (from Meditsinskiy Referativnyy Zhurnal, Series 2, No 2, Feb 59, p 85)

"An attempt to clarify the role of shock in combined and isolated cerebrocranial traumas is presented. The data supplied by the authors cover 567 cases. Blood pressure and pulse were determined in all patients. Vegetative tests -- orthostatic reactions, oculocardial reflex, and atropine blockage of the vagus nerve -- were conducted on 50 of the patients. Symptoms of sympatheticotonia were noted in cranial traumas. Shock was rarely encountered in cases of cranial and cerebral traumas."

115. New Syringe

"An Automatic Continuous Acting Syringe for Local Anesthesia and the Withdrawing of Fluids," by V. M. Polyakov, Medical-Sanitation Section of the Main Administration of 'Almetyevneft" Oil Industry, Tatarskaya ASSR: Kazan, Kazanskiy Medisinskiy Zhurnal, Vol XL, No 2, Mar-Apr 59, pp 91-92

A description of a new continuous acting automatic syringe is presented. The new syringe has a simple and dependable design and is superior to syringes presently in use. It can also be used as a suction apparatus for withdrawing fluids. The syringe has been tested by the Surgical Section of the Medical-Sanitation Department of the Main Administration of the Oil Industry in the city of Almetyevsk.

116. Chinese Introduce Acupuncture Into Field of Anesthesiology

"Acupuncture-Moxibustion Anesthesia," by Liu Yu-fei (刘玉飞), First Hospital of Chang-chia-k'ou Medical College; Peiping, Hu-li Tsa-chih (Journal of Nursing), Vol 10, No 3, Mar 59, p 124

This article presents the details of experimental anesthetization by acupuncture in the case of seven surgical operations, including artificial abortions, hysterotomies, a tonsillectomy, tibia traction, and a myomatectomy. Data on each case are tabulated to show the acupuncture points used, the length of time taken to make the punctures (10-30 minutes), and the length of time the needle was retained in the acupuncture points (15-60 minutes) as compared with the time required to perform the operation (10-50 minutes). One patient who had a hysterotomy reported slight pain during surgery but still considered acupuncture anesthetization good. Another who had a tonsillectomy reported slight postoperative pain, but all others reported no pain whatsoever. Reportedly, drugs were not used and no risk was involved.

The author states that these experiments have opened up a new branch of scientific investigation in the field of anesthesiology. The acupuncture points to which the needles were applied were selected for anesthetization on the basis of the effect they had produced on various parts of the body during the course of acupuncture therapy.

117. Acupuncture Found Effective in Paralytic Intestinal Obstruction

"Traditional and Western-Style Doctors Cooperate in Acupuncture Therapy for Paralytic Intestinal Obstruction," by Shanghai Children's Hospital; Peiping, Chung-hua Wai-k'o Tsa-chih (Chinese Journal of Surgery), Vol 7, No 3, Mar 59, pp 242-243

The effective application of acupuncture therapy in postoperative paralytic intestinal obstruction is reported in this article. Results are said to be more satisfactory than those obtained by conventional Western methods of treatment, i.e., block therapy and decompression.

The article states that, initially, acupuncture treatment was administered to two children with postoperative intestinal paralysis. Their abdomens were absolutely silent. But 2-3 minutes after the acupuncture needles were applied to sites designated as tsu-san-li (足三里), ch'i-hai (气海), and t'ien-shu (天樞), distinct borborygmi gave evidence of peristalsis.

Subsequently, it is reported, acupuncture therapy was administered to 14 other cases of toxic and postoperative paralytic intestinal obstruction. Most of the 11 cases which recovered shortly required only one treatment; a few, two treatments.

The article also states that the hospital's present policy is to promote cooperation between Chinese traditional and Western-style doctors in the treatment of paralytic intestinal obstruction.

118. Czechoslovaks Produce Artificial Blood Vessels

"Artificial Blood Vessels Manufactured by Us" (unsigned article); Prague, Hospodarske Noviny, No 4, 25 Jan 59, p 7

The Research Institute for Knitting [Vyzkumny ustav pletarsky] has succeeded in producing woven synthetic fiber blood vessels after several months of cooperative work between research workers and medical personnel. The vessels can be used to replace damaged or diseased sections of the human circulatory system, particularly in such cases as arteriosclerosis, Buerger's disease, congenital defects of the circulatory system, and injuries which occur most frequently in war. The latter is one reason why Czechoslovakia has not been able to import such artificial blood vessels from abroad. The Western nations regard them as strategic material. Now, even though production is only of an experimental nature, Czechoslovak medicine has domestic artificial blood vessels which are very similar to natural blood vessels, particularly from the standpoint of resiliency. Inasmuch as these vessels had been tested in operations on animals, they were used for the first time on a human whose femoral artery had been blocked. The operation was entirely successful and the vessels will be used in additional cases.

Miscellaneous

119. Public Health Developments in the Ukraine During the Next Seven Years

"Public Health in the Ukraine During the Seven-Year Plan," by P. Shupik, Minister of Health Ukrainian SSR; Moscow, Meditsinskiy Rabotnik, 29 May 59

The Ministry of Health Ukrainian SSR, together with scientific institutes and chairs of medical vuzes (higher educational institutions) have worked out the prospective plan for the development of public health of the republic for the next 7 years. It has been proposed that 100,000

additional beds be made available for the hospital network of the republic. Of these beds, 27,000 are slated for the Donbass area, 19,400 for the industrial cities of Dnepropetrovskaya, Zaporozhskaya, and Khar'kovskaya oblasts, and 13,000 for hospitals in the western oblasts of the Ukraine. An additional 14,000 beds are scheduled for therapeutic establishments for children.

