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CENTRAL INTELLIGENCE AGENCY

SCIENTIFIC INFORMATION REPORT

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PLEASE NOTE

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

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"Bactericidal Effect of the Leaves of Certain Plants on Staphylococci and Bacillus coli," by L. N. Savchuk, Sb. stud. rabot (Collection of Student's Works), No 4, 103-104 (from Referativnyy Zhurnal--Biologiya, No 9, 10 May 59, Abstract No 42135, by M. I. Nakhimovskaya)

"Leaves of different plants were covered with suspensions of Staphylococci and Bacillus coli cells at different periods of time, and then pressed on agar. The Staphylococci cells on the leaves of coriander were killed within 6 hours; on the leaves of walnut, wormwood, and hemp -- within 8 hours; on the leaves of peach, dahlia, potato, and raspberry plants -- within 10 hours; on the leaves of apricot, tomato, and chrysanthemum plants -- within 12 hours; on the leaves of cherry, grape, and petunia plants -- within 15 hours; on the leaves of plum trees -- within 18 hours. The Bacillus coli cells on the leaves of wormwood were killed within 8 hours; on the leaves of walnut, coriander, potato, and hemp plants -- within 10 hours; on the leaves of peach, dahlia, and tomato plants -- within 12 hours; on the leaves of cherry, petunia, and apricot, and raspberry plants -- within 15 hours; and on the leaves of grape, plum, and chrysanthemum plants -- within 18 hours. The extract of wormwood possesses the greatest bactericidal action; the extract of dahlia -- the least."

2. Bactericidal Plant Leaves

"Bactericidal Action of the Leaves of Some Spermatophyta," by A. Toshkov and G. Sheykova, Tr. Respubl. n-i, in-t epidemiol. i mikrobiol. (Works of the Republican Scientific-Research Institute of Epidemiology and Microbiology, Bulgaria), 1956, 3, 195-198 (from Referativnyy Zhurnal -- Biologiya, No 9, 10 May 59, Abstract No 42163, By K. I. Draganov)

"The leaves of Begonium, Belargonium zonalae, and Impatiens sultanili were covered on both sides with suspensions of different microbes (Staphylococcus aureus, Bacillus coli, Salmonella typhi, and Mycobacterium tuberculosis BCG strain); sometime later, at different periods of time (to 120 hours), the agar surface was smeared with sections of the leaves. On fresh leaves, the number of microorganisms sharply decreased within 24 to 48 hours, while on the withered leaves, microbes were found even after 120 hours had elapsed. The bactericidal effect of the leaves was particularly strong during the period of florescence. The bactericidal effect of the leaves was considerably reduced when kept in storage. Paste and aqueous extracts of fresh leaves also display bactericidal properties."

3. Natural Radioactivity of Mosses and Lichens

"On the Natural Radioactivity of Mosses and Lichens," by D. M. Grodzins'kyy, Ukrainian Scientific Research Institute of Plant Physiology; Kiev, Ukrayins'kyy Botanichnyy Zhurnal, Vol XVI, No 2, 1959, pp 30-38

The author presents the following summary of his work:

"The Investigation of the role of natural radioactivity in biological processes is one of the most important tasks of present-day radiobiology. As a result of the study of the beta-ray activity of over 300 plant species, it was found that the lower plants ordinarily accumulate more radioactive substances than angiospermous plants. On comparing the average data obtained on measuring the beta-activity of a great number of species of various classes of plants, it was found that plants may be placed in the following order of increasing radioactivity: angiosperms, gymnosperms, pteridophytes, bryophytes, and lichens. Mosses and lichens are typified by a particularly high radioactivity. Many species of these groups accumulate ten times as much radioactive substances as the angiospermous plants. In addition, the radioactivity of mosses and lichens is of a different origin than that of the angiosperms, being connected with the accumulation of heavy radioactive elements and not of potassium, which accounts for only 2-5% of the total beta-activity. The selective character of the radioactive accumulation is distinctly manifested. Mosses and lichens are concentrators of uranium and other radioactive elements of radicactive families of the thorium, uranium and uranium-actinium series.

"On the basis of established facts that considerable concentration of radioactive substances is found in cryptogamous plants, it may be inferred that the radioactive phenomena which are essential for certain physiological and biochemical processes are more typical for primitive ancient plant forms, which developed during the period when the radioactivity of the earth's crust was considerably higher than it has been in the modern epoch."

Fuels and Propellants

4. Thermal Decomposition of Perchloric Acid

"Thermal Decomposition of Aqueous Solutions of Perchloric Acid," by A. B. Tsentsiper; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 5, May 59, pp 1086-1091

The kinetics of the evolution of oxygen in the thermal decomposition of aqueous solutions of perchloric acid (at concentrations of from 83 to 98%) in the temperature range below 96° were investigated.

The decomposition of 83% perchloric acid was also investigated at higher temperatures up to 145°. It was established that the type of decomposition of the acid does not depend on the initial concentration. One may assume that the decomposition proceeds by a chain mechanism with degenerate branching. The activation energy of the decomposition of perchloric acid of the concentrations indicated was determined and found to be equal to 22,560 calories per mol. It is assumed that in the temperature range investigated, only that part of the acid decomposes which is in the pseudo-form $OHClO_3$. Under the conditions investigated, hydrated acid is stable for all practical purposes.

5. Purification of Oxygen From Methane and Other Hydrocarbons

"Catalytic Combustion of Small Quantities of Methane in Oxygen," by L. I. Kazarnovskaya, Candidate of Chemical Sciences, and N. M. Dykhno, Candidate of Chemical Sciences; Moscow, Kislorod, Vol 12, No 2, Mar/Apr 59, pp 28-33

In connection with the industrial separation of krypton from air, accumulation of hydrocarbons, small quantities of which are always contained in the air of industrial regions, takes place together with the enrichment of oxygen with krypton. To eliminate the hydrocarbons from the original krypton concentrate, which consists of oxygen containing about 0.1% of krypton, the hydrocarbons are subjected to combustion with oxygen. Because methane is the hydrocarbon which oxidizes with the greatest difficulty, ethane, acetylene, and other hydrocarbons accompanying it will also be oxidized when methane undergoes complete oxidation. The experiments described show that combustion of small quantities of methane in oxygen can best be carried out when Nikopol'sk manganese ore containing silver as a promoter is used as a catalyst.

7. Possibilities of Recovering Rhenium From Dzhezkazgan Copper Ores

"The Content of Rhenium in the Copper Ores of Dzhezkazgan," by T. A. Satpayeva, S. K. Kalinin, and E. Ye. Fayn; Alma-Ata, Vestnik Akademii Nauk Kazakhskoy SSR, Vol 15, No 5 (170), 1959, pp 52-59

Investigations in 1956-1958 on the composition of Dzhezkazgan copper ores in Kazakhstan indicate that these ores contain a relatively large quantity of rhenium. Typical figures obtained by analyzing samples at ore-enrichment plants in that region are tabulated below:

	Rhenium Content (in %)
Sulfide copper ore	0.0004-0.0005
Copper concentrate	Approximately 0.004
Lead concentrate	" 0.0025
Tailings of enrichment plant	0.0001-0.00015
Matte ("shteyn")	Approximately 0.002
Dumping slag	0.0004
Ash of reverberatory furnaces	Approximately 0.002
Dust from walls of the flue of reverberatory furnaces next to the stack	Approximately 0.005-0.01
Crude copper	none
Converter dust from chambers	Approximately 0.008
Converter dust carried over into stack	Approximately 0.02

On the basis of the results obtained in the investigation described, it is concluded that Dzhezkazgan copper ores represent an important source of rhenium. Development of technological procedures for the complete recovery of this rhenium is recommended. On the basis of geochemical data

reviewed in the article, the conclusion is made that rhenium occurs much more commonly in nature than has been assumed hitherto. It is proposed that more thorough investigations be conducted on the content of rhenium in diverse minerals and ores by subjecting them to spectral analysis according to a method described. Particular attention in these investigations should be paid to ores of copper deposits and polymetal deposits.

6. Purification of Oxygen From Acetylene and Carbon Dioxide

"Purification of Air From Acetylene and Carbon Dioxide by Adsorption at Installations Producing Technical Gaseous and Liquid Oxygen," by Prof I. P. Ishkin, Doctor of Technical Sciences, and Engineer N. F. Katina; Moscow, Kislorod, Vol 12, No 2, Mar/Apr 1959, pp 37-38

A method for the simultaneous adsorption of acetylene and carbon dioxide from air at low temperatures and a pressure of 5.5 atmospheres absolute is described. KSM silicagel in lumps was found to be the best adsorbent for the purpose.

Industrial Chemistry

8. Work on the Modification of Cellulose

"Cellulose Also Has a Great Future," by Prof Z. Rogovin, Head of the Chair of Synthetic Fibers, Moscow Textile Institute; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Vol 4, No 73 (528), 24 Jun 59, p 4

Cotton can be made as crease-resistant and as easy to launder as capron. Fishing nets consisting of linen or hemp fibers may be made as resistant to the action of water as khlorin [polyperchlorovinyl] nets. A viscose tire cord has been developed which is almost as strong as capron cord. By improving cellulose, which is much cheaper than synthetic fibers, materials having many of the advantageous characteristics of synthetic fibers can be developed. Work on the improvement of cellulose by modifying this natural fiber appropriately is being done by the Combined (Complex) Laboratory of Cellulose and Synthetic Fibers at the Moscow Textile Institute.

Experimental work on the introduction of amino-groups into cellulose was done at this laboratory. Cellulose fibers modified by the introduction of amino-groups acquire superior dyeing properties. On the basis of cellulose containing amino-groups, it will presumably be possible to synthesize naturally occurring high-polymer antibiotics.

The work that is being done on the introduction of amino-groups also has another purpose, namely that of grafting polyamides onto cellulose. Some success has already been achieved in the work in question: capron has been grafted to the cellulose molecule. The hybridized cellulose-capron polymer combines the desirable characteristics of both fiber materials. In addition to that, the new cellulose-capron fiber has the advantage of being cheap.

The nitrile groups contained in the synthetic fiber nitron [orlon] make this fiber exceptionally resistant to the action of light. At the Moscow Textile Institute nitrile groups have been introduced into cellulose. It is hoped that the cellulose containing nitrile groups will also exhibit fastness to light.

At present work has been begun at the Moscow Textile Institute on the synthesis of polyester-cellulose fibers. It is expected that these fibers will have the properties of the synthetic polyester fiber lavsan [dacron], with respect to permanent retention of creases that have been pressed into fabrics made of them.

Alginic acid, which is contained in sea weeds and has a composition resembling that of cellulose, is not a very good material for the production of fibers: the fibers made of it proved to be weak. However, if reactive groups of some kind or polyamides are introduced into alginic acid, the tensile strength of fibers derived from it may be increased. Sea weeds will then become a valuable raw material for the production of fibers and other polymer materials.

Modified cellulose fibers will not replace synthetic fibers: they will merely supplement them.

9. Publication of a New USSR Periodical on Plastics Announced

"Plasticheskiye Massy," [Plastics]; leaflet published by Goskhimizdat, Moscow, 6 Apr 59, 2 pp

"Subscriptions are accepted for the periodical Plasticheskiye Massy, an organ of the State Committee on Chemistry at the Council of Ministers USSR. Publication will start in 1959. Beginning with July, four issues of the periodical will be published in 1959. An issue will consist of ten standard printed sheets. The subscription price for 6 months is 32 rubles. The price of an individual issue is 6 rubles.

"The periodical Plasticheskiye Massy will outline the principal trends in the development of the industry producing plastics, polymers, and raw materials consisting of polymers, as well as problems pertaining to the application of plastics in different fields of the national economy. This periodical will publish articles dealing with new kinds of plastics and polymer materials (for instance, a special division of the periodical will be devoted to organosilicon polymers), methods of their conversion into finished articles, improvement of technological processes, automation and mechanization of technological processes, production equipment, and equipment for the testing of plastics, synthetic resins, and articles made of them. Major attention will be paid to problems involved in the improvement of the quality of production, introduction of advanced technology, exchange of experience acquired in production, rationalization and new inventions, improvement of the productivity of labor, lowering of costs, improvement of working conditions, and safety measures.

"The periodical will publish articles on technical and economic subjects, describe experience acquired in the operation of plants, and report on work in the field of plastics done at scientific research institutes and higher educational institutions.

"The journal will also publish discussions on timely problems in the field of the physics, chemistry, and technology of polymer materials and plastics. The division of bibliography will contain reviews and brief notices concerning articles and books dealing with high polymers and plastics.

"Brief notices in regard to the most important new research, technical achievements, and economics of the production of plastics in foreign countries will also be published.

"The periodical will serve the needs of engineering and technical personnel and skilled workers occupied at plants producing plastics, workers at scientific research institutes and planning and design [project] institutes, professors, instructors, and students at higher educational institutions and technical schools, and also engineers and technicians working in the chemical, petrochemical, machine building, aviation, shipbuilding, automobile, construction, and other industries."

10. A Continuous Chromathermographic Method to Control Industrial Production of Technical Krypton

"Determination of the Content of Krypton and Xenon," by Ye. V. Vagin, Candidate of Chemical Sciences, and S. S. Petukhov, Candidate of Technical Sciences: Moscow, Kislorod, Vol 12, No 2, Mar/Apr 59, pp 33-36

A chromathermographic method for the continuous determination of krypton and xenon in the first krypton concentrate is described. The method was developed by the All-Union Scientific Research Institute of Oxygen Equipment Building (VNIIKIMASh). Equipment for the determination of krypton according to the method described is now being produced industrially.

Inorganic Chemistry

11. USSR Developments in Inorganic Chemistry in Connection With the Current Seven-Year Plan

"Tasks of Soviet Inorganic Chemistry in Connection With the Decisions of the 21st Congress CPSU," by V. I. Spitsyn; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 6, Jun 59, pp 1227-1232

The 1959-1965 Seven-Year Plan provides for a considerable increase in the production of rare metals, semiconductor materials and ferromagnetics, and corrosion-resistant and heat-resistant metals. Expansion of the applications of nuclear energy and construction of a number of nuclear energy electric power plants set new tasks to inorganic chemistry. These tasks involve the production of special materials to be used in nuclear technology, the development of improved methods for the separation of elements present in microconcentrations, and participation of inorganic chemists in work on the application of radioactive isotopes. In outlining the principal directions along which Soviet science will develop, N. S. Khrushchev enumerated in his report to the 21st Congress of the CPSU the following aims that are to be attained: mastery of controlled thermonuclear reactions; extensive application of nuclear energy for power generation as motive power in transportation; expansion of the use in the national economy of synthetic materials, products of nuclear fission, and radioactive isotopes; solution of problems involved in many-sided mechanization and automation of production processes and creation for this purpose of new technical means based on the extensive application of the latest achievements of physics, radioelectronics, and computer techniques. Notwithstanding the fact that the developments enumerated are primarily in the fields of physics and engineering, inorganic

chemistry must play an important role in many of them. This applies to the development of new synthetic materials, the manufacture of heat-resistant products, the conversion of nuclear fuel, and the separation of radioactive isotopes.

Research on inorganic polymers is of primary importance from the standpoint of the developments foreseen. Organic polymers are being applied extensively at present and possess many useful properties. However, they have an important shortcoming, i.e., a low resistance to heat. Even the most stable product of this type, i.e. teflon (polytetrafluoroethylene), is stable only up to the temperature of 300° and begins to decompose at 390°. Plastic polymers of inorganic origin ought to exhibit a higher thermal stability. Unfortunately, they have not been investigated to a sufficient extent as yet. One may mention in connection with this that phosphonitryl chloride, $NPCl_2$, polymerizes at 250-350°, forming inorganic rubber. Derivatives of boron hydride, e.g., aminoborine (BH_2HN_2), are also capable of polymerization. High-polymer derivatives of boron require the most thorough investigation. There can be no doubt that new inorganic compounds will be found which may serve as starting materials for the production of polymers. A short time ago, it was possible to produce even elemental carbon in the form of flexible filaments which are suitable for the weaving of fabrics and the production of adsorbents of superior quality. It is very likely that the material in question is related to high polymers.

Because of the ample facilities available in the USSR for research in inorganic chemistry, work in this field can be conducted on an extensive scale. Particular attention should be paid to the development of the chemistry of nonmetals, particularly silicon, phosphorus, sulfur, and the halogens.

Rare elements are being introduced into technology at an increasingly rapid rate. During recent years, the production of pure metallic vanadium was organized. Aviation technology and the chemical industry require large quantities of metallic titanium. Zirconium that has been freed of hafnium has become indispensable in the construction of nuclear reactors.

Pure and ultra-pure metals and also oxides and other compounds of rare elements are acquiring increasing importance for applications as semiconductors and other uses for which they become suitable by reason of the new physical and chemical characteristics acquired by them as a result of the elimination of impurities.

For many years to come inorganic chemistry will be faced with the task of expanding the investigation of rare elements and their alloys and compounds. Considerable attention must be paid to developing the chemistry of zirconium and hafnium and also to investigating the properties of compounds formed by individual rare-earth elements. Of great importance is the application of rare-earth elements for the synthesis of new or little-known semiconductor compounds, i.e., sulfides, selenides, tellurides, lower oxides, etc. The scientific aspects of new methods for the extraction of rare elements from raw materials and processes for the production of rare metals in a state of exceptionally high purity must be investigated. In this work, technological methods which are most advantageous from the economic standpoint must be found. Research on the chemistry of rare elements must be conducted in close contact with physicists and technologists, so that new and valuable applications for the substances synthesized can be found in the shortest possible time.

Within the next few years it will be necessary to expand work on the synthesis of new molecular and complex compounds. During a long time, the principal objects of investigation in work on the synthesis of complex compounds were chromium, cobalt, the platinum metals, and a few other elements. One must expand this range of elements and use as complex-formers such elements as boron, aluminum, silicon, titanium, zirconium, phosphorus, vanadium, sulfur, the halogens, and other elements. The synthesis of new heteropolycompounds constitutes a new and very important field of research. Within the same range of investigation are problems of the synthesis of two-component, three-component, and multicomponent complex salts and also of molecular compounds with a great number of components. The synthesis of compounds of the types indicated is of considerable interest from the standpoint of determining the limits of the action exerted by the residual chemical agent and of elucidating laws which govern the structure of complex substances of this type. Work in the field of the chemistry of complex compounds will undoubtedly also yield results that are valuable from the practical standpoint, particularly in furnishing new means for the separation of rare elements and also of common elements.

In discussing the possibilities of inorganic synthesis, one must not underestimate work on the preparation of new two-component substances of the type of borides, carbides, silicides, nitrides, phosphides, oxides, etc.

Many substances of this class have great importance from the standpoint of their application as materials of great hardness or as materials exhibiting a high resistance to heat. Others are interesting from the standpoint of structure and of the type of chemical bonding. The highest melting substances known at present belong to this class. These substances are the tantalum carbide TaC (melting point 3,880°) and a solid solution consisting of tantalum and hafnium carbides (melting point 3,950°). Both of these materials were prepared synthetically.

Experimental techniques applied in inorganic synthesis require some improvement. For instance, the great majority of scientific research laboratories can carry out processes in vacuum, but many of them are not equipped to apply high and superhigh pressures. Because of the important role which the application of high pressure has played in the production of synthetic ammonia and other nitrogen compounds, of synthetic liquid fuel, of a number of plastics, and of other substances, one must expand the use of high pressures in inorganic synthesis. Important results have been obtained in investigations of the effect of high pressures on complex compounds. It is necessary to make high-pressure techniques generally accessible for the purposes of inorganic synthesis.

It is necessary to develop by every possible means experimental work at high temperatures (up to 3000° C).

One must remember that progress in the synthesis of new heat-resistant, high-melting, and hard materials depends on the development of suitable equipment which will make it possible to attain high temperatures and measure them. This field of research is of exceptional interest to inorganic chemists from the theoretical standpoint. The most valuable results can be expected from work in which both high temperatures and high pressures are used. The synthesis of diamonds is a typical example of results that may be expected in this field. It is not out of the question that new materials which are harder than diamonds can be obtained under such conditions.

On the other hand, one must develop methods of synthesis at low temperatures, using liquid gases such as nitrogen, hydrogen, and perhaps helium as cooling agents. One must also point out that the successes achieved as the result of applying liquid ammonia for the synthesis of many new compounds suggests that a search for other active reagents be made among liquefied gases.

One must apply various methods of activating atoms in processes of inorganic synthesis by applying nuclear radiation, conducting reactions in fields produced by an electric discharges or magnetic fields, or exposing the reacting substances to the effect of ultrasound. The application of electrochemical methods for the production of new inorganic substances must be expanded considerably.

Many scientific problems must be solved in the field of inorganic technology. The production of synthetic ammonia was formerly based on hydrogen from water gas or coke gas. At present naturally occurring methane and by-product gases of the petroleum converting industry have become the principal raw materials for hydrogen used in the synthesis of ammonia. A considerable amount of research must be done in connection with this development.

Of great importance is further work on the radiation method of direct nitrogen oxidation to produce nitric acid.

In the field of sulfuric acid technology, the most important task is organization of the production of sulfuric acid from hydrogen sulfide obtained in connection with the refining of petroleum and the conversion of coal. Work must also be done on the production of sulfuric acid from various industrial by-product gases which contain sulfur dioxide in low concentrations.

It is necessary to organize the separation of rare-earth elements in connection with the conversion of apatite by the sulfuric acid method. The feasibility of separating these elements from the economic standpoint has already been demonstrated in connection with the nitric acid method of conversion.

