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SCIENTIFIC INFORMATION REPORT

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PLEASE NOTE

This report presents unevaluated information extracted from recently received publications of the USSR and Eastern Europe. The information selected is intended to indicate current scientific developments and activities and is disseminated as an aid to research in the United States.

SCIENTIFIC INFORMATION REPORT

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I. BIOLOGY

Biochemistry

1. Enzyme Activity of Ribonuclease as Related to Structural Changes Due to the Effect of Ultrasound Waves

"The Effect of Ultrasound Waves on Ribonuclease," by I. Ye. El'piner and O. M. Zorina, Institute of Biological Physics, Academy of Sciences USSR; Moscow, Biofizika, Vol 5, No 5, Sep/Oct 60, pp 573-578

The purpose of the research described was to investigate the existence of any correlations between the enzymatic properties of a protein and the characteristics of its structure. Since ribonuclease is an enzyme and a much-studied protein compound, it was selected for these studies. On the basis of their research, the authors present the following conclusions.

1. Ribonuclease which has been subjected to ultrasound treatment (10 volts/cm^2) does not lose its enzymatic activity. No loss of activity was observed following ultrasound treatment of the enzyme either in the presence of hydrogen or in the presence of oxygen.

2. However, the ultrasound treatment of ribonuclease is accompanied by significant chemical transformations in the protein molecule, which is evidenced by the separation of low-molecular peptides or amino acid residues from the protein molecule. Furthermore, in the ribonuclease which was subjected to ultrasound treatment in the presence of oxygen solutions, a decrease in the maximum absorption band in the ultraviolet spectrum was noted.

3. With regard to ribonuclease which was subjected to ultrasound treatment in the presence of hydrogen, an increase in the molecular weight of the enzyme (on an average of 40-50 percent) was noted under the same conditions.

4. An analysis of the above-mentioned phenomenon makes it possible to consider that the breakdown of the cyclic amino acid residues of the ribonuclease molecule does not lead to a decrease of its enzymatic activity, as is the case with the proteolytic enzymes. Ultrasound action is not reflected by the enzymatic activity of ribonuclease or by the low-molecular fragments of peptides or of amino acids which separate from the molecule.

2. DNA Studies on Cell Surfaces

"A Change in the Surface Properties of Irradiated Desoxyribonucleoprotein and Desoxyribonucleic Acid," by A. M. Tongur and A. G. Pasynskiy, Institute of Biochemistry imeni A. N. Bakh; Moscow, Biofizika, Vol 5, No 5, Sep/Oct 60, pp 517-522

Nucleic acids and nucleoproteins, as well as lipoproteins, play a significant role in various intracellular structures, and in the formation of molecular surface boundaries in the protoplasm. These compounds, especially the nucleic acids, decompose under the effect of irradiation, as a result of which chemical and structural changes occur in the properties of nucleic acids and nucleoproteins, and in various internal surfaces of the cell boundary. With these facts in mind, the authors studied the capacity of desoxyribonucleoprotein (DNP) and desoxyribonucleic acid (DNA) to form monolayers and the effect of x-irradiation on the properties of these compounds in the monolayers.

The authors present the following conclusions.

1. Monolayers of DNA were prepared (by the method of spreading solid granules, and monolayers of DNP were prepared (by the method of spreading from solutions) on a 38% aqueous solution of $(NH_4)_2SO_4$. It was shown that the monolayers formed from the preparations of various molecular weights were 20-23 A° thick, which indicates that the molecules in the monolayers are arranged horizontally.

2. Curves representing pressure versus area of the monolayers which were obtained from natural preparations and from preparations which were destroyed by x-irradiation, (doses ranging from 10^4-10^6 r), coincide quite closely, which is characteristic of an essentially identical density of filling of the monolayers by convolutions of the polynucleotide chain, or by large fragments of this chain at a given lateral pressure.

Botany

3. A Review of the Physiological Role of Micronutrients in Plants

"The Physiological Role of Micronutrients in Plants," by M. Ya. Shkol'nik, Botanical Institute, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR-Seriya biologicheskaya, No 5, Sep/Oct 60, pp 686-706

This article reviews the recent studies of the physiological role of micronutrients in plants. Particular attention is paid to metal-containing enzymes, as well as to the effect of micronutrients in different enzyme systems. A more detailed discussion is given on some recent researches

on micronutrient participation in flavoprotein catalysis. In view of new findings concerning organometallic compounds and metal-containing enzymes a new approach to the problem of ion antagonism is suggested. The reader is referred to various data on the relationship between micronutrients and other chemical systems regulating vital functions, such as growth-promoting substances and vitamins. A detailed review is presented of micronutrient action in oxidation-reduction processes.

The paper discusses the role of micronutrients (especially that of Mn) in photosynthesis and in chlorophyll synthesis as well as in carbohydrate, phosphorus and protein metabolism and in transfer of organic substances. Much attention is paid to the effects on micronutrients of unfavourable environmental conditions and diseases. The problem of micronutrient interactions in metabolism and of absorption and translocation in plants is discussed.

4. Tannin-Bearing Plants

"High Mountain Plantations of Tannin-Bearing Plants," (Unsigned Article); Alma-Ata, Kazakhstanskaya Pravda, 5 May 60, p 4

"Semipalatinsk. A sovkhoz for the cultivation of tannin-bearing plants, the first of its kind in the country, was organized in the Dzhungarskiy Alatau Mountains. The sovkhoz will cultivate snakeweed, a tannin-bearing plant which grows in a wild state on the mountain plateaus, at an altitude of 1.5 to 2 kilometers. The roots of the plant weigh as much as 16 kilograms and contain up to 25 percent of tannin substances. The Kazakhstan botanists developed a method whereby the wild plant can be regularly cultivated; they also developed a method of processing the plant. The high-mountain snakeweed cultivating sovkhoz is subordinate to the Semipalatinsk sovnarkhoz which is constructing a processing plant which will be the largest in the country (the tannin extract is used by the leather industry). By the time the plant is completed, about 2,500 thousand hectares of land will be seeded in snakeweed."

5. Report of Russian Botanist's Trip to China

"Chinese Botanical Gardens," by M. V. Kul'tiasov; Moscow, Izvestiya Akademii Nauk SSSR-Seriya Biologicheskaya, No 5, Sep/Oct 60, pp 798-807

The author has reported on his visits to botanical gardens in China which took place from 23 December 1958 to 7 February 1959. The article presents a detailed account of his visits to six of the eight existing botanical gardens in China. The author who made the visit according to

a plan for scientific cooperation between the Academy of Sciences USSR and the Academy of Sciences of the People's Republic of China, was accompanied by a former student, Li Sheng-ch'eng, now a scientific assistant of the Peking Botanical Garden.

Microbiology

6. Plague and Pseudotuberculosis Antigens Studied

"A Study of Antigens of Plague and Pseudotuberculosis Bacteria by the Method of Precipitation in Agar," by S. I. Zaplatina, Tr. Astrakhansk. Protivochumn. St., (Works of the Astrakhan Anti-Plague Station), No 2, 1957 (1958), pp 100-108 (From Referativnyy Zhurnal Biologiya, No 16, 25 Aug 60, Abstract No 74970, by M. Krylova)

"Protein fractions A, B, and C of both microorganisms were investigated in the diffusion precipitation reaction performed according to a modified Oakley and Fulthorpe method. Ring precipitation appeared most rapidly in 0.3% agar (on the second day); dilution of the antigens prolonged the time of appearance of the precipitation zone. The complexity of antigenic structure of the plague and pseudotuberculosis microorganisms was demonstrated. The A fractions of both pathogen species were found to be strictly specific. The B and C fractions had a complex structure and had antigens common to both species. Nonspecific antigens were not observed."

7. Organism Resembling P. pestis Isolated From Rodents

"The Question of Pestiform Cultures Isolated From the Small Suslik (Preliminary Report)," by I. M. Vorona, Tr. Astrakhansk. Protivochumn. St. (Works of the Astrakhan Anti-Plague Station), No 2, 1957 (1958), pp 163-177 (From Referativnyy Zhurnal Biologiya, No 16, 25 Aug 60, Abstract No 74968, by A. Shapiro)

"Culture 1843, isolated from a small suslik, was examined. Morphologically and biochemically it differed slightly from Pasteurella pestis and P. pseudotuberculosis rodentium. It had common antigens with P. pestis No 17 and P. pseudotuberculosis No 6, but not with Escherichia coli communis. The culture was found to be pathogenic for white mice (subcutaneous and intraperitoneal administration), weakly pathogenic for guinea pigs (subcutaneous and intraperitoneal introduction), and completely

nonpathogenic for gerbils (subcutaneous introduction). The phage of this culture lysed slightly virulent P. pestis cultures No 1 and No 17, and virulent culture No 708. The author suggests that the isolation of culture No 1843 is the result of a P. pestis mutation in vivo."

8. Effects of Various Factors on Pasteurella

"The Resistance of the Pasteurellosis Pathogen to Certain Abiotic and Biotic Factors," by I. A. Dan'shev, Tr. Saratovsk. Zoovet. In-ta (Works of the Saratov Zooveterinary Institute), No 7, 1958, pp 72-76 (From Referativnyy Zhurnal Biologiya, No 16, 25 Aug 60, Abstract No 74960, by V. Roykhel')

"The viability of Pasteurella was studied in 1% and 3% solutions of carbolic acid, coal-tar creolin, lysol, NaOH, KOH, formalin, a 5% solution of a sulfur-carbolic mixture, and a clarified solution of calcium hypochlorite. It was shown that Pasteurella is not very resistant to the action of disinfectants. Sunlight killed Pasteurella within one to 2 hours; the organisms remained viable for 12-24 hours in diffused light. Pasteurella survived for 3-15 days during drying under conditions of weak or insufficient illumination at a warm time of year. Viability was 12 days in liquid manure, feces, soil, combined fodder, grain, decomposed hay, and water under sterile and unsterile conditions. The author suggests that the feeble resistance of Pasteurella to environmental factors is a species characteristic and does not depend on the individual characteristics of the different strains."

9. Filterable Forms of Bacteria Studied

"The Role of Filterable Forms in the Modifiability of Bacteria," by Ye. I. Zhitova, Nasledstvennost' i Izmenchivost' Rasteniy, Zhivotnykh i Mikroorganizmov (Heredity and Modifiability of Plants, Animals and Microorganisms), 1959, pp 294-298 (From Referativnyy Zhurnal Biologiya, No 18, 25 Sep 60, Abstract No 84778, by G. Kagan)

"The author calls filterable forms a special form of existence of bacteria as a result of their natural or artificial decomposition. Upon regeneration, filterable forms develop colonies: (1) by an incomplete process of development, which is distinguished by its morphology and by increased requirements for the composition of culture media; (2) by a complete process of development, which differs in some respects from the original. The first were repeatedly isolated by the author by seeding filtrates of aerated cultures on serum, yolk, and blood media, and media containing 'fodder.' They did not grow at all or did not grow very well

on simple media, and grew well on media containing serum albumin or yeast autolysates. Morphological, cultural and antigenic characteristics of similar cultures of different enteric bacteria are presented. It is noted that common characteristics of weakly growing cultures regenerated from filterable forms do not depend on their species; this, in the author's opinion, is a manifestation of a common mechanism of formation. The author considers that in the course of the formation of filterable forms, more new enzyme systems which determine the species distinctions are injured phylogenetically, and the systems which determine the vitally important functions are preserved. In serial passages of these cultures, on culture media and in the animal organism, they either die, recover the characteristics of the initial species, or form altered strains. Cultures with altered properties, seldom typical or identical with the initial properties, are frequently isolated from filtrates. The author subdivides the altered cultures into: (1) those differing from the initial cultures in antigenic properties; (2) cultures with decreased biochemical activity and inactive with respect to carbohydrate and alcohol; (3) pigment-forming cultures, which are distinguished by different properties. The nature of changes in enzymatic manifestations are approximately identical in different species of enteric bacteria. Antigenic complexes which differ from the original species are formed in the altered cultures; the antigenic species distinctions are also maintained to a known extent. As a rule, they are not virulent, not toxic, their properties are stable, and reversal of characteristics of the original species occurs only in isolated cases. In the author's opinion, the general direction of the course of mutation after regeneration of filterable forms is expressed by saprophytization. Filterable forms are the initial material for the formation of cultures with altered properties, but the process of their regeneration is one of the most important mechanisms of mutation."

10. Spirochetes Examined Under Electron Microscope

"The Structure of Pathogenic Spirochetes Under the Electron Microscope," by A. P. Shcheulov, Izv. ANUzSSR, Ser. Med (Bulletin of the Academy of Sciences Uzbek SSR, Medicine Series), No 5, 1959, pp 79-86 (From Referativnyy Zhurnal Biologiya, No 18, 25 Sep 60, Abstract No 84749)

"This article is a review of Soviet and foreign literature on electron microscopy of Cristispira, Treponema, Borrelia and Leptospira beginning in 1945."

11. Chemical Protection from Radiation

"Protective Action of Unithiol in Radiation Affections in Experiments on Rats and Rabbits," by S. Ya. Arbuzov and V. P. Korotkova; Yezhegodnik (Tr. In-ta Eksperim. Med. AMN SSSR) [Yearbook (Works of the Institute of Experimental Medicine, Academy of Medical Sciences USSR)], 1958, L., 1959, 433-437 (from Referativnyy Zhurnal-Biologiya, No 16, 25 Aug 60, Abstract No 79208, by K. Dubinina)

Unithiol intraperitoneally administered to rats in doses of 200 to 400 milligrams per kilogram body weight half an hour before irradiation (1000 to 1200 r) increases the resistance of the animals to the effects of radiation; this is manifested in the increase in the percentage of survival, an increase in the average life-span of the animals, and the more rapid recovery from the injuries caused by irradiation. Unithiol administered to rabbits (50 to 100 milligrams per kilogram body weight) one half hour before irradiation (1000r) increases the survival rate of the animals by 20 percent over that of the control animals. The protective action of unithiol and its doses vary depending on the species of the animals."

12. Pre- and Post-Irradiation Use of Bicillin Effective Against Radiation Sickness

"Bicillin in Different Variations of Complex Therapy and Prophylaxis of Acute Radiation Sickness in Dogs," by N. V. Rayeva and I. N. Usacheva; Moscow, Patologicheskaya Fiziologiya i Eksperimental'naya Terapiya, Vol 4, No 4, Jul/Aug 60, p 74

Bicillin was administered intramuscularly (600,000 units) in combination with streptomycin and chlortetracycline to dogs prior to and after their irradiation (by 600 r from x-rays and 300, 400, and 600 r from gamma-rays) for prophylactic and therapeutic purposes.

A certain degree of positive action due to bicillin was evident since the life span of the treated animals was prolonged by 2.5 days, and the symptoms of acute radiation sickness were less marked in the treated animals as compared with the control animals.

13. The Use of Ciin in the Therapy of Radiation Sickness

"Ciin and its Combination with Antibiotics in Acute Radiation Sickness in Mice," by Z. V. Yermol'yeva, G. Ye. Vaisberg, N. I. Givental', and T. N. Likina, Laboratory of New Antibiotics with the Chair of Microbiology, Central Institute for the Advanced Training of Physicians; Moscow, Antibiotiki, Vol 5, No 4, July-Aug 60, pp 37-41

Albino mice were used in the experiments which were carried out to determine the effectiveness of ciin, a polysaccharide of bacterial origin, when used in combination with antibiotics for the therapy of radiation sickness. Ciin was administered to the animals intraperitoneally in doses of 300 gamma per mouse of a 0.2 milliliters of a physiological salt solution. Control mice were administered only the physiological salt solution. Within 18 to 24 hours the animals were expose to X-ray irradiation in doses of 450 to 600 r. Ciin in combination with strepotmycin and bicillin was administered to some of the animals after the irradiation. The experiments established that a single administration of ciin sharply reduced mortality of the animals from radiation sickness; a single administration of ciin in combination with streptomycin and bicillin 24 hours before the irradiation almost completely prevented the death of the irradiated animals.

It is assumed that the effectiveness of ciin is due to its capacity to increase the resistance of the organism to a number of harmful effects caused by radiation.