During the past 2 years, over 100 district hospitals and 135 feldsher-obstetrical stations have been built in the republic. At present, 75 hospitals, 137 feldsher-obstetrical stations, and 14 buildings for rayon hospitals are being built. At the same time, considerable construction on public health institutions is being carried out in kolkhozes.

During the Seven-Year Plan, much emphasis will be placed on the development of sanatoriums and rest homes in the Ukraine. The number of available beds in sanatoriums will be increased by 18,000, and the number of available vacancies in rest homes by 2,000.

The fight against cancer will be greatly expanded as part of the Seven-Year Plan. Oncological examinations will be conducted continuously in the republic, and some 10 million persons will be examined. The Kiev Roentgenological and Radiological Institute will be expanded, and a new Institute of Experimental and Clinical Oncology (Institut Eksperimental'-noy i Klinicheskoy Onkologii) will be established. The number of beds in oncological establishments will be greatly increased and theses establishments will be equipped with the latest diagnostic and therapeutic equipment.

Similar developments will be undertaken in an attempt to liquidate tuberculosis and improve the treatment and care of women and children. Research and development in stomatology and general dentistry will be greatly expanded and improved.

To achieve these tasks, medical cadre training during 1959-1965 will be improved and more persons will be trained. More than 29,000 physicians and 85,000 specialists with an intermediate medical training will be trained. The increased number of physicians will increase the ratio of physicians to 23 physicians for every 10,000 persons. During the same period, some 40,000 physicians will receive advanced training in institutes for the advanced training of physicians.

120. Conference on Treatment of Burns Held in Leningrad

"Treatment of Burns" (unsigned article); Moscow, Meditsinskiy Rabotnik, 22 May 59

A scientific conference on the treatment of burns was recently held in Leningrad and was attended by representatives of scientific research and therapeutic institutions from more than 50 cities of the USSR.

The following persons gave reports: A. A. Vishnevskiy, B. A. Petrov, D. A. Arapov, P. A. Kupriyanov, I. S. Kolesnikov, T. Ya. Ar'yev, and others. One of the most interesting reports was that given by Prof N. A. Federov concerning the treatment of burn patients with blood transfusions, with blood taken from persons who have recovered from burns.

Other reports concerned the treatment of burns with hormones and methods of controlling shock following severe burns. Delegates to the conference accepted the decision to establish, in major cities and oblasts of the USSR, special establishments where the complex treatment of burns will be handled.

121. Prof L. G. Chlenov, Outstanding Soviet Neuropathologist, Dies

"In Memory of L. G. Chlenov" (unsigned article); Moscow, Meditsinskiy Rabotnik, 22 May 59

Prof Lev Grigor'yevich Chlenov, Doctor of Medical Sciences, head of the First Clinical Department of the Institute of Neurology, Academy of Medical Sciences USSR, and one of the most outstanding Soviet neuropathologists died in his 65th year following a short illness.

Chlenov was the author of over 100 scientific works dealing mainly with research on the pathology of higher cortical functions and on traumatic and vascular injuries of the nervous system. His most recent work concerned the study of the vascular pathology of the brain.

His awards include the Order of Lenin and medals. He was also a member of a Problem Commission of the Academy of Medical Sciences USSR and the Scientific Council, Institute of Neurology.

122. New Electroslag Method for Welding Large and Intricate Profiles

"New Method of Electroslag Welding With a Filler Weld Head," by G. Z. Voloshkevich and D. A. Dudko, Institute of Electric Welding imeni Ye. O. Paton, Academy of Sciences Ukrainian SSR, and V. V. Chernykh and L. P. Yeregin, Novo-Kramatorskiy Machine Building Plant; Kiev, Avtomaticheskaya Svarka, No 3, Mar 59, pp 3-7

Components of practically any thickness and shape or in difficultly accessible locations may be welded by a new electroslag method developed at the Institute of Electric Welding imeni Ye. O. Paton and introduced at the Novo-Kramatorskiy Machine Building Plant. The method differs from the usual electroslag processes in that the welding head remains fixed between insulators within the space to be filled and fuses to become part of the weld as the slag bath rises. Welding wires pass through flexible hoses attached to the weld head plates and along special weld head guides into the slag bath. Twelve weld head plates of steel MS-1 with 13 simultaneously fed Sv-10G2 electrode wires of 3-mm diameter were used for welding a 3,120 x 2,020 mm cross section of a 100-ton hammer for an anviless forge. Other examples are cited.

Descriptions of the electroslag filler weld head method, weld head and equipment designs, and recommended welding conditions are presented in another article in this periodical entitled, "Electroslag Welding With a Filler Weld Head," by G. Z. Voloshkevich and V. M. Khrundzhe, pp 32-44.

123. Superior Weld Strength of Soviet Inconel and Nimonic Type Alloys

"Heat Resistance of Welded Joints of the Nickel-Chromium Kh20N80T3Yu (EI437B) Type Alloy," by B. I. Medovar, A. N. Safonnikov, and R. O. Lents, Institute of Electric Welding imeni Ye. O. Paton, Academy of Sciences Ukrainian SSR; Kiev, Avtomaticheskaya Svarka, No 2, Feb 59, pp 3-19

Data from US and British literature are given in a critical reveiw of the heat resistance of weld joints of Inconel, Nimonic 80A, and Nimonic 90 alloys. Detailed results of heat resistance tests of weld joints of the similar type Soviet alloy EI437B are presented to show how it was possible to obtain considerably higher heat resistance.