Complex problems must be solved in connection with the development of the production of inorganic salts. One must survey and investigate from the physicochemical standpoint deposits of potassium, magnesium, borates, and other salts in the east and southeast of the USSR. Extensive research will have to be done on the many-sided utilization of potassium-magnesium salts, borates, and phosphates of the southern Ural and Caucasus regions, of the sulfate-soda raw materials derived from the lakes of Western Siberia, and of the potassium salts of Belorussia and other regions of the USSR in which these salts occur. There are a number of unsolved problems in connection with the utilization of the inorganic salts of Kara-Bogaz-Gol, specifically in connection with the extraction of boron, lithium, and other rare elements.

[SIR Note: In speaking of the production of flexible filaments consisting of elemental carbon, the author presumably had in mind a process for the graphitization of textile fibers, e.g., rayon: see Science News Letter, Vol 75, No 19, 9 May 59, p 296.]

12. Metal Indicator Method to Determine Stability of Complexes

"A Metal Indicator Method for the Determination of the Stability of Complexes," by A. K. Babko [Kiev State University imeni T. G. Shevchenko]; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 5, May 59, pp 1055-1059

A metal indicator method is proposed to determine the stability of complexes formed by different metal ions with the same additive. Indicator systems are used in which the optical density changes reversibly depending on the concentration of the additive A. To a system of this type containing a known quantity of A measurable quantities of ions of the metals M^{I}, M^{II}, ... M^{n} are added. When equal optical

effects are produced, the interrelationship

$$[M^{I}] : [M^{II}] : \ldots\ldots\ldots [M^{n}] = K_{M^{I}A} : K_{M^{II}A} \ldots\ldots\ldots : K_{M^{n}A}$$

is valid, where K are the dissociation constants of the corresponding complexes. From the ratio of volumes of solution M^{I}, M^{II} ..... used to achieve equal optical effects, one can find the relative position of the metals in question in a sequence indicating the stability of complexes. In some cases a simple calculation of the numerical values of K is possible when the dissociation constant of no more than one complex is known. In other cases even this condition does not have to be fulfilled: one can calculate K from the dissociation constant of the acid H_nA and variables depending on experimental conditions. The general conditions are considered under which the method described can be applied.

13. Stability of Fluoride Complexes

"An Investigation of the Stability of Fluoride Complexes of Some Metals," by A. K. Babko and L. G. Shimadina, Kiev State University imeni T. G. Shevchenko; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 5, May 59, pp 1060-1066

The metal indicator systems Fe^{3+} -- SCN^{-} and Ti^{IV} -- H_2O_2 were used to determine the relative stability of fluoride complexes. On the basis of the results obtained, it was established that the ions investigated can be arranged in the following sequence as far as the stability of the simplest fluoride complexes of the type MF_n formed by them is concerned:

$$Zr^{4+}\ (Hf) > Th^{4+} > La^{3+} > Nb^{V} > Ta^{V} > Al^{3+} > Sn^{IV} > Be^{2+} > Fe^{3+} >$$

$$> UO_2^{2+} > Ca^{3+} > Ti^{3+} > (In^{3+},\ Ce^{IV},\ SiO_2)$$

The approximate values of dissociation constants were calculated for some complexes. These values were found to be in satisfactory agreement with data published in the literature.

14. Stability of Fluoride Complexes Depending on Position of Central Atoms in Periodic System of Elements

"The Connection Between the Stability of Fluoride Complexes and the Position of the Central Atoms of These Complexes in the Periodic System of Elements," by A. K. Babko [Kiev State University imeni T. G. Shevchenko]; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 5, May 59, pp 1067-1069

The dependence between the stability of fluoride complexes in aqueous solutions and the position of the central atoms of these complexes in the periodic system of elements is considered and represented graphically. Generally speaking, the stability of fluoride complexes increases as the radius of ions decreases and the charge of these ions increases. However, this correlation is complicated by the competing influence of the bond between the central ion and the oxygen ion. The fluoride complex of zirconium is the most stable. As far as elements of the large periods are concerned, ions which have an electron shell of the noble gas type form considerably more stable complexes.

15. Heat Content and Heat Capacity of Lithium Chloride at High Temperatures

"The Heat Content and Heat Capacity of Lithium Chloride at High Temperatures," by E. N. Rodigina, K. Z. Gomel'skiy, and V. F. Luginina, Sverdlovsk Affiliate, All-Union Scientific Research Institute of Metrology imeni V. I. Mendeleyev; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 5, May 59, pp 975-978

Experimental data were obtained on the heat content and heat capacity of lithium chloride in the temperature range of 94-802°. On the basis of these data, equations are proposed for the heat content and heat capacity of lithium chloride in the solid and liquid states. The latent heat of fusion and the entropy of melting were determined and found to be equal to 4.67 ± 0.05 kilocalories/mol and 5.29 ± 0.05 calories/mol degree, respectively.

The melting point was found to be equal to 610 ± 1°.

16. New Insect Repellents Being Tested

"New Repellents," by I. V. Zil'berminta, Candidate of Biological Sciences; Moscow, Nauka i Zhizn', No 3, Mar 1959, pp 66-67

The most widely used repellent for protection against insects is dimethylphthalate. However, it has several drawbacks. Its effective action lasts no more than 4-5 hours at lower temperatures and only an hour at higher temperatures. One must be careful not to expose the eyes or the mucous membrane of the nose or mouth to it. It is also easily washed out of impregnated clothing by laundering.

Professor A. N. Kost, chemist at Moscow State University, and Docent Ye. Kh. Zolotarev, entomologist of the biology-soil faculty, have synthesized and tested some new more-effective repellents. The two most effective, of the more than 200 synthesized, are acetyltetrahydroquinoline and formyltetrahydroquinoline. According to their properties of pungency and length of effectiveness, they are 5-6 times more effective than dimethylphthalate. The strong repelling action of these preparations permits them to be used for protection against diptera and such dangerous arthropods as Ixodes ticks -- vectors of spring-summer encephalitis.

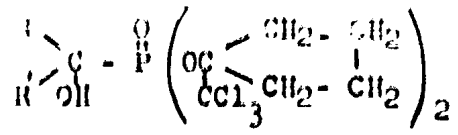
The new repellents have been named "Kyuzol" and are being used to impregnate clothing. Clothing so impregnated has offered complete protection against diptera for 6 weeks and does not lose its properties when laundered.

17. Synthesis of Several Candidate Organophosphorus Insecticides

"Concerning the Interaction of Dialkylphosphorous Acids With Aldehydes and Ketones. XIX. Di-1-trichloromethyl-cyclopentyl-1 esters of alpha-Hydroxyalkylphosphic Acids," by V. S. Abramov and V. K. Khayrullin, Kazan Chemicotechnological Institute; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 4, Apr 59, pp 1222-1225

The authors found that di-1-trichloromethylcyclopentyl-1-phosphorous acid reacts with aldehydes and ketones without a catalyst at room temperature (the reaction is accelerated on gradual heating to 50-60° C.) yielding as condensation products di-1-trichloromethylcyclopentyl-1 esters of substituted alpha-hydroxymethylphosphinic acids.

A total of ten new esters were synthesized and characterized. The results are presented in tabular form. The general formula of these esters is as follows:



where R' represents CH3, C2H5, normal C3H7, iso-C4H9, CCl_3, C6H5, p-CH3C6H4, m-NO2C6H4, o-NOC6H4, R represents H. In one compound, both R and R' are replaced by the $-(CH_2)_5-$ group.

18. Research on Organic Insectofungicides

"From the Field of Organic Insectofungicides. XLI. On the Interaction of Dialkylchlorothiophosphates and Phosphorus Thiotrichloride With Phenols in the Presence of Tertiary Amines," by Ya. A. Mandel'baum, N. N. Mel'nikov, and Z. M. Bakanova, Scientific (Research) Institute of Fertilizers and Insectofungicides; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 4, Apr 59, pp 1149-1151

In their attempt to find a synthesis for mixed esters of thiophosphoric acid which would hold side reactions, especially isomerization of thiophosphates, to a minimum, the authors studied the reaction of dialkylchlorothiophosphates with phenols in the presence of triethylamine. They found that the O,O-dialkyl-O-arylthiophosphates which are formed apparently as a result of an exchange reaction are obtained with good yields by this reaction.

The aryldichlorothiophosphates are obtained with satisfactory yields upon the interaction of phenols with phosphorus thiotrichloride in the presence of triethylamine.

19. Insecticidal Effect of Aldrin and Dieldrin

"Experiment of the Application of Dieldrin and Aldrin for Disinfestation" by V. N. Plyater-Plokhotskaya, Central Scientific-Research Laboratory of Hygiene and Sanitation on Water Transport Facilities; Moscow, Gigiyena i Sanitariya, Vol 24, No 2, Feb 59, pp 85-87

A report on the results of tests which were conducted to determine the effectiveness of dieldrin and aldrin when used as insecticides for the control of red roaches, Blatella germanica L, is presented. The tests were made on ships of the Central Scientific-Research Laboratory

of Hygiene and Sanitation on Water Transport Facilities. Aldrin and dieldrin are crystalline substances, insoluble in water, but soluble in organic solvents. The tests established that both preparations are considerably more toxic to the red roaches than is DDT. It was found, however, the neither of the preparations is 100 percent effective and that repeated treatments are necessary for the control of the insects.

Nuclear Chemistry

20. Discovery of Element 102

"Concerning the Discovery of Element 102," by V. Druin; Moscow, Atomnaya Energiya, Vol 6, No 6, Jun 59, pp 678-679

At the Eighth Mendeleyev Congress of General and Applied Chemistry, which was held in March 1959 in Moscow, G. N. Flerov, Corresponding Member Academy of Sciences USSR, and Prof A. Ghiorso (USA) presented reports on work done on the synthesis of element 102.

The first report on the isolation of element 102 appeared in print in 1957. A collaborating group of American, British, and Swedish scientists reported that they had isolated chemically an isotope of elements 102 (supposedly 102^{253}) subsequently to experiments in which Cm^{244} was irradiated with C^{13} ions accelerated in a cyclotron. According to the information given by these scientists, the isotope isolated by them undergoes α-decay, has a half-life of 10-15 minutes, and emits α-particles with an energy of 8.5 Mev.

However, as was mentioned in the reports, the bad reproducibility of the results aroused astonishment even then, as well as the lack of correspondence between the considerable length of the half-life of the element and the relatively high energy of the α-particles.

As has been pointed out in Ghiorso's paper, it became possible to check the results obtained in Stockholm when the linear accelerator of heavy ions was put into commission at Berkley. Experiments done in the USA were conducted under conditions analogous to those of the experiments in Sweden. After careful, but unsuccessful attempts to obtain an isotope of element 102 with the properties described above, American scientists who worked under the direction of G. Seaborg and A. Ghiorso came to the conclusion that the information given by the Stockholm group was faulty.

G. N. Flerov described work on the synthesis of element 102 carried out in the USSR. Experiments along this line were started in 1956 and continued until the end of 1958. These experiments were conducted by a large group of physicists and chemists at the Institute of Nuclear Energy, Academy of Sciences USSR. Also, workers at the Joint Institute of Nuclear Research and the Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy participated.

The first successful results in this work were obtained in the fall of 1957. Element 102 was obtained as a result of the interaction between Pu^{241} nuclei and O^{16} ions accelerated in a cyclotron. The decay of the new element was recorded by means of a special tester and by using nuclear photoemulsions. It was established that the element 102 which is formed exhibits an alpha radioactivity and has an energy of the alpha particles equal to ~8.8 Mev. The half-life of the isotope obtained was found to be between several seconds and one minute. The supposed mass number of the isotope that has been synthesized is equal to 253. No long-lived activity which could have been ascribed to element 102 was detected in the experiments.

As has been pointed out in Ghiorso's report as well, the results of experiments carried out in Berkley and in Moscow were not in agreement with the results obtained in Stockholm.

Ghiorso in his report dwelt on the results of the work done by the Berkley group, i.e., G. Seaborg, himself, and others. In these experiments, carried out by irradiating Cm^{246} with C^{12} ions and using a special rapidly acting arrangement (a conveyer belt), the existence of short-lived isotopes of the new element was recorded. In the first experiments aimed at measuring the yield of Fm^{250}, which is a product of the decay of element 102, the investigators succeeded in determining the half-life of one of the isotopes of element 102, namely 102^{254}. This half-life amounted to ~3 seconds. Further improvement of the technique used made it possible to record by means of an ionization chamber α-particles derived from the decay of 102^{254}.

Measurement of the energy of α-particles yielded a value of ~ 8.3 Mev. The experiments described were carried out in 1958 and in the beginning of 1959. A somewhat unexpected result was the observations of splinters derived from the spontaneous fission of 102^{254}. Preliminary experiments showed that in addition to α-decay the isotope 102^{254} undergoes spontaneous fission in approximately 30% of the cases. In other words, the period of spontaneous fission is smaller by a factor of 10^5 - 10^6 than that which would be expected on the basis of a systematic treatment of even-even nuclei.

Early in 1959 an attempt was made to determine the characteristics of the radioactive decay of 102^{253} (i.e., $T_{1/2}$ and E_α) in connection with the irradiation of Cm^{244} with C^{13} ions. On the basis of preliminary data, the isotope 102^{253} was found to have a $T_{1/2}$ of ~15 seconds and an E_α = ~8.8 Mev, which is in excellent agreement with results obtained at G. N. Flerov's laboratory in connection with the irradiation of Pu^{241} with O^{16} ions.

Nuclear Fuels and Reactor Construction Materials

21. Determination of Uranium With the Aid of Chromium (II) Compounds

"The Problem of the Determination of Uranium With the Aid of Chromium (II) Compounds," by Ye. A. Nikolayev, Chair of Analytical Chemistry, Moscow State University; Moscow, Vestnik Moskovskogo Universiteta -- Seriya Matematiki, Mekhaniki, Astronomii, Fiziki, Khimii, Vol 13, No 6, Nov/Dec 58, pp 105-109

The velocity of the oxidation of chromium (II) by oxygen of the air in hydrochloric acid solutions, sulfuric acid solutions, and in the presence of acetate ions was investigated. The results obtained confirmed that it is possible to apply chromium (II) for the preliminary reduction of uranium preceding oxydimetric determination of this element. The effect of a number of factors on the process of potentiometric titration of uranium with chromium (II) was investigated. It was established that one can determine hexavalent uranium by the chromometric method when vanadium is present in a ratio of concentrations amounting to U: V = 1:1.

22. Colorimetric Determination of Thorium With Azo Compounds

"Colorimetric Determination of Thorium With Some Azo-Compounds," by Ye. S. Przheval'skiy (deceased), A. P. Golovina, and A. F. Kuteynikov; Chair of Analytical Chemistry, Moscow State University; Moscow, Vestnik Moskovskogo Universiteta -- Seriya Matematiki, Mekhaniki, Astronomii, Fiziki, Khimii, Vol 13, No 6, Nov/Dec 58, pp 99-104

The following organic azo-compounds were synthesized and tested as colorimetric agents for barium: benzene-4-sulfonic acid-(-1-azo-5)-8-hydroxyquinoline (I); benzene-2-arsonic acid-(-1-azo-1)-2-hydroxynaphthalene-3-6-disulfonic acid (thoron) (II); and benzene-2-arsonic acid-(-1-azo-3)-4, 5-dihydroxynaphthalene-2, 7-disulfonic acid (arsenazo reagent) (III). Colorometric methods for the determination of thorium with the three reagents mentioned were worked out. It was established that colorimetric

determination of thorium with II can be carried out in the presence of hexavalent uranium, trivalent cerium, and lanthanum. It was also established that it is possible to determine thorium colorimetrically with III in the presence of hexavalent uranium and of rare-earth elements. Furthermore, it was established that the composition of the compound formed by thorium with III corresponds to a ratio of Th: III = 1:1.

23. Synthesis of Plutonyl Chloride

"Separation and Investigation of the Physicochemical Properties of Plutonyl Chloride," by I. F. Alenchikova, L. L. Zaytseva, L. V. Litis, and V. V. Fomin; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 5, May 59, pp 961-962

A solution of plutonyl chloride was prepared by oxidizing tetravalent plutonium chloride with chlorine. The plutonyl chloride was isolated by evaporation of the solution in vacuum at room temperature. The chemical analysis of the plutonyl chloride obtained indicated that the composition of this compound corresponds to the formula $PuO_2Cl_2 \cdot 6H_2O$. The electron diffraction and infrared absorption spectra of crystals of plutonyl chloride prepared in the manner described showed that PuO_2^{2+} ions are present in them and tetravalent plutonium is absent. It was established that both the electron diffraction and infrared absorption spectra of plutonyl chloride change after prolonged storage as a result of the reduction of plutonium under the action of alpha-radiation.

24. Some Organic Compounds of Beryllium

"Beryllium Alcoholates; Part I," by N. Ya. Turova, A. V. Novoselova, and K. N. Semenenko, Moscow State University; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 5, May 59, pp 997-1001

It was established that the reaction of metallic beryllium with absolute ethyl alcohol in the presence of $BeCl_2$, $HgCl_2$, or I_2 is a convenient method for the synthesis of beryllium ethylate. Some properties of this compound were investigated including its behavior towards absolute ethyl alcohol, anhydrous acetic acid, and an alcoholic solution of $BeCl_2$.

A semialcoholate of beryllium of the composition Be $(OC_2H_5)(OCOCH_3)$ was prepared. It was established that this compound is identical with the beryllium semialcoholate of the same composition obtained by the alcoholysis of beryllium oxyacetate with ethyl alcohol. It was found that the interaction of metallic beryllium with absolute methyl alcohol in the presence of $BeCl_2$, $HgCl_2$, or I_2 leads to the formation of compounds of varying composition which have the general formula $[x\ Be(OCH_3)_2 \cdot y Be(OCH_3)Hal]_n$.

25. Valency of Praseodymium in Some Compounds

"The Problem in Regard to the Composition of Praseodymium Oxides," by M. N. Ambrozhiy and A. M. Pol'tsev, Saratov State University imeni N. G. Chernyshevskiy; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 5, May 59, pp 969-971

It was established that some praseodymium oxides contain tetravalent praseodymium rather than praseodymium in the pentavalent state, as was assumed formerly. A chemical method is proposed for identifying tetravalent praseodymium. Quantitative determination of praseodymium oxide by the method described makes it possible to obtain definite information on the composition of praseodymium oxides that form as a result of the thermal decomposition of praseodymium oxalate, praseodymium nitrate, and other salts of this element.

26. Separation of Niobium From Titanium by Ion-Exchange Chromatography

"Separation of Niobium From Titanium by the Method of Ion-Exchange Chromatography," by I. P. Alimarin and N. P. Borzenkova; Moscow, Vestnik Moskovskoga Universiteta--Seriya Matimatiki, Mekhaniki, Astronomii, Fiziki, Khimii, Vol 13, No 6, Nov/Dec 1958, pp 191-199

The curves of adsorption of niobium and titanium by ion-exchange resins from sulfuric acid solutions and citric acid solutions were determined. The optimum conditions for the separation of these elements were established. It was shown that the curves of adsorption of niobium and titanium by ion-exchange resins from the sulfuric acid solutions in the absence of other complex-forming agents are similar and that separation of these elements by means of the SVS cation exchange resin is impossible when 0.1-1.0 N solutions of sulfuric acid are used. Both niobium and titanium are in the colloidal state in such solutions; their adsorption by the ion-exchange resin is apparently of a purely physical type. The nature of curves of adsorption from citric acid solutions of different concentrations indicates that niobium and titanium are present in these solutions in the form of rather unstable citrate complexes which readily decompose

upon addition of inorganic acids. The differences in the cationic adsorption of niobium and titanium from 5% citric acid solutions containing sulfuric acid in a concentration of 0.3-0.4 N indicate that one can separate these elements when they are present together in such solutions. If perchloric acid, which does not form complexes, is used instead of sulfuric acid, niobium and titanium are in the colloidal state and their separation becomes impossible.

27. Book on the Metallurgy of Calcium

Metallurgiya Kal'tsiya (The Metallurgy of Calcium), by N. A. Doronin, Atomizdat, Moscow, 1959, 92 pages

According to the author's introduction, an adequate monograph on the production of metallic calcium was not available hitherto either in the USSR or non-USSR literature. Information on the most thoroughly investigated industrial method for the production of metallic calcium, i.e., the electrochemical method, had not been published in the form of a generally available book or manual.

According to the author, the development of reaction engine technology, nuclear engineering, and certain other industrial fields has greatly increased the demand for high-melting rare metals, particularly beryllium, zirconium, titanium, and tantalum, as well as for the alloys based on these metals. The great chemical stability of these metals, and alloys based on them, makes them indispensable for the construction of present-day nuclear energy power-producing plants. These metals are produced from their compounds by the metallothermic method. One of the best reducing agents for producing these metals is metallic calcium. Metallic calcium is also used as a reducing agent in ferrous metallurgy as well as in the metallurgy of uranium and thorium.

The subject matter of the book is arranged as indicated in the following table of contents:

Table of Contents

The bibliography consists of 27 references, 26 of which are USSR published.

28. Contamination of Water-Cooling Circuit With Corrosion Products

"Investigation of the Contamination of the Water-Cooling Circuit at the First USSR Nuclear Energy Electric Power Station," by P. N. Slyusarev, V. A. Ivanov, and L. N. Nesterova; Moscow, Atomnaya Energiya, Vol 6, No 6, Jun 59, pp 639-643

The rate of the washing out of corrosion products from 1Kh18N9T steel by water used as coolant at the first USSR Nuclear Energy Electric Power Station was investigated. The dependence of the rate of washing out of corrosion products on the rate of blowing out of the first water-cooling circuit with fresh water and on the power of the reactor was determined.