14. Aminoethylisothiuronium Effect on the Organism

"The Protective Action of Aminoethylisothiuronium Against Ionizing Radiation," by I. Belokonskiy, Voyen-Med. Delo (Bulgaria), 1959, 14, No 3, 13-17 (from Referativnyy Zhurnal-Biologiya, No 18, 25 Sept 60, Abstract No 88881 by S. Stefanov)

"Experiments which were carried out on mice, rats, and guinea pigs established that aminoethylisothiuronium (I) (intraperitoneally and subcutaneously 10 to 30 minutes, and by mouth two hours before irradiation) prevented the death of 30 to 60 percent of the animals (100 percent mortality of the control animals) and increased the average life-span of the animals. The effective doses of I are considerably smaller than the toxic doses. The application of I 5 minutes before the irradiation produced no effect."

15. Plasma and Serum Protect Erythrocytes Against Radiation Damages

"Changes of Erythrocyte Radiosensitivity," by A. M. Kuzin and K. S. Trincher, Institute of Biological Physics, Academy of Sciences USSR; Moscow, Biofizika, Vol 5, No 5, Sep/Oct 60, pp 533-538

A method of detecting radiation damage to erythrocytes suspended in physiological solution gamma-irradiated by 500 r from radiocobalt has been developed. The method is based on the following formula:

$\sim \frac{1}{6}(500)(1.6 \times 10^{12})\ (50 \times 10^{-8})\ (200 \times 10^{-8}) \approx 130$ radicals; where 500 r is the irradiation dose, 1.6×10^{12} is the number of ionizations in one ml of water, 50×10^{-8} cm is the free path of a radical in the water, and 200×10^{-8} cm is the surface area of an erythrocyte.

The various protein molecules of blood plasma exert a protective effect against penetrating radiation action on "structured" protein complexes of the surface layer of erythrocytes. This protective action is evident following the action of irradiation doses as high as 3,000 r.

A hypothesis is expressed by the authors on the radical mechanism of radiation damage to the cell surface which has been irradiated by very low doses of penetrating radiations. Results of these studies indicate that erythrocytes under normal conditions are highly radio-resistant cells as a result of the protective effect of blood plasma. However, following a sharp decrease of the blood serum, the in vitro erythrocytes diluted by a factor of 200 become very radio-sensitive, and radiation injury becomes evident after irradiation by 500 r.

16. An Analysis of the Action of Agents Which Modify Radiosensitivity

"An Analysis of the Action of Fundamental Physical Factors Which Change Radiosensitivity," by L. Kh. Eydus and Ye. E. Ganassi, Institute of Biological Physics, Academy of Sciences USSR; Moscow, Biofizika, Vol 5, No 5, Sep/Oct 60, pp 523-532

Taking into consideration various factors which modify radiosensitivity, the authors attempt to compare the results of experiments concerning the irradiation of biological objects in vivo and in vitro with data obtained by using the method of electron paramagnetic resonance; they present the following conclusions.

Following irradiation, unpaired electrons which are subject to the action of a series of agents can be detected and may remain for long periods in macromolecules and in biological objects. Later, the fate of these unpaired electrons differs.

In the presence of sufficient moisture, a number of them disappear and thus cause no damage. The protective role of water is linked to this fact.

The effect of oxygen on a second part of these electrons causes injury ("oxygen effect") but only when water is present.

Injury by heat ("thermal" sequelae) is linked to the action exerted on the third part of the unpaired electrons, and the injury resulting therefrom is possible only in the presence of water. However, the protective role of heat which has been observed in a number of experiments depends on a change in the interrelationship of the action of various agents which modify the damage.

The fact that the injurious action of all three agents discussed by the authors, i. e., heat, oxygen and nitrogen oxides, is brought about only through the participation of water, deserves attention.

In the authors' experiments with protein solutions, the disappearance of the unpaired electrons under the effect of the modifying agents was accompanied by an irreversible loss of enzyme activity. Since the zone of localization of the unpaired electrons evidently is at some distance from the enzyme centers under normal conditions, these processes must involve migration of a charge and energy.

The presence of water is as essential for this as is the action of the modifying agents themselves.

It should be considered that water may play a double role in this case, i. e., the role of a substance through which migration occurs, and also the role of a factor which stabilizes the structure of the macro-molecules and thereby creates the possibility of migration through this structure.

A consideration of the physical mechanisms of the action exerted by agents which modify radiation injury does not enter into the scope of the present review. The authors point out that one should consider possible mechanisms of the action of modifying agents on the unpaired electrons which are preserved in the macromolecules, and on the protein structure itself in connection with the effect of the water which enters into the hydration of this structure.

17. The Effect of Radioactive Phosphorus On Aseptic Inflammations Caused by Burns

"The Second Azerbaydzhan SSR Conference On the Application of Radioactive Isotopes and Nuclear Radiation" by A. M. Mamedov; Moscow, Atomnaya Energiya, Vol 9, No 4, Oct 60, pp 338-339.

"At the Sector of Physiology, Academy of Sciences Azerbaydzhan SSR, the effects of a phosphorus isotope on the course and nature of aseptic inflammations were investigated. It was found that the radioactive phosphorus isotope P^{32}, when introduced 20 hrs before and 2 hrs after inflication of a burn trauma, changes in a significant manner the course of the inflammation process. It was established that under the action X-rays the strength and character of interoreceptive exchange reflexes is significantly altered. Whereas irradiated animals do not exhibit any noticeable changes in the composition of the blood (as far as the sugar level is concerned), significant changes can be detected in the character of the interoreceptive exchange reflexes. This finding is of practical importance."

18. Excretion of Radioactive Substances from the Organism

"Methods of the Excretion of Radioactive Sulfur of Mercamine From the Organism of Irradiated and Non-irradiated Animals," by S. Ya. Arbuzov, V. A. Bazanov, I. Ya. Nekachalova, V. N. Patalova, V. V. Petelina, and E. K. Shamova; Yezhegodnik (Tr. In-ta Eksperim. Med. AMN SSSR) [Yearbook (Works of the Institute of Experimental Medicine, Academy of Medical Sciences USSR)], for 1958, L., 1959, 419-424 (from Referativnyy Zhurnal-Biologiya, No 16, 25 Aug 60, Abstract No 79209, by K. Dubinina)

"A solution of mercamine S^{35} (100 milligrams of mercamine with an activity of 100 microcuries) was intraperitoneally administered to control and experimental rats (60) in a dose of 2.5 milligrams per kilogram body weight. Half an hour later the animals (30) were irradiated with 1000 r, and the activity of S^{35} in the urine and feces was determined. During the first 24-hour period the S^{35} was excreted mainly with the urine; an increase of the excretion of S^{35} with the feces was noted during the second 24-hour period. Less S^{35} was excreted by the experimental animals than the control animals; diuresis decreased. Mercamine increased the excretion of ester-sulfur compounds with the urine, a fact, which apparently points to the intensification of the detoxication process."

19. Electrical Conductivity Correlated With Autolysis in Hepatic Tissue Surviving Irradiation

"A Study of the Electrical Conductivity and Autolysis of the Hepatic Tissue of Irradiated Animals," by Ye. V. Burlakova and I. M. Parkhomenko, Biology-Soil Faculty of the Moscow State University imeni M. V. Lomonosov; Moscow, Biofizika, Vol 5, No 5, Sep/Oct 60, pp 552-557

The purpose of the research described was to correlate the autolytic processes in the hepatic tissue of irradiated animals with the changes occurring in its electrical parameters.

The change of high-frequency and low-frequency (0.2, 2, 10, 50 and 100 kc, and 1 megacycle) resistance values and the dispersion of resistance in the hepatic tissue irradiated in vitro by gamma-rays from cobalt, and also the change in the resistance value and in the autolytic processes of the surviving hepatic tissue of mice subjected to in vivo gamma-irradiation from radiocobalt were studied.

1. It was established that, following gamma-irradiation from radiocobalt by doses of 40,000 and 50,000 r, there is an increase in the values of dispersion of resistance and of low-frequency and high-frequency resistance in the surviving hepatic tissue of rats.

2. It was evident that the autolytic processes (determined from amino nitrogen) in the surviving hepatic tissue of mice subjected to gamma-irradiation from radiocobalt by doses of 800-1,000 r were intensified.

3. A direct correlation between the intensification of the autolytic processes in the surviving hepatic tissue of the irradiated mice and the increase in the value of low-frequency resistance of the hepatic tissue was established. The value of the correlation ratio of these two processes was 0.88 for the first hour, 0.86 for the second hour, and 0.81 for the third hour.

Fuels and Propellants

20. Heats of Formation of Hydroperoxides and the Conjugation Energies of Some Peroxide Radicals

"A Semiempirical Method for Calculating the Heats of Formation of Hydroperoxides and the Conjugation Energies of Some Peroxide Radicals," by G. I. Likhtenshteyn, A. L. Buchachenko, and V. I. Vedeneyev, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 133, No 5, 11 Aug 60, pp 1102-1104

In the oxidation of a great number of organic substances in the gaseous, liquid, and solid phases, hydroperoxides play an important role as chain-branching agents. To calculate the energy of reactions in which hydroperoxides participate, it is necessary to have data on the heats of formation of these compounds. A satisfactory method for calculating these heats of formation was not available hitherto. A semiempirical method for this purpose is proposed. By using this method, it was established that with the increase of the length of the hydrocarbon chain and the growth of the degree of branching, Q_{RO-OH} increases in a regular manner from 32 kilocalories for CH_3OOH to 39 kilocalories for tert-C_5H_{11} OOH. An equation is derived which makes it possible to calculate the conjugation energy of peroxide radicals. This equation was used to calculate the conjugation energy of the radical that forms after irradiation of teflon with gamma-rays in the presence of oxygen. By using this equation, it was possible to analyze the structure of a number of polyoxygen compounds. Specifically, it was established that the true structure of ozone corresponds neither to a biradical nor to a three-membered ring.

21. Initiating Effect of Nitrosyl Chloride in Oxidations

"The Initiating Effect of Nitrosyl Chloride in the Oxidation of Propane," by Z. K. Mayzus and N. M. Emanuel', Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 133, No 3, 21 Jul 60, pp 627-629

Controlled oxidation of propane in the presence of nitrosyl chloride was investigated. It was found that addition of NOCl not only increases the rates of formation of acetaldehyde and formaldehyde in comparison with the rates at which these products are formed in the presence of nitrogen dioxide or in an oxidation that has not been initiated by a gaseous catalyst,

but also raises the maximum concentrations of these two substances. Furthermore, the catalytic action of nitrosyl chloride is effective in lowering the temperature of spontaneous ignition of mixtures of propane with oxygen. When the oxidation of propane is catalyzed by nitrosyl chloride or nitrogen dioxide, the principal nitrogen-containing compound that is formed during the oxidation is nitropropane. Practically all of the nitrogen contained in the nitrosyl chloride is transferred into nitropropane.

With equal quantities of NOCl and NO_2 added, the rate of formation of nitropropane is greater in the reaction catalyzed by NOCl. From the fact that the maximum yields of nitropropane in the presence of NOCl and NO_2 are the same, one may draw some conclusions in regard to the mechanism of the action of NOCl. If the catalytic effect were due solely to the action of NO_2 formed from NOCl, as has been assumed for the nitrosyl chloride-sensitized reaction of hydrogen with oxygen, the action of NOCl and NO_2 must be the same in the systems under consideration. Actually the catalytic effect of NOCl is much greater than that of equivalent quantities of NO_2. Consequently, in catalysis with NOCl, an important role in the initiation of oxidation chains must be played by Cl atoms formed as a result of the decomposition of nitrosyl chloride.

22. Conversion of Natural Gas to Synthesis Gas and Production of Hydrogen From Natural Gas

"Conversion of Natural Gas With Water Vapor on Iron-Nickel Catalysts," by Yu. I. Ibragimov, N. P. Grebenshchikova, Ya. Yu. Aliyev, and S. A. Sigov, Institute of Chemistry, Academy of Sciences Uzbek SSR; Tashkent, Uzbekskiy Khimicheskiy Zhurnal, No 4, Aug 60, pp 49-54

A very extensive supply of raw material is available in the form of natural gas at the Bukhara Oblast' of the Uzbek SSR. Conversion of solid or liquid fuel does not make it possible to produce at a low enough cost synthesis gas for the production of ammonia and organic synthesis. By converting the hydrocarbons of natural gas, the cost of synthesis gas can be reduced considerably.

At present, natural gas in the USSR is converted principally by the catalytic method. Nickel is used as a catalyst in the process applied. Although nickel is sufficiently active when the gases do not contain sulfur, it is too easily poisoned (sometimes irreversibly) even by traces of sulfur compounds. For this reason, the development of new low-temperature, highly active, mechanically strong, sulfur-resistant, and cheap catalysts for the conversion of natural gas is of particular importance. Catalysts on the basis of iron appear especially promising from this standpoint.

A. A. Baykov proposed as early as 1933 that iron ore be reduced directly with natural gas. However, no such process has been applied on a technical scale as yet.

K. P. Lavrovskiy and A. L. Rozental' developed a continuous process for the production of hydrogen by the reduction of iron ores by a fluidized solids method, using water gas and, later, natural gas (Trudy Instituta Nefti AN SSSR, 8, 1956, p 134). In the opinion of Lavrovskiy and Rozental', the iron ore transfers oxygen taken from the water during the oxidation stage, i.e., it functions as a chemical reagent.

I. M. Artyukhov devised a novel method for the conversion of hydrocarbons on catalysts containing 15-50% of iron (Gazovaya Promyshlennost', 5, 1958, pp 36-40).

T. Ogawa and coworkers established that it is feasible to apply an iron oxide catalyst for the conversion of methane to synthesis gas (cf T. Ogawa, U. Matui, and H. Senco, Chemical Abstracts, Vol 33, 1939, p 3327; Vol 34, 1940, p 5627)

In the work described at present, Bukhara natural gas containing 95-97% of methane was converted together with water vapor in the temperature range of 600-900° on a catalyst consisting of the oxides of aluminum, iron, and chromium. It was found that this catalyst exhibits only a low activity in this type of process. Its activity could be increased considerably by adding nickel; it reached a maximum at a nickel content amounting to 10-15%. A method proposed for the heat treatment of the catalyst eliminated settling at the temperatures used in the experiments. No data on the poisoning of the catalyst due to the presence of sulfur compounds are given.

23. Thermodynamic Treatment of Experimental Data on Vapor-Liquid Equilibrium in the System Oxygen-Argon

"Thermodynamic Treatment of Experimental Data on Vapor-Liquid Equilibrium in the System Oxygen-Argon," by G. B. Narinskiy, Institute of Oxygen Machine Building; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 8, Aug 60, pp 1778-1787

Experimental data on vapor-liquid equilibrium in the system oxygen-argon for the temperatures 90.5, 100, 110, and 120°K (1) have been subjected to thermodynamic analysis with the objective of testing their validity.

On the basis of the general Van-der-Waals equation, using the equation of state with the second virial coefficient in its precise form for the vapor phase, a relation has been derived between the total pressure and the composition of the equilibrium phases of liquid and vapor at constant temperature. The equation is of sufficient accuracy for the pressures occurring in the experiments. The deviation of the experimental data from the equation has been determined both for the entire range of concentrations and for individual regions, and it has been shown that the deviations fall within the limits of possible errors in the determination of pressures, temperatures, and compositions of the liquid and vapor phases. The activity coefficients of the solution components have been calculated, and it has been shown that the oxygen-argon system may be regarded as belonging to the class of regular solutions.

24. Investigation of the Separation of Nitrogen-Helium Mixtures by Diffusion Through Porous Membranes

"Investigation of the Separation of Nitrogen-Helium Mixtures by Diffusion Through Porous Membranes," by M. G. Kaganer, All-Union Scientific Research Institute of Oxygen Machine Building; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 9, Sep 60, pp 2005-2012

The diffusion of three helium-nitrogen mixtures containing 4-20% helium through porous partitions with pore sizes of a few tenths of a micron has been investigated. The effect of the pressure in front and behind the partition, of the mean pressure, and of the fraction of the gas having passed the partition on the separation coefficient has been determined. The experimental data deviate markedly from the theoretical. The relation between the ratio of the theoretical and experimental values for the enrichment coefficient and the pressure difference has been found to be described by a straight line in the region from 0.5 to 3.0 kg/cm^2.