The introduction of the article briefly mentions problems associated with welding increased thicknesses of nickel-chromium alloys of the Kh20N80 type (EI437A and EI437B, mechanical and heat resistance properties given in a table) and gives the information that thin sheet items of this alloy type are argon-arc welded with a nonfusible (tungsten) electrode, items from forged or rolled materials in thicknesses exceeding 5 mm are submerged-arc welded, preferably by the multipass method, and thicknesses exceeding 30-35 mm should be welded by the electroslag method. Immediate subsequent statements are as follows:

"Foreign investigators consider submerged welding not suitable for high-temperature alloys [K. H. Koopman, "Shielded-Arc Welding Process for Jet Engine Components," The Welding Journal, Vol 32, No 2, 1953; K. M. Spicer, "Joining Wrought Nickel and High-Nickel Alloys," The Welding Journal, September 1949; The Iron Age, 10 December 1953]. The negative opinion of American, English, and other researchers concerning submerged welding of high-temperature alloys resulted from the fact that ordinary molten silicate fluxes applied in foreign practice are strong oxidizers. In sumberged welding with such a type of flux, not only do titanium and aluminum oxidize intensely, but also chromium. As a result, it is not possible to ensure the required level of heat resistance of joint metal and the absence of hot cracks.

"After oxygen-free fluoride fluxes were developed in the Soviet Union [B.I. Medovar, S. M. Gurevich, "Oxygen-Free Fluxes for Welding High Alloy Steels and Alloys," Avtomaticheskaya Svarka, No 4, 1955] which give slags practically free of oxidizers, fluxes of such type appeared in the US. Likewise, for example, quite recently information appeared in an American welding journal on submerged welding of uranium in a fluoride flux containing 75% calcium fluoride and 25% sodium cryolite (Na_3AlF_6) [G. S. Hanks, J. M. Taub, E. L. Brundige, "Submerged-Arc Welding of Uranium," The Welding Journal, No 9, September 1958, pp 890-896]."

Of the number of foreign works known to them on welding of high-temperature nickel-chromium alloys, the authors say that only the works of Scott [D. A. Scott, "Rupture Properties of Inconel Weldments at 1,400, 1,600, and 1,800° F," The Welding Journal, Vol 35, No 4, 1956] and Thorneycroft and Davies [D. R. Thorneycroft, R. J. Davies, "Effect of Welding on the Stress-Rupture Properties of Some Nimonic Alloys," Proceedings of the British Commonwealth Conference 1957, Institute of Welding] contain factual data on the endurance strength of welded joints. It is noted from the work of Scott that weld metal strength in joints of

3/4" thicknesses of Inconel is only 0.80 to 0.85 that of the parent after 10,000 hours operation at 870°C. The authors agree that weld and parent metal strengths are equal in operation at 760°C. The British work on welding 1.5 mm thicknesses of Nimonic 80A and Nimonic 90 by the argon-arc method is admitted to be satisfactory; however, the welding of 3/4" thicknesses of Nimonic 80A with standard 20% Cr-80% Ni wire is considered inferior. The foreign literature review concludes with the following statements:

> "Thus literature data make it possible to assume that the problem of ensuring high heat resistance for weld joints of nickel-chromium alloys of large thickness has not been solved either in the US or England. Below it will be shown that with the aid of submerged and electroslag welding it was possible for us to attain considerably greater heat resistance in weld joints than has been achieved abroad."

Detailed results given of weld joint tests on 10-20 thicknesses of alloy EI437B welded with EI437A alloy wire submerged in flux ANF-5 (CaF_2 + NaF) and flux ANF-6 (CaF_2 + Al_2O_3) show weld metal strengths to be 80-85% of that of the parent metal. It is recalled that British researchers obtained a weld metal strength of only 40% of that of the parent metal in arc welds of Nimonic 80A. Weld metal strengths of joints of EI437B in thicknesses up to 100 mm welded with plates of EI437A in a ANF-5 bath equaled 90% of that of the parent metal. The authors believe that high heat resistance of welded joints of EI437B in thicknesses up to 20 mm may also be obtained by a certain decrease in heating time for quenching and, possibly, in the duration of aging. Preliminary cold working of welded joints before quenching also leads to an increase in heat resistance.

124. Austenitic-Ferritic Welds for 100,000 Hours' Operation at 600°C

"Investigation of the Heat Resistance of the Austenitic-Ferritic Kh19N12M2F-Type Weld Metal," by V. N. Zemzin, Ye. M. Pivnik, and N. A. Yeroshkin, Central Scientific Research Boiler and Turbine Institute imeni I. I. Polzunov; Kiev, Avtomaticheskaya Svarka, No 3, Mar 59, pp 19-31

Kh19N12M2F-type weld metals with varying ferrite content produced with EI-400 and 1Kh18N11M-type electrode wires containing 10.8-12.5% Ni were investigated to determine the effect of the σ-phase on heat resistance. Structural transformations of the $\alpha \longrightarrow \sigma$ type occur in

the deposited metal at high temperatures with the formation of an intermediate dispersed σ' -phase. When ferrite content is limited to 5%, particles of the σ'-phase are sufficiently stable and ensure the required properties for operation at 600°C up to 100,000 hours. Increasing ferrite content above 5% results in rapid coarse separation of the σ-phase and decrease in ductility and impact strength. Austenitization of the deposited metal after welding so that ferrite content is approximately 5% results in the best heat resistance for operation at temperatures lower than 600°C.

125. New Mills for Rolling Ball Bearings

"Mills for Transverse-Helical Rolling of Balls," by Ye. A. Zhukevich-Stosha and P. I. Sofinskiy; Moscow, Kuznechno-Shtampovochnoye Proizvodstvo, No 2, Feb 59, pp 13-17

Descriptions are given of new mills for manufacturing balls for bearings and ball crusher mills by a new method of transverse-helical rolling. The method consists of feeding rods heated to 900-1,000°C between helical rollers rotating in the same direction. Rods acquire rotational movement from the rollers and are displaced axially to a distance equal to the thread pitch of the rollers with each rotation of the rollers. One ball is ejected per rotation of the rollers.