It was established that under the effect of ionizing radiation emitted by the nuclear reactor, formation of nitric acid as a result of the oxidation of dissolved nitrogen takes place in the water used as coolant. The chemical nature and composition of the corrosion products was investigated by the methods of ion exchange, electrodialysis, ultrafiltration, and spectral, radiometric, and chemical analysis. It was established that all products of the corrosion of 1Kh18N9T steel are present in the ionic state in the water used as coolant, with the exception of iron and copper (sodium calcium, manganese, nickel, cobalt, chromium, and silicon were found to be present in the ionic state).

29. Hungarian Institute Will Develop Nuclear Reactor Corrosion Protection

"Corrosion Protection for Atomic Reactors is Being Prepared in the Heavy Chemical Industry Research Institute," (unsigned article); Budapest, Magyar Nemzet, 3 Jun 59

When the first Hungarian atomic reactor was put into operation, exploratory work was also begun at the Veszprem Heavy Chemical Industry Research Institute (Nehezvegyipari Kutato Intezet) on corrosion protection of equipment used in connection with nuclear fission. It has been established that the life expectancy of the equipment depends primarily on the effectiveness of the corrosion-resistant cladding.

After summarizing foreign experiences, corrosion protection will be developed at the Institute for atomic reactors which will be placed in operation in Hungary in the future and, on the basis of data which have now been prepared, they will direct attention to existing atomic reactor equipment which has been destroyed by corrosion.

Organic Chemistry

30. Study of Reactions Between Halonitroparaffins and Olefins to Synthesize New Weed Killers and Plant Growth Regulators

"Concerning the Interaction of Halonitroparaffins With Olefins," by Yu. A. Baskakov and N. N. Melnikov, Institute of Plant Physiology of the Academy of Sciences USSR; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 4, Apr 59, pp 1233-1235

The purpose of this research was to study the reaction between halonitroparaffins and olefins since the higher polynaloninitrocompounds have practical interest as weed killers and plant-growth regulators.

The olefins used in the experiments were hexene-1, cyclohexene, heptene-1, octene-1, and iso-octene-1. The halonitroparaffins were chloronitromethane, dichloronitromethane, chloropicrin, bromonitromethane, tribomonitromethane, and 1,1-dichloro-1-nitroethane.

The reactions were conducted both under ultraviolet light and in the presence of benzoyl peroxide. Because of the presence of the semipolar bond in the molecule of the nitrocompounds it was expected that the reaction between halonitroparaffin and olefin would proceed very slowly. Under the experimental conditions imposed, only tribromonitromethane reacts with the olefins with any significant speed. This reaction can be represented in the idealized form:

$$RCH = CH_2 + CBr_3NO_2 \longrightarrow RCHBr\text{-}CH_2CBr_2NO_2.$$

Thus, four previously undescribed tribromonitroparaffins were synthesized and characterized.

31. New Plant-Growth Regulator Candidates

"Some New Acid Amides -- Regulators of Plant Growth," by K. S. Bokarev, Institute of Plant Physiology of the Academy of Sciences USSR; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 4, Apr 59, pp 1358-1363

A great number of variously substituted acid amides which exhibit growth regulating properties have been described in recent publications. Recently, several halophenoxyacyl derivatives of amino acids were synthesized; upon testing on plants some of these amides approached the corresponding halophenoxyacetic acid in activity, while others were less active, while still others were completely inactive.

In the author's opinion, the above-presented data indicate either that plants cannot hydrolyze some of these amides or that the activity of the compounds depends on the specific peculiarities of the molecular structure as a whole and on their capacity to be rearranged by the plant.

The author describes the synthesis and characterization of 13 acyl derivatives of para-aminobenzoic and anthranilic acids (12 of them have not been previously described in the literature) which he considers as possible plant-growth regulators and stimulants.

32. Difluorochloromethane as a Difluoromethylating Agent

"Difluorochloromethane as a Difluorochloromethylating Agent. I. The Reaction of Difluorochloromethane With Sodium Alcoholates and Mercaptides," by L. Z. Soborovskiy and N. F. Baina; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 4, Apr 59, pp 1142-1143

Difluorochloromethane (freon-22) was first prepared in 1931. Because it had been considered a chemically inert substance little investigation had been done on its chemical properties. In spite of this, the authors have established that the chlorine atom in difluorochloromethane is comparatively mobile and therefore can serve as a difluoromethylating agent.

At room temperature difluorochloromethane reacts with sodium alcoholates and mercaptides in an anhydrous alcoholic medium, forming simple fluorinated esters and fluorinated sulfides according to the general equations:

$$CHF_2Cl + NaOR \longrightarrow CHF_2OR + NaCl.$$

$$CHF_2Cl + NaSR \longrightarrow CHF_2SR + NaCl.$$

Upon reacting sodium beta-hydroxyethylmercaptide with difluorochloromethane in ethyl alcohol, the previously unknown beta-hydroxyethyldifluoromethylsulfide was obtained with good yield. Likewise the previously undescribed difluoromethyl ester of acetoxime was prepared by reacting difluorochloromethane and the sodium derivative of acetoxime.

33. Difluorochloromethane as a Difluoromethylating Agent

"Difluorochloromethane as a Difluoromethylating Agent. II. The Reaction of Difluorochloromethane With Sodium Dialkylphosphites," by L. Z. Soborovskiy and N. F. Baina; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 4, Apr 59, pp 1144-1146

The purpose of the present work was to study the possibility of using difluorochloromethane in the Michaelis-Becher reaction with the sodium derivatives of dialkylphosphorous acids to obtain the corresponding ester of difluoromethylphosphinic acid.

It was found that sodium derivatives of dialkylphosphorous acids react with difluorochloromethane in an inert medium such as petroleum ether. The diethyl, diisopropyl, and the dibutyl esters of difluoromethylphosphinic acid were successfully synthesized and characterized. The previously

undescribed dichloranhydride of difluoromethylphosphinic acid was obtained by reacting the dibutyl ester of difluoromethylphosphinic acid with phosphorus pentachloride under mild conditions (insufficient PCl_5, temperature 70° C.)

The authors discovered that by the action of PCl_5 on the ester of difluoromethylphosphinic acid simultaneously with the formation of the dichloranhydride of difluoromethylphosphinic acid a cleavage of the phosphorus-carbon bond occurs and the corresponding alkylphosphates are formed.

34. Synthesis of Organophosphorus Compounds From Hydrocarbons and Their Derivatives

"The Synthesis of Organophosphorus Compounds From Hydrocarbons and Their Derivatives. X. The Oxidative Chlorophosphination of Several Derivatives of Ethylene," by L. Z. Soborovskiy, Yu. M. Zinov'yev and T. G. Spiridonova; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 4, Apr 59, pp 1139-1141

It had been previously shown that with the oxidative chlorophosphination of olefins and chloro-olefins the acid chlorides of the corresponding chloro- and dichloroalkanephosphinic acids are formed. Recently a description was presented of the oxidative chlorophosphination of the methyl ester of acrylic acid.

In the present investigation the possibility for the oxidative chlorophosphination of ethylene derivatives containing bromine, chlorine, fluorine and such comparatively complex groups as sulfofluoride radicals was examined.

As a result of this work, five derivatives of ethylene, the acid chlorides of 1-chloro-2-bromo-, 1,2,2-trichloro-, fluorochloro-, fluorodichloro- and chloro-(fluorosulfo)- ethanephosphinic acid and also the acid chloride of 2-bromoethenephosphinic acid were synthesized.

Previously undescribed 1,2-dichlorobromoethane was likewise obtained.

35. New Method for Synthesizing Esters of Phosphinic and Thiophosphinic Acids

"New Method for Synthesizing Esters of Phosphinic and Thiophosphinic Acids. XXX. Concerning the Interaction of Dialkylphosphorous and Dialkylthiophosphorous Acids With Ketene," by A. N. Pudovik and V. I. Nikitina, Kazan State University; Leningrad, Zhurnal Obshchey Khimii, Vol 29, No 4, Apr 59, pp 1219-1222

It had been shown earlier that dialkylphosphorous and dialkylthiophosphorous acids are capable of addition to esters of isocyanic acid (cf A. N. Pudovik and A. V. Kuznetsova, Zhurnal Obshchey Khimii, Vol 25, p 1369, 1955), represented by the idealized equation:

$$RN{=}C{=}O + HOP(OR')_2 \longrightarrow RNH{-}CO{-}\overset{O}{\overset{\|}{P}}(OR')_2$$

In expanding and developing this line of research the authors thought of adding dialkylphosphorous and dialkylthiophosphorous acids to ketene. The reaction does not take place unless a catalyst, either pyridine or sulfuric acid, is present in small amounts. The reaction proceeds in two stages. The initially formed acetophosphinic or acetothiophosphinic esters upon further interaction with ketene form the dialkyl esters of acetoxyvinylphosphinic and acetoxyvinylthiophosphinic acids, respectively. The over-all reactions are exemplified by the following equations:

$$(RO)_2POH + CH_2{=}C{=}O \longrightarrow CH_2{=}C\begin{matrix}\diagup OH \\ \diagdown \overset{\nearrow O}{P}(OR)_2\end{matrix} \longrightarrow CH_3{-}CO{-}\overset{\nearrow O}{P}(OR)_2$$

$$CH_2{=}\overset{OH}{C}{-}\overset{O}{\overset{\|}{P}}(OR)_2 + CH_2{=}C{=}O \longrightarrow CH_2{=}\underset{OCOCH_3}{C}{-}\overset{O}{\overset{\|}{P}}(OR)_2.$$

The total yield of both products usually amounts to 75-80%.

The reaction between ketene and dialkylthiophosphorous acids proceeds analogously. The yields of acetoxyvinylthiophosphinic esters are less in these reactions than in the reactions with dialkylphosphorous acids and amounted to 40-60%. The reactions proceed according to the equations:

$$CH_2{=}C{=}O + HSP(OR)_2 \longrightarrow CH_2{=}\overset{OH}{C}{-}\overset{S}{\overset{\|}{P}}(OR)_2 \xrightarrow{CH_2=C=O}$$

$$\longrightarrow CH_2{=}\underset{OCOCH_3}{C}{-}\overset{S}{\overset{\|}{P}}(OR)_2.$$

Organometallic Compounds

36. Organoberyllium Compounds

"Beryllium-Organic Compounds," by A. V. Novoselova, K. N. Semenenko, and N. Ya. Turova, Chair of Inorganic Chemistry, Moscow State University; Moscow, Vestnik Moskovskogo Universiteta -- Seriya Matematiki, Mekhaniki, Astronomii, Fiziki, Vol 13, No 6, Nov/Dec 58, pp 139-147

Non-USSR work on organoberyllium compounds is reviewed briefly. It is pointed out that organoberyllium compounds are used for the production of pure metallic beryllium (by electrolytic reduction to metallic beryllium; cf G. Wood and A. Brenner, Journal of the Electrochemical Society, Vol 104, 1957, p 29). They are also used as activators of the polymerization of unsaturated hydrocarbons (cf K. Ziegler's work). The preparation of beryllium-boron double hydrides and Wittig's work on the preparation of lithium-beryllium organometallic compounds are described.

Radiochemistry

37. Use of Radioactive Isotopes to Prevent Fouling in Sea-Water

"Application of Radioactive Isotopes to Prevent Fouling in Sea-Water," by N. A. Dolgopol'skaya, L. A. Il'in, I. A. Puzanov, and V. A. Tsenev; Moscow, Atomnaya Energiya, Vol 6, Jun 59, pp 674-676

On the basis of experiments carried out with Y^{91} it is concluded that a surface activity of 0.05 microcuries per square centimeter prevents fouling of plates immersed in sea-water. On the other hand, low activities of the order of 3×10^{-3} microcuries per square centimeter were found to stimulate the growth of organisms deposited on the plates. Glass plates were used in the experiments described. The authors suggest that isotopes with a longer half-life than that of Y^{91} be used for the actual formulation of anti-fouling compounds and give Tl^{204}, Ru^{106}-Rh^{106}, and Ce^{144} - Pr^{144} as examples of such isotopes.

38. All-Union Biochemical Society Established

"The Ukrainian Biochemical Society," (unsigned article); Kiev, Ukrayins'kyy Biokhimichnyy Zhurnal, Vol 31, No 2, 1959, p 302

On 7 February 1959, the Presidium of the Academy of Sciences USSR passed a resolution creating the All-Union Biochemical Society. A republic branch organization will be created in each Union Republic.

On 6 March, a Delegates Conference of the Ukrainian Biochemical Society was held in Kiev. Delegates from the Kiev, Kharkov, L'viv, Dnepropetrovsk, and Stalinsk branches were present. O. V. Palladin was selected chairman; I. N. Bulankin and V. P. Korotkoruchko vice-chairmen and N. M. Polyakova secretary. The Central Council of the Society is composed of 20 members. The total membership of the organization is 350 members.

III. ELECTRONICS

Communications

39. Ground Resistance in Regions of Permafrost

"Lowering of Ground Resistance in Rocky and Permafrost Regions", by S. A. Sokolov; Moscow, Elektrosvyaz', No 6, Jun 59, pp 65-70

The Central Scientific Research Institute of Communications has conducted a series of experiments aiming to reduce the ground resistance to electric current in regions of permafrost. Experimental grounding points were established at Skovorodino station, Amurskaya Oblast, to test for cheap and efficient means of lowering the ground resistance. Several grounding compounds were studied, including common salt and copper ferrocyanide.

The experiments revealed that resistance to grounding can be considerably reduced during winter in the permafrost region by insulating the ground above with snow or sawdust. It was disclosed that resistance to grounding is 25 times greater during the winter for places not protected with a snow cover or other insulating materials. A very satisfactory grounding can be secured at the bottom of a water body which does not freeze in the winter.

Components

40. Magnetic Pulse Shaper of One-Polarity Pulses

"Magnetic Pulse Shaper of One-Polarity Current Pulses for Feeding Magnetic Elements," by N. V. Korol'kov, Novocherkassk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Elektomekhanika, No 4, Apr 59, pp 28-45

Magnetic pulse amplifiers and relay-action logic elements are often used in computer engineering, automation, and other fields of electromechanics.

The problem of obtaining single-polarity current pulses for simultaneous feeding to a great number of elements at high frequency is rather difficult. To overcome such a difficulty, the author has developed a magnetic method of pulse shaping which utilizes the interaction of dc current and ac voltage. The advantage of this system is that it can supply pulse power to a great number of magnetic elements simultaneously through several shapers from a single ac source.

An experimental model of the pulse shaper was tested for a period of one year at the Laboratory of Electromodeling of the All-Union Institute of Scientific and Technical Information, Academy of Sciences USSR, and proved to be very efficient in supplying pulses to a great number of magnetic elements (several hundred). Good results were obtained for operation at a frequency of 50 kc.

41. Piezoelectric Transducer

"Piezoelectric Acceleration Transducers," by V. P. Nenyukov, A. S. Zhmur, and G. L. Lyapin; Moscow, Izmeritel'naya Tekhnika, No 5, May 59, pp 17-19

Quartz and barium titanate piezoelectric transducers for registering impact-type accelerations from 20 to 20,000 g are described.

Methods of assembly and calibration and a typical electrical circuit for use with the transducer are given.

The transducer, the inertial body of which weighs 1.2 grams, provides a voltage of 0.1 volt on the surface of the quartz disc for an acceleration W = 1,000 g.

Instruments and Equipment

42. Waveguide Characteristics Measuring Device

"Waveguide Measuring Line" (unsigned article); Moscow, Vestnik Svyazi, No 6, Jun 59, cover page

At the Scientific Research Institute of the Ministry of Communications an instrument was designed to measure the traveling-wave ratio and input impedance in wave guides used in the radio-relay system "Vesna." The device is manufactured in two models for wave guides of different cross section. The natural traveling-wave ratio of the device is 0.99; the frequency range of the detector head is 3,300-4,750 Mc. During the shifting of the probe along the slot, nonuniformity of the indicator reading does not exceed ± 1%.

43. Soviet Handbook on Instruments Used With Radioactive Materials

Spravochnik po Dozimetricheskim, Radiometricheskim i Elektronno-Fizicheskim Priboram, Schetchikam, Stsintillyatoram i Fotomnozhitelyam (Handbook on Dosimetric, Radiometric, and Electron-Physical Instruments, Counters, Scintillators, and Photomultipliers); Moscow, Publishing House of the Main Administration on the Use of Atomic Energy under the Council of Ministers USSR, 1959

A new illustrated handbook has been published which is intended to inform Soviet scientists and technical workers of the availability of contemporary devices designed for use with radioactive substances and nuclear radiation.

Brief technical data, designations, and operating conditions, and in some cases, prices, are given for a variety of instruments, including those for individual radiation monitoring, measurement of gamma, beta, and alpha radiation, measurement of neutron flux, and for determining air contamination. Also described are amplifiers and discriminators, scalers and analyzers, rectifiers, counters, scintillators and photomultipliers.

Organizations wishing to purchase any of the instruments described are directed to place orders through their respective ministries, sovnarkhozes, or departments which will, according to the type of instrument

desired, order directly either from the Soyuzglavspetsprom (All Union Main Administration of Specialized Industry), the Glavradiosbyt (Main Sales Administration of the Radio Industry), the Rosglavpriborsnabsbyt (Main Administration for the Supply and Sale of Instruments of the RSFSR), the Order of Lenin Agricultural Academy imeni K. A. Timiryazev, or the All-Union Trust "Soyuzreaktiv."

It is noted in the errata that due to a delay in publishing the handbook and subsequent reorganization, orders normally sent through the Glavradiosbyt should now be sent to the Soyuzglavspetsprom.

44. Transducer of Linear Displacement

"Measuring Transformer-Converter of Large Linear Displacement," by A. A. Kol'tsov; Novocherkassk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Elektromekhanika, No 3, Mar 59, pp 56-62

The article presents theoretical and experimental investigations of a new type transformer-transducer intended for measurement of large linear displacements and of other quantities which can be converted into proportional values of displacement.

On the basis of material presented in this article, the calculation of main parameters and characteristics of the industrial type displacement transducer is possible. This measuring transformer-transducer is an electromagnetic device having an ac current excitation winding and a measuring winding. The flux linkage of the measuring winding changes in proportion to the measured quantity in such a manner that the emf in the measuring winding is a single-valued function of the measured quantity.

Most widely used transducers of this type have a movale ferromagnetic core and can measure displacements in the range up to 30 mm.

Prof L. F. Kulikovskiy and the author have suggested a new construction of such a transducer, which is capable of directly measuring displacement up to several hundred millimeters. This new type of transducer is characterized by a moving winding and is designated as TPO.

At the All-Union Industrial Exhibit in 1958 a TP-1 system was demonstrated which incorporated a displacement transducer of the TPO type. The transducer was capable of measuring displacements up to 275 mm and the power in the excitation winding was 0.035 va.

45. Fourteen-Channel Oscillograph

"Type N-700 (POB-14M) Portable 14-Channel Oscillograph," by B. N. Froymovich; Moscow, Priborostroyeniye, No 5, May 59, p 30

The Kishinev Plant for electrical measuring instruments has begun the production of the type N-700 oscillograph designed at the Institute of Physics of the Earth imeni O. Yu. Shmidt, Academy of Sciences USSR.

This instrument is a universal recording device which registers both high-frequency and low-frequency processes. Such a wide range of frequency measurement is made possible through incorporation of several galvanometers, each with different frequencies of natural oscillations and a wide range of tape velocities. The natural frequencies of the galvanometers GB-IV-V-3, GB-IV-V-4, GB-IR-V-5, GB-IV-V-6, GB-IV-V-7 GB-IV-V-8 and GB-IV-V-9 are respectively as follows: 120, 300, 600, 1,200, 2,500, 5,000 and 10,000. The last five of these galvamometers are liquid filled and have a damping factor of 0.7. The instrument wiring is designed for a voltage of 500 v. The instrument has two tape holders, one for low speed and the other for high speed of the tape; each tape is 12 m long and 120 mm wide.

The reduction gear of the instrument permits the following tape speeds: 0.25, 1.0, 4.0, 16.0, 50, 64.5, 200, 250, and 300 cm/sec. The time markers are placed on the tape in the form of light lines at a frequency of 10 and 200 cycles. Visual display of the recording process on the screen is produced with the aid of a mechanical scanner.

The power to the instrument can be drawn from a 24-volt dc or ac power source; the power consumption is about 6 a. The over-all size of the instrument is 420 x 240 x 270 mm and it weighs 17 kg.

A drum-type tape holder, electrical heater, and remote control panel will be supplied to customers on request, beginning in 1960.

46. Highly Sensitive Photoelectric Fluxmeter

"On the Design of a Photoelectric Fluxmeter," by S. G. Rabinovich and A. N. Tkachenko, Moscow, Izmeritel'naya Tekhnika, No 5, May 59, pp 30-35

The principle of operation and basic circuit of a photoelectric fluxmeter (FEF) are given, and relationships are determined which will permit the computation of a highly sensitive photoelectric fluxmeter with predetermined constants for the measurement of single cycles of magnetic flux.

47. Universal Photoelectric Amplifier F17

"Photoelectric Amplifier F17," by A. N. Kasperovich; Moscow, Izmeritel'naya Tekhnika, No 5, May 59, pp 35-39

Universal photoelectric amplifiers F17, designed for use with a number of different instruments, were developed and have been produced since 1957 at the plant "Vibrator."

The construction of the three basic units of the amplifier -- the galvonometer, the illuminator, and the photoconductive cell -- are described. The photoconductive cell of cadmium sulfide was designed by B. T. Kolomiyets and A. O. Olesk and has high sensitivity, a wide resistance range, and a low temperature coefficient.