25. Arrangement for Determining the Compressibility of Gases at Pressures Up to 200 Atm and Temperatures in the Range of 0° to Minus 200° C

"Arrangement for Determining the Compressibility of Gases at Pressures up to 200 Atm and Temperatures of 0° to minus 200°C," by I. A. Rogovaya and M. G. Kaganer, All-Union Scientific Research Institute of Oxygen Machine Building; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 9, Sep 60, pp 1933-1937

An arrangement has been developed for measuring the specific volumes of gases in the ranges of temperatures from 0° to minus 200°C and pressures up to 200 atm with an accuracy of approximately 0.05%. The arrangement was designed to measure the specific volumes of air, argon, oxygen, and

other atmospheric gases. The specific volume of air has been measured at temperatures of 0°, minus 50°, and minus 100°C and pressures up to 110 atm (absolute). The results obtained are in good agreement with the data of Michel et al.

Geochemistry

26 a. Distribution of Germanium in Coal Components

"On the Character of the Distribution of Germanium in Coal Components," by I. S. Sofiyev and I. N. Semasheva; Moscow, Geokhimiya, No 6, Aug 60, pp 541-543

Investigation of a section of a coal deposit that is considerably enriched in germanium and is described in some detail indicated that germanium was present in all components of the coal, including fusain (cf I. S. Sofiyev, I. N. Semasheva, and D. T. Zabramnyy, Doklady Akademii Nauk Uzbekskoy SSR, No 8, 1959). It was apparent that the gelled portions of structural vitrain had a greater tendency to accumulate this element than other coal components. However, there was no connection between an increased vitrain content and accumulation of germanium in every region of the deposit; some sections were rich in vitrain, but poor in germanium. It is concluded that the distribution of germanium between sections does not depend on the petrographic composition of the coal in the sections, although there is a distinct correlation between the germanium content and individual petrographic components in any particular section. The determining factor in the distribution of germanium between sections of a coal deposit is apparently not the petrographic composition of the coal, but the total complex of physicochemical conditions that have contributed to the migration of germanium from one section of buried peat to another. Enrichment of germanium within sections in individual coal components must be regarded as a consequence of subsequent redistribution due to the characteristic properties of the coal components.

26 b. Migration of Rhenium From Molybdenites.

"Specific Characteristics of the Migration of Rhenium From Molybdenites," by D. Ye. Morachevskiy and A. A. Nechayeva, All-Union Scientific Research Geologic Institute, Leningrad; Moscow, Geokhimiya, No 6, Aug 60, pp 543-545

The rhenium content in a molybdenite deposit that had been investigated was found to vary widely (from traces to 170 g of Re per ton). In some other molybdenite deposits, the content of Re reaches 0.1% and more. The

content of water-soluble rhenium and molybdenum in molybdenites and the content of molybdenum and rhenium in molybdenites of some deposits as compared with that in the waters correlated with these deposits were determined. It was established that rhenium goes into solution much more readily than molybdenum and migrates with greater facility. The compounds of rhenium formed from molybdenites are more soluble in water than the corresponding rhenium compounds. Rhenium is oxidized more easily than molybdenum. The relative content of rhenium increases with the depth of the deposit because oxidation is less pronounced at greater depths. Notwithstanding the greater tendency of rhenium to migrate, rhenium and molybdenum may occur together in iron ochers, which have a good adsorption capacity for both of these elements.

27. On Interrelationships Pertaining to Rare-Earth Elements and Some Peculiarities of Rare-Earth Separation in the Processes of Endogenous Mineral Formation

"On Interrelationships Pertaining to Rare-Earth Elements and Some Peculiarities of Rare-Earth Separation in the Processes of Endogenous Mineral Formation," by L. S. Borodin, Institute of Mineralogy, Geochemistry, and Crystal Chemistry of Rare Elements, Academy of Sciences USSR; Moscow, Geokhimiya, No 6, Aug 60, pp 506-517

The study of variations in the composition of rare earths in a number of minerals of a different genesis (monazite, rinkolite, sphene, apatite, perovskite) with the aid of a correlative "lanthanum" graph shows that in many geochemical processes, a division of the rare earths into two groups, those of "more basic" and "less basic" elements, is observed. Being determined by concrete geochemical conditions, the composition of the indicated groups is not constant. Only in some cases (when there is approximately equal activity of ceric and yttric earths) do these groups correspond to ceric and yttric earths.

The change in the composition of both groups takes place in a conjugated manner which is displayed in a constantly observed multiple correlation -- direct and inverse -- of all the rare-earth elements.

The composition of the group of rare-earth elements which separate from the solution determines the possibility of the appearance of a selective or complex composition of the rare earths in minerals of the same paragenesis.

28. Composition of the Rare Earths in Gadolinites From Deposits of Different Genetic Types

"Composition of the Rare Earths in Gadolinites from Deposits of Different Genetic Types," by E. Ye. Vaynshteyn, I. T. Alexandrova, and N. V. Turanskaya, All-Union Institute of Mineral Raw Materials and Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, Academy of Sciences USSR; Moscow, Geokhimiya, No 6, Aug 60, pp 498-505

The distribution of rare-earth elements and yttrium in gadolinites from deposits of four different genetic types was studied with the aid of X-ray spectral analysis. It is shown that the character of the distribution of elements in gadolinites (belonging to the number of so called complex minerals) strongly depends on the conditions of their formation. The most enriched in yttrium are the gadolinites, the formation of which is connected with granitic and alkaline pegmatites. The richest in cerium are the accessory gadolinites. If albitization processes are developing in gadolinites, an accumulation of yttrium and ceric rare-earth elements and a removal of yttric earths occur.

29. Neutron-Borometric Surveying

"Neutron-Borometric Profiling," by V. I. Baranov, V. K. Khristianov, B. V. Karasev, and S. S. Korobov, Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, Academy of Sciences USSR; Moscow, Geokhimiya, No 6, Aug 60, pp 490-497

Detectors of neutrons and gamma-quanta combined with amplifying schemes are arranged together with a hydrogen-containing reflector of neutrons symmetrically in relation to a Po-Be neutron source. The reflector, together with the rest of the arrangement set on metal runners, is pulled by an automotive vehicle with a speed of 6 ÷ 8 km/h.

The readings are automatically recorded. A concentration change of the boron oxide in the soil by 0.005 percent causes a change in the counting speed of the neutron counter by 10 percent relative.

With the aid of a simultaneous recording of the density of the neutron flux and the intensity of secondary gamma radiation, one succeeds in following changes in the boron concentration in areas of chloride saline accumulations (salt domes). The arrangement described is of use in detecting deposits of boron minerals and accumulations of boron in waters correlated with petroleum deposits. Neutron-borometric surveying was found to be superior to surveying by the boron-metallometric method.

30. Extraction of Uranium by Adsorption From Slurries and Solutions

"Extraction of Uranium by Adsorption From Slurries and Solutions," by B. N. Laskorin; Moscow, Atomnaya Energiya, Vol 9, No 4, Oct 60, pp 286-295

It is brought out that ion-exchange processes are used extensively in the uranium industry. Adsorption from acidic and carbonate solutions and slurries is applied in the treatment of uranium ores and in the production of pure uranium compounds. The fundamental relationships underlying these processes are discussed. The characteristics of different types of ion-exchange resins which can be used for the selective adsorption of uranium are given. USSR cation-exchange resins employed for this purpose are described and compared with US, British, and GDR resins. The behavior of elements accompanying uranium is described. Information is given on variations of the flowsheet for an adsorption process by which uranium can be extracted from a slurry containing up to 40% of solids. It is pointed out that further improvement in technical adsorption processes can be achieved by using ion-exchange agents which exhibit superior kinetic characteristics and have a higher selectivity with respect to uranium. The article is based to a considerable entent on the author's own work in this field.

31. Existence in Solutions of a Monoacetate Uranyl Complex

"The Existence in Solutions of a Monoacetate Uranyl Complex," by V. P. Nikol'skiy, V. V. Kolychev, A. L. Grekovich, and V. I. Paramonova; Leningrad, Radiokhimiya, Vol 2, No 3, May 60, pp 330-338

By applying the methods of ion exchange, pH measurements, and spectrophotometry, it was established that in acetate solutions at low concentrations of the ligand (not exceeding 3.5×10^{-3} M), only the complex ion $[UO_2 Ac]^+$ is present, in addition to uranyl ions. It was also established that at concentrations of the ligand higher than 3.5×10^{-3} M, complexes with a higher content of the ligand are present in solution in addition to the cationic complex $[UO_2 Ac]^+$. The value of the dissociation ("instability") constant K_1 for the complex cation $[UO_2 Ac]^+$ was established by all three methods mentioned above and found to be equal to 3.5×10^{-3} on the basis of ion exchange data, 3.8×10^{-3} on the basis of data obtained by pH determinations, and 3.7×10^{-3} on the basis of spectrophotometric data. Because in the calculation of the constant K_1 the possibility of partial formation of complexes with a greater number of ligand groups than one was not considered, the lowest value obtained,

i.e., 3.7×10^{-3}, must be regarded as the lower limit of the value of the constant. Actually, the stability of the complex may be somewhat lower than that corresponding to this value.

32. Solubility Product of the Hydroxide of Tetravalent Uranium

"The Solubility Product of the Hydroxide of Tetravalent Uranium," by M. A. Stepanov and N. P. Galkin; Moscow, Atomnaya Energiya, Vol 9, No 4, Oct 60, pp 282-285

The solubility product of $U(OH)_4$ has been calculated. Knowledge of this product is necessary for the efficient carrying out of processes of uranium conversion and methods for the determination of uranium. As a basis for the calculation, experimental data have been used which were obtained by the potentiometric titration with alkali of a hydrochloric acid solution of tetravalent uranium. The p_H was determined by using an LP-5 tube potentiometer; the active concentration of U^{4+} was calculated from the analytically determined concentration of tetravalent uranium under consideration of hydrolysis and the ionic strength. It was established that the solubility products equals $(1.10 \pm 0.72) \cdot 10^{-52}$.

33. Determination of the Composition of Nitric Acid Solutions of Uranyl Nitrate on the Basis of Specific Weight, Electrical Conductivity, and Refraction Index

"Physicochemical Properties of Nitric Acid Solutions of Uranyl Nitrate and Determination of the Composition of These Solutions (on the Basis of Specific Weight, Electrical Conductivity, and the Refraction Index)," by T. A. Slepyan and S. M. Karpacheva; Leningrad, Radiokhimiya, Vol 2, No 3, May 60, pp 369-376

The specific weight, viscosity, electrical conductivity, and refraction index of the system uranyl nitrate-nitric acid-water have been investigated in the concentration range from 0 to 2 M with respect to uranyl nitrate and from zero to saturation with respect to nitric acid. It was found that the specific weight can be calculated by using the formula $d = d_0 + 0.317\ c_U + 0.029\ c_H$ with a precision reaching 0.5% relative. It was also established that the refraction index can be determined by the formula $n = n_0 + 0.0339\ c_U + 0.0067\ c_H$ with a precision approaching 0.2% (relative). On the basis of the physicochemical characteristics that have been studied, a method was developed for the determination of the composition of the tricomponent system uranyl nitrate-nitric acid-water. Diagrams relating the specific weight to electrical conductivity and the index of refraction to electrical conductivity have been constructed that are to be used in determinations of the composition of this system.

34. Infrared Spectra of Organic Solutions of Uranyl Nitrate Hydrates in the Region of Frequencies of Deformational Vibration of Water

"Infrared Spectra of Organic Solutions of Uranyl Nitrate Hydrates in the Region of Frequencies of Deformational Vibration of Water," by V. M. Vdovenko, D. N. Suglobov, and Ye. A. Smirnova; Leningrad, Radiokhimiya, Vol 2, No 3, May 60, pp 296-300

On the basis of data obtained by investigation of the nature of changes in spectra of solutions of uranyl nitrate dihydrate in some organic solvents and also of spectra of ether solutions of uranyl nitrate with varying concentrations of water taken in the region of frequencies of deformational vibrations of water, it was established that the water coordinated with uranium is polarized and that there is formation of a hydrogen bond between the water of hydration and molecules of the solvent. It was also established that unequal values must be ascribed to the positions of the first two and subsequent two molecules of water in the coordination sphere of uranium. By comparing spectra of uranyl nitrate solutions in mixtures of ethyl ether-carbon tetrachloride with spectra of solutions of uranyl nitrate in ethyl ether at varying concentrations of water, it was established that the apparent reduction of the average degree of hydration of uranyl nitrate with increasing proportions of carbon tetrachloride takes place as a result of changes in the quantity of freely dissolved water and water of the second solvate layer. Even at high concentrations of carbon tetrachloride, the hydrogen bond between the water of hydration and ether remains unbroken.

35. Improved Method for the Coprecipitation of Uranium From Natural Waters

"Organic Coprecipitants; Part 14 -- An Improved Method for the Coprecipitation of Uranium From Natural Waters," by V. I. Kusnetsov and T. G. Akimova; Leningrad, Radiokhimiya, Vol 2, No 4, Aug 60, pp 426-430

It was established that uranium can be coprecipitated quantitatively with methyl violet thiocyanate from natural waters containing only 0.02 γ of U per liter when the p_H is no higher than 3-3.5. At a $p_H \sim 4.5$ coprecipitation of uranium proceeds to the extent of ~80%. It was found that when diethylthiocarbamate of sodium, ammonium thiocyanate, and methyl violet are used together, coprecipitation of uranium takes place quantitatively from water with a p_H of 7.8-8.6 . Procedures are described for the coprecipitation of uranium from acidified and and nonacidified natural waters. A method has been developed for the preparation of samples on which fluorometric determination of uranium is carried out. The experiments described have been conducted with a sodium chloride solution, water from the Moskva river, and water from the Pacific Ocean.

36. Determination of the Solubility of Ammonium Plutonyl Carbonate in Different Aqueous Solutions

"Determination of the Solubility of Ammonium Plutonyl Carbonate in Different Aqueous Solutions," by L. Ye. Drabkina; Leningrad, Radiokhimiya, Vol 2, No 3, May 60, pp 377-378

In an earlier paper, the isolation of ammonium plutonyl carbonate $(NH_4)_4[Pu\ O_2\ (CO_3)_3]$ in the solid state was reported (cf. L. Ye. Drabkina, Zhurnal Neorganicheskoy Khimii, Vol 3, 1958, p 1109). Its characteristics were described. In the investigation reported at present, the solubility of this salt in aqueous solutions of ammonium carbonate, ammonium nitrate, and mixed solutions of ammonium carbonate and ammonium nitrate was determined. It was established that in all of the solutions mentioned, the solubility of ammonium plutonyl carbonate changes in accordance with the solubility product law.

37. Extraction Capacity of Neutral Organic Substances Containing Oxygen

"The Extraction Capacity of Neutral Organic Substances Containing Oxygen," by V. G. Timoshev, K. A. Petrov, A. V. Rodionov, V. V. Balindina, A. A. Volkova, A. V. Yel'kina, and Z. I. Nagnibeda; Leningrad, Radiokhimiya, Vol 2, No 4, Aug 60, pp 419-425

The extraction capacity of neutral oxygen-containing organic substances is characterized on the basis of distribution coefficients of uranyl nitrate and of the nitrates of plutonium (IV), zirconium, and niobium. A great number of distribution factors, particularly between aqueous solutions and organophosphorus solvents, was determined. It was established that the extraction capacity depends on a number of parameters, particularly the chemical composition and physical state of the extracting agent and also the displacement of electronic density toward the oxygen atom which functions as a donor of electrons during the formation of the coordination complex which is extracted. This displacement of the electronic density is affected both by the chemical composition and the physical state of the extracting agent. It is shown that the most generally valid relationship affecting extracting capacity is the displacement of electronic density in the molecule of the extracting agent or solvent.

38. Coprecipitation of Tetravalent Plutonium With Organic Reagents

"Organic Coprecipitants; Part 13 - Coprecipitation of Tetravalent Plutonium," by V. I. Kuznetsov and T. G. Akimova; Leningrad, Radiokhimiya, Vol 2, No 3, May 60, pp 357-363

A method has been developed for coprecipitating plutonium in the form of the nitrate anion $Pu(NO_3)_6^{2-}$ with the nitrate of the butyl ester of rhodamine B (butylrhodamine). It was established that coprecipitation of plutonium takes place quantitatively in such a manner that this element is separated from large quantities of any other elements that may be present with the exception of U (IV), Th, and Ce (IV). It was found that at an appropriate value of the pH, plutonium can be quantitatively coprecipitated with precipitates formed by stilbazo, arsenazo, phensulfazo, and chromotrope 2 B when these reagents are reacted with methyl violet or methylene blue.