Design, development, and plant installation of the mills was conducted by the Central Design Bureau of Metallurgical Machine Building (TsKBMM) of the Central Scientific Research Institute of Technology and Machine Building under the supervision of A. I. Tselikov, Corresponding Member of the Academy of Sciences USSR. Mill TsKBMM-8 for rolling 25-45-mm balls has been installed at State Bearing Plant No 1, mill TsKBMM-37 for 25-55-mm balls at State Bearing Plant No 4, mill TsKBMM-37A for 40-60-mm balls for ball crusher mills at Plant imeni 1 May, and two TsKBMM-59 mills for 40-80-mm balls at the Katav-Ivanovskiy and Voskresenskiy plants. Mills TsKBMM-44 and TsKBMM-45 for rolling 40-80-mm and 80-125-mm balls, respectively, have been constructed but not assembled in plants at present. No data on capacities of any mill are given.

126. Increased Niobium Content for Higher Corrosion Resistance

"Radiographic Examination of the Distribution of Niobium in Stainless Steel," by L. S. Livshits, Candidate of Technical Sciences, and Engr L. P. Bakhrakh, All-Union Scientific Research Institute of Hard Alloys; Moscow, Svarochnoye Proizvodstvo, No 1, Jan 59, pp 20-22

Welds of 18-9-type stainless steel sheets with niobium were studied with the aid of the radioactive isotope Nb-95 to determine the effect of heating conditions on the formation and solution of carbides of niobium. Stainless steel welds with an increased content of niobium (ratio of Nb to C equal to 10 to 13) are recommended for intergranular corrosion stability at operating temperatures of 550 to 650°C. Steel welds with a decreased content of niobium (ratio of Nb to C equal to 8) must not be heated in excess of 1,200°C because of the solution of the carbides of niobium and its negative effect on corrosion stability. A radical method for increasing corrosion stability consisting of heating to 850-900°C and holding for 3 hours results in the formation of carbides of niobium and the simultaneous withdrawal of carbon from the solid solution. Formation of carbides of chromium at operating temperatures is prevented even in steel with decreased contents of niobium by this method. It is noted that although the experiments were conducted on stainless steel weld joints containing niobium because of difficulty of introducing titanium into a weld joint, the results may be related to stainless steel containing titanium. However, maximum heating temperatures must be lower for steels containing titanium, as carbides of titanium go into solution at a lower temperature than those of niobium.

Experimental Physics

127. Chinese Consider Periodic Focusing of High Current Electron Beams

"Periodic Focusing of High Current Electron Beams," by Ho Kuo-chu (何 國 柱), Nan-k'ai University; Peiping, Wu-li Hsueh-pao (Acta Physica Sinica), Vol 14, No 5, Sep 58, pp 376-392

The focusing of high current electron beams by means of several different systems of periodic electric and magnetic fields has been studied theoretically [at Nan-kai University]. One of these periodic electron optical systems, namely, a periodic electric field produced by a series of annular disks held at alternately higher and lower potentials, was also investigated experimentally in an electrolytic tank.

It was found that if the distance between the disks or half period of the field is long (i.e., two or three times longer than the diameter of the apertures at the center of the disks), the potential on the axis may be expressed by a saw-toothed function [which is presented in the Chinese text.] The equation for describing the electron beam profile under this condition is solved analytically. The conditions which must be satisfied to give periodic focusing are obtained.

If the distance between the disks is short and comparable with the diameter of the aperture, the potential on the axis is more accurately expressed by a cosine function [which is also given in the Chinese text.] Under such conditions, the equation for describing the electron beam profile becomes a complicated nonlinear differential equation. This nonlinear differential equation has been treated by earlier researchers [Clogston, Heffner, and others] who were able to obtain its first-order approximation solution.

A perturbation method which yields higher-order approximations is presented and applied to treat other periodic electric and magnetic fields such as an axially symmetric magnetic field, a quadrupole electric field, and a quadrupole magnetic field. For these various fields, higher-order periodic approximate solutions are computed, and the required conditions to give periodic focusing are discussed. The necessity of higher-order approximation in the design of high-current electron beams with periodic focusing is demonstrated.

The author states that other workers in the Department of Physics of Nankai University worked on some of the mathematical computations and derivations of formulas which are presented in his paper.

The paper was received for publication on 20 December 1957.

Nuclear Physics

128. Motion of Charged Particles

"Equations of Motion of Charged Particles in the General Theory of Relativity," N. M. Petrova, Tr. In-ta yadern. fiz. KazSSR, 1958, 1, 160-165 (from Referativnyy Zhurnal--Fizika, No 5, May 59, Abstract No 9803)

In a first approximation of equations of gravity in the general theory of relativity, equations of motion of a system of bodies are derived, between which gravitational and electromagnetic forces exist. The equations have the usual aspect of the second law of Newton for a particle under action of Lorentz force and force of gravity $F_i = -\partial\phi/\partial x_i$ (ϕ is the gravitational potential). V. A. Foch's method is used for the derivation and for the expansion of the sought components of the metric tensor into powers of the parameter (v/c).