Modifications of the amplifier have been produced to provide voltage sensitivity (F17/1), current sensitivity (F17/2), and for use as stabilizers (F17/3).

The Measuring Instrument Plant (ZIP) has produced automatic styluses (N373) employing F17 amplifiers, while the "Vibrator" plant has used the amplifiers in photocompensation voltage stabilizers U1136.

The photoelectric amplifier F17 is expected to find wide application in various fields of science and technology.

48. New Waveguide Device for Dielectric Research

"A Device for Measuring Specific Inductive Capacitance at Superhigh Frequencies," by A. I. Tereshchenko; Moscow, Izmeritel'naya Tekhnika, No 5, May 59, pp 54-55

"The article discusses a device for measuring specific inductive capacitance, based on a method developed by the author in 1957 at Khar'kov State University, which operates on the use of the phase-sensitive properties of a wave guide discriminator. The discriminator compares the phase of waves reflected from a sample of the test dielectric and from a standard resonator. The result of this comparison is expressed in the form of the differential current of the detectors of the discriminator, which is proportional to the value of specific inductive capacitance of the sample."

The method and device were developed for the study of high-frequency dielectrics with small losses, such as titanates and other ceramic materials, but may be used also in liquid- and gas-dielectric research.

Materials

49. Investigation of the Piezoelectric Properties of Crystals

"Investigation of New Piezoelectric Crystals Carried Out on Small Samples," by V. A. Koptsik, K. A. Minayeva, A. Voronkov, A. F. Solov'yev, A. N. Izrailenko, Ye. G. Popkova, and G. I. Kozlova, Chair of Crystal Physics, Moscow State University; Moscow, Vestnik Moskovskogo Universiteta -- Seriya Matematiki, Mekhaniki, Astronomii, Fiziki, Khimii, Vol 13, No 6, Nov/Dec 58, pp 91-98

The results of an investigation of the piezoelectric properties of 111 organic and inorganic compounds are reported. A method proposed by V. A, Koptsik in 1955 was applied in the investigation described. By using this method, the piezoelectric effect can be determined on crystal grains and fragments no thicker than 0.1 mm.

50. Alloys in the System Al Sb-Al_2 Te_3

"Investigation of Alloys in the System Al Sb- Al_2 Te_3" by M. S. Mirgalovskaya and Ye. B. Skudnova; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 5, May 59, pp 1113-1120

Solid solutions in the system Al Sb- Al_2 Te_3 were investigated with particular attention to their properties as semiconductors.

Patents

51. Recent Soviet Patents in the Field of Electronics

"Class 21. Electrical Engineering" (unsigned article); Moscow Byulleten' Izobreteniy, No 9, 1959, pp 18-35

Class $21a^1$, 36_{01}, No 119542. S. I. Kochergin. A Method of Recording Electrical Signals on a Stationary Photographic Plate and Their Reproduction.

Class $21a^2$, 18_{08} No 119545. A. V. Rozanov and N. I. Valayev. Device for Limiting DC Input Signal of a Transistor.

Class 21a^2, 36_{22}, No 119546. L. A. Korobkov. A Method of Time-Sequence Compression and Expansion of Multichannel Pulse Signals in Systems of Communication.

Class 21a^4, 14_{01}. No 119548. V. M. Zhukov. A Device for Generation of High-Frequence Width-Modulated Pulses

Class 21a^4, 29_{04}. No 119551. B. I. Savitskiy. Method to Improve Noise Immunity of Superheterodyne Receiver.

Class 21a^4, 48_{01}. No 119552. V. S. Sirigin, Device for Reception of Polarization-Modulated Oscillations.

Class 21a^4, 71. No 119556. A. A. Vasil'kovskiy. Multilayer Film-Type Sensing Element of Hall's EMF.

Class 21a^4, 48_{04}. No 119553. A. N. Plemyannikov. Loop Direction Finder.

Class 21a^4 48_{66}. No 119555. B. B. Lagor'yev. Wide-Band Antitransmit-Receive Tube.

Class 21c, 46_{05}. No 119566. A. M. Dubinovskiy, Synchronous Servomechanism.

Class 21c, 47_{01}. No 119570. V. V. Ivanovskiy. Remote Control Device With Five-Digit Code Selection.

IV. ENGINEERING

52. 1959-1965 Program of Power Capacitor Development and Production

"Production of Power Capacitors and Problems for 1959-1965," by M. M. Morozov; Moscow, Vestnik Elektropromyshlennosti, No 6, Jun 59, pp 1-7

The tremendous progress in recent years in power engineering and other branches of industry has increased the demand for various types of high- and low-voltage capacitors. Recent investigations of thermonuclear reaction control, simulation of explosions, microsecond X-ray photography, and rock crushing with the aid of spark discharge were carried out with the help of power capacitors.

"Our new branch of the electrical industry -- power capacitor building -- is successfully solving the complex problems of developing and manufacturing new types of power capacitors.

"In 1958, the largest series-capacitor installation in the world for power factor correction was placed into operation on the 400-kv, 500,000-kva Kuybyshev-Moscow power line. On this line, the highly reliable 50-kvar capacitors of KPM 0.6-50-1 type were used.

"This installation made it possible to raise the transmission capacity of the line by 25%; the installation paid for itself during the first 2 months of operation.

"The production of only two power-capacitor plants in the USSR exceeds the combined production of power capacitors of such nations as West Germany, France, England, Sweden, Switzerland, and Italy."

The following problems of power capacitor development should be solved during the coming Seven-Year Plan: developing capacitor paper with lower loss angle (tangent); providing the capacitor plants with film-type nonpolar and polar dielectric materials in rolls; preparing chlorinated diphenyl of various modifications; producing metalized procelain and glass insulators.

Extensive scientific research should be done in the field of design, construction, and study of the behavior of capacitors under various operating conditions, as well as in the development of reliable and accelerated methods of testing.

53. New 400,000 Kw Turbine

"Turbine SVK-400 (Engineering Project) of the Leningrad Metal Plant," by V. L. Polishchuk; Leningrad, Energomashinostroyeniye, No 5, May 59, p 31

The Scientific and Technical Council of the Leningrad Metal Plant has examined the design project of the SVK-400 steam turbine (400,000-kw capacity) and its auxiliary equipment and feed pumps.

The initial steam pressure and temperature will be 240 atm abs and 580°C; the intermediate steam reheating will be 565°C at a pressure of 40/36 atm abs; vacuum at the condenser will be maintained at 0.035 atm abs with the cooling water at 12° C; the feed water will be heated to 260°C by steam extracted at eight points.

The SVK-400 turbine is a single-shaft, four-cylinder machine operating at 3,000 rpm and has four exhausts into two condensers. The turbine blades in the last stages will be 940 mm long. The total length of the turbine with the generator will be 38.4m; without the generator, 27.6 m. The main feed pump is driven by a seven-stage turbine of 14,300-kw capacity, operating at 6,000 rpm. The steam to this feed-pump turbine is extracted behind the fourth stage of the medium-pressure cylinder of the main turbine at 17.65 atm abs and a temperature of 460°C. The exhaust steam at 2.4 atm abs is returned to the low-pressure cylinder of the main turbine.

A synthetic fire-resistant fluid will be used in the main turbine control system.

54. New Method of Manufacturing Prestressed Concrete

"Electrothermal Method for Stressing Reinforcing Bars," by G. Geyman, S. Kosolapov and V. Pletmintsev; Kiev, Stroitel'stvo i Arkhitektura, No 5, May 59, pp 34-35

At the Mushketovskiy Plant for structural reinforced concrete (Donbasszhelezobeton Trust) new technology and equipment were developed for electrothermal stressing of high-strength wire.

With this method, the high-strength wire is first straightened and cut to size on the bench of Nosenko-s design. Then the anchorages at the wire ends are made by upset forging. The wire is then heated to 420-430°C

for about 7-10 sec by passing electric current through it. Under these conditions of heating the wire does not undergo any microstructural changes. The heated wires are then anchored in the special slots mounted at the concrete-casting frames. It takes about 10-12 min for the wire to cool and contract, setting up a stress of 1,330 kg in a 5-mm wire. The total elongation of the heated wire should be 23.8 mm to attain the desired stress after cooling and contraction.

The introduction of this method for prestressing high-strength (14,500 kg per mm^2) cold-drawn wire resulted in a considerable saving in metal (up to 52%.). The results of the tests have shown that the load-carrying capacity of panels produced by this method has increased substantially; such panels withstood a distributed static load of 13,625 kg.

The method of electothermal stressing of reinforcing bars is now being introduced at other plants of the "Donbasszhelezobeton" trust.

55. Industrial Automation Notes

"At a Base of Complex Automation," by M. Dunenkov, Correspondent of Promyshlenno-Ekonomicheskaya Gazeta; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 24 May 59, p 1

In March 1959 a department of mechanization and automation was formed at the Nekitinsk boiler-radiator plant of the Novosibirsk economic region.

V. Bulankov, chief engineer of the plant, remarked that the work of the department will be completed by 24 June 1959.

"Automation and Milk, (unsigned article); Moscow, Pravda, 17 Jun 59, p 1

An interesting, automatic pasteurizing and cooling assembly, produced by the Bolshevek machine-building plant, was demonstrated in the exposition pavilion "Milk Industry." In this assembly milk is heated to 70 degrees, is caused to remain at that temperature for 20 seconds, and is then slowly cooled to plus 4 degrees. The entire process is automatically controlled, without human interference. The productivity of the assembly is 5,000 liters per hour.

"Extensive Automation of Industry -- Main Direction of Technical Progress" (unsigned article); Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 17 May 59, p 2

The Tashkent experimental cotton gin plant, the only enterprise-laboratory institution of its type in the Soviet Union, made its first automatically produced product 3 years ago.

The cotton is now separated from the seeds automatically.

"Conference in the Central Committee of the All-Union Lenin Young Communist League on the Questions of Automation and Mechanization" (unsigned article); Moscow, Sovetskaya Aviatsiya, 29 May 59, p 1

A conference of the leaders of the transport and construction industries was held 28 May 1959 by the Central Committee of the All-Union Lenin Young Communist League. The conference was dedicated to the encouragement of the Young Communist League to take part in the automation and mechanization of industrial processes.

56. Mean Modulus for the Class of Bounded Monophyllous Functions Estimated

"Concerning an Estimate of the Mean Modulus in the Class of Bounded Monophyllous Functions," by I. Ye. Bazilevich; Moscow, Matematicheskiy Sbornik, Vol 48(90), No 1, 1959, pp 93-104

For S, the class of functions

$$w = f(z) = z + c_2 z^2 + \ldots + c_n z^n + \ldots ,$$

monophyllous and regular in the circle $|z| < 1$ much has been proved in the work by I. Ye. Bazilevich, "Concerning Theorems of Distortion and the Coefficients of Monophyllous Functions," Matem. Sb., No 28(70), 1951, pp 147-164, and in particular, the following theorem was proved: in the class S the form $D^*(r)$ of the circle $|z| \leq r < 1$, corresponding to the function $f^*(z) = \frac{z}{(1-z)^2}$, covers the greater part of the circumference $|w| = x$, if $x \geq e^{\pi/e} r$.

On the basis of this assumption, estimates for the integrals $\int_0^{2\pi} |f(re^{i\varphi})| \, d\varphi$, $\int_0^{2\pi} |f^2 (re^{i\varphi})| \, d\varphi$, $0 \leq r < 1$ and the coefficients c_n were obtained.

The purpose of the present work is to strengthen the indicated theorem for the case of bounded functions of the class S and to obtain an estimate of their mean modulus.

57. Metric Problem of the Theory of Diophantine Approximations

"Concerning One Metric Problem of the Theory of Diophantine Approximations," by I. P. Kubilyus, Institute of Physics and Mathematics, Academy of Sciences Latvian SSR; Vil'nyus, Trudy Akademii Nauk Litovskoy SSR Seriya B, No 2(18), Apr-Jun 59, pp 3-8

The following metric theorem is proved: let $f(q)$ be a positive function of the whole number argument $q \geq q_0 > 0$, $\sqrt{q}\ f(q)$ be non-increasing, and let the series

$$\sum_{q \geq q_0} q^{-1/2} f(q)$$ be convergent, then the system of

inequalities

$$\|\alpha q\| < f(q),$$

$$\|\alpha^2 q\| < f(q)$$

for almost all real α does not have more than a finite number of solutions in the natural numbers $q \geq q_0$. Here $\|x\|$ denotes the distance of the real number x from the next whole number.

58. Series Representation of Measurable Functions

"On the Representation of Measurable Functions by Series," by A. A. Talalyan, Institute of Matematics and Mechanics, Academy of Sciences, Armenian SSR; Yerevan, Izvestiya Akademii Nauk Armyanskoy SSR, Seriya Fiziko-Matematicheskikh Nauk, Vol 12, No 2, Mar/Apr 59, pp 3-19

It is known (A. A. Talalyan, "Concerning Convergence according to Measure of Series in terms of Bases of the L_p Space," Izvestiya AN Armyanskoy SSR Seriya Fiz.-Mat. Nauk, Vol 10, No 1, 1957), that if a sequence of functions $\{\varphi_n(x)\}$, defined on a bounded, measurable set G of positive measure, forms a normalized basis in the $L_p(G)$ space, then for any measurable function $f(x)$, defined on G, there exists a series

$$\sum_{n=1}^{\infty} a_n \varphi_n(x),$$

which converges according to the measure on the set G to $f(x)$, where

$\lim_{n \to \infty} a_n = 0$.

In connection with this, there naturally arises the question:

What sequences of functions $\{f_n(x)\}$, in addition to the bases of the L_p space, possess such properties that any measurable function $f(x)$ is expressible in the form of a series

$$\sum_{n=1}^{\infty} a_n f_n(x) \qquad (a_n, \text{ real numbers}),$$

which converges to that function according to the measure? The present work examines this problem.

59. Approximate Solution of Operator Equations

"Concerning the Approximate Solution of Operator Equations Depending on a Parameter," by E. E. Tamme and L. E. Kheynla, Tartu State University; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Matematika, No 3, May/Jun 59, pp 229-232

Several iteration processes for an approximate solution of the equation

$$P(x, y) = 0,$$

depending on the parameter y, are considered. The author refers the reader to a work by L. V. Kantorovich, "Several Further Applications of the Newton Method for Functional Equations," Vestnik LGU, Vol 12, No 7, pp 68-103, 1957. P is assumed to be an analytic operator (in a neighborhood of point x_0, y_0) acting from Banach spaces X and Y into the Banach space Z.

60. Density Function for a Random Variable in the L_p Metric Converging to the Normal Distribution Function

"On an Exact Estimate for a Local Theorem," by S. Kh. Sirazhdinov, Institute of Mathematics and Mechanics, Academy of Sciences Armenian SSR; Moscow, Teoriya Veroyatnostey i Yeye Primeneniya, Vol 9, No 2, Apr/Jun 59, pp 229-233

This paper deals with the convergence of the density function for the sum of identically distributed and appropriately normalized independent random variables in the metric L_p $(-\infty, +\infty)$ $(p \geq 1)$ to the normal density function. An exact expression for the fundamental term of the remainder is given.

61. Strength of the Chi-Squared Criterion Applied to the Two-Choice Problem

"Concerning the Strength of the Chi-Square Criterion Applied to the Two-Choice Problem Relative to 'Close' Alternatives," by S. Kh. Tumanyan, Institute of Mathematics and Mechanics, Academy of Sciences Armenian SSR; Yerevan, Izvestiya Akademii Nauk Armyanskoy SSR Seriya Fiziko-Matematicheskikh Nauk, Vol 11, No 6, Nov/Dec 58, pp 31-45

Let n independent observations of a random variable ξ be taken and a hypothesis H_0 be tested, the correctness of which would require the observations to form a random selection from a general set with the distribution function $F(x)$. One of the best methods of testing the hypothesis H_0 is the chi-squared criterion. In this case, the set of all possible values of the random variable are divided into s+1 nonoverlapping intervals $\Delta_i (i = \overline{0,s})$ and the statistic

$$\chi^2 = \sum_{i=0}^{s} \frac{n}{p_i} \left(\frac{\mu_i}{n} - p_i \right)^2 \quad \text{is tested,} \qquad (1.1)$$

where $p_i = \int_{\Delta_i} dF(x)$, and $\frac{\mu_i}{n}$ are the respective frequencies of observation belonging to intervals $\Delta_i (i=\overline{0,s})$.

It is known that if the hypothesis H_0 is correct, the statistic (1.1) has a chi-squared distribution with s degrees of freedom for $n \to \infty$; that is,

$$P\left\{\chi^2 < x\right\} \xrightarrow[n \to \infty]{} K_s(x),$$

where

$$K_s(x) = \begin{cases} \frac{1}{2^{s/2}\,\Gamma(s/2)} \int_0^x x^{(s/2-1)}\, e^{-(x/2)}\, dx, & x \geq 0 \\ 0, & x \leq 0. \end{cases} \qquad (1.2)$$

The assumption is then made that the hypothesis H_0' is not correct, but that an alternative hypothesis is correct whose probabilities of belonging to the observed intervals Δ_i are equal to p_i' $(i = \overline{0,s})$, where

$$p_i' - p_i = \frac{z_i}{\sqrt{n}}, \text{ where } z_i \text{ is a constant number.}$$

Then it is known that the limit distribution of the statistic (1.1) for $n \to \infty$ converges to a noncentral chi-square distribution ("The Chi-Square Test of Goodness of Fit," Cochran, W. G., Annals of Math. Stat., Vol 23, No 3, 1952).

The Chi-Square Criterion is also applied to the investigation of a problem of two choices, as follows:

Let m independent observations of a random variable ξ and n independent observations of a random variable η be made. The hypothesis is then tested that the results of these observations constitute two random samples from general sets with one and the same distribution functions.

It is possible to test this hypothesis by use of the statistic

$$\chi^2 = mn \sum_{i=0}^{s} \frac{1}{\mu_i + \nu_i} \left(\frac{\mu_i}{m} - \frac{\nu_i}{n} \right)^2, \qquad (1.3)$$

where μ_i and ν_i are numbers from the first and second sets, respectively, belonging to the intervals Δ_i $(i=\overline{0,s})$.

In this case, it is known that if the hypothesis is correct, the limit distribution of the statistic (1.3) as $m \to \infty$ and $n \to \infty$ is also expressed by the relation (1.2) ("Mathematical Methods of Statistics" G. Cramer, Cos. izdat. inostran. literatury, Moscow, 1948, p 485).

The assumption is then made that the hypothesis of the relative identity of the two distributions is not correct. In this case, the probabilities that the observed random values of ξ and η belong to the interval $\Delta_i (i=\overline{0,s})$ were designated by p_i and p_i', respectively, and the assumption was made that

$$p_i' - p_i = \frac{z_i \sqrt{(m+n)p_i}}{\sqrt{mn}}, \qquad (1.4)$$

where z_i is a constant number.

In this manner we assume that the alternative hypothesis is closer to the one under consideration than the greater bulk of the first and second samples.

The purpose of the present work is to establish the limit distribution of the statistic (1.3) under the condition (1.4) for $m \to \infty$ and $n \to \infty$.

62. Eigenfunction Expansion of Self-Adjoint Operators

"On the Expansion of Self-Adjoint Operators by Eigenfunctions," by Yu. M. Berezanskiy; Kiev, Ukrainskiy Matematicheskiy Zhurnal, Vol II, No 1, Jan/Mar 59, pp 16-24

The author gives a simple way of constructing eigenfunction expansions for self-adjoint operators in a general separable Hilbert space. The eigenfunction theorem is shown to be a simple complement to the general theorem on the existence of spectral decomposition for self-adjoint operators.

63. Representation of Continuous Functions of Three Variables by Continuous Functions of Two Variables

"Concerning the Representation of Continuous Functions of Three Arguments by the Superposition of Continuous Functions of Two Arguments," by V. I. Arnol'd; Moscow, Matematicheskiy Sbornik, Vol 48(90), No 1, 1959, pp 3-74

The work is devoted to proof of the following theorem formulated in the work of the author, "Concerning Functions of Three Arguments," DAN SSSR, Vol 114, No 4, 1957, pp 679-681: any real, continuous function of three arguments, $f(x_1, x_2, x_3)$, given on a unit cube E^3 may be represented in the form

$$f(x_1, x_2, x_3) = \sum_{i=1}^{3} \sum_{j=1}^{3} h_{ij}[\varphi_{ij}(x_1, x_2), x_3],$$

where h_{ij} and φ_{ij} are real and continuous functions of two arguments.

VI. MEDICINE

Bacteriology

64. Brucellar Bacteriophage Isolated From Aborted Fetuses

"The Isolation of Brucellar Bacteriophage From Aborted Fetuses of Agricultural Animals," by M. S. Drozhevkina and V. I. Tolstokorova, Tr. Rostovsk.-N/D. N.-T. Protivochumn. In-ta (Works of the Rostov-na-Donu Scientific Research Antiplague Institute), No 12, 57, pp 424-427 (from Referativnyy Zhurnal -- Biologiya, No 3, 10 Feb 59, Abstract No 9871, by Ya. I. Rautenshteyn)

"Bacteriophages capable of lysing Brucella melitensis and Br. suis were isolated from blood taken from the stomach, spleen, and other internal organs of aborted sheep fetuses. The phages were isolated both from the organs of fetuses from which Brucella cultures were obtained and from organs of fetuses from which Brucella were not isolated. Phages were also successfully isolated from material removed from aborted cattle. The phage titers increased to 10^{-7} - 10^{-10} after 1-5 passages. The isolated phages easily lysed Brucella on a solid medium and lysed them only slightly on a liquid medium. The presence of brucellar bacteriophage in almost all the fetuses examined negatively affected the results of bacteriological investigation of the fetuses; the use of specific antiphage serum in such investigations is therefore suggested."