39 a. Properties of Nitric Acid Solutions of Plutonyl

"Properties of Nitric Acid Solutions of Plutonyl; Part 3- Stability of Plutonyl in Nitric Acid Solution," by V. B. Nikol'skiy, M. Ye. Pozharskaya, and B. G. Pozharskiy; Leningrad, Radiokhimiya, Vol 2, No 3, May 60, pp 320-329

It was shown that during the storage of nitric acid solutions of plutonyl, there is radiolytic reduction of plutonium, the rate of which diminishes with increasing concentrations of plutonyl. It was found that during the radiolytic reduction of dilute nitric acid solutions of plutonyl at pH = 2.15 - 3.55, pentavalent plutonium is formed. Hexavalent plutonium is reduced in the form of a plutonyl hydroxy compound. The reaction takes place according to the equation

$$PuO_2OH^{+} + H \rightleftharpoons PuO_2^{+} + H_2O$$

The reduction of plutonyl is accompanied by an increase in the concentration of hydrogen ions formed as a result of the radiolysis of water and also because of the ionization of hydrogen formed in radiolysis due to the action of the α-radiation emitted by plutonium. Accumulation of hydrogen ions may lead to the formation of tetravalent plutonium by the reaction

$$2\,PuO_2^{+} + 4\,H^{+} \rightleftharpoons Pu^{4+} + 2\,H_2O$$

The assumptions are made that in weakly acidic solutions hydroxy compounds of plutonium are reduced and that the reaction of the disproportionation of tetravalent plutonium takes place according to the equation

$$3\ PuOH^{3+} \rightleftharpoons PuO_2^{2+} + 2\ Pu^{3+} + H^+ + H_2O$$

$Pu(OH)_2^{2+}$ ions and possibly $Pu(OH)_3^+$ ions may participate in the disproportionation reaction. $Pu(OH)_4$ molecules do not participate in the disproportionation because they undergo polymerization.

39 b. Solubility of Double Sulfates of Zirconium and Plutonium in Saturated Potassium Sulfate Solutions

"Determination of the Solubility of Double Sulfates of Zirconium and Plutonium in Saturated Potassium Sulfate Solutions on the Basis of Data Obtained by Applying Radioactive Tracers," by V. N. Dobrova; Leningrad, Radiokhimiya, Vol 2, No 3, May 60, pp 364-368

It was established that the double sulfates formed by zirconium and plutonium with potassium are difficultly soluble compounds. It was found that a double sulfate of zirconium and potassium of constant composition can be obtained by agitating for a long time the originally formed double sulfate together with the saturated solution of potassium sulfate in which it had formed. The data that have been obtained on the double potassium-plutonium sulfate indicate that there is no hydrolysis of this plutonium salt in the solutions used in the experiments. The compositions of the plutonium (IV)-potassium and zirconium-potassium double sulfate prepared under the same conditions are different and can be expressed by the formulas $K_4 Pu(SO)_4$ and $K_2 Zr(SO_4)_3$.

40. Separation of Boron Isotopes by Exchange Between Boron Trifluoride and Fluoroboric Acid

"The Separation of Boron Isotopes by Chemical Exchange Methods," by B. P. Kiselev; Moscow, Atomnaya Energiya, Vol 9, No 2, Oct 60, pp 312-313.

The chemical methods for the separation of boron isotopes are briefly reviewed and compared with distillation methods. The author's experiments on the separation of boron isotopes by chemical exchange between gaseous boron trifluoride and fluoroboric acid according to the equation

$$B^{10}F_4^- + B^{11}F_3 \rightleftharpoons B^{11}F_4^- + B^{10}F_3$$

are described. It was found that B^{10} concentrates in the gas phase. The separation factor was found to be 1.028 ± 0.008, which is a higher value than that obtained in the separation by distillation of BF_3. The experiments described were carried out at 20-30°C.

41. Isotopic Mass-Spectrometric Analysis of Boron by the Thermionic Emission Method

"Isotopic Mass-Spectrometric Analysis of Boron by the Thermionic Emission Method," by A. M. Kolchin, V. F. Malakhov, and G. M. Panchenkov, Moscow State University; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 9, Sep 60, pp 2124-2125

Determination of the isotopic composition of boron in oxygen compounds of this element by the method involving conversion of the boron into boron trifluoride is cumbersome and not precise enough; the method of thermionic emission, which can be applied directly to the oxygen compounds, is preferable. By using a single filament ionic source with sodium borate as the emitter, ionic radiation beams with the masses 88 and 89 (corresponding to the ions $Na_2B^{10}O_2^+$ and $Na_2B^{11}O_2^+$) are obtained. Comparison of the intensities of the two peaks makes it possible to establish directly the B_{11}/B_{10} ratio. It was found in the experiments described that the intensity of the ionic emission from borax increases with increased reducing capacity of the metal employed as material for the band serving as carrier for the borax; according to the measurements made, the emission increases in the sequence Pt < Ni < W < Ta (there is no emission of $Na_2BO_2^+$ ions at all from platinum). This suggested to the authors that the intensity of emission can be increased by adding a reducing agent to the borax. By using as the emitter a mixture of borax with magnesium powder (at a volume ratio of 4 : 1), a rather intensive (of the order of 10^{-11} amperes) ionic current that was stable in time could be obtained, by means of which isotopic analyses of boron could be carried out with a precision of 1%. No memory effect and no fractionation of boron isotopes in the course of the process of thermionic emission were observed.

42. Extraction of Uranium (VI) Investigated in Hungary

"Investigation of Extraction of Uranium (VI) With Di-n-butylphosphoric Acid," by Csaba Ujhelyi, Nuclear Research Institute of the Hungarian Academy of Sciences, Debrecen; Budapest, Magyar Kemiai Folyoirat, Vol 66, No 8, Aug 60, pp 306-309

The author discusses his procedure for preparing di-n-butylphosphoric acid (DBP). He established that the viscosity of a DBP preparation, washed with water 15 times in the course of preparation, is 45.3 ± 0.3 cp; its index of refraction, (n_D) $1.4262 \pm 1.4, 10^{-4}$; and its density, $1.0519 \pm 1, 10^{-4}$ gcm^{-3} at 25° C temperature.

The author conducted quantitative investigations to establish the extractability of uranyl chloride, nitrate, sulfate, and acetate from aqueous solutions as a function of the concentration of hydrochloric acid, nitric acid, sulfuric acid, and acetic acid. In these extraction experiments, the concentration of uranyl ions was $0.04N$, and the extractability of these ions was investigated by means of 0.1 N DBP in carbon tetrachloride.

Best yields were obtained if the hydrochloric acid, nitric acid, and sulfuric acid concentrations were 0.2 N. In contrast to this, the extraction process in solutions of acetic acid showed totally different behavior. In the latter case, the efficiency of extraction was best at about a concentration of 10 N.

43. Heat Capacity of Calcium and Barium Uranates (VI) at High Temperatures

"Heat Capacity of Calcium and Barium Uranates (VI) at High Temperatures," by V. Ya. Leonidov, T. N. Rezukhina, and I. A. Bereznikova, Moscow State University; Moscow, Zhurnal Fizicheskoy Khimii, Vol. 34, No 8, Aug 60, pp 1862-1865

The mean specific heat capacities of calcium monouranate have been measured over the temperature range 293-1134°K and of barium monouranate over the temperature range 293-1984°K. Equations are proposed for calculating the mean and true heat capacities within these temperature limits. The heat capacity of $CaUO_4$ has been shown to change abruptly in the temperature range of 1022-1027°K. Here, a phase transition evidently takes place, the heat of which is 220 cal/mol.

44. Patent Issued for the Qualitative Determination of Phosgene

"Qualitative Method for Determining Phosgene," by Yu. N. Forostyan and G. V. Lazur'yevskiy, Class 421, 3_{01}, No 122634 (620796/23 dtd. 27 Feb 59); Moscow, Byulleten' Izobreteniy, No 18, 1959, p 43

"The qualitative method of determining phosgene with the aid of a reagent and indicator paper is distinguished by the fact that anabasin or its alkaloids are used in this case with the aim of obtaining a reaction of greater sensativity and specificity."

45. New Indole Derivatives Synthesized

"Research in the Field of Indole Derivatives; Report No IV, Dialkyl - beta-alkyl - gamma -(2-Methylindolyl-3) propylamines," by A. L. Mndzhoyan, A. G. Terzyan, Zh. G. Akopyan, and G. T. Tatevosyan, Institute of Fine Organic Chemistry, Academy of Sciences Armenian SSR; Yerevan, Izvestiya Akademii Nauk Armyanskoy SSR - Khimicheskiye Nauki, Vol 13, No 1, 1960, pp 69-75

The present work is a continuation of the research on the synthesis of amino compounds, related in structure to tryptamine and its analogs, for the purpose of studying their biological properties. A number of dialkyl- beta-alkyl-gamma-(2-methylindolyl-3)-propylamines, which are analogs of biogenic amines of the indole series, where synthesized.

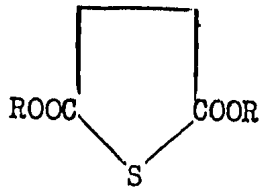
It was found that the substituent located in the alpha position to the carboxylic group substantialy lowers the yields of dialkylamides of the aliphatic indolyl acids, obtained by the Yur'yev and Belyakovaya method, and at the same time limits the applicability of this method.

Some tryptophol homologs were obtained as intermediate substances.

46. Twenty-Five New Physiologically Active Compounds Synthesized

"Research in the Field of Thiophene and Tetrahydrothiophene (Thiophane) Derivatives. Report 1. The Synthesis of Some Amino Esters of Tetrahydrothiophene-2,5-Carboxylic Acid," by A. L. Mndzhoyan, V. G. Afrikyan, A. N. Oganyesyan, and V. Ye. Badalyan, Institute of Fine Organic Chemistry, Armenian SSR; Yerevan, Izvestiya Akademii Nauk Armyanskoy SSR - Khimicheskiye Nauki, Vol 13, No 1, 1960, pp 63-66

This report deals with the synthesis of some amino esters of tetrahydrothiophene-2,5-dicarboxylic acid with various amino alcohols with the following general formula:



In all, twenty-five compounds not previously described in the literature were synthesized, and a table describing some of their physical properties is presented. Data on the pharmacological properties of these compounds will be published separately.

47. New Benzofuran Compounds Synthesized

"Research in the Field of Benzofuran Derivatives. Report III. The Synthesis of Some Mono- and Di-N-Substituted of Amides of Benzofuran-2-Carboxylic Acid and Their Reduction by Lithium Aluminum Hydride," by A. L. Mndzhoyan and M. A. Kaldrikyam, Institute of Fine Organic Chemistry, Academy of Sciences Armenian SSR; Yerevan, Izvestiya Akademiy Nauk Armyanskoy SSR - Khimicheskiya Nauki, Vol 13, No 1, 1960, pp 55-61

As a result of the investigation, six N-substituted benzofurfurylamines, four unsymmetrical ethyldiamines, and two urethans not formally described in the literature were obtained. Appropriate chlorohydrates, iodmethylates, and iodoethylates were obtained in order to study the biological properties of these compounds.

48. Mechanochemistry -- a New Branch of Chemistry

"Chemistry and Fantasy," by G. Aleksandrov; Moscow, Ekonomicheskaya Gazeta, 27 Jun 60, p 4

"Chemistry and Fantasy -- this is just what you will think when you have become acquainted with the laboratory of the Chair of High Molecular Compounds headed by Academician V. A. Kargin. It is located at the Moscow State University imeni Lomonosov.

"Prof P. Kozlov shows us an example of a mysterious material in which quartz sand has chemically been joined together with rubber. Yes, sand is really there. Metal, soot, and common table salts form chemically integrated materials with organic substances.

"Indeed, you have perceived all of this during your waking hours in spite of the written rules on chemical compounds. Thus, a new wide bridge has been laid across the precipice which has separated living nature from the dead.

"The honor of accomplishing this bold dream has fallen to a new branch of science -- mechanochemistry. From the moment of the formation of contemporary chemistry, catalysts have been known as stimulators and accelerators of reactions. Quartz sand has never been known earlier as a catalyst. But, actually, scoop it from the bottom of a river, toss it into a vat with a solution of organic substance, and the sand will silently fall to the bottom, not causing any chemical process whatsoever. Sand is absolutely inert.

"In long searches, scientists have come to the conclusions of grinding sand to a maximum to break its crystals. With their fractures, they have observed such fantastic forces about which no one previously had any idea. Pulverized sand becomes, not only an accelerator of chemical reactions, but also, in itself actively unites with an organic liquid (monomer), forming a solid, chemically integrated substance.

"Thus, in the most simple form, the processes of mechanochemistry proceed independently of combinations dealing with organic and inorganic substances.

"Earlier, for example, it was supposed that it was impossible to obtain polymers from acetone. Experiments conducted by Scientists at Moscow State University disprove this opinion. They fashioned a mechano-chemical method for the nonyielding acetone to be converted into a polymer, i.e., into a chemical substance with a very long molecular chain.

"Workers in branches of the scientific research establishments have already had success using processes of mechancchemistry to obtain new plastics, lacquers, and dyes.

"Researchers at the Chair of High Molecular Compounds are at this moment explaining the microstructures of polymers and materials from them. Why is this necessary? The development of engineering requires the creation of new synthetic materials which possess high durability and great mechanical strength. Is this not an absorbing task -- to approach the creation of "everlasting" materials?

"The soluction of the structural composition of substances should offer scientists an even more powerful agent for creating materials 'on order.'

"What type of materials these will be, it is difficult at the present to say. But mechanochemistry at its present degree of development is similar to plants which, without high pressure and temperature, using only water, air, and certain mineral salts, produce wonderful combinations of products. Who knows, perhaps our chemists will be able to obtain by this method even more valuable products which will enrich the pallette of chemicals.

Physical Chemistry

49. Catalysis by Metal Vapors

"Catalysis by Metal Vapors; Part 1 -- The Catalytic Properties of Zinc and Cadmium Vapors," by M. N. Danchevskaya and N. I. Kobozev, Moscow State University; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 8, Aug 60, pp 1728-1733

It has been shown that zinc and cadmium in the vapor phase are capable of catalyzing decomposition of methanol to CO and H_2. The introduction of water vapor into the reaction zone lowers the catalytic activity of zinc vapor, i.e., oxidation of zinc atoms leads to their inactivation. On the basis of optical investigations of the reactor surface and of experiments with changes in wall surface to volume ratios of the reactor, it has been concluded that zinc or cadmium adsorbed on the reactor walls do not play any significant role in the catalytic conversions of methanol and that the reaction proceeds predominantly in the vapors of the metal. On the basis of all the facts established, the conclusion has been drawn that zinc and cadmium atoms isolated from the crystal lattice preserve their catalytic properties.

50. Thermodynamic Properties and Heats of Sublimation of Gallium, Indium, and Thallium

"Determination of the Heats of Sublimation of Metals by Anomalous Dispersity Measurements With the Aid of Rozhdestvenskiy's Method; The Thermodynamic Properties and Heats of Sublimation of Gallium, Indium, and Thallium," by L. V. Gurvich, Institute of Mineral Fuels, Academy of Sciences USSR; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 8, Aug 60, pp 1691-1698

It has been shown that by presenting the results of measurements of Nf by Rozhdestvenskiy's method in the form of $R \ln NfT = A - B/T$, one may determine with high accuracy the heats of sublimation of metals at 0°K if the thermodynamic properties of the metals in the condensed and gaseous states are known. This procedure was applied in determining the heats of sublimation of gallium, indium, and thallium on the basis of published data for Nf. It has been found that $\Delta H_0^\circ(Ga_{gas}) = 59.0 \pm 1.0$ kcal/g atom; $\Delta H_0^\circ(In_{gas}) = 57.7 \pm 0.6$ kcal/g atom; and $\Delta H_0^\circ(Tl_{gas}) = 43.15 \pm 0.25$ kcal/g atom. The thermodynamic functions of metals in the gaseous state were calculated by statistical methods in the solid and liquid state on the basis of known values of heat capacities.