129. Efficient Operation of a Betatron

"The Electron Capture Mechanism and Acceleration in a Betatron, I," by B. N. Rodimov, Izv. Tomskogo politekhn. in-ta, 1957, 87, 11-29 (from Referativnyy Zhurnal--Fizika, No 5, May 59, Abstract No 9916)

"The Electron Capture Mechanism and Acceleration of a Betatron. II.," by B. N. Rodimov, Izv. Tomskogo politekhn. in-ta, 1957, 87, 30-40 (from Referativnyy Zhurnal--Fizika, No 5, May 59, Abstract No 9917)

"Account of the Proper Magnetic Field of the Equilibrium Beam in a Betatron," by P. A. Cherdantsev, Izv. Tomskogo politekhn. in-ta, 1957, 87, 52-56 (from Referativnyy Zhurnal--Fizika, No 5, May 59, Abstract No 9918)

"The Relativistic Potential Function of the Magnetic Field and Its Application to Computation of Density of the Equilibrium Charge in a Betatron," by P. A. Cherdantsev, Izv. Tomskogo politekhn, in-ta, 1957, 87, 48-51 (from Referativnyy Zhurnal--Fizika, No 5, May 59, Abstract No 9919)

The above articles are directed toward more accurate design and improved operation of the betatron.

"The Problem of Selection of a Rational Location for the Injector and the Determination of the Potential Magnitude of Injection Into the Betatron," by K. S. Grishin, Izv. Tomskogo politekhn.. in-ta, 1957, 87, 137-150 (from Referativnyy Zhurnal--Fizika, No 2, Feb 59, Abstract No 2602)

"Stabilization of Betatron Emission," by V. M. Razin, Izv. Tomskogo politekhn. in-ta, 1957, 87, 206-215 (from Referativnyy Zhurnal--Fizika, No 2, Feb 59, Abstract No 2603)

Both preceding articles discuss the efficient capture of injected electrons as a means of raising the efficiency of the betatron.

130. State Diagram of Cu-Ni-Si

"Investigation of the State Diagram of the System Cu-Ni-Si," by I. I. Novikov and L. I. Dautova, Tr. In-ta Yadern, fiz. AN KazSSR, 1958, 1, 274-281 (from Referativnyy Zhurnal--Fizika, No 5, May 59, Abstract No 10578)

The investigation of the system Cu-Ni-Si has been carried out within the triangle of concentrations Cu-8%, Ni-8%, Si from six radial sections passing through the Cu angle. For the plotting of the state diagram methods of thermal, microscopic and X-ray phase analysis were applied, as well as the method of microhardness. Isotherms of liquidus through 10° and isotherms of limited solubility in a solid state at 700, 800, 900, 1000° C have been drawn, as well as six polythermal and four isothermal cross sections, it is shown that no one of the chemical compounds of Ni with Si forms a quasibinary system with C_u and that the compound Ni_2Si cannot be in equilibrium with a solid solution on a Cu basis.

131. Radiative Capture Yield

"Yield of (γ ,n) Reactions of Light Isotopes of Elements With Z = 6-68," by N. A. Tikhonov, Izv. Tomskogo politekhn. in-ta, 1957, 87, 437-440 (from Referativnyy Zhurnal--Fizika, No 2, Feb 59, Abstract no 2827)

Measurements were carried out of the relative yield of (γ ,n) reaction under effect of radiative capture of 25 Mev energy for light isotopes of elements with Z = 6-68. The obtained data show that the yield of reaction of irradiation of the studied elements by radiative capture with a maximum energy of 25 Mev appears to be a quadratic function of Z.

132. Threshold of Photoneutrons

"Threshold of Photoneutrons of 13 Isotopes," by A. K. Berzin, Izv. Tomskogo politekhn. in-ta, 1957, 87, 433-436 (from Referativnyy Zhurnal--Fizika, No 2, Feb 59, Abstract No 2832)

The thresholds of (γ ,n) reactions were measured for 13 isotopes. The measurements were carried out either directly by neutron records (RZhFiz. 1958, No 10, 22371) or by recording of the produced activity. The established accuracy of the maximum energy of the radiative capture spectrum of the betatron was ± 10 lev. The samples were oxides of the elements. It has been found that the yields of separate isotopes are expressed with adequate accuracy by correlations of the type $N = K (E_{max} - E_o)^m$, while the threshold energy E_o and the constant m are selected graphically for each isotope. The threshold energies have been found in Mev: for Ba-138 8.51 ± 0.08; La-139, 8.75 ± 0.08; Ce-140, 9.01 ± 0.08; Ce-142 7.17 ± 0.08; Pr-141 9.35 ± 0.08; Nd-150 7.43 ± 0.08; Nd--144 8.27 ± 0.08; Nd-142 9.81 ± 0.08; Sm-149 6.91 ± 0.08; Sm-144 10.46 ± 0.2 for Sm-147 (?) 7.3 ± 0.3 Mev. It has not been established to which isotope Nd 143 or 145, the measured threshold of 6.69 ± 0.08 Mev corresponds. It is also not clear to which isotope 6.69 ± 0.08 correspond -- to Ba 135 or 137.

133. Deviation of Nuclear Shape From Axial Symmetry

"Rotational States of Nonaxial Odd Nuclei," by A. S. Davydov, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1555-1559

A theory is developed for the rotational states of odd nuclei whose ground state spin is due to the angular momentum $j = 1/2$ of the outer nucleon. The energy of the rotational states is derived as a function of the parameter γ $(0 \leq \gamma \leq \pi/3)$ which specifies the deviation of the nuclear shape from axial symmetry.

134. Model of Meson-Nucleon Cloud Production

"The Role of Viscosity in the Hydrodynamical Theory of Multiple Particle Formation," by A. A. Yemel'yanov, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1550-1554

The model of a viscous ultrarelativistic fluid is employed to describe the emission of the "meson-nucleon" cloud produced in the collision of high energy nucleons. An asymptotic solution of the one-dimensional equations has been obtained. It is shown that account of viscosity leads to a less pronounced anisotropy in the angular distribution of the secondary particles than if an ideal fluid is considered.