65. Studies of Brucellar Bacteriophage

"Brucellar Bacteriophage, the Methodology of Its Isolation and Reinforcement," by M. S. Drozhevkina, M. S., Tr. Rostovsk.-N/D. N.-I Protivochumn. In-ta (Works of the Rostov-na-Donu Scientific Research Antiplague Institute), No 12, 57, pp 384-391 (from Referativnyy Zhurnal -- Biologiya, No 3, 10 Feb 59, Abstract No 9869)

"The methodology of isolating brucellar phages from lysed cultures prepared from human and animal organs, cerebrospinal fluid, feces, and urine, and methods of reproducing the phages, are described."

66. Characteristics of Brucellar Bacteriophage

"Polyvalent Brucellar Bacteriophage, Its Specificity and Valence," by M. S. Drozhevkina, Tr. Rostovsk.-N/D. N.-I. Protivochumn. In-ta (Works of the Rostov-na-Donu Scientific Research Antiplague Institute), No 12, 57, pp 392-402 (from Referativnyy Zhurnal -- Biologiya, No 3, 10 Feb 59, Abstract No 9870, by Ya. I. Rautenshteyn)

"It was shown that the sensitivity of different Brucella cultures to different races of brucellar phage is not the same. Polyvalent Vi-O-phage, which is a mixture of eight Vi-phages and seven O-phages, was prepared for phage typing. This polyphage lysed all the test standard and freshly isolated Brucella cultures. The author recommends it for identifying these cultures. Testing of the reaction of 35 tularemia culture strains to brucellar phage showed that half of them were completely resistant to it, some strain were rather sensitive, and the rest reacted to the phage with insignificant changes."

67. Antiphage Serum in Brucellosis

"The Micromethod of Seeding Blood With Antiphage Serum in Brucellosis," by M. N. Mishnayevskiy and A. S. Fomicheva, Tr. Otchetn. Nauchn. Konferentsii Rostovsk.-n./D. Med. In-t za 1956) (Works of the Scientific Summary Conference of the Rostov-na-Donu Medical Institute for 1956), 1957, pp 621-622 (from Referativnyy Zhurnal -- Biologiya, No 4, 25 Feb 59, Abstract No 14918, by M. A. Gruzman)

"Blood was seeded from the little fingers of 22 brucellosis patients. Sixty-seven seedings (0.2-0.4 ml) in all were done on bouillon containing antiphage serum; positive results were obtained in 13 cases. Brucella were isolated in only four cases from parallel seedings on bouillon without antiphage serum. In 39 parallel seedings of blood from the fingers and from veins on a medium containing antiphage serum, 22 cultures were isolated from veins, and 6 from fingers; 11 and 3 cultures respectively were isolated on media without antiphage serum. Brucella were seeded from both veins and fingers in the acute and subacute forms, or in exacerbations of the chronic form, of brucellosis. In view of its simplicity and suitability, the micromethod of seeding blood in brucellosis, in the author's opinion, merits attention in cases where there is difficulty in employing the usual method of seeding venous blood. Introduction into a medium with antiphage serum considerably increases seedability by both methods."

68. Medical Service in Chemical, Biological, and Radiological Warfare

Foreword to Organizatsiya Meditsinskogo Obespecheniya pri Massovykh Porazheniyakh Naseleniyo (The Organization of Medical Service Following Mass Contamination of the Population), edited by A. Ye. Minenko; Kiev, State Medical Publishing, House of Ukrainian SSR, 1957, pp 3-4

"The banning of atomic and other types of weapons of mass destruction is one of the most important international problems of recent years.

"For this noble task, for the reinforcement of the peace and security of the peoples of all countries, the Soviet Union, true to its peace-loving policy, is conducting a systematic, steadfast struggle together with all the democratic states and progressive peoples of all countries.

"The imperialist circles of the capitalist countries are following a diametrically opposite policy. A number of capitalist countries headed by the US, resorting to very diverse maneuvers, persistently refuse to ban atomic and hydrogen weapons. Certain military leaders of these capitalist states widely recommend the use of the atomic, hydrogen, chemical, and bacteriological weapon in a future war. They voice the notion of an atomic attack on the Soviet Union, forgetting that the myth about the monopoly of the atomic bomb by the US was dispelled long ago and that our country has sufficient atomic strength as well as the means to reach any point on earth.

Despite this, the slightest indication of an air-borne attack on our homeland will obligate every citizen of the Soviet Union, including medical workers, to be ready for the defense of our socialistic society.

"One type of defense of the Soviet Union is local MPVO (antiair defense), of which the MPVO medical service is a part.

"Knowledge of the problems connected with the organization of medical protection in mass attacks on the population is compulsory for every medical worker, his specialty and place of work notwithstanding.

"The paucity of published sources on the aforementioned problem has created the necessity of publishing an appropriate manual for physicians.

"The authors of this book have assumed the responsibility of acquainting a wide circles of physicians with contemporary means of attack and contamination from the air by atomic, chemical, and bacteriological weapons, and with the organization of medical aid in mass affection of the population.

"Sections on traumatology have been consciously omitted and the section on dosimetry is very brief since these problems require special consideration; appropriate literature on them is being prepared for publication. Physician-specialists will therefore not find an answer in this book to all their problems which arise. Nevertheless, the volume of data included is, in our opinion, sufficient to depict the role and tasks of medical personnel under conditions in which agents of mass affection are used by an enemy.

"The individual chapters of this book are in the nature of a review of foreign and Soviet literature on the given problem; some of the chapters contain original material which is being published for the first time. A number of propositions expressed by the authors are their own views or the results of observations.

"The achievement by a great number of authors of a book which explains questions concerning almost every type of weapon of mass affection has naturally encountered a number of difficulties. Therefore, in the process of editing, all precautions were taken to exclude the possibility of duplicating material being presented. Despite this, repetitions which could not be eliminated without loss of clarity may be encountered in some sections.

"M. S. Sergiyenko contributed much to the publication of this book. I. M. Poltavets and A. L. Golega took an active part in preparing the book for publication. The authors convey their deep appreciation for the assistance rendered by the above-mentioned comrades.

"The authors hope that by attracting the attention of the readers, especially medical workers, the book will assist in studying the problems of the organization of medical care for a population which has been the victim of an atomic or other type of weapon of mass affection.

Epidemiology

69. Epizootology of Q Fever in Georgian SSR

"Data on the Study of the Epizootology of Q Fever Under Conditions Found in the Georgian SSR," by R. N. Lomsadze, Materialy 12-y Nauchn. Konferentsii Posvyashch. 25-letiyu Gruz. Zootekhn.-Vet. In-ta (Data on the 12th Scientific Conference Devoted to the 25th Year of the Georgian Zootechnical-Veterinary Institute), Tbilisi, 1957, pp 52-53 (from Referativnyy Zhurnal -- Biologiya, No 4, 25 Feb 59, Abstract No 16818, by A. G.)

"Q fever among humans has been reported in 12 rayons of the Georgian SSR since 1955. The author examined 853 cattle and 255 sheep in 12 points by using the RSK [complement fixation reaction] and dry Rickettsia burneti

antigen; 120 cattle (14%) and 51 sheep (20%) gave positive results. Q fever among cattle was noted during the entire year, but mass infection of animals was observed in the spring. The Ixodes ricinus tick is the vector of this disease in the Georgian SSR."

Immunology and Therapy

70. Live Brucellosis Vaccine Tested

"The Effectiveness of the Industrial Use of Live Brucellosis Vaccine Prepared From Strain No 3," by A. Ya. Dzerzhinskiy, Tr. Kazakhsk. N.-I. Vet. In-ta, (Works of the Kazakh Scientific Research Veterinary Institute), No 9, pp 158-164 (from Referativnyy Zhurnal -- Biologiya, No 3, 10 Feb 59, Abstract No 12141, by L. S. Goberman)

"The history of the search for a Soviet brucellosis vaccine strain by the Kazakh Scientific Research Veterinary Institute is described; also, the results of hospital testing of a live vaccine prepared by the institute from its own Brucella bovis strain No 3, and its experimental use with positive results on 68,300 sheep on Kazakh farms threatened with brucellosis, are reported. The vaccine was found to be harmless and greatly increased the net yield of young in the vaccinated flock; the offspring were born healthy and did not respond to brucellosis."

"Results of Production Testing of Live Brucellosis Vaccine Strain Br. abortus bovis No 3," by A. Ya. Dzerzhinskiy, Tr. Alma-Atinsk. Zoovet. In-ta (Works of the Alma-Ata Zooveterinary Institute), No 10, 57, pp 363-374 (from Referativnyy Zhurnal -- Biologiya, No 3, 10 Feb 59, Abstract No 12142, by A. D. Musin)

"Testing of the effectiveness of the vaccine on a sheep farm threatened with brucellosis showed that vaccinated sheep developed lasting and stable immunity. There were no abortions among yearling ewes when they were kept with inoculated sheep for a long time. A lamb born of vaccinated sheep gave a negative seroallergic reaction for brucellosis on examination after birth and re-examination after one year."

71. Effect of Ditilin on the Organism

"The Combined Action of Ditilin With Organophosphorus Compounds," by A. V. Miron, Sb. nauchn. stud. rabot. Minskiy med. in-t, (Collection of Scientific Students Works, Minsk Medical Institute), 1957, 2, 110-116 (from Referativnyy Zhurnal -- Biologiya, No 9, 10 May 59, Abstract No 41999, by I. I. Baryshnikova)

"Ditilin [diidomethylate of the dimethylaminoethyl ester of succinic acid. Lekarstvennyye Sredstva, by M. D. Mashkovskiy, Moscow, Medgiz, 1957, pp 155-156 is decomposed by cholinesterase in the animal organism. Its curarelike action is therefore of brief duration. The preliminary administration of "preparation No 11" (a derivative of thiophosphoric acid which possesses anticholinesterase action) to white mice may prolong and enhance the effect of ditilin; its toxicity, however, is increased."

72. Muscle Relaxing Agents

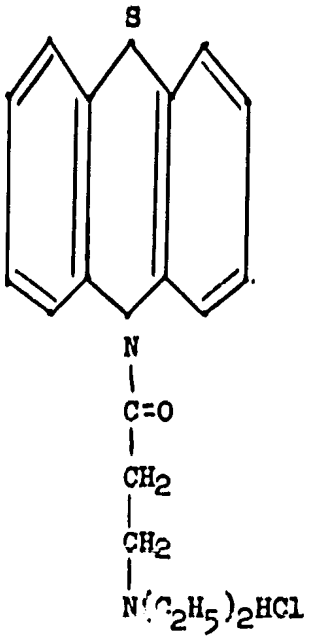
"Experiment of the Therapy of Diseases of the Central Nervous System Which Accompany a Rise in Muscular Tonus With Curarelike Preparations," by D. A. Alelekov, Tr. Kliniki Nervn. Bolezney Gorgovsk. Med In-t (Works of the Nervous Diseases Clinic, Gor'kiy Medical Institute), 1958, No 1, 76-80 (from Referativnyy Zhurnal -- Biologiya, No 9, 10 May 59, Abstract No 41995)

"Clinical investigations of elatine (an alkaloid obtained from Delphinium elatum L, Lekarstvennyye Sredstva, by M. D. Mashkovskiy, Moscow, Medgiz, 1957, pp 153-154) and methyl lycaconitine were made on 38 patients suffering from disturbed motor functions and a rise in muscular tonus of a pyramidal and extrapyramidal character. To determine individual sensitivity and the optimal dosages of the preparations, elatine was administered to begin with in a dose of 10 milligrams once a day, with the dose being gradually increased to four to five times a day; methyl lycaconitine was administered in doses of 20 milligrams once a day to begin with and then increased to three to four times a day. The course of treatment was 7-30 days. In addition, the patients were administered iodine preparations and received physiotherapy. The observations established that elatine and methyl lycaconitine posses a highly effective curarelike action and their administration to patients suffering from a high muscular tonus and limited motor activity is advisable."

73. New Spasmolytic Drug

"On the Pharmacology of Chloracizine," by Yu. I. Vikhlyayev and N. V. Koverina, Laboratory of Special Pharmacology of the Institute of Pharmacology and Chemotherapy, Academy of Medical Sciences USSR; Moscow, Farmakologiya i Toksikologiya, Vol XXII, No 1, Jan/Feb 59, pp 28-33

Cats, dogs, and rats were used in experiments which were conducted to determine the effect of chloracizine on the organism. Chloracizine is a new spasmolytic agent synthesized by the Chemistry Division of the Institute of Pharmacology and Toxicology of the Academy of Medical Sciences USSR. Chemically it is the hydrochloride of 10 (beta-diethylamino-propionyl)-2-chlorphenothiazine. Its structural formula is as follows:



Chloracizine is a light-yellow fine crystalline powder with a melting point of 168-169 degrees. It is readily soluble in water and in physiological solution. The experiments established that the preparation is capable of dilating the cardiac vessels without lowering blood pressure. In this respect, it differs considerably from preparations of the nitroglycerin and papaverine type. It may be used as a spasmolytic agent in spastic conditions of the gastrointestinal tract and in disturbed states of coronary circulation. It may be used also in the therapy of disturbed cardiac rhythm.

74. Isoverin-- a Gangliolytic and Hypotensive Drug

"Isoverin," by N. A. Gerova and L. M. Utkin, Materialy po Obmenu Peredov. opytom i Nauchn. Dostizh. v Khim-Farmatsevt prm-sti (Data of the Exchanges of Experiences and Scientific Achievements in the Chemicopharmaceutical Industry), 1958, No 1/12. 10-13 (from Referativnyy Zhurnal -- Khimiya, No 7, 10 Apr 59, Abstract No 24446, by A. Vavilova)

"Isoverin (the dihydrochloride of N-isoamylcadaverine) (I) is a white crystalline powder with a melting point of 293-295 degrees; it is readily soluble in water and alcohol, poorly soluble in ether and acetone; it is nonflammable and nonexplosive. Aqueous solutions of (I) are stable and transparent. In its pharmacological activity, (I) is similar to ephorophysin and can be used as a substitute for the latter. The initial material for the synthesis of (I) is the readily available caprolactam from which (I) in the form of a hydrochloride is obtained after a series of several stages: (6-benzoilaminocapronic acid) (II); the hydrochloride of (II); the amide of (II); monobenzoilcadave-verine; hydrobromide; N-isoamyl-N-benzoilcadaverine, and the washing of the benzoil group of the latter. The structural formula, method, and technological process of synthesis of (I) are presented. It is an active hypotensive and gangliolytic agent, and is also used in the obstetrical-gynecological clinic."

75. New Anticoagulant

"Diphenatsin-- A New Anticoagulant," by M. A. Kotovshchikova and Z. D. Bleksmit, V sb.: Aktualn. vopr. perelivaniya krovi (Actual Problems of Blood Transfusion), No 6, L., 1958, 208-216 (from Referativnyy Zhurnal -- Biologiya, No 9, 10 May 59, Abstract No 42035)

"Diphenatsin in a dose of 2 milligrams per kilogram of body weight killed 10 of a total of 15 rats; males only survived; the development of uterine hemorrhage was noted in the females. A dose as large as 10 milligrams per kilogram of body weight was not lethal for rabbits. A single dose of 0.5-1.0 milligram per kilogram of body weight when administered to dogs caused their death within 8-11 days. Autopsies revealed hemorrhages in the internal organs of the animals. A single administration of diphenatsin to dogs in a dose of 0.25 milligram per kilogram of body weight disclosed the development of a stable hypoprothrombinemia; the prothrombin index, however, did not fall below 16 percent. The blood coagulation time was decreased (150" instead of the initial 50")."

76. Anticoagulants in Experimental Thromboses

"On the Problem of the Effect of Anticoagulants on Experimental Thromboses," by V. P. Teodorovich, M. A. Kotovshchikova, and Z. D. Bleksmit, V. sb.: Aktualn. vopr. perelivaniya krovi (Actual Problems of Blood Transfusion), No 6, L., 1958, 216-218 (from Referativnyy Zhurnal -- Biologiya, No 9, 10 May 59, Abstract No 42037)

"Experiments were carried out on 25 rabbits with preliminarily induced thromboses of the vena jugularis interna. When pheniline, heparine, and combinations of both preparations were administered upon the excision of the veins, thromboses were found in only half of the cases."

77. Therapy of Myeloid Leukemia

"Myelosan," by S. I. Sergiyevskaya and K. V. Levshina, Materialy po' Obmenu Peredov. Opytom in Nauchn. Dostizh. v Khim-Farmatsevt. prom-sti (Data of the Exchange of Advanced Experiences and Scientific Achievements in the Chemicopharmaceutical Industry), 1958, No 1/12, pp 5-9 (from Referativnyy Zhurnal -- Khimiya, No 8, 25 Apr 59, Abstract No 28553, by A. Vavilova)

"Myelosan (mileran) -- 1,4-dimethansulfonyloxybutane (I)-- is white crystalline substance with a melting point of 116-117 degrees; it is soluble in CH_3OH and C_2H_5OH, more readily soluble in acetone, and is insoluble in cold water; it is nonexplosive and nonflammable. (I) is recommended for the therapy of chronic myeloid leukemia. The following brief description of the technological process of its synthesis is given:

"The derivation of methylthiourea; interaction of dimethylsulfate and thiourea in a xylol medium; derivation of (I) by the reaction of methylthiourea with 1,4-butanediol in the presence of pyridine. The harmful and dangerous substances developed in the course of the process are enumerated."

78. Leukopenia Therapeutic Agent

"Leukogen," by I. T. Strukov, Materialy po Obmenu Pered. Opytom i Nauchn. Dostizh. v. Khim-Farmatsevt. prm-sti (Data of the Exchange of Advanced Experiences and Scientific Achievements in the Chemicopharmaceutical Industry), 1958, No 1/12, 62-65 (from Referativnyy Zhurnal -- Khimiya, No 7, 10 Apr 59, Abstract No 24445, by A. Vavilova)

"Leucogen [2-(alpha-phenyl-alpha-carbethoxymethyl)-thiazolidine-4-carboxylic acid] (I) is used in the therapy of leukopenia caused by Roentgen irradiation or by the action of a chemical agent which depresses

hemopoiesis. It is a white crystalline substance with a melting point of 169 to 171 degrees; it is slightly soluble in water and alcohol, unstable in solutions, and decomposes on boiling. (I) is supplied in tablet form prepared according to the following recipe (in grams): (I) -- 0.02, lactose -- 0.039, starch -- 0.04, Ca stearate-- 0.001. The tablets are kept in a dry place and protected from light. A detailed description of the technological process of the production of (I) according to the stages of its derivation is given, and is as follows: the hydrochloride of l-cysteine from l-cysteine; ethyl ester of HCOOH; ethyl ester of formylphenyl acetic acid; and (I)."

79. Effect of Nitrofurans on Experimental Infections

"Effect of Some Preparations of the Nitrofuran Series on Experimental typhi murium Infection in Mice," by L. N. Alekseyeva, Izv. AN Latv SSR (Herald of the Academy of Sciences Latvian SSR), 1957, No 8, 113-116 (from Referativnyy Zhurnal -- Biologiya, No 9, 10 May 59, Abstract No 42182, by M. Ye. Krol)

"The therapeutic action of preparations of the nitrofuran series -- furaxolone (5-nitro-furfurylidene- -oxyethylsemicarbazone) (I); furazidine (N-5-nitro-2-furylallideno)-l-aminohyadantoin) (II); furacilin (5-nitro-2-furfurylidene semicarbazone); and furadonin (N-5-nitro-2-furfurylidene-l-aminohyadantoin) was determined in mice infected with Salmonella typhi murium. The animals were infected by the enteral method. Therapy began within 24 hours. The preparations were administered per os one or two times a day for period of 3-10 days. Only preparations (I) and (II) exhibited therapeutic action. When (I) was applied, about 50 percent of the experimental animals were still alive even within 30 days after therapy was terminated. When preparation (II) was used during a 10-day period of therapy, and then during the succeeding 5 days, most of the animals survived. Later, only 27 of a total of 40 mice died. The advisability of carrying out large scale experimental and perhaps clinical tests of (I) and (II) in human, farm animal, and domestic fowl salmonelloses is indicated."

80. Anti-Influenza Preparation

"New Medicinal Preparations," by the Main Administration of the Drug Industry, Tatarskaya ASSR; Kazan, Kazanskiy Meditsinskiy Zhurnal, Vol XL, No 1, Jan/Feb 59, pp 102-103

"Cutisone, the thiosemicarbazone of p-isopropyl-benzaldehyde, is a Soviet synthesized anti-influenza preparation. It is indicated for adults and children in all forms of virus influenza. It is administered

internally to adults in doses of 0.005 g three times a day for a period of 3 days, and to children for 3-4 days in the following doses: 1-3 years old -- 0.001 g; 3-5 years old -- 0.0015 g; 5-7 years old -- 0.002 g; 7-10 years old -- 0.003 g; and 11-14 years old -- 0.004 g. Cutisone is contraindicated in hepatic disorders."

81. New Drug

"New Medicinal Preparations," by the Main Administration of the Drug Industry, Tatarskaya ASSR; Kazan, Kazanskiy Meditsinskiy Zhurnal, Vol XL, No 1, Jan/Feb 59, pp 102-103

Redergam is a solution of dehydrated ergot alkaloids. It is indicated in stenocardia, hypertonia, migraine, thromboangitis obliterans, and other disorders. It is supplied in the form of one-milliliter ampoules each containing 0.3 milligram of redergam; in the form of solution, with one milligram of the substance in each milliliter of the solvent; and in the form of tablets, each containing 0.25 milligram of the drug. It is contraindicated in cases of hypotonia, expressed atherosclerosis, organic cardiac disorders, disturbed renal functions, and old age.