51. Thermodynamic Properties of Alloys of the System Chromium-Tantalum

"Thermodynamic Properties of Alloys of the System Chromium-Tantalum," by G. O. Piloyan, A. M. Yevseyev, and Ya. I. Gerasimov, Moscow State University; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 8, Aug 60, pp 1768-1772

The thermodynamic properties of alloys of the system chromium-tantalum have been investigated at 1228-1303°C. The existence of the intermediate phase $TaCr_2$ has been confirmed.

52. Thermodynamic Study of the Reduction of Tungsten Trioxide by Hydrogen

"Thermodynamic Study of the Reduction of Tungsten Trioxide by Hydrogen," I. A. Vasil'yeva, Ya. I. Gerasimov, and O. P. Simanov, Moscow, State University; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 8, Aug 60, pp 1811-1815

An equilibrium study has been made of the reduction of the low temperature modification of WO_3 (α) over the temperature range 640-937°C. The reduction has been found to proceed in four stages through intermediate oxides of the composition: $WO_{2,90}$, $WO_{2,72}$, and WO_2. On the basis of experimental results, the transition temperature of $WO_3(\alpha) \rightarrow WO_3(\beta)$

was found to be about 800°C. The standard thermodynamic Characteristics for the low temperature modification were calculated from the experimental data, their values being:

$$\Delta H^{o}_{298} = 203.0 \text{ kcal/mol}$$

$$\Delta Z^{o}_{298} = -184.7 \text{ kcal/mol}$$

$$\Delta S^{o}_{298} = -61.6 \text{ e.u.}$$

$$S^{o}_{298} = 20.0 \text{ e.u.}$$

53. Solubility and Properties of Tellurium Trioxide

"On the Investigation of Certain Physicochemical Properties of Tellurium Trioxide," by M. S. Sarsembayev and V. D. Ponomarev; Alma-Ata, Vestnik Akademii Nauk Kazakhskoy SSR, Vol 16, No 8, Aug 60, pp 69-78

Results of the experiments which were conducted to determine the solubility of tellurium trioxide in water, solutions of caustic soda, and solutions of sodium carbonate are reported. The experiments established that the solubility of tellurium trioxide depends on the temperature and concentration of caustic soda and sodium carbonate in the solutions; at the same temperature and depending on the concentration of caustic soda and sodium carbonate in their solutions, sodium tellurates of different compositions are formed; on the basis of the experiments, it was possible to determine the solubility coefficients of the solubility of tellurium trioxide in the solutions of caustic soda and sodium carbonate; a method for the derivation of tellurium trioxide from the tellurium elements was established.

Radiation Chemistry

54. Intermediate Products of the Radiolysis of Water

"Concerning the Intermediate Products of the Radiolysis of Water," by M. A. Proskurnin and V. A. Sharpatyy, Institute of Physical Chemistry imeni L. Ya. Karpov; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 9, Sep 60, pp 2126-2128

The transformation of nitrate into nitrite in aqueous solutions containing conjugated acceptors (e.g. glycerin) was investigated. On the basis of curves expressing the relation between the radiation yield of

nitrite and the concentration of nitrate and that between the yield of the transformation of the acceptor and the concentration of the acceptor, conclusions are drawn in regard to the manner in which water molecules are excited and the nature of the action of acceptors. It is assumed that two types of excited water molecules participate in radiation-chemical reactions: those which are dissociated and those which are not dissociated into radicals. Conjugated acceptors promote the separation of water molecules into radicals. According to V. V. Voyevodskiy, the action of acceptors is exercised over a distance, being channeled along hydrogen bonds. In order that this action take place, the excited water molecule must merely form a link in a chain of molecules at the end of which conjugated acceptors are located. For that reason, the concentration of acceptors may be very samll (of the order of 10^{-4} M). By using acceptors, the action of excited water molecules can be discerned in some radiation-chemical reactions.

Radiochemistry

55. Disproportionation of Americium (V)

"Disproportionation of Americium (V)," by A. A. Zaytsev, V. N. Kosyakov, A. G. Rykov, Yu P. Sobolev, and P. N. Yakovlev; Leningrad, Radiokhimiya, Vol 2, No 3, May 60, pp 339-347

The kinetics of the disproportionation of Am O_2^+ in perchloric, sulfuric, and nitric acids were investigated. The reaction velocity constants in all solutions in question were determined. In the cases of perchloric and sulfuric acids, the dependence between the velocity constant of the disproportionation reaction and the hydrogen ion concentration was established. The dependence of the reaction velocity in perchloric acid on the temperature was determined. The changes in the thermodynamic values for the activated complex that is formed in perchloric acid were calculated.

56. Kinetics of the Reduction of Americium (V) With Hydrogen Peroxide

"Kinetics of the Reduction of Americium (V) With Hydrogen Peroxide," by A. A. Zaytsev, V. N. Kosyakov, A. G. Rykov, Yu. P. Sobolev, and G. N. Yakovlev; Leningrad, Radiokhimiya, Vol 2, No 3, May 60, pp 348-350

The kinetics of the reduction of Am O_2^+ with hydrogen peroxide in 0.1 M perchloric acid were investigated. The dependence of the velocity constant of the reaction on the temperature was determined.

The energy of activation of the reaction and the change in the enthalpy of the activated complex were calculated. The data obtained are of interest because the radiolytic reduction of $Am\,O_2^{+}$ in aqueous solutions is ascribed to a reaction with H_2O_2 formed as a result of the decomposition of water by the radiation emitted by Am^{241}.

57. Oxalate Complexes of Trivalent Americium

"Investigation of the Formation of Complexes by Am^{3+} With Oxalate Ions," by I. A. Lebedev, S. V. Pirozhkov, B. M. Razbitnoy, and G. N. Yakovlev; Leningrad, Radiokhimiya, Vol 2, No 3, May 60, pp 351-356

The composition of the americium oxalate which separates from solutions in the temperature range of 20-90° was determined by chemical analysis. It was found that this composition corresponds to the formula $Am_2(C_2O_4)_3 \cdot 9H_2O$. On the basis of the solubility of americium oxalate in perchloric acid at 5°, the solubility product of this compound was determined and found to be equal to 2.2×10^{-31}. By analyzing the solubility curve, the existence of the complex ions $Am(C_2O_4)^{+}$, $Am(C_2O_4)_2^{-}$, and $Am(C_2O_4)_3^{3-}$ was established. Their step-wise dissociation constants were calculated and found to be equal to 5.0×10^{-8}, 6.9×10^{-5}, and 1.6×10^{-1} for zero ionic strength.

58. Determination of Boundaries Between Petroleum-Bearing and Water-Bearing Strata by Using Electron and Photon Beams

"On the Determination of Boundaries Between Petroleum-Bearing and Water-Bearing Strata by Using Electron and Photon Beams," by V. I. Gomonay, I. Yu. Krivskiy, N. V. Ryzhkina, V. A. Shkoda-Ul'yanov, and A. M. Parlag; Moscow, Atomnaya Energiya, Vol 9, No 4, Oct 60, pp 313-315

Because water and petroleum contain isotopes with different thresholds of the (γ, n) reactions, irradiation of water and petroleum with electrons or photons of a definite energy results in the formation of different numbers of photoneutrons in these two media. This is illustrated on the examples of irradiation at the thresholds of the (γ, n) reaction for deuterium, C^{12}, C^{13}, O^{16}, O^{17}, and O^{18} under consideration of the content of these isotopes in water and petroleum. The conclusion is reached that the boundaries between petroleum-bearing and water-bearing strata can be determined by employing electron beams with energies of the order of 8 mev and higher. To apply the procedure proposed by the authors on a practical scale, small-dimensioned electron accelerators of a high intensity will have to be developed.

59. Concentration of Radioactive Cesium in Glauconite Ion-Exchange Columns

"Concentration of Radioactive Cesium by Using Ion-Exchange Glauconite Columns," by S. Z. Roginskiy, O. V. Al'tshuler, M. I. Yanovskiy, Ye. I. Malinina, and A. Ye. Morokhovets; Leningrad, Radiokhimiya, Vol 2, No 4, Aug 60, pp 431-437

A great number of natural and synthetic adsorbents was investigated from the standpoint of their suitability for the adsorption of radioactive cesium Cs^{137} from solutions containing large quantities of salts other than those of cesium. Glauconite was found to be the most suitable adsorbent for this purpose. It was found that cations can be arranged in the following order so far as their adsorbability on glauconite is concerned:

$$Mg^{2+} < Ca^{2+} < Sr^{2+} < Na^{+} < La^{3+} < NH_4^{+} < K^{+} < Cs^{+}$$

It was established that the lower the energy of hydration of the cation, the greater is the force with which the cation is adsorbed on the glauconite. In the region of microconcentrations of cesium and macroconcentrations of other cations, the adsorption of cesium does not depend on the p_H within the range of $p_H = 2.7-13$. By adsorbing Cs on glauconite and desorbing it with an ammonium carbonate solution, concentrates with a high specific activity can be obtained. It was found that further concentration of the cesium can be carried out in columns filled with porous inert materials such as carbon, silica gel, etc. that have been impregnated with the double ferrocyanide of nickel and potassium.

60. Radiochemical Investigation of Ion Exchange on Swelled Exchangers

"Radiochemical Investigation of Ion Exchange on Swelled Exchangers," by A. M. Trofimov and L. N. Stepanova (Leningrad) Radium Institute imeni V. G. Khlopin, Academy of Sciences USSR; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 8, Aug 60, pp 1837-1842

Relationships pertaining to the exchange of ions of various valences on swelled ion exchangers have been investigated by a radiochemical method. A relation has been established between the distribution coefficient of the ions of the radioelement, the specific capacity of the exchanger, and the specific volume of the latter. This is expressed by the following equation:

$$\frac{\alpha . V^{\frac{z_1 - z_2}{z_2}}}{g^{z_1/z_2}} = \text{const}$$

where z_1 and z_2 are the valences of the exchanging ions. On the basis of this equation, with the aid of two resin specimens of the same specific capacity but greatly different swelling powers, one can determine the magnitude of the charge of the radioelement in solution.

61. Work at Scientific Institutions of the Azerbaydzhan SSR on the Application of Radioactive Isotopes in the Petroleum Industry and Investigation of Semiconductor Materials

"The Second Azerbaydzhan SSR Conference on the Application of Radioactive Isotopes and Nuclear Radiation," by A. M. Mamedov; Moscow, Atomnaya Energiya, Vol 9, No 4, Oct 60, pp 338-339

The Second Azerbaydzhan SSR Conference on the Application of Radioactive Isotopes and Nuclear Radiation was held at Baku in March 1960. Thirty-three reports that originated at different scientific institutions of the Azerbaydzhan SSR were presented at the conference. Discussion of these reports demonstrated that progress was made in the fields under consideration during the time that had elapsed since the first conference on the subject, which was held in 1957. By using radioactive isotopes and also sources of gamma and neutron radiation, problems are being successfully solved that are involved in the study of effects produced by irradiation of seeds before sowing on the growth, development, and yield of cotton plants; the effects of prolonged action of a radioactive source ("factor") on the condition of the blood and some biochemical indexes; the effect of phosphorus isotopes on the course and character of aseptic inflammations; the determination of the tension of saturated vapors and the behavior of impurities during the distillation of semiconductor materials; determination of diffusion coefficients; determination of the water content of petroleum crudes; study of the circulation of catalysts applied in industrial processes; investigation of the protective properties of concrete; etc.

The Azneftegeofizika Trust applies on an extensive scale methods based on radioactivity in geophysical well logging. Gamma and neutron methods are used to identify petroleum-bearing and gas-bearing strata in the cross-section of wells whenever electrical methods do not work and also in the examination of old wells. Radioactive isotopes are being used in the investigation and exploitation of petroleum deposits.

The Institute of Petrochemical Processes, Academy of Sciences Azerbaydzhan SSR, has developed methods for the investigation of transformations of hydrocarbons, the mechanism of the action of additives to oils, and control of various processes by applying isotopes. By using tracer atoms, the catalytic cracking of alkylaromatic and paraffinic hydrocarbons that are typical constituents of petroleum crudes was investigated. The course of primary and secondary cracking reactions

was studied. The role of individual parts of molecules and individual classes of hydrocarbons in the formation of coke deposits on catalysts was investigated. The active part played by the side chain of alkylaromatic hydrocarbons in the formation of coke was established. The data obtained are of value from the standpoint of the selection of catalysts for the cracking of different types of petroleum crudes.

By applying tracer atom procedures, the action of the AzNII-7 and TsIATIM-339 additives to oils was investigated at the Institute of Petrochemical Processes. A new device was designed by means of which the quality and mechanism of the action of oils can be investigated either with or without tracer atoms. The additives AzNII-7 and TsIATIM-339 were subjected to comparative evaluation. The kinetics of film formation, the solubility and stability of additives, their anticorrosion characteristics, the conditions under which films form, and the participation of individual components of the additive in the formation of films were studied. Furthermore, a method for determining rapidly and precisely the content of water in petroleum and a procedure for estimating precisely the velocity of the circulation of the catalyst in catalytic cracking (by employing a catalyst sphere containing Co^{60}) were developed.

At the Isotopes Laboratory of the Institute of Physics, Academy of Sciences Azerbaydzhan SSR, equipment has been designed for measuring the tension of saturated vapors with a high degree of precision by using radioactive isotopes. The saturated vapor tensions of thallium sulfide, thallium selenide, and selenium were determined. It was established that Tl_2Se_3 decomposes on being evaporated from the solid phase and changes into Tl_2Se. By using a suitable isotope, experiments were carried out to establish behavior of some impurities in the vacuum distillation of selenium. It was found that mercury which is present as an impurity volatilizes together with the selenium in vacuum distillation. By using Se^{37} the effect of bismuth present as an impurity on the self-diffusion of selenium was studied. It was found that the energy of activation of self-diffusion depends on the bismuth content.

62. Atoms for Peace Conference

"Chronicles" (unsigned article): Moscow, Nauka i Zhizn', Vol 27, No 6, Jun 60, p 80

"An All-Union conference on the utilization of radioactive isotopes and nuclear radiation for peaceful purposes was held in Riga. About 600 specialists in the field of utilization of atomic energy in the national economy of the country, as well as representatives of national economic councils, took part in the conference. An exhibition, "Atoms for the People," was organized at the Riga Home for Scientific-Technical Propaganda. Here visitors were able to familiarize themselves with different types of equipment, instruments, and devices, models of atomic power plants, and the route of the first voyage of the 'Lenin,' the atomic icebreaker."

III. ELECTRONICS

Communications

63. Multichannel Radio-Relay Systems

"Radio-Relay System R-600," by N. N. Kamenskiy; Moscow, Elektrosvyaz', No 10, Oct 60, pp 53-61

The radio-relay system R-600 is designed for six high-frequency wide-band communication trunks with transmission range up to several thousand kilometers. Each wide-band communication trunk can accommodate 600 telephone channels or one television program. One of the communication trunks is generally reserved as "hot" redundancy trunk, thus a six-trunk system is able to handle up to 3,000 telephone channels. However, for the present, the most probable number of trunks assigned to each R-600 relay system will be three (a telephone, television, and redundancy trunk). All the intermediate relay points are controlled from the terminal stations. The total frequency range for all six trunks is 400 Mc; the six receiving trunks are grouped in one half of the frequency range and the six transmitting trunks are grouped in the other half of the frequency range. For better separation of adjacent trunks, a different polarization is employed. The system utilizes horn-parabolic antennas with traveling-wave ratio of about 0.95. The system operates on the frequency-modulation principle.

64. Recent Soviet Patents in Field of Communications

"Authorship Certificates" (unsigned article); Moscow, Radiosvyaz', No 10, Oct 60, pp 74

Class $21a^1$, 32_{04}. No 125811. L. G. Semenov. A Method for Obtaining Rectangular Vibrations of a Mechanical System.

Class $21a^1$, 32_{20}. No 125812. I. K. Malakhov-Kamartan. Device for Transmitting Two-Color Television Images.

Class $21a^1$, 32_{35}. No 125277. B. V. Krusser, V. I. Konchin, and R. Gaynulina. A Method for Neutralizing Residual Charges on a Super-Orthicon Target.

Class $21a^1$, 34_{12}. No 125278. B. I. Rappoport. A Method and Device for Automatic Regulation of Illumination in a Super-Orthicon Transmitting Tube.

Class $21a^3$, 63_{40}. No 125819. S. S. Nedosekov. Low-Frequency AC Pulse Generator.