135. Scattering of Dirac Particles

"Scattering of Dirac Particles in the Second Born Approximation," by V. M. Arutyunyan and R. M. Muradyan, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1542-1545

Elastic scattering of Dirac particles by a spherically symmetrical field of a fixed center is considered. The values of the scattering amplitudes are determined in the second Born approximation.

136. A Plasma Discontinuity

"Structure of a Magnetohydrodynamic Shock Wave in Partially Ionized Gas," by S. B. Pikel'ner, Crimean Astrophysical Observatory, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1536-1541

A magnetohydrodynamic shock wave in a partially ionized gas consists of a thin plasma discontinuity and a transition zone. An approximate solution of the equations for the transition zone is carried out for some particular cases. The charge exchange effect does not significantly influence the general nature of the motion but decreases the scale. As long as the wave can be considered stationary within the transition zone, the magnitude of energy dissipation is independent of the degree of ionization.

137. The Thomas-Fermi Model

"Refinement of the Thomas-Fermi Model at Small Distances," by Ye. S. Fradkin, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1533-1535

A correction to the Thomas-Fermi model is suggested for small distances from the nucleus which leads to a significant improvement between the calculated and experimental values for the total energy of the atoms.

138. Parity Conservation Analysis

"Azimuthal Symmetry in Cascade of Reactions and Parity Conservation," by M. I. Shirokov, Joint Institute for Nuclear Research; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1524-1532

Some angular azimuthal symmetry relations in cascade of reactions of the proton triple scattering type are derived which follow from parity conservation in the cascade reactions. It is pointed out that experimental establishment of the simplest of these symmetries, which is well known, namely, symmetry of twice scattered particles relative to the plane of the first scattering, is not an exhaustive proof of parity conservation. The experiments suggested here are a more reliable proof of this law, and in some cases it can be considered as a complete proof.

139. Electron Excitation in Collisions

"A Qualitative Interpretation of the Mean Electron Excitation Energy in Atomic Collisions," by O. B. Firsov; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1517-1523

Transformation of the kinetic energy of relative motion of colliding particles into electron excitation energy is interpreted as being the result of their decelaration caused by electron exchange. Electron motion in the region of overlapping of the shells of the colliding particles is considered quasi-classically. It is assumed that when the electron moves from the potential field of one of the atoms to that of another, it transfers from the first atom to the second a momentum which, on the average, is equal to the product of the relative velocity of the atoms on the mass of the electron.

140. Radiative Capture of Mesons

"Radiative Capture of Polarized μ -Mesons by Nuclei," by G. M. Gandel'man and V. N. Mokhov; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1513-1516

The correlation between the direction of the μ -meson spin and the direction of the γ -quantum emitted in the radiative capture of the μ -meson by a nucleus is considered with account of the interaction between the μ -meson and nuclear spins (hyperfine splitting). The analysis is carried out for nuclei of arbitrary spin J.

141. Shape of Nuclei

"The Shape of Even-Even Nuclei," by A. S. Davydov and G. F. Filippov, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1497-1502

A nuclear model which assumes a core and two nucleons in a shell of angular momentum j is considered. The energy as a function of the parameters β and γ is determined for various values of the total nucleon angular momentum. It is shown that in the ground state minimum of energy corresponds to a nonaxial shape of the nucleus providing $j > 3/2$.

142. Model of Photonuclear Reactions

"Single-Particle Mechanism in Photonuclear Reactions," by G. M. Shlyarevskiy, Physicotechnical Institute, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1492-1496

The single-particle (direct) mechanism of photonuclear reactions at high energies is considered on basis of the shell model. It is shown that the momentum distribution of the ground nuclear state which this model yields permits one to explain the shift forward of the photoproton momentum distribution peak and to obtain the correct value for the cross section of the reaction.

143. Correlations in Multiple Production

"Angular Correlations Near the Multiple Production Threshold," by A. F. Grashin, Moscow Engineering Physics Institute; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1480-1484

Limiting angular correlations near the threshold have been obtained for reactions in which final products are an infinitely heavy nucleus and 2, 3, or 4 identical fermions with spin 1/2.

144. Nuclear Absorption of Ultrasound

"Resonance Absorption of Ultrasound on Nuclei," by A. R. Kessel, Kazan State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1451-1456

A theory of resonance absorption of ultrasound on paramagnetic nuclei of the atoms of a simple cubic lattice is developed under the assumption that the spin-lattice interaction is determined by nuclear quadrupole forces. Absorption coefficients for spin transitions $\Delta m = 1$ and $\Delta m = 2$ have been obtained for arbitrary directions of propagation and arbitrary polarizations of the sound waves. The theory for In^{115} in InSb is compared with the experiments.

145. Gamma Scattering on Nuclei

"Resonance Scattering of Low Energy γ -Quanta on Nuclei," by B. N. Kalinkin, Physics Institute imeni Lebedev, Academy of Sciences, USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1438-1442

The mechanism of resonance scattering of low energy γ -quanta on nuclei is discussed. It is shown that it is of the nature of resonance nuclear fluorescence and that excitation of the nucleus can be described with aid of single-nucleon transitions. The γ -ray scattering cross sections are calculated on the basis of the shell theory. The width of the excited level was estimated by making use of the Fermi gas model and of the results of the investigations of Signell and Marshak on the theory of scattering of nucleons. The results are in satisfactory agreement with the experimental data.

146. Bethe-Salpeter Equation

"Nonrelativistic Solution of the Bethe-Salpeter Equation," by A. I. Alekseyev, Moscow Engineering Physics Institute; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1435-1437

A nonrelativistic solution of the Bethe-Salpeter equation has been obtained with account of terms of the same order as the relative velocity of the particles.