Physiology

82. Effects of Physical Labor on Human Motor Apparatus

"Some Results of Research on the Effects of Physical Labor and Physical Exercises on the Structure of the Motor Apparatus of Man," by M. G. Prives, Chair of Normal Anatomy, Leningrad First Medical Institute imeni I. P. Pavlov, Arkhiv Anatomii, Gistalogii, i Embriologii, No 5, May 59, pp 7-18

The author of this article states that systematic research has been conducted for the past 10 years on the effects of various types of physical labor and sports on the structure of the motor apparatus. The research has been conducted by the author of this article and his coworkers at the Chair of Normal Anatomy of the First Leningrad Medical Institute imeni Academician I. P. Pavlov. Workers of the Military Institute of Physical Culture imeni Lenin have also engaged in this type of research. Observations were conducted with the aid of X rays. Over 2,000 people, members of various professions and trades, athletes, ballet dancers, circus performers, students in industrial schools, and others were used as subjects in the investigations.

Results of the studies conducted revealed that prolonged physical exertion produces changes in muscles, particularly in the diaphragm, and causes the development of working hypertrophy in the bones. Prolonged physical exercise also brings about changes in the spongy substance, makes the substantia compacta thicker, and reduces the size of the bone marrow cavities.

If a profession that requires great physical exertion is changed to one that requires little physical effort, symptoms of working hypertrophy decrease. Results of the application of tracer atoms showed that physical exercise causes phosphorus to be deposited mainly in the bones that carry the greater physical load.

It is the opinion of the author of this article that any study of anatomy of living human beings which takes into consideration their occupation and living conditions can furnish valuable information which could serve as a basis for directing adequate and proper physical development of a human organism.

83. Metabolism Under Arctic Conditions

"Metabolic Processes in the Human Organism During the Period of Acclimatization to Central Arctic Conditions," by N. I. Makrov and Ya. A. Kimbarovskiy, Klinicheskaya Meditsina, No 5, May 59, pp 112-116

The authors of this article state that they conducted systematic daily observations of members of an expedition to the Central Arctic region who were between 20 and 40 years of age. They were given a complete physical examination by a medical commission prior to their departure and were all declared to be in good health. During their stay in the Arctic, the polar explorers were supplied with conventional food which contained sufficient calories. This food was supplemented by a daily ration of 0.2 gram of ascorbic acid. Melted snow was used as drinking water.

It was observed that during the period of acclimatization, lasting 3-4 months, the appetite of polar explorers diminished; thirst, frequent and abundant urination, increase in the pulse rate by 15-20 beats per minute, and dryness of the skin and mucous membranes was also noted. The morphological picture of blood did not exhibit any deviation from normal and the erythrocyte sedimentation rate did not exceed 8 millimeters per hour. The arterial pressure increased 10-15 millimeters during the period of polar days; the arterial pressure dropped 10-15 millimeters during the period of polar nights. A disturbance and distortion in nitrogen (protein) metabolism along with a disturbance in the water-salt metabolism was noted during the period of acclimatization.

The authors of this article further state that the process of acclimatization is retarded in persons with unstable nervous systems.

Public Health, Hygiene, and Sanitation

84. Dust Content in the Air of Kiev

"Experiment of the Determination of the Dust Content in the Air of Kiev," by G. Ye. Tsapko, State Sanitary Inspector, and A. I. Serebryannaya Chemist, Kiev Sanitary-Epidemiological Station; Moscow, Gigiyena i Sanitariya, Vol XXIV, No 2, Feb 59, pp 74-75

Air samples were gathered at three points in Kiev: a thickly populated rayon where large industrial plants are located, with heavy railroad and auto traffic; a residential rayon having considerable vegetation and large industrial plants; and a garden-park area in the city. The greatest concentration of dust in the atmosphere was found in the area of the industrial plants with railroad and auto traffic. The investigations revealed also that the dust concentration in the air was considerably greater during the autumn-winter season than in the other seasons of the year. This may be explained by the fact that during the autumn-winter season many of the large industrial enterprises of the city use solid fuel instead of gas for heating boilers.

85. Brucellar Hides Disinfected With Chloramine

"The Use of Chloramine for Disinfecting Brucellar Leather," by K. Ye. Yedygenov, Tr. Alma-Atinsk. Zoovet, In-ta, No 10, 57, pp 388-395 (from Referativnyy Zhurnal -- Biologiya, No 3, 10 Feb 59, Abstract No 12143)

"It was established that a one-percent salt solution of chloramine reliably decontaminates hides infected with Brucella in 30 minutes, without lowering the quality of the leather."

86. Problems Connected With Control of Infections

"Our Tasks in the Control of Infections," by S. Muromtsev, Institute of Epidemiology and Microbiology imeni N. F. Gamaleya; Moscow, Meditsinskiy Rabotnik, 12 May 59, p 2

S. Muromtsev, director of the Institute of Epidemiology and Microbiology imeni N. F. Gamaleya, states in this article that vital aspects of the further development of the national economy will be determined by scientific achievements. He discusses the problems confronting medical workers in connection with improving the health and prolonging the life of the Soviet population.

In accordance with resolutions of the 21st Congress of the CPSU, the Institute imeni Gamaleya has accelerated research on a number of problems. The development and practical use of associated vaccines, particularly against children's diseases, is mentioned as one of the foremost projects of the institute; it is scheduled for completion on 1961, and includes the production of a whooping cough-diphtheria-tetanus vaccine, and preparations which contain a poliomyelitis component. Production and testing of the most complex of the associated vaccines, a vaccine against anaerobia and intestinal infections, is expected by 1962. Muromtsev points out that the successful accomplishment of these tasks is possible only as a result of research on theories of immunity and intensified biochemical research on purified preparations free from ballast. He also states that existing preparations and methods of using them should not be neglected. In connection with improving the efficiency of preparations already in use, it is pointed out that secondary inoculation can be facilitated by the cutaneous administration of such vaccines as tularemia and brucellosis. Revaccination can also be done orally for other infections, and the inhalation method is indicated for diphtheria and whooping cough.

Testing of the immunizing properties and suitability of chemical antigens prepared from mycobacterium tuberculosis and treated with ultrasound should by completed in 1960. Research on an anatoxin to combat Staphylococcus infections, and on sera for whooping cough and dyspepsia is scheduled for the next 2 years.

In the field of antibiotics, mycerin was developed this year. The first practical recommendations for the use of "aurantin" and "sekazin," a wide-spectrum antibiotic, are due in 1960; the institute expects to coordinate the testing of antitumor preparations with clinicians in 1961. The next 4-5 years will see the isolation of specific antigens of human tumors, and new diagnostic methods. Luminescent sera for the rapid diagnosis of several infections have already been developed, and a pure, dried preparation for diagnosing rheumatism will be produced in the next 2 years. A lag in the study of Streptococcus infections, especially angina and rheumatism, is revealed.

In a brief discussion of medical apparatus, Muromtsev states that valuable Soviet and imported equipment has been acquired by the institute in recent years. Equipment mentioned includes a powerful ultracentrifuge; "original" ultrasonci equipment; optical instruments for electron, luminescence, and ultraviolet microscopy; and microtomes for cutting ultrafine sections.

According to this article, the institute is planning intensive research on modern biochemical and biophysical methods of studying the biochemistry of microorganisms, and the nature of antigens and antibodies. Particular attention will be devoted to protective antigens found suitable for the prevention of certain infections against which previously immunity could be conferred only by live vaccines. It is mentioned that tissue culture methods will be widely employed. Muromtsev emphasizes the importance of long-term, theoretical work which will contribute to the solution of such problems as variability of pathogens, the material basis of heredity, the origin of bacteriophages, the ultramicroscopic structure of microbial cells, the physiological and biochemical bases of immunity, etc.

Decreasing disease incidence and eradicating a number of infections are huge and important tasks of Soviet public health during the 1959-1965 period. The institute has developed complex measures for eradicating typhus in the entire country, and tick-borne encephalitis, tularemia, leptospirosis, and several other infections in affected areas.

No mention can be made of methods for resolving these problems, the author continues, without considering the conditions under which the investigators must work and the opportunities for cooperation with other scientific groups and individuals. Almost all research carried out at the institute is done in cooperation with other institutes of the Academy of Medical Sciences USSR, universities, other republics, and clinicians. Mobile groups of scientific coworkers are set up to cope with special problems which arise.

The author states in conclusion that the institute is aware of its obligations with respect to the aforementioned problems and is endeavoring to meet them.

Radiology

87. Lethality of Experimental Anthrax Infection in Irradiated Mice

"Experimental Anthrax Infection in Irradiated Animals," by A. P. Krasil'nikov and N. A. Izraitel', Chair of Microbiology, Minsk Medical Institute; Moscow, Meditsinskaya Radiologiya, Vol 4, No 6, Jun 59, pp 56-61

This research presents results of a study of the course of experimental anthrax infection in irradiated animals. The authors found no data on this subject in the literature.

The following problems were studied: (1) The natural resistance of irradiated animals to experimental infection depending on the interval between irradiation and infection dose of irradiation, and site of introduction of the infectious material. (2) The time of the onset and the duration of bacteremia, and the dissemination of microorganisms into various organs. (3) Quantitative characteristics of bacteremia and the accumulation of microorganisms in the liver.

Tests were conducted on mice. An attenuated B. anthracis variant, the first Tsenkovskiy vaccine, was used for infection. The methodology and results of the experiments are discussed in the text.

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

"1. Single total irradiation of white mice by sublethal doses of X-rays (342 r) decreases the resistance of the animals to anthrax. This decrease is noted as early as 24 hours after irradiation, it becomes more pronounced by the 3d day, and attains its maximum by the 7th day. The resistance is completely restored between the 12th and 21st days after the effect of irradiation.

"2. The decreased resistance of irradiated organisms to anthrax is more sharply manifested in experiments using more massive radiation doses (550 r).

"3. The decrease in the resistance of white mice subjected to the effects of ionizing radiation develops after subcutaneous and intraperitoneal infection. No essential difference was observed in irradiated and control animals after intranasal and peroral methods of infection.

"4. During the development of radiation sickness, experimental anthrax is induced by a significantly smaller (by a factor of hundreds of thousands) dose of infectious agent, develops 1-1 1/2 days sooner, is marked by the seeding of a greater number of organs and the accumulation in them of a tremendous (in comparison with controls) amount of microorganisms, and exhibits lethality for exceeding that in the controls."

88. Ethylenediaminetetraacetate an Effective Sequestering Agent in Causal Therapy of Yttrium-91 Poisoning

"The Effectiveness of Certain Sequestering Agents in the Causal Therapy of Acute Poisoning by Radioactive Yttrium," by L. A. Il'in; Moscow, Meditsinskaya Radiologiya, Vol 4, No 5, May 59, pp 72-76

The therapy of injuries caused by radioactive substances is one of the most complicated and least advanced fields of radiotoxicology. One of the most difficult approaches is to find compounds, i.e., sequestering agents, which accelerate the process of eliminating those osteotrophic isotopes which become trapped in bone tissue and remain a constant source of radiation hazard for long periods of time. Radioactive strontium $^{89, 90}$, yttrium $^{90, 91}$, calcium ^{45}, zirconium^{95}, and radium^{226} belong in this group. In this investigation the author limited his experimentation to compounds that would accelerate the elimination of Y^{91} from mice.

 The author presents the following conclusions:

"1. The effect of benzhydrylaminodiacetic acid, benzylaminediactic acid, parafucsinhexaacetic acid, and hexamethyenediacetic acid on accelerating Y^{91} elimination from white mice was studied. No positive effect was noted in using these compounds.

"2. ETDA [ethylenediaminetetraacetic acid] possesses a marked stimulating effect on the elimination of Y^{91} from white mice. On the fifth day after poisoning, the residual activity in the animals treated with ETDA was half as great as that in the controls.

"3. The index of the rate of elimination of radioactive substances from organisms, 'q', is a criterion for the comparative evaluation of the dynamics of the elimination of radioactive isotopes from experimental and control groups of animals.

"4. Under practical conditions, for the treatment of acute Y^{91}, poisoning, it is possible to use ETDA as a means of blocking the entrance of Y^{91} into bone tissue."

89. Characteristics of the Effect of Ionizing Radiation on Individual Development

"Data Concerning the Characteristics of the Effect of Ionizing Radiation on Individual Development," by Yu. M. Olenov, K. F. Golkovskaya, and A. D. Pushnitsyna, Institute of Cytology, Academy of Sciences USSR, Leningrad; Moscow, Tsitologiya, Vol 1, No 3. May/Jun 59, pp 293-305

The aim of the present research was to present certain data on the mechanism of the effect of ionizing radiation on individual development. Tests were conducted on larvae and pupae of Drosophila melanogaster irradiated by 1,000-6,000 r from X rays at various stages of its development.

Based on the analysis of various data which consist of tables, histological sections, and sketches, the authors present the following conclusions:

"1. X-irradiation of larvae and pupae lead to the destruction of parts of the cells of imaginal discs, i.e., rudiments of the definitive organs of the fly. X-ray induced morphoses are the result of incomplete reparation of this injury. Their frequency depends on the period of reparation.

"2. These data make it possible to present a new pathway to an understanding of "the sensitive period" of ontogenesis. The sensitive period of a given trait to a given external effect often is that stage at which the process of reparation caused by the inflicted injury coincides with the period of the determination of the trait.

"3. The destruction of part of the undifferentiated cells and the deviations thus resulting during the course of ontogenesis evidently are a general characteristic of the effect of ionizing radiation on the developing organism. This characteristic should be kept in mind in developing the theory of the biological effect of ionizing radiation."

90. Method for Studying Characteristics of Radiation Sickness Resulting From Physical Stress During Irradiation

"Concerning the Methodology Studying the Role of Physical Stress Under Conditions of Irradiation of Animals," by K. V. Ivanov, V. V. Perelygin, V. P. Malikhov, and Ye. A. Pal'mov (Moscow); Moscow, Meditsinskaya Radiologiya, Vol 4, No 5, May 59, pp 84-85

The scope of experimental work in the study of the effect of physical stress on the development of radiation sickness is constantly being expanded because of the practical significance of this problem and because of the possibility of explaining the mechanism of radiation injuries. To date, on the whole, experimental work has been devoted to explaining the significance of physical stress before and at various periods after irradiation, but the characteristics of the action of ionizing radiation occurring simultaneously with physical stress have been completely overlooked. The present research describes a method for producing the combined effect of radiation during physical exertion.

White rats were placed in 10-liter glass cylinders and the cylinders were then filled with water so that the animals had to swim constantly to stay afloat. An 8-gram weight was attached to each animal. Physical stress was calculated according to the duration of swimming. Irradiation began immediately after the animals were placed in the glass cylinders and was accomplished by means of two X-ray instruments, RUM-3 and RUM-11, simultaneously so that all the parts of the vessel had an equal amount of irradiation, regardless of the position of the animals during the time of swimming. Each cylinder contained one animal. The temperature of the water in the vessels fluctuated between 21 and 23°C. Radiation doses for each apparatus amounted to 47 r per min, yielding a total of 940 r in 10 minutes, and 611 r in 6 1/2 minutes. In both series the animals developed acute radiation sickness with its characteristic clinical picture and blood changes. These results were compared with those of controls, and the following conclusions were presented:

"In summarizing the results of the first and second series of experiments referred to above, it can be said that the result of temporary physical stress occurring during the time of irradiation by doses that cause radiation sickness of a severe degree is reflected in the general condition of the animals immediately after irradiation, but subsequently it does not exert a marked negative effect on the outcome of radiation injuries."

01. Disturbances in Endocrine Regulation Complicate Radiation Pathology

"Radiation Effects and the Endocrine System," (Summary of Experimental Data), by D. E. Grodzenskiy, All-Union Institute of Experimental Endocrinology; Moscow, Meditsinskaya Radiologiya, Vol 4, No 5, May 59, pp 77-83

In recent years, a great amount of experimental data which has been accumulated explains the role of the nervous system in radiation pathology (report by A. V. Lebedinskiy on "Peaceful Use of Atomic Energy," presented at the First International Conference at Geneva in 1955). However, comparatively little research has been concerned with the role of the endocrine system in the unfolding picture of radiation pathology as a whole, in the onset, course, and outcome of its various symptoms, and in the reaction of the various systems of an organism to ratiation." In this article the author brings this subject up to date and presents the fundamental tasks facing the researchers, which he outlines as follows:

1. The study of the functional condition of the glands of internal secretion, especially during the period soon after irradiation, and also during the various periods of the formation of the symptom complex of radiation sickness, especially the explanation of those hormonal functions which are changed under the effect of ionizing radiation.

2. The elucidation of the possibility of influencing the course of radiation sickness and the outcome of its various symptoms by the use of hormonal preparations, i.e., testing the use of hormones both as therapeutic agents against radiation sickness and as a means of biological protection for organisms.

The following is a summary of research done to date:

Research on the functional condition of the adrenals of irradiated animals: (a) The value of diuresis after water ingestion under radiation effects; (b) the effect of DOCA [desoxycorticosteron acetate] on diuresis in irradiated animals.

The content of corticosteroids in the blood flowing from the adrenals of irradiated rats; (a) The content of corticosterones in adrenal blood of rats at various periods after irradiation; (b) the content of cortisosterones in adrenal blood of rats 3 hours after irradiation and the injection of ACTH.

Changes in the chemical composition of the adrenals, the the rate of synthesis of steroid hormone precursors i.e., cholesterol.

A study of the effects of somatotropic hormone (STH) following its administration to rats before or after irradiation, and survival rate of rats that had received STH for a period of 10 days before their irradiation. In this case, STH proved to be ineffective if administered after irradiation, but protective if administered before irradiation. CPYRGHT

CPYRGHT The author concludes that "in the complex picture of radiation pathology one should distinguish those features that are imposed by factors of hormonal regulation," and that the "resolution of the problem of radiation pathology should not overlook disturbances in the activity of the endocrine system."

02. Morphological Changes in Bones Due to Injuries from Plutonium

"Morphological Changes in Bone Tissue in Acute and Subacute Plutonium Injuries," by N. N. Litvinov; Moscow, Meditsinskaya Radiologiya, Vol 4, No 5, May 59, pp 68-72

Because plutonium-239 is an alpha-emitter with a very long half-life, its ingestion by organisms and subsequent fixation in bone tissue makes it very toxic. With this fact in mind, tests were conducted on four groups of rats (a total of 70 animals) which received plutonium 239. Details of the experimental work and photomicrographs showing morphological changes in bone structure due to plutonium injuries are included.

CPYRGHT The author presents the following conclusions:

"1. Significant changes were observed in the bone tissue of rats which received plutonium 239 intraperitoneally in amounts of 0.15, 0.08, 0.04, and 0.02 microcuries/ g of body weight. These changes were most marked in the long bones, and had a definite sequence of development.

"2. During the first few days after the administration of plutonium 239, there were signs of increased bone resorption and development of fibrous cellular tissue containing large quantities of osteoclasts.

"3. Starting with the second week, there was a gradual inhibition of the processes of endochondral ossification and bone reconstruction, together with a decrease in the number of osteoblasts.

"4. At the peak of injury (3d-5th week), complete inhibition of osteogenesis and death in the osteogenic tissue became evident.

"5. In animals which received 0.04 and 0.02 microcuries of plutonium 239/g of body weight, disturbances in osteogenesis were less pronounced that in those which received 0.15, and 0.08 microcuries/g of body weight, and in the course of the second month there was a certain amount of restoration in bone growth. A large amount of immature bone tissue formed in the metaphysis and diaphysis.

"6. Toward the end of the 3d month, premature cessation in bone growth was noted, and the quantity of immature bone in various parts of the skeleton increased."

93. Safety in Handling Radioactive Substances

"Problems of Safety in the Utilization of Radioactive Isotopes," by Engineers A. A. Korzhev, M. L. Zelenskaya, and R. G. Fedoseyev; Moscow, Bezopasnost Truda v Promyshlennosti, Vol III, No 4, Apr 59, pp 15-17

The article discusses the means and measures for protecting workers in the petroleum industry from the harmful effects of irradiation when handling radioactive substances. Workers engaged in handling radioactive substances should be provided with special clothes, rubber gloves, caps, and aprons. They should also be provided with means of decontamination. All work with radioactive substances should be done in special chambers provided with exhaust facilities. Liquid waste materials should be disposed of into special containers made of concrete and heavy iron. Dosimetric measurements should be made in the laboratories at least once a month.

Surgery

94. Seven-Year Plan (1959-1965) for Research in the Field of Surgery

"Scientific Research in the Field of Surgery in the Projected Plan for 1959-1965 (According to the data of the Scientific Planning Commission of the Presidium, Academy of Medical Sciences USSR," by Prof I. M. Grigorovskiy; Moscow, Vestnik Khirurgiya, Vol 82, No 6, Jun 59, pp 3-10

The planning of medical sciences for the Soviet Union is done at present by the Presidium of the Academy of Medical Sciences USSR. Among 50 scientific problems scheduled for scientific research and development by the academies during the projected Seven-Years Plan, problems of surgery and surgical treatment occupy a prominent place in the field of medical sciences.

Research in surgery will emphasize the following: the organs of the thoracic cavity, especially the cardiovascular system, the gastrointestinal tract and the lungs; prophylaxis and treatment of trauma, shock, and surgical infections; the development of heterogenous and synthetic plasma substitutes; the problem of transplantation and restoration organs and tissues, especially glands of internal secretion; and the use of synthetic material for the replacement of organs; etc. Significant improvement and increased production of various medical and optical diagnostic instruments is planned. These advances reveal the close connection of surgery with the latest electronic technology, and its rapid introduction into medicine and surgery.