Class $21a^4$, 8_{02}. No 125585. S. I. Berger and L. M. Gribanov. A Method for Automatic Frequency Adjustment.

Class $21a^4$, 10. No 125821. P. G. Pozdnyakov. Piezoelectric Resonator.

Class $21a^4$, 48_{69}. No 125826. Yu. F. Shuleshov. Fast-Acting High-Frequency Switch.

Class $21a^4$, 66_{02}. No 125823. S. I. Tetel'baum. Diffraction Antenna.

Class $21a^4$, 69. No 125827. B. A. Kravchenko and V. N. Yakovlev. Device for Automatic Tuning of Circuits.

Instruments and Equipment

65. New Cesium Frequency Standard Developed

"Model of a Cesium Frequency Standard," by M. Ye. Zhabotinskiy, L. V. Levkin, Ye. I. Sverchkov, and V. R. Fetisova; Moscow, Radiotekhnika i Elektronika, Vol V, No 7, Jul 60, pp 1173-1176

A brief description is given of a model of a cesium frequency standard developed at the Institute of Radio Engineering and Electronics of the Academy of Sciences USSR. The apparatus consists of a copper tube with a diameter of 12 mm and length of 1,200 mm under a high vacuum. To decrease the effusion of cesium, the source has a narrow slit of long thin channels of corrugated foil leaves. At the opposite end of the tube is the beam detector. In the middle of the tube is a thin copper ring holding a collimator diaphragm. A U-shaped resonator providing the resonance frequency is soldered to sections of the tube.

The sideband level of the resonator is at least 70 db below the carrier level. This is made possible by the use of a new frequency multiplier circuit developed at the institute. This circuit is intended to decrease the errors introduced by the RF circuit used in the "Atomichron" device developed by the National Company of Malden, Massachusetts. The spectral line may be observed by very slowly changing the frequency of the quartz oscillator with the aid of a reactance tube, to the grid of which is applied a sawtooth voltage. The signal from the output of the detector is fed to an oscillograph where the spectral line, having a width of 300 cycles, is fixed on the screen.

66. Radioactive Isotopes Applied to Study of Cathode Electronics

"The Application of Radioactive Isotopes to the Study of Processes in Oxide Cathodes and Other Problems of Cathode Electronics," by G. N. Shuppe and V. P. Vasil'yev; Moscow, Radiotekhnika i Elektronika, Vol V, No 7, Jul 60, pp 1135-1144

A description is given of recent studies carried on at the Chair of Electrophysics of the Central Asiatic University imeni V. I. Lenin and the Tashkent Electron Tube Plant involving the use of marked atoms for the study of processes in oxide cathodes and other problems of cathode electronics. These problems include vaporization of metals, diffusion of some metals into others, diffusion of nickel and barium into coatings of an oxide cathode, and distribution of material of a getter flash and vaporized material of different parts of an electron tube throughout all of its elements, i. e., grids, anode, beam-forming shield, etc. An autoradiographic method is used to study the distribution of certain substances in a tube with an oxide cathode.

It is concluded that a true oxide cathode has a very complex structure, including an unequal distribution of barium, porosity of the cathode and the presence of an "intermediate" layer immediately beneath the base in which are found atoms of the admixture and base nickel, a compound of the oxides of alkali earth metals, etc. The role of all of these factors should be considered in determining the emission properties of the cathode.

67. Light Modulation at Superhigh Frequencies Shown Possible

"Light Modulation With Superhigh Frequency (10^{10} Cycles)," by G. S. Simkin, V. P. Naberezhnykh, and I. V. Lukin; Moscow, Izmeritel'naya Tekhnika, No 8, Aug 60, pp 41-43

An account is given of an experiment performed at the Khar'kov State Institute of Measurements and Measuring Instruments on the possibility of modulating light with a frequency of 10^{10} cyles (λ = 3 cm) by means of a Kerr cell filled with nitrobenzene. Two rectangular wave guides, tapered toward each other and connected to the Kerr cell with flanges, serve as the basis for the instrument.

The value of the Kerr constant for a modulation frequency of 10^{10} cycles was found to be approximately 3.10^{-11} seconds, while the modulation depth was equal to 1% at an oscillator power of 50 kw. Modulation depth may be increased by the optimum selection of the dimensions and design of the cell, an increase in the power of the pulse oscillator, and cooling of the cell during operation.

The authors conclude that the described method of determining relaxation time of nitrobenzene may also be used to determine the relexation time of other substances.

68. Bolometer Heads for High-Frequency Power Measurement Described

"Bolometer Heads for Measuring Power at Frequencies up to 1000 Mc," by V. I. Krzhimovskiy and V. V. Kshimovskiy; Moscow, Izmeritel'naya Tekhnika, No 8, Aug 60, pp 38-40

Two types of bolometer heads are described which are used to connect bolometers to high-frequency channels to measure power. The heads were designed for use in a standard measuring device having an error on the order of 1% which was developed by the All-Union Scientific Research Institute of Metrology imeni D. I. Mendeleyev.

The first is a wide-band bolometer head with one bolometer having a voltage standing wave ratio of not less than 1.15 v in a frequency range of 450-1100 Mc. Efficiency of the head at 1000 Mc is approximately 99.7%. The second is a wide-band symmetrical bolometer head with two bolometers which divides the input power into two approximately equal parts. The head has a voltage standing wave ratio of 1.15 v in a range of 30-2000 Mc and an efficiency of approximately 99.6% at 1000 Mc.

69. Circuits for Indicating 90° Phase Shifts Categorized

"Methods and Apparatus for Accurately Indicating a 90° Phase Shift," by P. P. Ornatskiy, Yu. A. Skripnik, and N. F. Suvid; Moscow, Izmeritel'naya Tekhnika, No 8, Aug 60, pp 24-29

A general classification is made of various devices used to indicate 90° phase shifts, such as compensation phase monitors, electromechanical phase monitors, devices based on phase-sensitive circuits, and thermoelectric phase monitors. The applications and limitations of each type of device are discussed. Also mentioned is an automatic rectangular-coordinate recording compensator ("avtograf"), used to take amplitude-phase characteristics of automatic control systems operating at very low frequencies.

70. High-Purity Tellurium for Electronic Use

"Refining of Tellurium by the Zone-Melting Method," by N. F. Shvartsenau; Moscow, Fizika Tverdogo Tela, Vol 2, No 5, 1960, pp 870-873

Vacuum distillation is suitable only for preliminary separation of tellurium from the oxides of heavy metals or highly volatile admixtures. For further refining of tellurium the zone-melting method should be used.

An experimental zone-melting was carried out in an atmosphere of hydrogen. A 250-gr sample of tellurium was secured from the Pyshma electrolytic copper refining plant; the sample was 99% pure. The width of the fusion zone was maintained at about 3 cm, and the speed of zone travel was 6 cm per hr. Since the chemical and spectral analysis for impurities did not provide accurate results, a method of estimating tellurium purity by electrical resistance at the temperature of liquid nitrogen was devised. After a repetition of the zonal melting nine times, a sample 99.9999% pure was obtained.

The described method of zonal-melting of tellurium is now widely used at the Institute of Semiconductors of the Academy of Sciences USSR.

71. Electrical Conductivity of Sputtered Germanium Layers

"Electrical Conductivity of Sputtered Germanium Layers," by P. P. Konorov and O. V. Romanov, Leningrad State University; Leningrad, Fizika Tverdogo Tela, Vol 2, No 8, Aug 60, pp 1869-1873

Preparation of thin germanium layers and investigation of their properties have a bearing on practical applications such as the production of p-n junctions, the development of light ("optical") filters and bolometers, etc.

The conductivity, structure, and light absorption of thin germanium layers were studied. These layers were prepared by sputtering germanium in vacuum onto a glass support from either a tungsten spiral or a quartz crucible coated with a layer of graphite. All freshly applied layers of germanium had an amorphous structure. It was found that the energy of activation of conduction for these layers depended on their thickness and comprised 0.5 ev for layers with a thickness of the order of 0.05 microns and about 0.9 ev for layers with a thickness of the order of 0.6 microns. When the layers were heated to a temperature above 120° C, crystallization

took place. This crystallization was accompanied by oxidation if the heating was carried out in air. The characteristics of layers sputtered from tungsten differed from those of the layers sputtered from graphite. It is assumed that in the first case alloying of germanium with tungsten takes place. During the crystallization the tungsten separates from the germanium crystals. Changes in the energy of activation of conduction which occur in the germanium layers and depend on the heat treatment to which these layers are subjected correspond to changes in the position of the edge of the spectrum of light absorption.

72. P-N Junctions in Photosensitive PbS Layers

"On p-n Junctions in Photosensitive PbS Layers," by V. F. Zolotarev and V. N. Larichev; Leningrad, Fizika Tverdogo Tela, Vol 2, No 8, Aug 60, pp 1741-1750

The volt-ampere characteristics of PbS layers that were prepared by chemical precipitation and vacuum sputtering were investigated. The dependence of the volt-ampere characteristic on the temperature and illumination of the layers was studied. It was established that there are p-n junctions in layers sensitized at high temperatures in air.

73. Seignettoelectric Properties of Solid Solutions in Ternary System $Ba(Ti,Zr,Sn)O_3$

"Seignettoelectric Properties of Solid Solutions in the Ternary System $Ba(Ti,Zr,Sn)O_3$," by M. M. Nekrasov and Yu. M. Poplavko; Leningrad, Fizika Tverdogo Tela, Vol 2, No 8, Aug 60, pp 1681-1684

This investigation deals with problems pertaining to the preparation of seignettoelectric ceramics which exhibit a high nonlinearity and a low dielectric loss. Results obtained with some solid solutions in the system $Ba(Ti,Zr,Sn)O_3$ are reported. For the optimum composition a reversible nonlinearity $N_p = -0.9$ cm/kv was obtained and a ratio of $\varepsilon_{max}/\varepsilon_{min} = 20$ at tg $\delta = 0.03$ when the intensity of the field is low and at tg $\delta = 0.15$ when the intensity of the field is high. The optimun composition was determined and found to correspond to the formula $Ba(Ti_{0.85},Zr_{0.11},Sn_{0.04})O_3$.

74. Bridgman Effect in Bismuth Telluride Crystals

"The Bridgman Effect in Bismuth Telluride Crystals," by P. I. Baranskiy and S. L. Tomkevich, Institute of Physics, Academy of Sciences Ukrainian SSR; Leningrad, Fizika Tverdogo Tela, Vol 2, No 8, Aug 60, pp 1714-1722

Semiconductor materials exhibiting high values of the differential thermal EMF and electrical conductivity at low values of the heat conductivity are best suited for the direct conversion of heat energy into electric energy and also for the conversion of electric energy to produce high temperatures or low temperatures in refrigeration. Bismuth telluride (Bi_2Te_3) was found to be a semiconductor which satisfies these requirements rather well.

Single crystals of bismuth telluride, because they belong to the hexagonal system, exhibit anisotropy of different characteristics. It was found that anisotropy of electrical conductivity, the thermal EMF, and other characteristics is observed not only on Bi_2Te_3 single crystals, but also on polycrystalline samples. When bismuth telluride crystallizes as a polycrystal, the individual crystals orient themselves with their slip planes along the direction of the growth of the polycrystalline sample (this direction coincides with that of the maximum thermal current), while their crystallographic axes become oriented in a direction perpendicular to that of the growth of the sample.

The heat evolution (heat absorption) was investigated which arises when a current passes through the volume of polycrystals of bismuth telluride of the p-type in regions that correspond to transitions from a direction along slip planes to a direction perpendicular to them ($\parallel - \perp$).

The linear dependence of this heat evolution on the electric current made it possible to identify this evolution with the Peltier effect at ($\parallel - \perp$) transitions, e.e., with the Bridgman effect. It was established experimentally that when an external temperature gradient T is applied to parallel-perpendicular transitions, a thermal EMF $\alpha_{\parallel - \perp}$ is generated which corresponds to the Bridgman effect mentioned above. It was also established that there is a linear dependence between the over-all value of this thermal EMF ($\mathcal{E}_{\parallel - \perp}$) and the temperature gradient in the actual region of $\mathcal{E}_{\parallel - \perp} = \alpha_{\parallel - \perp} \Delta T$.

75. Adsorption of Some Metal Ions in Etching and Washing of Silicon

"Adsorption of Some Metal Ions in the Etching and Washing of Silicon," by V. S. Sotnikov and A. S. Belanovskiy; Moscow, Zhurnal Fizicheskoy Khimii, Vol 9, Sep 60, pp 2110-2114

It has been shown that during the etching of silicon in a mixture of hydroflouric and nitric acids, adsorption of Cu, Ag, Au, In, and Sb ions takes place on its surface. The magnitude of the adsorption is 10^{14} - 10^{17} atoms/cm^2, when the content of the above elements in the etching bath is 1.10^{-3} - 1.10^{-4}%. It has also been shown that as a result of washing silicon with water, adsorption of Cu, Ag, P, Fe, Zn, Rb, Na, Sb, In, and Au ions (1.10^{15}-1.10^{17} atoms per cm^2 silicon surface area) takes place. Adsorption of Ag and Au is directly proportional to their initial concentration in the etching bath.

Repeated treatment of silicon with boiling bi-distilled water practically does not lower the number of adsorbed Ag and Au ions on the silicon surface. The use of complex-forming agents -- potassium cyanide, dithizone, and methyl cyanide -- leads to a sharp fall in the number of atoms of the above impurities adsorbed on the silicon surface.

76. Electrochemical and Corrosion Behavior of Semiconductors in Electrolyte Solutions.

"Electrochemical and Corrosion Behavior of Semiconductors in Electrolyte Solutions; Part 3 -- Dissolutions of Germanium in Contact With Other Metals," O. G. Deryagina, Ye. N. Paleolog, and N. D. Tomashov, Institute of Physical Chemistry, Academy of Sciences USSR; Moscow, Zhurnal Fizicheskoy Khimii, Vol 34, No 9, Sep 60, pp 1952-1959

The behavior of germanium in contact with other metals (In, Sn, Cu) in 1N NaOH solutions containing various amounts of hydrogen peroxide has been investigated for the first time.

It has been shown that the rate of dissolution of germanium in contact with the metals is determined by the rate of spontaneous solution and by the rate of solution due to the current of the germanium-copper couple. The contribution by spontaneous solution of germanium has been shown to increase with increasing hydrogen peroxide concentration, becoming predominant in pure hydrogen peroxide. All results were confirmed on actual diodes.

77. Wave Propagation in Wave Guides of Complex Shape Studied

"Propagation of Electromagnetic Waves in Wave Guides With Complex Cross Sections Containing a Cross-Magnetized Ferrite Plate," by N. M. Kovtun, Khar'kov State University imeni A. M. Gor'kiy, Chair of Superhigh-Frequency Physics; Moscow, Radiotekhnika i Elektronika, Vol V, No 9, Sep 60, pp 1426-1430

The author examines the propagation of electromagnetic waves in wave guides having H-, Π - and L-shaped cross sections and containing cross-magnetized ferrite plates. Equations for determining the propagation constants in such wave guides are derived.

78. Operation of Backward-Wave Tubes With Ridged Delay Systems Examined

"Experimental Study of Backward-Wave Tubes With Inhomogeneous Delay Systems," by L. P. Lisovskiy; Moscow, Radiotekhnika i Elektronika, Vol V, No 9, Sep 60, pp 1442-1447

Results are given of a study of the properties of a backward-wave tube with a delay system in the form of two "combs" or ridged delay structures, the teeth of which are offset by a half step relative to each other. The electron beam passes along the slit between the ridges in the longitudinal focusing field of a solenoid.

Conclusions are that the use of a delay system with slowly changing geometric dimensions does not lead to a substantial change in the relationship between the frequency of generated oscillations and voltage and does not increase the total range of the backward-wave tube. The trigger current in a tube with an inhomogeneous delay system sharply increases, particularly in the short-wave region, as the length of the ridges increases. On the basis of these results it is assumed that the use of inhomogeneous systems will contribute to the elimination of self-excitations of traveling-wave tube amplifiers operating on inverse harmonics.