147. Scattering of Mesons

"Scattering of Fast π -Mesons on Deuterons," by A. G. Sitenko, Kharkov State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1419-1422

Shadow effects appearing in the diffractional scattering of fast π -mesons on deuterons are considered.

148. Particle Scattering on Nonspherical Nuclei

"Account of Nuclear Interaction in the Scattering of Charged Particles on Nonspherical Nuclei," by A. D. Pilliya; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1393-1397

Nuclear interaction involved in the scattering on black nonspherical nuclei of charged particles possessing energies close to the height of the coulomb barrier is considered.

149. Phase Shift in Particle-Hole Transition

"Account of the Phase Shift Upon Transition From 'Particles' to 'Holes' in the Nuclear Shell Theory," by V. V. Balabashov, Institute of Nuclear Physics, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1387-1392

The second quantization method developed by the author et al. (Trudy Vsesoyuznoy Konferentsii, Nov, 1957) for calculation of the matrix elements of the F and G-operators in the nuclear shell theory is employed to establish the relation between the fractional parentage coefficients corresponding to the beginning and end of the shell. Variation of the phase shift upon transition from "particles" to "holes" is investigated. Selection rules with respect to the symplectic group are formulated for electromagnetic transitions in nuclei in the case of jj-coupling.

150. K_2^0 -- K_1^0 Transformation

K_2^0 -- K_1^0 Transformation on Electrons," by Ya. B. Zel'dovich; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1381-1386

The E0 transformation of K_2^0 into K_1^0 is considered for the case when these particles interact with electrons. The cross section of the process and angular distribution are estimated. Interference between the electron and nuclear interaction for $K_2^0 \rightarrow K_1^0$ transformation in the unscattered beam is examined.

151. Angular Distribution in Stripping Reactions

"Angular Distributions in the Reactions Ne-22(d,p)Ne-23 and Ar-36(d,p)A r-37," by V. G. Sukharevskiy, Institute of Nuclear Physics, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1377-1380

The angular distributions of protons emitted in stripping reactions of the type (d, p) induced by 4 MeV deuterons in gas targets enriched with Ne^{22} and Ar^{36} were investigated with aid of nuclear emulsions. For the ground and first excited (0.98 MeV) states of Ne^{23} the orbital angular momenta of the captured neutrons l_n were found to equal 2 and 0 (shell model configurations $(1d_{5/2})^{-1}$ and $(2S_{1/2})^{-1}$, for the ground state of Ar^{37} l_n is equal to 2 $(1d_{3/2})^{-1}$ configuration).

152. Formation of Isomeric Mo-93m

"Formation of Isomeric Mo-93m in the Reaction Se-80(O^{16},3n)," by A. S. Karamyan, L. I. Ruskin, and V. A. Fomichev; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1374-1376

The Mo^{93}m isomer has been obtained by irradiating the separated Se^{80} isotope with O^{16} ions accelerated in a 150 cm cyclotron. The isomer is formed as a result of evaporation of three neutrons from the nucleus produced as a result of complete coalescance of the Se^{80} and O^{16} nuclei. The excitation function of this reaction has been determined, and the absolute cross section for Mo^{93} m production has been measured.

153. Polarization of Co and Fe Nuclei

"Polarization of Cobalt and Iron Nuclei in Ferromagnetics," by B. N. Samoylov, V. V. Sklyarevskiy, and Ye. P. Stepanov; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1366-1367

The anisotropy of the γ -radiation from Co^{60} in a magnetized cobalt-iron alloy (permendure) was measured. The measurements were carried out in the temperature range from 0.03 to 0.1° K. The magnetic field strength on the cobalt nucleus is obtained, H = $2.5 \cdot 10^5$G. No γ-ray anisotropy was detected in similar experiments carried out with Fe^{59} nuclei in Armco iron cooled down to 0.02° K.

154. Excited States of Re-187

"Investigation of the Excited States of Re-187," by M. V. Klimentovskaya and P. I. Shavrin, Institute of Nuclear Physics, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1360-1365

The excited state angular moments and the multipolarities of the transitions of Re^{187} have been obtained by measuring the angular correlation of the 552-134 keV, 480-134 keV and 72-134 keV γ cascades. The value $(2.2-0.5) \cdot 10^{-2}$ has been obtained for the ratio of the E2 and M1 amplitudes of the radiation mixture, δ^2 = I (E2)/I (M1), corresponding to a γ transition of 134 keV energy. The relative intensity of the 552 keV γ line has been determined. The internal conversion coefficient in the K shell has been determined for the 134 keV γ transition.

155. Photoproduction of π -Mesons

"Photoproduction of Low Energy Charged π -Mesons on Composite Nuclei," Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, Apr 59, pp 1357-1359

The yield of 0 to 3 MeV charged photomesons at angles of 90° with respect to the photon beams has been studied for Be, C, Al and Cu nuclei. The maximum photon energy was 265 MeV. The dependence of the negative π -meson yields and also the ratio of the positive and negative π -meson yields on the atomic number have been observed. A comparison of the experimental results with the theoretical calculations of Baldin and Lebedyev (ibid. 33, 1221 (1957)) indicates that the mesons are produced on nucleons located on the surface of the nucleus.