05. Soviet Physicians Study Acupuncture in Peiping

"Punctures Which Cure--Acupuncture" (unsigned article); Brussels, Le Drapeau Rouge Magazine, 14 Mar 59, p 17

This article reports that a group of Soviet physicians went to Peiping to study acupuncture 2 years ago. After their return to Moscow, laboratories were set up in Moscow and Leningrad. Directed by Prof N. Grashchenkov, member of the Academy of Medical Sciences USSR, these laboratories are to study acupuncture and to extend its use to all hospitals of the USSR. In 1958, after a 2-month course, about 100 Soviet physicians returned to their hospitals to report on their experience.

Veterinary Medicine

06. Methods of Titrating Foot-and-Mouth Disease Virus

"Comparative Titration of the O-Type Virus of Foot-and-Mouth Disease in Tissue Culture and On the Tongue of a Cow," by E. Kuwert and T. N. Hoang, Friedrich Loeffler Institute, Riems; Leipzig, Archiv fuer Experimentelle Veterinaermedizin, No 2, Mar/Apr 59, pp 293-297

Equally good results were obtained in a comparative titration of the cytopathogenic type O, variant O_2 ("Kocs") foot-and-mouth disease virus on a cow tongue and in a calf kidney cell culture; the differences in the virus titers obtained by the two methods are slight--within a power of ten in 18 comparative titrations. In 14 of the 18 titrations, the values obtained from the cultures were only slightly higher than those obtained from the cow tongue. The results were quite similar to those obtained for the unweaned mouse and tissue culture by Wesslen and Dinter (Nord.vet.med., Vol 8, 1956, pp 795-806) and Mackowiak and Lang (Bull.Off.Int.Epiz., No 49, 1958, pp 99-105) and for the unweaned mouse and cow tongue by Skinner, Henderson and Brooks (Nature, Vol 169, 1952, pp 794-795).

The experiments described here proved that the inferences derived for the tissue culture, on the basis of the cow tongue titers, are justified. Through the use of the proper strain of the foot-and-mouth disease virus, it is thus possible, with any of the three methods of titration, to obtain more accurate information on the content of infectious virus antigen in liquids and tissues; the expensive cow tongue method of titration can thus be replaced by titration in a calf kidney cell culture.

The results obtained in these titrations indicate that in the case of foot-and-mouth disease, the content of the complement-fixing antigen affords only conditional information on the content of infectious virus.

97. Electron Microscopy of Foot-and-Mouth Disease

"Electron Microscope Studies of the Fine Tissue Changes in the Case of Foot-and-Mouth Disease in Cattle," by G. Hoffmann, Friedrich Loeffler Institute, Riems; Leipzig, Archiv fuer Experimentelle Veterinaermedizin, Vol 13, No 2, Mar/Apr 59, pp 249-275

The article presents and discusses 25 photographs similar to those published by Sognnaes, Weisberger, and Albright (J.Nat.Cancer Inst., No 17, 1956, p 329).

The scabs of generalized apthae of a cow's tongue were removed from the mucous membrane by a method proposed by Sjoestrand and Hanzon (Exper. Cell Res. No 7, 1956, p 393), fixed in a buffered 1% O_4 solution (p_H 7.4) according to a modified Palade method (J.Exper. Med., No 95, 1952, p 285), embedded in plexiglas in the manner described by Newman, Borysko, and Swerdlow (Res. Nat. Bur. Stand., No 43, 1949, p 183), cut with an ultramicrotome by the method of Niklowitz (Mikroskopie, No 10, 1955, p 401) and examined in the Elmiskop I-Siemens electron microscope.

Two forms of cell nucleus degeneration were distinguished: hyperchromatosis of the nucleus wall and pyknosis. In the majority of cases of such degenerated nuclei, there were juxtanuclear vacuoles, some of considerable size, sharply separated from the cytoplasm and possessing a distinct membrane. In one photograph a cytoplasmatic space is visible between the nucleus and the vacuole; in another photograph a large vacuole seems to be compressing the nucleus, its membrane still completely intact, while in another photograph the membrane is perforated in many places on the vacuole side or detached from the karyoplasm.

The juxtanuclear vacuoles are produced when the nucleus is still completely intact. From the loosened cytoplasm at the edge of the nucleus, fine filaments extend out, leaving between them optically empty voids. This is the beginning of a juxtanuclear vacuole. A photograph of a more advanced stage shows the juxtanuclear vacuole more clearly defined and more uniform in structure -- the nuclear chromatin has become denser, and the nucleolus has become much less distinct, which represents the beginning of pyknosis. However, juxtanuclear vacuoles were also found at nuclei which seemed to be completely unchanged.

The ballooning type of degeneration commonly described in texts is revealed here in a most varied form which could not be further classified into distinct stages, nor embraced in its entirety, on the basis of the photographs.

The reticulating degeneration is shown here to be initiated by three things: decomposition by external leukocytic enzymes (vacuoles at the cell wall); the swelling, decomposition and vacuole-induced enlargement of the mitochrondria; and the juxtanuclear vacuoles. The leukocytes in the aphthae perform three functions: enzymatic decomposition of the cells from outside, phagocytosis of degenerate nuclei inside the cells, and phagocytosis of detritus masses.

The following peculiarities were observed. At the beginning of the disease, in the stage of the first tendency of the epithelial cells to dissociate, numerous dense, strongly osmiophilic, round granules 150-250 angstroms in diameter were distributed in a diffuse pattern among the cells. In cells, whose nuclei revealed scarcely any degenerative changes, slightly osmiophilic granules were found in the vicinity of the nucleus, often in clusters and about 80 angstroms in size, similar to forms photographed and surmised to be the complement-fixation antigen by Bachrach and Breese (Proc. Soc. Exper. Biol. Med., No 97, 1958, p 659).

98. Attempt to Synthesize Immunizing Erysipelas Vaccine

"On the Chemistry and Immunochemistry of Bacterial Substances and the Technology of Vaccines. Report No 1: On the Analytical Chemistry of the Bacteria of Swine Erysipelas (Erysipelothrix rhusiopathiae)," by G. Zimmermann, H. D. Mueller, and H. Uhlig, Chemical Department, Research Institute for Vaccines, Dessau; Leipzig, Archiv fuer Experimentelle Veterinaermedizin, No 2, Mar/Apr 59, pp 318-327

This article gives some data obtained during fundamental erysipelas research which has been in progress at the institute since 1953. Tables give the average yields of the bacterial mass of various strains, the nitrogen content of the bacterial mass of various strains, analysis data

on lyophilized bacteria, analysis data on hapten fractions obtained in ethanol precipitation, analysis data on various hapten preparations, precipitation titers of hapten fractions isolated by the paper-electrophoresis method, the components of various amino acids, and analysis data on extraction residues.

The hapten character of the acid-soluble bacterial component is confirmed. The serological activity of the extracted hapten could not be increased by means of purification. Four carbohydrate-containing peptide components in the hapten were identified by the paper-chromatographic method, and their qualitative amino acid composition is described.

Immunizing erysipelas vaccines could not be produced from the extraction residues of the bacteria.

The chemical composition is approximately the same for the bacteria of various strains and cultures, but the yield and analytical composition of the hapten varies.

99. Prevention of Embrittlement in Austenitic 25-20 Type Welds

"Effect of Chemical Composition of an Austenitic 25-20 Type Weld Joint on the $\gamma \rightarrow \sigma$ Transformation," by B. I. Medovar and Yu. B. Malevskiy, Candidates of Technical Sciences, Institute of Electric Welding imeni Ye. O. Paton, Academy of Sciences Ukrainian SSR; Moscow, Svarochnoye Proizvodstvo, No 4, Apr 59, pp 12-16

Content of magnesium, molybdenum, tungsten, chromium, nickel, carbon, copper and nitrogen in automatic weld joints of 12-mm thick sheets of 25-20 type steels (EI417 and EI533) was varied to determine the effect of chemical composition on high-temperature embrittlement. Test blanks held at temperatures of 650, 800, 875 and 900°C for periods of 25 and 3 to 8 thousand hours. Welds with standard Sv-Kh25N20 wire exhibited extreme embrittlement due to the $\gamma \rightarrow \sigma$ transformation resulting from long heating at temperatures of 650 to 875°C. Manganese in concentrations up to 4 percent did not affect the rate to sigma-phase formation whereas molybdenum, tungsten, and copper sharply accelerated this transformation. Decrease of chromium content from 22-25 percent to 20-21 percent with nickel content maintained at 15 to 25 percent produced a sharp increase in resistance to embrittlement at high temperatures. Increase of carbon content from 0.10 to 0.20 percent completely inhibited sigma-phase formation but resulted in decreased impact strength due to precipitation of secondary carbides. Nitrogen impeded intense sigma-phase formation by binding a portion of chromium to form a nitride. Experimental 2Kh25N15G7 wire (0.20-0.26% C, 6-8% Mn, 22-25% Cr, 16-18% Ni, maximum of 0.3% Si) is recommended as most satisfactory for industrial application.

100. Welding High-Melting and Active Metals

"Methods of Welding Active Metals," by A. V. Mordvintseva and N. A. Ol'shanskiy, Candidates of Technical Sciences, Moscow Higher Technical School imeni Bauman; Moscow, Svarochnoye Proizvodstvo, No 5, May 59, pp 4-7

Welding tests on molybdenum, tantalum, zirconium, and other high-melting and extremely active metals (not specified) were performed employing inert gas and vacuum electron-beam methods developed at the Moscow Higher Technical School imeni Bauman and the Moscow Power Engineering Institute. Satisfactory seams were obtained in 18-mm diameter tantalum tubing with 0.2-mm walls using a nonfusing electrode with full gas shielding of the joint area. Attempts to weld other active and high-melting metals proved unsatisfactory due to insufficient gas protection of the

weld zone. Uniform weld quality was difficult to obtain in argon-arc welding of active metals in a portable welding chamber whereas certain high-melting metals were not weldable. Most satisfactory active metal weld joints were obtained with a special argon-chamber welding machine. This machine differs from foreign designs in that all mechanisms for controlling work pieces and electrodes are located within the hermetic chamber. Chamber is exhausted to 10^{-4} mm of mercury in 30 minutes and then filled with argon to atmospheric pressure (argon contains 0.03 to 0.04% nitrogen and 0.005% oxygen).

Highest quality weld joints of 0.2-mm thicknesses of highly active metals were obtained with a special high-vacuum electron-beam fusion welding machine. Welding is performed at 10^{-4} mm of mercury, cathode voltage of 25 kilovolts, with an electron beam of 40 milliamperes at 1,000 volts and at a welding speed of 5 meters per hour. An electron gun developed by N. G. Sushkin, Candidate of Technical Sciences, for melting metals was incorporated in this machine. Authors believe electron-beam welding may be applied for extremely active and high-melting metals not weldable by ordinary methods. Electron-beam welding is recommended for welding of vacuum instruments.

101. Continuous Melting of Steel Planned

"Creative Cooperation," by N. Gubenkov; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 24 Jun 59, p 1

An original complex for continuous melting and pouring of steel has been designed through the joint efforts of the Ukrainian State Institute for the Design and Planning of Metalworking and Machine Building Plants (Ukrgipromash), scientists and manufacturers. Working drawings of this complex were completed by Ukgipromash and assembly at the Toretskiy Machine Building Plant in Druzhkovka is contemplated for this year. No specifications are given.

102. Special Features of Flash Welded High-Temperature Tubing

"Special Features in Flash Butt Welding of Tubing Made of High-Temperature Austenitic Steels," by E. S. Slepak, Candidate of Technical Sciences, and A. S. Gel'man, Professor and Doctor of Technical Sciences, Central Scientific Research Institute of Technology and Machine Building; Moscow, Svarochnoye Proizvodstvo, No 5, May 59, pp 20-24

Certain features in flash welding of high-temperature austenitic steels are established from results of a series of investigations of butt welded steam superheater tubing. Mechanical properties of heat-treated and untreated weld joints were approximately equal to those of the parent metal in short- and long-term tests at room temperatures and up to 1,200°C. Considerable homogenization of microstructure occurs in the butt zone after long operational periods so that mechanical properties of weld and parent metals change equally with time. An earlier assumption of a correlation between mechanical properties of an austenitic steel at high temperatures and its shrinkage parameters during flash welding is proved erroneous.

103. Precision Die Forging of Compressor Blades

"Precision Die Forging of Steel Compressor Blade Blanks," by N. A. Kravchenko and M. Ya. Kuleshov; Moscow, Kuznechno-Shtampovochnoye Proizvodstvo, No 5, May 59, pp 4-10

A brief review is presented of American processes for precision die forging of compressor blade blanks which are considered basically analygous to those applied in Soviet Industry. Problems in selection of optimum blade form, blade components and forging tolerances are discussed. A flow chart for processes in die forging blade blanks as applied in Soviet serial production is given and recommendations are made for technological processes for forging blades up to 100 mm and from 100 to 250 mm in length. A description is also given of a technological process for forging Kh17N2 and 3Kh2V8 steel blade blanks in lengths up to 100 mm as developed by the Scientific Research Institute of Technology and Organization of the Aviation Industry.

Tests were conducted on methods for prevention of oxidation and decarbonization of heated billets prior to forging. Muffle furnace heating considerably decreased these effects. Glass-coated billets were protected from oxidation and decarbonization but became pitted when glass was of alkaline composition and heating was prolonged. Heat resistant enamel appeared to be a good medium of protection but is considered difficult and expensive. Billets heated in pure argon to 1,200°C for 30 minutes showed no traces of oxidation or decarbonization. A special glass lubricant was applied before heating as a protective coat but proved unsatisfactory due to its effect on blank surface quality.

104. Decomposition-Reduction of Metal Salts to Fine Powders at Low Temperatures

"Investigations of Chemically Produced Fine Iron and Iron-Nickel Powders," by F. Eisenkolb and G. Ehrlich, Institute of Materials Science, Dresden Technische Hochschule; Berlin, Monatsberichte der Deutschen Akademie der Wissenschaften zu Berlin, Vol, 1, No 1, 1959, pp 12-20

A description is given of the production of very fine iron and iron-nickel powders by the decomposition and reduction of corresponding metallic salts at low temperatures. Several characteristic physical-chemical properties of the metal powders and of the intermediate oxides are investigated in relation to the initial salt and the conditions of decomposition and reduction.

If very pure and, at the same time, very fine products are required, the best results can be obtained if oxalates and nitrates are used as the initial salts. Before reduction, the salts must be decomposed in air at the lowest possible temperatures. If the iron-nickel salts are isomorphous and completely miscible, extensively homogeneous alloys are produced during the reduction process, even if the intermediate oxides are not homogeneous.

105. Enrichment of Ores in a State of Suspension in Air

"New Methods for the Enrichment of Ores"; Moscow, Pravda, No 173 (14,932), 22 Jun 59, p 2

"Within recent years, many deposits of nonferrous and rare metals were discovered in Central Kazakhstan. However, the production and enrichment of these valuable ores is being impeded because of a lack of water for industrial purposes.

"A Baychulakov, Scientific Associate at the Institute of Metallurgy, Academy of Sciences Kazakh SSR, points out in the newspaper Sotsialistik Kazakhstan that in some foreign countries enrichment of nonferrous and rare metals without the use of water has become rather widespread. The author of the article considers it essential that scientific research institutes and planning and design organizations pay serious attention to the development of methods for the enrichment of ores in a state of suspension in air (aerial enrichment)."

106. Hungarians Use Radioactive Isotopes in Metallurgical Research

"The Isotope Laboratory of the Heavy Industry Technical University," by Sandor Simon, docent, candidate in technical sciences, Felsooktatasi Szemle; Budapest, Mar 59

In Hungary, developments similar to those which have taken place abroad can be found. The country's first radioactive isotope laboratory was built at the Csepel Iron and Metal Works for application of the radioactive isotopes in metallurgy. Considering the fact that the metallurgical engineers, who had outstanding training in their own specialities, were not familiar with the theory or practice of radioactivity nor the instruments to be used, experiments with the use of isotopes were started by nuclear physicists and nuclear chemists who had outstanding knowledge in their own fields, but were inexperienced in metallurgy. Overcoming the difficulties which thus arose was possible only by means of constant consultation between the two groups of specialists and this led to our metallurgists learning the practical use of radioactive isotopes sooner than they learned the theory. The Ferrous Metallurgy Directorate of the Ministry of Metallurgy and Machine Industries and the Csepel Radioactive Isotope Laboratory tried to help matters last fall by starting a course for metallurgical specialists on the theory and practice of isotope applications.

In Miskolc, the radioactive isotope laboratory organized at the ferrous metallurgy faculty of the Heavy Industry Technical University has as its goal the training of metallurgical engineers in both theoretical and practical aspects of the use of radioactive isotopes in metallurgy, thus raising the level of metallurgical engineer training. In addition to giving practical instruction to the students, the laboratory will also do scientific research.

The tasks of the laboratory include study of oxidation and reduction reactions in metallurgical processes; a study of relationships pertaining to the formation and separation of oxides and other occluded substances; a study of diffusion phenomena, of thermodynamic activity of various elements, of the laws governing solution and separation of elements, etc.

In addition to the practical training of students and their instruction in the use of the instruments, the laboratory will also determine in a practical manner the dosage limits important from the medical viewpoint in connection with the danger of exposure to radiation.

The laboratory is not responsible for plant scale production, nor does it carry out production line measurements and analyses involving the use of isotopes.

The organization and instrumentation of our laboratory satisfy modern demands but for research work of great scientific or economic significance the most necessary requirements with regard to personnel must be satisfied in the future. Unfortunately, I must say that so far there has been a certain failure to realize the need of providing the minimum necessary staff.

Modern university training must solve without delay the problem of supplying personnel to the radioactive isotope laboratory.

[For additional information on Metallurgy see Item 7.]

Atomic and Molecular Physics

107. The Negative Ni Ion

"The Existence of the Negative Nitrogen Ion," by Ya. M. Vogel, V. F. Kozlov, A. A. Kalmykov, Physico-Technical Institute, Academy of Sciences of the Ukrainian SSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1354-1356

Very small amounts of negative nitrogen ions were found in a beam produced after passage of positive nitrogen ions through a gaseous target. The cross section for the process $N^+ \longrightarrow N^-$ was estimated to equal $1.9 \cdot 10^{-22}$ cm^2. No negative molecular nitrogen ions were detected.

108. Raman Spectrum of Ni

"Effect of Pressure and Temperature on the Raman Spectrum of Nitrogen," by G. V. Mikhaylov, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1368-1373

The rotational structure of the Q branch in the vibrational band of the Raman spectrum of nitrogen is studies. Impace broadening of the vibrational and rotational spectrum lines is found to be of a various nature. The effective impact ranges determining the broadening of the Raman lines are found. For the Q branch of the vibrational band ρ_γ = 0.43 Å and for the pure rotational band ρ_ω = 3.9 Å. It is shown that the results of the experiments do not contradict the impact theory of spectral line broadening.

109. Electron Emission From Molybdenum

"Electron Emission From the Surface of Pure Molybdenum After Bombardment by Electrons," by M. V. Sinel'nikov, Moscow Engineering Physics Institute; Moscow, Doklady Akademii Nauk SSSR, Vol 126, No 3, May 59, pp 554-556

The study of electron emission from the surface of pure molybdenum at room temperature, without an electric field, and in darkness has been carried out as a continuation of a former investigation of emission from magnesium by the author (Radiotekhnika i electronika, 3, 12, 1523 (1958)

It has established that a high energy negative particle emission occurs from the molybdenum surface at room temperature after irradiation by a weak electron beam. It should be assumed that in the former experiments with magnesium the electron emission from magnesium may also be due to a preliminary electron irradiation. The properties of this type of emission from pure metals are still under study.

Nuclear Physics

110. "Superposed" Accelerators

"On Superposed Accelerators," by Ye. M. Moroz, Moscow Atomnaya Energiya, Vol 6, No 6, Jun 59, pp 660-661

The possibility of using the same ring-shaped accelerator for a consecutive or simultaneous acceleration of various particles has been demonstrated by V. I. Veksler and the author (Authors Certificate for the Invention No 111367 with priority from 29 April 1957). Design and operation of the accelerator are analyzed. Simultaneous acceleration of protons and electrons appears to be possible for energies up to several Bev.

111. A New Cyclotron Design

"Operation of a Cyclotron With a Spatially Varying Magnetic Field," by D. P. Vasilevskaya, A. A. Glazov, V. I. Danilov, Yu. N. Denisov, V. P. Dzhelepov, V. P. Dmitriyevskiy, B. I. Zamolodchikov, N. L. Zaplatin, V. V. Kolga, A. A. Kropin, Liu Nei-Chuan, V. S. Rybalko, A. L. Savenkov, and L. A. Sarkisyan; Moscow, Atomnaya Energiya, Vol 6, No 6, Jun 59, pp 657-658

In January 1959, the operation of a new cyclotron began at the Laboratory of Nuclear Problems of the Joint Institute of Nuclear Research (Dubna). The periodic structure of the magnetic field varies in azimuth as well as in radius. The diameter of the magnet is 1,200 mm. The line of constant intensity of the magnetic field is bent into a spiral of Archimedes. A quarter wave resonance with one dee was used for ion acceleration. Deuterons have been accelerated to 12 Mev, alpha particles to 24 Mev at a minimum dee amplitude of 8 kv. The experimental results indicate the possibility of constructing a relativistic cyclotron for proton energies which have been attained only on modern synchrocyclotrons.