79. Cross Noises in Tropospheric Propagation Analyzed

"On the Theory of Cross Distortions in Long-Distance Tropospheric Propagation of Ultrashort Waves," by A. V. Prosin; Moscow, Radiotekhnika i Elektronika, Vol V, No 7, Jul 60, pp 1052-1064

The article examines a method for computing cross noises originating in multichannel long-distance communication systems with frequency modulation and frequency-division multiplexing due to the interaction of direct and scattered fields at the point of reception. Among the conclusions reached by the author are:

1. For relatively large delays of the direct component of the field and the use of highly directive antennas in the communication lines, it is possible to determine cross noises using a model of two-beam wave propagation.

2. Cross noise intensity increases with an increase in the directivity of the transmitting and receiving antennas.

3. The statistical characteristics of a turbulent troposphere influence the value of cross noises.

4. There is an optimum distance between the transmitter and receiver at which the value of cross noises will be a minimum.

80. New Directive Couplers for Superhigh-Frequency Lines Described

"Directive Couplers for Surface Waves," by D. I. Mirovitskiy and G. G. Valeyev; Moscow, Radiotekhnika i Elektronika, Vol V, No 7, Jul 60, pp 1078-1084

Results are given of an experimental study of new types of directive couplers and multichannel wave-guide splitters for super-high frequency transmission lines based on the principle of directive coupling between intersecting lines. The experiments were made using dielectric wave guides of methylmetacrylate with a cross section of $0.4\ \lambda_0 \times 0.92\ \lambda_0$.

Studies showed that the energy diverted to the auxiliary tract is determined generally by the time lags in phase velocities of the surface waves in the lines, the angle of intersection of the lines, and the distance between them. The simplicity of design, high directivity (greater than 45 db) in a wide frequency range, and low level of attenuation at the junctions of the lines indicate the possibility that directive couplers may find application in the development of various hybrid and balancing devices, phase inverters, and other superhigh-frequency elements.

Aeronautical Engineering

81. Flight-Information Recording Instrument

"Three-Component Recording Instrument for Altitude, Velocity of Flight, and Plane Overloading" (unsigned item); Moscow, Byulleten' Izobreteniy, No 13, Jul 60, p 57

Class 42d, 3_{10}, No 129842 (643987/26 from 12 Nov 1959)

Post Office Box 828 Enterprise

"A three-component recording instrument for altitude, velocity of flight, and plane overloading, which contains an altitude sensing element, for example, in the form of an aneroid box; a velocity of flight sensing element, for example, in the form of a marometer chamber; and a sensing element of plane overloading in the form of an elastically suspended weight. It also contains a registering system, time recorder, tape mechanism with a gear box, stop mechanism, and electric heater. The distinguishing feature of this instrument is that, in order to reduce the weight and size of the recording instrument, the tape mechanism and the altitude and velocity registering units, mounted on an elastically suspended platform, are utilized as the elastically suspended weight for registrating the overloading."

Atomic Power

82. Gas-Cooled Nuclear Power Plants

"Analysis of Thermal Efficiency of Gas-Cooled Nuclear Electric Stations," by L. S. Sterman, V. V. Petukov, V. P. Protsenko, and A. V. Chikilevskaya, Moscow Power Engineering Institute; Moscow, Teploenergetika, No 9, Sep 60, pp 6-12

Several nuclear power plants with gaseous coolant will be put in operation during the next few years in the Soviet Union and in certain of the People's Democracies.

The article gives an analysis of thermal efficiency of gas-cooled nuclear power plants for several temperatures (340, 375, and 400°C) of gas at the inlet to the steam generator. Cases of thermal cycles with dual-pressures and one pressure are discussed. The gaseous coolant considered in this case was carbon dioxide at a pressure of 15 atm.

The purpose of the analysis was to determine the operating parameters for maximum thermal efficiency with various coolant temperatures at the outlet of the reactor. Vacuum of 0.05 atm abs was maintained at the steam condenser. Comparison of a one-pressure cycle with a two-pressure cycle has shown that the former allows for a higher temperature of the gas at the outlet of the steam generator.

The relationship between the power consumption for circulating the gaseous coolant and the temperature of the coolant at the inlet and outlet to the steam generator is formulated in the article.

Computers and Automatic Control Engineering

83. Study of Nuclear Reactor Performance With Electronic Simulating Devices

"Simulating the Start-up Processes of Nuclear Reactors With Electronic Analog Devices," by B. Ya. Kogan; Moscow, Izvestiya Akademii Nauk SSSR, OTN, Energetika i Avtomatika, No 4, Jul/Aug 60, pp 36-47

Electronic simulating devices have found wide application in investigating the dynamics of nuclear power installations, the processes of reactor poisoning, isotope composition, etc. However, the study of processes occurring during the start-up of a nuclear reactor has encountered some difficulty, primarily because during the reactor start-up, the neutron flux and the concentration of nuclei emitting delayed neutrons may fluctuate in a very wide range, i.e., from 0 to 10^{10}. Since dynamic ranges for even the best components of electronic analogs do not exceed 10^{3}, the direct application of electronic analogs to the solution of reactor start-up equations is limited.

For problems of this type, the method of solution by section with automatic transfer from one section to another is more accurate than the method with logarithmic representation of the reactor power.

The author thanks F. Ye. Tranin, V. F. Kondakov, and A. I. Kaz'min for assistance.

84. Electronic Computers to Control Power Distribution in Electric Systems

"Certain Possibilities for Application of Computers in Power Systems," by V. M. Sin'kov, Gosplan Institute of Automation, Ukrainian SSR; Moscow, Elektrichestvo, No 10, Oct 60, pp 7-12

The use of computers to control power flow in electric systems is very promising at the present state of electronics development. The problems that could be solved with the aid of electronic computers are varied, such as computation of economic-engineering factors, determination of reactive and active power flow, estimation of static and dynamic stability for parallel operation of several turbogenerators, etc.

An experiment conducted in the boiler room at one of the Kiev electric stations has shown that the distribution of load mainly on the basis of nominal steam-producing capacity of the boilers may lead to appreciable waste of fuel. For economic distribution of load between the turbogenerators of an individual station, the following computers may be successfully utilized: the "Uran" computer designed at the All-Union Scientific Research Institute of Electrical Power Engineering and the contactless device Ekran-5 designed at the Gosplan Institute of Automation of the Ukrainian SSR.

A problem of great interest will be the utilization of computers for controlling the speedy restoration of normal operating conditions after emergencies. The All-Union Scientific Research Institute for Complex Automation is now working on the problem of incorporating into a single electronic computer the functions of regulating, controlling, and signaling for each boiler-turbine unit.

It is believed that computer devices will soon be perfected to such an extent as to allow the proper distribution of the load among the individual units of an electric station and among different power plants of the same system.

Electrical Engineering

85. Mobile Electric Power Plants

"Electricity in the Diamond Taiga" (unsigned item); Moscow, Ekonomicheskaya Gazeta, 8 Oct 60

"The Urelyakh diamond mine, located in the vicinity of the taiga town Mirnyy, has received plenty of industrial current. It is now on a new high-voltage, 250-kilometer electric power line from power-generating trains. These mobile electric stations on rail-wheels were delivered via water routes on special barges and were installed on the shore at the settlement Mukhtuya.

"This will permit tripling the power supply to local mines, factories, and equipment, which in turn will result in a further increase of diamond mining."

86. World's Two Largest Thermal Power Plants in Planning Stage

"/Equivalent of/ Four Dnepr Hydroelectric Power Plants on the Moscow Sea," by I. Tsyganov; Moscow, Izvestiya, 25 Oct 60

The world's two largest thermal state regional power plants will be built in the USSR, one at the town of Konakovo near the boundary between Moskovskaya and Kalininskaya oblasts and the other at the settlement of Yermak (just south of Pavlodar) on the Irtysh River.

The state regional electric power plant at Konakovo will have 180-meter stacks, which will be seen from a distance of 60 kilometers. According to the chief engineer of the Konakovo project, Semen S. Rakita, this station will be the largest in the world with an initial installed capacity of 2.8 million kw. The 800,000-kw-capacity turbines will be installed at the Konakovo plant. Huge boilers for these generators will produce 2,500 tons of steam per hour.

An exact replica of the Konakovo plant at one-fiftieth scale, will be built now at Moscow for training of future operating personnel. The Konakovo plant will operate on cheap gaseous fuel. The plant will supply power to Moscow, Leningrad, and the new Cherepovetsk metallurgical region.

The Yermak thermal plant will produce its first current in 1963, supplying power to Northern Kazakhstan, including the aluminum plant. The Yermak plant will burn cheap coal from the Ekibas-Tuz fields.

The problem of automation and mechanization of these power plants was entrusted to the Kiev branch of the "Teploelektoproyekt" Institute.

Mechanical Engineering

87. Gyroscope for Inertial Guidance Systems

"Gyroscope for Inertial Guidance Systems," by V. N. Timoshchenko; Moscow, Byulleten' Izobreteniy, No 15, Aug 60, p 55

Description is given of a patent by V. N. Timoshchenko, Class 42c, 25_{50}, No 130686 (624527/26 from 9 April 1959)

"1. An inertial-system gyroscope with floating-sensing element, the stator of which is fed with current passing through the fluid. Peculiarity of this device is a clearance-free suspension of the rotor, the ball bearings of which are subjected to constant pressure of the fluid through the hemispheres of the stator casing in order to eliminate unbalancing of the rotor due to uneven wear of the ball bearings.

"2. Gyroscope as in paragraph 1, but differs in that electromagnets are used to center the suspension of the internal gimbal ring in the fluid. These electromagnets are fixed on the housing and are situated diametrically on the three axes to hold the sensing element in a central position with respect to the stabilization axis.

"3. Gyroscope as in paragraphs 1 and 2, but differs in that the gyroscope housing rotates about the axis of the rotor's rotation so as to eliminate the detrimental effect on the rotor of the external forces caused by nonsymmetry of the construction. This can be achieved, for instance, by means of a DID-0.5 motor."

88. Conference Held to Discuss Earthquake-Proof Construction

"All-Union Conference on Earthquake-Proof Construction" (unsigned article); Moscow, Ekonomicheskaya Gazeta, 7 Oct 60, p 4

"The Academy of Construction and Architecture USSR, the Institute of Construction of the Academy of Sciences, Georgian SSR, and the Scientific-Technical Society of the Construction Industry held an all-union conference to discuss problems of decreasing construction costs in regions subject to seismic activity. The participants discussed in detail the fundamental aspects of a re-examination of active norms and specifications of earthquake-proof construction in connection with the introduction of new industrial methods of erecting buildings. The conference also recognized the necessity of further clarifying the method of calculating earthquake-proof structures."

Approximation Theory

89. Logarithms of Algebraic Numbers Approximated

"Concerning the Approximation of the Logarithms of Algebraic Numbers by Algebraic Numbers," by N. I. Fel'dman; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Matematicheskaya, Vol 24, No 4, Jul/Aug 60, pp 475-492

A new estimate is derived for the expression $|P(\ln \alpha)|$, where α is an algebraic number and $P(z) \not\equiv 0$ is a polynomial with whole number coefficients. Also considered is the more general problem concerning an estimate from below of the sum $|\ln \alpha_1 - \xi_1| + \ldots + |\ln \alpha_m - \xi_m|$ where $\alpha_1, \ldots, \alpha_m, \xi_1 \ldots, \xi_m$ are algebraic numbers.

Differential Equations

90. Dirichlet Problems Compared

"Concerning the Connection Between Generalized and Classical Solutions of a Dirichlet Problem," by V. A. Il'in and I. A. Shishmarev; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Matematicheskaya, Vol 24, No 4, Jul/Aug 60, pp 521-530

In the present work it is proved that the classical and generalized (in the sense of yielding the minimum of the Dirichlet integral) solutions of the Dirichlet problem

$$Lu = -f \quad \text{(in a region g)}$$

$$u|_\Gamma = 0,$$

where L is a self-conjugate elliptic operator, coincide in an arbitrary N-dimensional normal region of g.

91. Properties of Solutions of Systems of Nonlinear Differential Equations

"On Certain Properties of the Solutions of Systems of Nonlinear Differential Equations With Slowly Varying Parameters," by O. B. Lykova; Kiev, Ukrainskiy Matematicheskiy Zhurnal, Vol 12, No 3, Aug 60, pp 267-278

In a previous paper the author proposed an algorithm for finding an approximate (with precision up to a magnitude of order ϵ) two-parameter family of special solutions of the system

$$\frac{dx}{dt} \quad X(\tau,x) \quad \epsilon X^*(\tau, x, \epsilon), \tag{1}$$

where x, X, X* are n-dimensional vectors, $\tau = \epsilon t$ is slow time, $\tau \in [0,L]$ (L is a finite number).

In this paper the existence and uniqueness of a corresponding exact two-parameter family of solutions of system (1) is proved; the difference between the exact family of solutions and its mth approximation is shown to be of the order of ϵ^m; the property of attraction to the found approximate family of solutions is established for any solutions of system (1) having initial values which belong to the region of definition of the exact two-parameter family of solutions of system (1).

92. Properties of Boundary Problems of Linear Elliptical System of Differential Equations

"On Solutions of a Linear Elliptical System of Differential Equations With a Discontinuous Free Term," by S. P. Gavyelya; Kiev, Ukrainskiy Matematicheskiy Zhurnal, Vol 12, No 3, Aug 60, pp 235-242

The author considers a nonhomogeneous linear elliptical system of differential equations with smooth coefficients in the left part, but with an isolated point particularity of arbitrary (finite) order in the free term. The fundamental matrix, the existence of which is assumed, is modified in such a way that at the corresponding point, zero of the required order is formed. As a result, the formula defining a certain partial solution of a nonhomogeneous system known for a smooth (or limited discontinuous) term is extended to the case under discussion. Conclusions are drawn as to the statement and certain properties (generalized) of boundary problem solutions for such systems.

93. Boundary Problems of Elliptical Differential Equations Solved Numerically

"On a New Method of Numerical Solution of Boundary Problems for Elliptical Differential Equations," G. N. Polozhiy; Kiev, Ukrainskiy Matematicheskiy Zhurnal, Vol 12, No 3, Aug 60, pp 308-323

The author proposes an effective method of solving boundary problems for equations with partial finite differences corresponding to the two-dimensional and three-dimensional problems of mathematical physics. The essence of the method consists in finding solutions in explicit form or in the form of formulas with a small number of parameters determined from a corresponding small number of algebraic equations. For partial differential equations of the second order with constant coefficients, this is attained in the two-dimensional case; and in the three-dimensional case it is attained by means of formulas established by the author.

94. Inhomogeneous Equations of Infinite Order in Generalized Derivatives

"Concerning Inhomogeneous Equations of Infinite Order in Generalized Derivatives," by Yu. N. Frolov, Theory of Numbers Chair, Moscow University; Moscow, Vestnik Moskovskogo Universiteta, Seriya 1, Matematika, Mekhanika, No 4, Jul/Aug 60, pp 3-13

Let $f(z) = \sum_{k=0}^{\infty} a_k z^k$, $a_k = 0$ $(k = 0, 1, 2, \ldots)$

be an entire function of order ρ and type $\sigma \neq 0, \infty$, satisfying the condition that there exists the limit

$$\lim_{k\to\infty} k^{1/\rho} \sqrt[k]{|a_k|} = (\sigma e \rho)^{1/\rho}.$$

The equation

$$M(F) = \sum_{k=0}^{\infty} c_k D^k F = \quad (z) \qquad (1)$$

is considered, where

$$D^n F = \sum_{k=n}^{\infty} b_k \frac{a_{k-n}}{a_k} z^{k-n} \quad \text{for } F(z) = \sum_{k=0}^{\infty} b_k z^k,$$

and the characteristic function $(t) = \sum_{k=0}^{\infty} c_k t^k$ is an entire function of order ρ and type σ_1. $\Phi(z)$ is a regular function within some circle.

In the work it is proved that (i) there exists a solution of equation (1); (ii) if $\Phi(z)$ is an entire function there exists a solution which is an entire function; (iii) if $\Phi(z)$ is an entire function of order $\rho_0 \leq \rho$, there exists a solution which is an entire function of order $\leq \rho_0$.

95. Systems of Linear Differential Equations Investigated

"Concerning the Solution and the Characteristic Exponents of the Solutions of Certain Systems of Linear Differential Equations Having Periodic Coefficients," by K. G. Valeyev; Moscow, Prikladnaya Matematika i Mekhanika, Vol 24, Jul/Aug 60, pp 585-602

A method is presented for the solution of certain systems of linear differential equations having periodic coefficients with the help of a Laplace transformation. The results obtained are employed for the finding of the characteristic exponents of the solutions for systems close to the stationary.