Solid State Physics

156. Exciton Capture Centers

"Exciton Capture Centers in Alkali Haloid Crystals, Activated by Mercury-Like Ions," by Ch. B. Lushchik, and G. G. Liyd'ya, Trudy In-ta fiz. i astron. AN EstSSR, 1958, No 7, 193-226 (from Referativnyy Zhurnal--Fizika, No 4, Apr 59, Abstract No 9433)

Studies are carried out of absorption and excitation spectra of KBr crystals activated by mercury type ions (Ga^+, In^+, Tl^+, Ge^{2+}, Sn^{2+}, Rb^{2+}) forming after X-ray or ultraviolet irradiation in the range of activating or exciton absorption bands. On the basis of the obtained results and literature data, the interaction of excitons with impurities and natural microdefects of the crystal are analyzed. The microdefects are exciton centers of dissociation and exciton centers of annihilation. The first may be 2-valent ions, impurities, e.g., $M^{2+} + ex \rightarrow M^{2+} ex \rightarrow M^{2+} + e + p$ with a consequent localization of a hole on the cation vacancy (it is shown experimentally for KBr-Pb, KBr-Ge, KBr-Mn); the latter may be one-valent impurity ions, e.g., $M^+ + ex \rightarrow M + ex \rightarrow M + \rightarrow M^+ + h\nu$ (M is an impurity ion, ex-exciton, e-electron, p-hole). The phenomenon of stimulating action of x-rays has been tested on phosphors NaCl-Pb, KBr-Tl, KCl. The exciton mechanism of this phenomenon is discussed. The stimulating action of excitons in KBr-Pb is experimentally confirmed. The study of the optical quenching of F-centers KCl-Ca, Ag showed that the F-centers are quenched at irradiation not only in F- and V-bands absorption bands, but also in other electron absorption bands.

157. Chinese Research on Stoner's Collective Theory of Ferromagnetism

"Diagrammatic Representation for Stoner's Collective Theory of Ferromagnetism," by Hsiang Jen-sheng (尚 仁 生), Institute of Applied Physics, Academia Sinica; Peiping, Wu-li Hsueh-pao (Acta Physica Sinica), Vol 14, No 5, Sep 58, pp 369-375

"On the basis of the three premises of Stoner's collective theory of ferromagnetism, appropriate energy band diagrams are constructed. These diagrams vividly show the physical situation involved in Stoner's theory. With the help of diagrams, Stoner's criterion for occurence of ferromagnetism, $k\Theta'/\varepsilon_0 = \xi > 2/3$, and for complete magnetism, $\xi \geq 2^{-1/3}$, can be deduced in a rather simple and straightforward way. With the help of diagrams, the migration of electrons from d-band to s-band due to the splitting of d-band in the ferromagnetic state is considered. Such a transfer of electrons is estimated to be about one percent for nickel at 0° K."

The author states that part of the work reported in this paper was done at Rutgers University and acknowledges the help of Prof P. R. Weiss, with whom he had discussed the problem many times.

The paper was received for publication 17 April 1957.

Spectroscopy

158. Intermolecular Interactions

"Evaluation of Intermolecular Interactions in a Liquid According to the Absorption Spectrum of Atomic Mercury," by K. Mustafi, Uch. zap. Tadzh. un-t, 1957, 10, 133-137 (from Referativnyy Zhurnal--Fizika, No 5, May 59, Abstract No 11694)

A review is presented of works devoted to the study of intermolecular interactions in liquids from absorption spectra of solutions of neutral atoms (in particular mercury) in various solvents. Because opinions are different concerning the nature of the double absorption band of solutions of atomic mercury in hexane, methyl alcohol, and water, the author studied the absorption spectrum of mercury solution in ethyl alcohol at a temperature of 60°C by using a photographic method. The accuracy of the determination of the maximum is ± 5 A. The absorption spectrum exhibits two bands of maximum at 2535 and 2575 A. The distance between the maxima agrees with known data on the connection of the magnitude of the band splitting and the value of the dipole moment of the solvent. The addition to the solution of small amounts of impurities does not affect the position of the maxima of absorption.

IX. MISCELLANEOUS

159. New Soviet Scientific Institutes To Be Organized in Near Future

(Untitled and unsigned articles) Tallin, Sovetskaya Estoniya, 8 Jan 59, 13 Jan 59; Minsk, Sovetskaya Belorussiya, 29 Mar 59

The following Soviet scientific research institutes have been proposed and are to be established during 1959-1961:

Physicotechnical Institute (Fizikotekhnicheskiy Institut), Academy of Sciences Estonian SSR, Tallin. (Tallin, Sovetskaya Estoniya, 8 Jan 59)

Scientific Research Electrical Engineering Institute (Nauchno-Issledovatel'skiy Elektrotekhnicheskiy Institut) and Scientific Research Shale Institute (Nauchno-Issledovatel'skiy Slantsevoy Institut) both to be subordinate to the Estonian Sovnarkhoz in Tallin. (Tallin, Sovetskaya Estoniya, 13 Jan 59)

Institute of Nuclear Physics (Institut Yadernoy Fiziki), Academy of Sciences Belorussian SSR; and Institute of Botany (Institut Botaniki), Institute of Zoology and Parasitology (Institut Zoologii i Parazitologii), Institute of Physiology and Microbiology (Institut Fiziologii i Mikrobiologii), Institute of Genetics and Cytology (Institut Genetiki i Tsitologii), and Institute of Experimental Medicine (Institut Eksperimental'noy Meditsiny) all subordinate to the Academy of Sciences Belorussian SSR. (Minsk, Sovetskaya Belorussiya, 29 Mar 59)

160. Two New Institutes Established in Academy of Sciences Uzbek SSR

(Untitled and unsigned article) Tashkent, Pravda Vostoka, 8 Feb and 13 Feb 59

Two new scientific research institutes have been established in the Academy of Sciences Uzbek SSR:

The Institute of Mechanics (Institut Mekhaniki), Academy of Sciences Uzbek SSR, and the Institute of the Chemistry of Polymers (Institut Khimii Polimerov), Academy of Sciences Uzbek SSR.

* * *