112. Report on Conference of High Energy Physics

"The Physics of High Energies; a report on the Eighth International Conference on High Energy Physics," by L. I. Lapidus and L. B. Okun; Moscow, Atomnaya Energiya, Vol 6, No 6, Jun 59, pp 648-656

A brief report on the Eighth International Conference on high energy physics in Geneva, 29 June — 5 July 1958, is presented. The conference discussed the results of research on interaction of mesons, nucleons, and strange particles at high energies, as well as weak particle interactions. Success in investigations of weak interactions was noted. Achievements during the last few years in various regions of the physics of elementary particles have been reported.

113. Anisotropy of U-238 Fission

"Anisotropy in the 14 Mev Neutron-Induced Fission of U-238, by A. N. Protopopov and V. P. Eysmont; Moscow, Atomnaya Energiya, Vol 6, No 6, Jun 59, pp 644-647

A double ionization chamber has been used for the determination of angular distribution of fission fragments produced in U-238 fission induced by neutrons of 14.4 Mev energy. It has been found that the angular distributions of light and heavy fragments are within a 3% accuracy symmetrical with respect to the direction perpendicular to the neutron beam. It is also shown that the directions of flight of the light and the heavy fragments are equivalent under symmetrical, as well as at asymmetrical fission. It has been established that if the ratio of the fragment masses is below 1.7 — 1.8, the angular anisotropy increases with increasing mass asymmetry. The results are discussed within the framework of the statistical theory of V. M. Strutinskiy (Atomnaya Energiya, II, No 6, 508 (1957)).

114. Cascade Showers Analyzed

Dependence of the Mean Angle Between the Direction of Motion of Cascade Shower Particles and the Shower Axis on the Distance of the Particles From the Shower Axis," by V. V. Guzhavin and I. P. Ivanenko, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1509-1512

The dependence of the mean angle between shower particles and the shower axis on the distance from the shower axis is computed. An electron photon shower averaged over the depth is considered. Ionization losses are neglected. The results of the calculations are compared with the experiments.

115. Fermi Interaction

"Universal Fermi Interaction and Astrophysics," by B. Pontecorvo, Joint Institute of Nuclear Physics; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1615-1616

Attempt is made to prove that the existence of ν - e interaction of first order may lead to macroscopic effects. If follows from such interaction that a positron-electron annihilation may occur with emission of a neutrino-antineutrino pair (B. Pontecorvo, Phys. Rev., 72, 246 (1947). Thus, in electromagnetic processes instead of photon emission it may be possible to emit a pair $\bar{\nu}\nu$ through a pair e^+e^-. The process of radiative capture of an electron with an emission of a photon or $\bar{\nu}\nu$ pair is analyzed and compared to nuclear processes in stars.

116. Study of Angular Anisotropy of Fission Products

"Angular Anisotropy and Energy Characteristics of the Fission Process," by A. N. Protopopov, I. A. Baranov, and V. P. Eysmont; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1608-1609

Attempt was made to find the difference in excitation energies of fission fragments at 0° and 90° angles to the incident beam. The fission of U-238 was studied at 14.9 Mev. The angular resolution of the equipment did not permit over 26° deviation from the studied directions of 0° and 90°. It was found that at a ratio of fragment masses of 1.40 — 1.44, the mean kinetic energy of the fragments equals 170.7 ± 0.6 Mev under 0° and 169.4 ± 0.8 Mev under 90°. Thus, the energy difference of fragments, provided such one exists, does not exceed 1.5%.

117. Annihilation of Antiproton

"Some Peculiarities of Antiproton Annihilation on a Deuteron," by E. O. Okonov, Joint Institute of Nuclear Physics; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1597-1598

The energy distribution of nucleons emitted in an annihilation process is analyzed. Instead of the B. M. Pontecorvo formula (ZhETF, 30, 947 (1956) $\bar{p} + d \rightarrow p + \pi^-$; and $\bar{p} + d \rightarrow n + \pi^\circ$, the following reaction is discussed: $\pi^\circ + d \rightarrow p + p$. A production of cascade hyperons in this kind of reaction is also envisaged.

118. Study of Angular Anisotropy of Fission Products

"Relation of the Degree of Angular Anisotropy of Fission Process to the Nuclear Structure," by A. N. Protopopov and V. P. Eysmont; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1573-1574

Attempt is made to find a thermodynamic interpretation of the relation of the ration Z^2/A to the anisotropy of the angular distribution of fission products. The obtained results, plotted in graphs, showed that the anisotropy of angular distribution $\sigma(0^\circ)/\sigma(90^\circ)$ varies as exp $(\Delta E/T)$ at ΔE = constant, (the ΔE being the difference of fission direction parallel and perpendicular to the beam) and the temperature $T = f(Z^2/A)$. These results were later confirmed by J. Halpern at the Geneva Conference (Atoms for Peace) September 1958, Report P/1513.

119. Axial Asymmetry of Nuclei

"The Problem of Axial Asymmetry of Atomic Nuclei," by D. A. Zaikin, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1570-1571

Numerical energy evaluations of various nuclear configurations showed that in the case of several particles, at least three over the last filled shell, in minimum energy should correspond to the non-axial equilibrium shape of the nucleus. Nevertheless, the model is crude, and the obtained results are not expected to concur with experimental ones.

120. Cosmic Rays Affected by Sun Flares

"Small Sun Flare Effects and the Energy Spectrum of the Primary Cosmic Ray Variations," by Ye. V. Kolomeyets, Kazakh State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1351-1353

The relation between the intensity of cosmic ray neutrons and chromospheric flares on the sun was studied on basis of the data obtained from four stations located at various latitudes. By the epoch superposition method a "small flare effect" has been found to occur at each of the above mentioned stations. With aid of coupling constants the energy spectrum of particles of the supplementary beam has been determined.

121. Positron Annihilation

"Radiation Polarization at Three Photon Positron Annihilation," by V. P. Shmelev, Moscow State University of the Order of Lenin imeni Lomonosov; Tomsk, Izvestiya Vysshykh Uchebnykh Zavedeniy, Fizika, No 1, (1959), pp 15-24

Orthopositronium is analyzed because it decays into three photons with polarization effects. The degrees of linear and circular polarization were determined. The angular distribution of radiation has been found in relation to polarization. It has been found in particular that in a three photon decay the emission of two photons with the same circular polarization is most probable under a mutual angle of 155 — 165°, while the third necessarily has an inverse ciruclar polarization. Within a 60° angle no significant polarization occurs. The values of linear polarization and its distribution are computed, and their distribution along the quantum states of orthopositronium m = 0, ± 1. These states do not effect circular polarization.

122. Betatron Radiation

"Some Characteristics of Betatraon Radiation at 10 -- 25 Mev," by A. A. Vorob'yev and V. A. Moskalev, Tomsk Polytechnical Institute imeni Kirov; Tomsk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Fizika, No 1, (1959), pp 102-106

Experimental results are presented of studies of spatial distribution of betatron radiation. The esperimental data concur well with the theory by J. D. Lowson (Proc. Phys. Soc., 63, 653 (1950). Obtained data of mean "effective" radiation energy of betatrons are given, as well as the maximum spectral energy of the betatron radiation.

Plasma Physics

123. The Electric Field in a Plasma

"The Electric Field in a Microwave Plasma as Function of Time," by V. Ye. Mitsuk and M. D. Koz'minykh, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1603-1604

The time behavior of the electric field potential during the establishment of a steady state in an ultrahigh frequency pulse discharge of 9400 Mc has been studied. The field amplitude was measured optically, using the Stark effect on Balmer lines in the external alternating field. The microwave plasma was obtained in a narrow capillary, 2 mm in diameter, and located in a waveguide of 23 x 10 mm^2 dimensions. The amplitude of the field inside the plasma has been found steady, while the glowing, indicating the time function of electron concentration, exhibited a monotonic increase of the concentration.

124. Conducting Liquid Flowing in a Magnetic Field

"Stability of an Ideally Conducting Liquid Flowing Between Rotating Cylinders in a Magnetic Field," by Ye. P. Velikhov, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1398-1404

Sufficient conditions for the stability of an ideal liquid flowing in axial and toroidal fields are derived. Critical values of the magnetic fields which stabilize the flow are obtained and a physical interpretation of the results is presented.

125. Energy Losses Due to Plasma Oscillations

"Charged Particle Energy Losses Due to Excitation of Plasma Oscillations," by Yu. L. Klimontovich, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1405-1418

Beam electrons and plasma oscillations are considered as two subsystems. A kinetic equation describing the interaction between the beam and plasma is obtained under the assumption that the beam does not change its properties and that the plasma state is specified by its equilibrium characteristics. The expression for the deceleration force calculated on basis of this formula includes losses due to electron-electron collisions as well as those due to excitation of plasma oscillations. A more general case is considered when

neither of the subsystems is in a state of thermal equilibrium. The solution of a set of nonlinear equations for the beam electron distribution function and electric potential is considered for this particular case. The results obtained are used to explain the effect of rapid energy transfer from the beam electrons to the plasma electrons first observed by Langmuir.

126. Electromagnetic Field Penetration in a Plasma

"Penetration of an Electromagnetic Field in a Plasma," by K. N. Stepanov, Physico-Technical Institute. Academy of Sciences of the Ukrainian SSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1457-1460

The depth of penetration of an electromagnetic field into a semi-infinite plasma located in a magnetic field perpendicular to the plasma boundary is calculated.

127. Inductive Acceleration of a Particle Flux

"Self-Acceleration of a Flux of Charged Particles by Induction," by G. A. Askaryan; Moscow, Atomnaya Energiya, Vol 6, Jun 59, pp 658-659

The phenomenon of plasma current created by a strong gas discharge, containing electrons with low and ordered velocities is analyzed as a means of plasma acceleration. By assuming that a sharp decrease of directed electron velocities occurs due to scattering processes, an inductive field should arise and accelerate the remaining particles. A possibility is envisaged that this type of inductive processes occurs in stellar plasma and is responsible for ejection of cosmic rays.

128. Magnetic Particle Trap

"Resonance Processes in Magnetic Traps," by B. V. Chirikov; Moscow, Atomnaya Energiya, Vol 6, No 6, Jun 59, pp 630-638

Resonances between Larmor rotation of a charged particle in a magnetic field and slow oscillations of a particle along the lines of force are analyzed. It is shown that these resonances may under certain conditions lead to a complete exchange of energy between the degrees of freedom of the particle and its exit from the trap. The effect of resonances on adiabatic processes connected with the variation of the field in time are also analyzed.

"An Experimental Test of the Behavior of Charged Particles in an Adiabatic Trap," by S. N. Rodionov; Moscow Atomnaya Energiya, Vol 6, No 6, Jun 59, pp 623-629

The motion of beta particles of tritium has been studied in an adiabatic trap. It was shown that under certain circumstances the number of beta particles reflected from regions with a strong magnetic field (magnetic mirrors) exceeds 10^7. The relation of the life span of beta particles in the trap to the gas pressure has been obtained, as well as the configuration of the magnetic field and the degree of its homogeneity.

Solid State Physics

129. Feynman Diagrams in Theory of Metals

"Some Applications of the Method of Summation of the Main Feynman Diagrams in the Theory of Metals," by Yu. V. Tskhmistrenko, Physics Institute, Academy of Sciences of the Ukrainian SSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1546-1549

On basis of the condition of smallness of the mean phonon energy as compared with the mean electron transition energy, a Hamiltonian involving direct electron-electron interaction is set up which, in the indicated approximation, describes a Froehlich system of interacting electrons and phonons.

130. Spin-Lattice Relaxation in Mn^{++} Salts

"Measurement of the Spin-Lattice Relaxation Time in Some Mn^{++} Salt Solutions," by P. G. Tishkov, Physico-Technical Institute, Kazan Affiliation of the Academy of Sciences; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1337-1341

A Q-meter was used to measure the period of the spin-lattice interaction and the internal field constants of some Mn^{++} salts solutions. The spin-lattice relaxation time in glycerine and aqueous glycerine solutions of $MnCl_2 \cdot 4H_2O$ is satisfactorily described by the Casimir and Du Pret theory, if account is made for spin-spin absorption, and is also in good agreement with the Brons-Van Vleck formula. Concentration of the paramagnetic salt and viscosity of the solutions only weakly influence the spin-lattice relaxation times.

131. Conductivity of Germanium

"Electric Conductivity of Germanium in Strong Electric Fields at Low Temperatures," by E. I. A. baulina-Zavaritskaya, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1342-1350

The electric properties of germanium single crystals containing Sb, Bi and Zn impurities were studied at temperatures between 2 and 10°K. In strong electric fields the electrical conductivity of germanium is characterized by the presence of three regions, a feature of the last one (the so-called breakdown region) being a sharp increase of the electrical conductivity. The breakdown effect is related to the development of the cascade in the conduction band and is independent of the conduction mechanism of germanium at low temperatures. The product of E_{br} and the mobility μ is a function of J/kT where J is the ionization energy of the impurity in germanium. The effect of various factors (temperature, magnetic field) on E_{br} is mainly due to their influence on the carrier mobility. The dependence of E_{br} and resistance on the magnetic field are found to be similar.

132. Voigt Effect in Paramagnetics

"The Phenomenological Theory of the Voigt Effect in Paramagnetics," L. M. Tairol'nikova, Perm State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1428-1434

A macroscopic calculation of the Voigt effect in paramagnetic media is presented for centimeter waves.

133. Optical Constants of Conductors

"The Optical Constants of Conductors," by V. P. Silin, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1443-1450

The problem of determining the complete set of optical constants of a conductor is discussed. It is shown that for an isotropic conductor, besides the refraction index and absorption constant two real quantities should be included which correspond to a complex boundary impedance. The real part of the boundary impedance determines the surface losses in the conductor in contrast to the imaginary part of the dielectric constant which determines volume losses. Dispersion relations are given which relate the real and imaginary parts of the complex surface conductivity. Fluctuations of an electromagnetic field in the conductor are studied and a correlation formula is derived for the field components of an isotropic metal occupying semispace.

134. Electron Motion in a Crystal

"Motion of an Electron in a Crystal Located in an External Field," by G. Ye. Zilberman; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1465-1471

Various forms of the equation of motion of an electron with an arbitrary dispersion law in a uniform magnetic and arbitrary electric field are considered. A transition from the exact equation to approximate ones involves neglections which are estimated. Special attention is paid to nondiagonal terms (due to neighboring energy zones).

135. Doppler Effect in a Crystal

"The Doppler Effect in an Anisotropic and Gyrotropic Medium," by K. A. Barsukov, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1485-1491

The Doppler effect from of an oscillator moving along the axis of a gyrotropic and anisotropic crystal is considered. Some general formulas for the radiation energy have been obtained from which, in particular, formulas for the Cherenkov radiation of a charge and a dipole can be derived. A number of peculiarities of the radiation in an anisotropic gyrotropic medium is investigated.

136. Vacancy Concentration in Metals

"A Problem of Determining a Balanced Vacancy Concentration and the Energy of their Formation in Metals," by I. Ya. Dekhtar, Kiev Order of Lenin. Polytechnic Institute; Tomsk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Fizika, No 1, 1959, pp 3-5

The vacancy concentration in a number of pure metals is computed on the basis of heat of formation of vacancies (ΔH_f) and entropy variation (ΔS_t). The computation of energy of vacancy formation is related to a part of the variation of free crystal energy independent of temperature and related to the transition from the state at temperature T to a state near melting. The computation of the value ΔS_f is related to the mean square atomic shift from the equilibrium position. The computations presented are in good agreement with experiments.

137. Effect of Space Charge on Electric Strength

"Effect of Space Charge on Electric Charge of Ionic Crystalline Dielectrics," by V. D. Kuchin, Scientific Research Institute of Physics, Electronics, and Automatics at the Tomsk Polytechnical Institute imeni Kirov, Tomsk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Fizika, No 1, (1959), pp 30-34

Computation and experimental data indicate that the space charge in ionic crystalline dielectrics forms as a result of of positive ions moving toward the cathode. It increases the electric strength of the dielectric. Nevertheless, the nature of the space charge in ionic crystalline dielectrics is not yet sufficiently explained.

Theoretical Physics

138. Half-Integer Spin

"Quantization of Half-Integer Spin Fields," by D. V. Volkov, Physico-Technical Institute, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1560-1566

A half-integer spin wave field quantization scheme is considered which is different from the usual one with anticommutators and is consistent with the principle of relativistic causality, positiveness of the energy (for noninteracting fields), with the Lagrangian formalism in Schwinger's formulation, and with invariance under CPT transformations. The main difference between the scheme under consideration and the usual one is that the maximum occupation number is two.

139. Gibbs Probabilities for Nonlinear Systems

"Calculation of Cooridinate Probabilities by the Gibbs Method for Nonlinear Systems," by V. B. Magalinskiy, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1423-1427

On basis of the general principles of Gibbs' statistical mechanics a method is developed which permits one to compute the transition probability density for a generalized coordinate in a system with a nonlinear relaxation mechanism. A knowledge of the law of motion of the mean coordinate is not required in the method, only the general form of the corresponding equation of motion being employed.

140. Electric Resonance to Ultrasonic Waves

"Resonance of Current Carriers Produced by Ultrasonic Waves," by Ye. P. Pokatilov, Kishinev State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1461-1464

The interaction between current carriers in a magnetic field and the electric field created by a ultrasonic wave is considered. The power absorbed per unit volume is computed for charges with scaler and tensor effective masses. Energy absorption peaks are observed at frequencies $w = nw_o$ (n is an integer, w_o is the cyclotron frequency of the current carriers) and the relaxation time $\tau \gg 1/w_o$. Since the ultrasound wave length at the same frequency is smaller than that of light by a factor of 10^5, no polarization effects should be expected which prevent the use of cyclotron resonance in semiconductors containing a high concentration of free electrons.

141. Scattering Matrix in Indefinite Metrics

"Causality in the Theory With an Indefinite Metric," by D. A. Slavnov and A. D. Sukhanov, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1472-1479

The possibility of setting up a unitary and macroscopic scattering matrix in the theory with an indefinite metric is discussed. The matrix is constructed within the framework of perturbation theory with aid of a Lagrangian interaction of complete (physical plus sum of non-physical) fields. By a special choice of the nonphysical field spectrum it has been possible to satisfy the unitarity and macro-causality requirements in the second and third orders. However, it has not been possible to satisfy simultaneously both of these requirements in the fourth order. This means that under the assumptions made above it is not possible to construct a unitary and macro-causal scattering matrix in a theory with an indefinite metric.

142. Causality Commutators

"The Analytic Properties of Causality Commutators," by V. Ya. Faynberg, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 5, May 59, pp 1503-1508

A simple deduction of the integral representation of the causality commutators discovered by R. Jost and H. Lehman (Nuovo Cim., 5, 1598 (1957)) and generalized by F. J. Dyson (Phys. Rev., 110, 1460 (1958)) is proposed which does not require use of six dimensions. More detailed spectral formulas are found for the simplest cases (vertex part, two-particle matrix element). It is shown on basis of these formulas that the scattering amplitude of two particles (for real values of the energy in the c.m.s.) is an analytic function of the square of the transferred momentum which is regular throughout the complex plane, excluding poles and cuts on the real axis.

IX. MISCELLANEOUS

143. Second All-Union Conference on Machine Translation in 1960 or 1961

"Recommendations of the First All-Union Conference on Machine Translation," Mashinnyy Perevod i Prikladnaya Lingvistika, No 1 (8), 1959, pp 63-72

In the "Recommendations of the First All-Union Conference on Machine Translation," held in Moscow, 15-21 May 1958, the conference requested the First Moscow State Pedagogical Institute of Foreign Languages (Association for Machine Translation) in touch with the Committee on Applied Linguistics of the Section on Speech Research of the Commission on Acoustics of the Academy of Sciences USSR to convoke the Second All-Union Conference on Machine Translation in 1960.

Official sanction for organizing the Second All-Union Conference on Machine Translation was given in Decree No 1228 on the Development of Scientific Research in Machine Translation, dated 28 November 1958, of the Minister of Higher Education USSR. The decree charged Pivovarova, Director of the First Moscow State Pedagogical Institute of Foreign Languages, to make preparations for holding the second scientific conference of higher educational institutions on problems of machine translation and mathematical linguistics in 1960-1961.

[Sir Note: The First Conference on Mathematical Linguistics was held at Leningrad State University 15-21 April 1959.]

144. Hungarian Journal Claims Soviets Can Build Tower 160 Kilometers Tall

"Soviet Technology Does Not Know the Impossible," (unsigned Article; Budapest, Ujitok Lapja, 5 Jun 59

Prof G. Pokrovskiy, Doctor of Technical Sciences, has written that it would be possible to build a tower 160 kilometers tall upon which astrophysics, astronomic, and other types of laboratories and observatories could be placed. The top of the tower would be 390 meters in diameter and the bottom of the tower would be 100 kilometers in diameter. The structure would combine the weight carrying properties of a balloon and of steel construction. The tower would be filled with hydrogen, the lower structure would be solid but the upper parts would consist of a thin skin kept tense by the pressure of the hydrogen. Pokrovskiy bases his calculations on the fact that the pressure of air drops to half its value with each 5 kilometers of altitude; hydrogen, however, has a molecular weight 15 times smaller than air and thus the reduction to half pressure requires 75 kilometers of altitude. At an altitude of 20 kilometers the skin of the tower would be 6.4 meters thick, growing thinner with increasing altitude. The top could bear weights of 260,000 tons in buildings and equipment.

"Even if we cannot expect realization of this plan in the near future, still it is probable that if, with the passing of decades, it is realized then we can point proudly to the fact that the plan was born in our day."

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