A criterion is given for the stability of the solutions of an equation of the second order having periodic coefficients in the case of resonance.

Numerical Analysis

96. Finite Differences of High Order

"Concerning Finite Differences of High Orders of Continuous Functions," by A. A. Konyushkov; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Matematicheskaya, Vol 24, No 4, Jul/Aug 60, pp 549-566

The behavior of the ratio $\frac{\Delta_t^k f(x)}{\varphi(t)}$ and of the pair of ratios $\frac{\Delta_t^k f(x)}{\varphi(t)}, \frac{\Delta_t^k g(x)}{\varphi(t)}$ $(k \geq 1)$ for the functions f and the pairs [f, g], forming certain residue sets respectively in the space of continuous functions and in the square of that space, are investigated. The theorems obtained do not have exact analogs for k=1; in this case several weaker assertions hold.

The set M of the space P is called a residue in the space P if the complement $P \setminus M$ is a set of the first category in P.

97. Fourier Series of Almost-Periodic Functions

"Concerning the Summability of Fourier Series of Almost-Periodic Functions," by Ye. A. Bredikhina, Kuybyshev Aviation Institute; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Matematika, No 5, Sep/Oct 60, pp 33-39

Several theorems are generalized in the present work relative to the summability of the Fourier series of continuous 2π-periodic functions to uniform almost-continuous functions, the Fourier exponents of which do not have finite limit points.

Probability

98. Coordinate-Homogeneity for Continuous Markov Processes

"Criteria for Coordinate-Homogeneity for Continuous Markov Processes," by I. Ya. Cherkasov; Moscow, Teoriya Veroyatnostey i yeye Primeneniya, Vol 5, No 2, May 60, pp 229-237

A Markov process with an infinitesimal operator

$$A_t = A^i(t, x)\frac{\partial}{\partial x^i} + B^{ij}(t, x)\frac{\partial^2}{\partial x^i \partial x^j}$$

where $x = (x^1, \ldots x^n)$ is a point in the Riemannian space V_n with a metric $g_{ij}(t, x)$ is considered.

The necessary and sufficient conditions for the existence of the transformation

$$x^{i'} = x^{i'}(t, x^1, \ldots, x^n)$$

which transforms the operator (*) into the well-known operator

$$A_t^o = B^{i'j'}(t)\frac{\partial^2}{\partial x^{i'} \partial x^{j'}}$$

are given.

At the end of the paper an example is given from statistics, in which these conditions are applied for establishing the density of the probabilities $f(t, x, \tau, \xi)$ of a certain Markov process.

99. Strong Markov Processes

"On the Definition of a Strong Markov Process," by A. A. Yushkevich; Moscow, Teoriya Veroyatnostey i Yeye Primeneniya, Vol 5, No 2, May 60, pp 237-243

The two definitions for strong Markov processes given in Ye. B. Dynkin's "Strong Heterogeneous Markov Processes," DAN SSSR, Vol 2, 1957, pp 261-263, are proved equivalent.

Series

100. Permutation of Series

"Concerning Series, Universal With Respect to Permutations," by A. A. Talalyan, Institute of Mathematics and Mechanics, Academy of Sciences Armenian SSR, Yerevansk State University; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Matematicheskaya, Vol 24, No 4, Jul/Aug 60, pp 567-604

For any basis $\{\varphi_n(x)\}$ of the $L_p[0, 1]$ space the existence of a series $\sum_{n=1}^{\infty} a_n \varphi_n(x)$ is proved which possesses the following property: for any measurable function $f(x)$ the terms of the series may be placed such that the obtained series converges to $f(x)$.

Miscellaneous

101. International Symposium on Mathematics To Be Held in Berlin

Berlin, Berliner Zeitung, 26 Sep 60

According to Prof Dr Reichardt, head of the mathematics classes of the Humboldt University, Berlin, an international symposium on mathematics will be held during the anniversary celebrations of the Humboldt University and of the Charité. Among the participants in the symposium will be Prof Dr Alexandrov from the Soviet Union, a distinguished American mathematician, and leading mathematicians from Czechoslovakia, Bulgaria, Britain, France, Greece, Italy, Yugoslavia, Norway, Austria, Poland, Hungary, West Germany, and West Berlin.

Behavioral Science

102. Cybernetics Applied in Medicine

Voprosy Kibernetiki v Biologii i Meditsine (Problems of Cybernetics in Biology and Medicine), by V. D. Moiseyev, Medgiz; Moscow, 1960, 302 pp

The following introductory note briefly described the contents of this book:

"Several theoretical and practical problems of cybernetics which are especially important with regard to biology and medicine are examined in popular form in this book.

"The first chapter is devoted to automatic computers as computation-decision-making automats with self-organizing processes, which serve as a basis for making analogies between modern automats and living organisms and which permit relatively broad modeling of biological processes with physical imitators.

"The second chapter is devoted to fundamental concepts of cybernetics itself and to the practical application of its achievements in the fields of biology and medicine, i.e., for the creation of certain analogs which model biological processes and the activity of separate organs of the living organism, for designing apparatuses which replace certain capacities lost by a human, etc.

"In the third chapter, concrete examples of the use of automatic computers in clinical medicine are examined, for example: for diagnosing diseases, analyzing electrocardiograms and electroencephalograms, etc.

"The book is intended for a wide circle of biologists, physiologists, psychologists, neuropathologists, psychiatrists, and physicians in different specialties."

A lengthy foreword by N. A. Bernshteyn, Doctor of Medical Sciences and Corresponding Member of the Academy of Medical Sciences USSR, is entitled "Historical Sources of Cybernetics and Prospects for Its Use in Medicine." Bernshteyn traces the development of cybernetics from the ideas of Descartes and Borelli in the 18th Century, through the progress of neurophysiology in the 19th Century, to the more complex combinations of analogy with physiological processes in the 20th Century.

In a message which follows the foreword, the author reiterates and expands the purpose stated in the introductory note and extends his thanks to N. A. Bernshteyn and F. V. Bassin for their assistance on special problems of biology and medicine.

The table of contents follows:

103. Book on Cybernetics Reviewed

"Voprosy Kibernetiki v Biologii i Meditsine (Problems of Cybernetics in Biology and Medicine), by V. D. Moiseyev, reviewed by A. D. Voskresenskiy; Moscow, Sovetskaya Zdravookhraneniye, Vol 19, No 9, Sep 60, pp 84-86

After a detailed review in which he criticizes various shortcomings in Moiseyev's book, A. D. Voskresenskiy points out that the book contains must information which will be of use to biologists and physicians. He considers the parts of the second and third chapters devoted to modeling of neuron networks, the role of feedback in the organism, and the practical use of automatic computers for analysis of electrocardiograms and electroencephalograms particularly interesting. The reviewer specifically disagrees with the author's final conclusion that "in a very general case the machine will be universal and will determine any disease from every conceivable field of clinical medicine." The reviewer states that a basic knowledge of cybernetics and automation is not necessary to doubt the extreme optimism of this point, because at present it is possible to construct symptom complex tables for precise diagnosis of only a few diseases. The value of the diagnostic machine, in his opinion, is difficult to assess in the case of atypical forms of disease.

The major criticism of the book seems to be the author's failure to include concrete instances to support such statements as "many medical workers have experiemnted with the use of cybernetic methods in clinical medicine," which, in the reviewer's opinion, discredits to some extent the reported achievements in this field.

104. Physical Culture to Aid in Training New Soviet Man

"The Eighth Plenum of the Central Committee of the VLKSM" (Vsesoyuznyy Leninskiy Kommunisticheskiy Soyuz Molodezhi; All-Union Lenin's Young Communist League) (unsigned article); Moscow, Teoriya i Praktika Fizicheskoy Kul'tury, Vol 23, No 10, 1960, pp 721-724

The eighth plenum of the Central Committee of the VLKSM decided to sponsor more social, cultural, and athletic organizations and to make each one of them a "beehive" of activity. All these organizations are expected to help in preparing the youth of the Soviet Union for life in a Communist Society.

This decision was inspired by the fact that the Soviet Union has made considerable progress in agriculture and has expanded heavy industry. The country has moved ahead in science and technology and all main indicators show that the general economic condition of the country improved considerably during the past 1 1/2 years.

Abolition of all taxes by the Supreme Soviet USSR and transition to a 7- and 6- hour day is expected to increase labor productivity. All this is expected to be accomplished without a decrease in take-home pay.

In his speech before the all-union conference of teachers, N. S. Khrushchev stated: "Our aim is twofold -- to establish a material and technical base for Communism, and to train a new man. Both aims are part and parcel of a single process. If we fall behind in the education and training of the Soviet people, then the entire effort of building Communism will inevitably be retarded."

105. Reorganization of Education in USSR

"Psychology -- in the Service of Communist Education," (unsigned article); Moscow, Voprosy Psikhologii; Moscow, No 4, Jul/Aug 60, pp 3-8

This article states that the All-Russian Congress of Teachers disbanded on July 1960 after discussing in detail what preliminary action should be taken before the Soviet educational system is reorganized. This congress was called in response to resolutions of the 21st Congress of the CPSU and proposals advanced by the Central Committee CPSU, the Council of Ministers USSR, and the law requiring the promotion of a stronger bond between schools and life.

The First Secretary of the Central Committee CPSU and chairman of the Council of Ministers USSR, N. S. Khrushchev, spoke at one of the meetings. He amplified in his address Lenin's principle that education must be linked with work. "We are resolving at present two historical problems," Khrushchev said. "These two problems are the establishment of a material and technical base on which to build Communism, and the education of the new man. Both these problems actually are part of a single process. If we fall behind in the education and indoctrination of Soviet people, then the entire effort directed toward the building of Communism will inevitably be delayed. This is why, in formulating the program for increased Communist construction, the party and the government have directed their attention toward strengthening the bond between school and life and improving public education."

"The Soviet system of education must be geared to the needs of a Communist society. The Soviet school is called on to offer Soviet youth a general and a scientific and technical education, and to contribute to their indoctrination in the spirit of socialist patriotism, proletarian

internationalism, friendship among nations, and profound love for work and participation in social activities. The general aim of Soviet education is to develop a generation of courageous, strong, cheerful, ideologically hardy people with deep convictions in the ultimate victory of the great cause."

To impart knowledge is only one function of the school and teacher, the article continues. To be sure, it is of paramount importance. But knowledge alone is not enough. The Soviet school must graduate enlightened members of the Communist society who have a Communist view of proper conduct and behavior.

The education of the new man and the formation of a material and technical base on which Communism can be built requires a new psychological theory, a theory of the development of a well-rounded, well-developed personality.

The Communist Party and the government of the Soviet Union are making great demands of pedagogical science in general and of psychology in particular. This reliance on the science of psychology becomes even greater as the country moves forward on the road to Communism.

The solution of the essential problems of the reorganization of education in the Soviet Union will elevate psychology to the position of an important basic science.

The article says that shortly before the All-Russian Congress of Teachers, the Bureau for the RSFSR of the Central Committee CPSU examined the activity of the Academy of Pedagogical Sciences RSFSR; a report by I. A. Kairova, president of the Academy, was heard, and a special resolution of the Bureau and the Council of Ministers RSFSR was adopted: "On the Work of the Academy of Pedagogical Sciences RSFSR and the Reinforcement of Its Connection With Schools and Scientific-Pedagogical Institutions." It was noted in this resolution that "the Academy of Pedagogical Sciences has recently improved its work somewhat."

106. Therapy of Hypertension

"Effect of Thiphen on Arterial Pressure," by R. I. Mangushev, Tr. Orenburg. Obl. Otd. Vseros. Nauchn. O-va Terapevtov (Works of the Orenburgskaya Oblast Branch of the All-Union Society of Therapeutists), 1959, No 1, 55-61 (from Referativnyy Zhurnal -- Biologiya, No 16, 25 Aug 60, Abstract No 79056)

"The effect of thiphen on arterial pressure was studied in 154 patients suffering from different diseases of the cardio-vascular system. The subcutaneous administration of thiphen reduced arterial pressure within 15-30 minutes, occasionally within 1-2 hours after the injection (by 50-60 millimeters of the mercury column in hypertension). The duration of the effectiveness of the drug was 2-3 hours, occasionally 6 hours. A repeated administration of thiphen produced a considerable reduction of arterial pressure. The reduction in arterial pressure and the cessation of stenocardia attacks do not always coincide."

107. Therapy of Atherosclerosis

"On the Problem of the Therapy of Atherosclerosis," by V. V. Gorbachev, Chair of Hospital Therapy, Minsk Medical Institute; Minsk, Zdravookhraneniye Belorussii, Vol 6, No 8, Aug 60, pp 14-18

For therapeutic purposes 83 patients suffering from atherosclerosis were divided into three groups. Group 1 was administered sunflower oil in doses of 60 grams in 24 hours, in three to four administrations; the patients of the second group were given pyridoxine in a dose of 50 milligrams in 24 hours; the third group of patients was administered a 5 percent solution of iodine. Observations established that the best therapeutic results were obtained by the administration of sunflower oil: modifications in the cholesterine content, in the relation between lecithin and cholesterine, lipoproteins, albumins, and beta- and gamma- globulins were noted. The administration of pyridoxine produced results similar to that produced by sunflower oil. Iodine was found to be the least effective of the three preparations used.

108. Atherosclerosis

"Epidemiology of Atherosclerosis," by Z. Reinis, D. Zoulek, J. Mestan, K. Soukupova, J. Hrabane, and J. Konrad, Casop. Lek. Cesk. (Czechoslovakia), 1960, 7-8, 231-240 (from Meditsinskiy Referativnyy Zhurnal, Section 1, Vol 4, No 8, Aug 60, Abstract No 4989, by L. I. Gnesin)

"A comparative study of the age, weight, cholesterinemia, phospholipidemia, general lipemia, blood content of alpha- and beta-lipoproteins, character, occupation, and sanitary living conditions of a group of Czech peasants living in two villages and a group of Koreans and Vietnamese was conducted. Some 222 clinically healthy persons (121 males and 121 females) in the ages of 20-79 were investigated in Czechoslovakia. A total of 108 persons (61 males and 47 females) were investigated in the areas of Chongjin (Korea) and Haiphong (Vietnam). Considerably smaller quantities of cholesterine, lipids, and phospholipids were found in the blood of the inhabitants of the Far East than in the blood of Czech peasants. The inhabitants of the Far East consume 400-700 grams of rice, 50-100 grams of fish, 10-15 grams of vegetable oil (peanut), and 250-500 grams of vegetables a day; almost no animal fats are consumed, while milk and dairy products are seldom eaten. Sanitary-hygienic conditions are at a low level in the Far East. Atherosclerosis is rarely a cause of death among the people of the Far East, while about 200 persons per 100,00 in Czechoslovakia in the ages of 55-64 die from atherosclerosis. About 110 grams of fats a day are consumed in Czechoslovakia. The mortality rate from atherosclerosis is particularly high in the US, where more than 800 persons per 100,000 die from the disease. The daily consumption of fats in the US is about 140-150 grams a day. The lowest mortality rate from atherosclerosis is found in Japan (about 50 persons per 100,000 of the same age groups as above); about 20 grams of fats a day are consumed in this country."

109. Nutrition and Atherosclerosis

"Nutrition as an Epidemiological Factor in Atherosclerosis," Z. Reinis, D. Zoulek, J. Mestan, J. Konrad, and J. Hrabane, Ceskosl. Gastroenter. Vyz (Czechoslovakia), 1960, 3, 213-216 (from Meditsinskiy Referativnyy Zhurnal, Section 1, Vol 4,

Nov 8, Aug 60, Abstract No 4991 by L. I. Gnesin)

"Investigations of the epidemiology of atherosclerosis in the people of the Far East (Korea and Vietnam) were conducted. A definite relationship between the composition of the food consumed and the development of atherosclerosis was established. The lipid level in the blood of the people of the Far East was found to be considerably lower than that in the blood of the people of Czechoslovakia. While mortality from

atherosclerosis in Czechoslovakia was as high as 25 percent of all mortality cases, in the Far East it was a minimal figure. Thromboembolism was rarely encountered in the Far East. The data obtained in the investigations coincided with those of Kiys who held that the consumption of fats is the main etiopathogenic factor in the development of atherosclerosis. In Czechoslovakia, fats make up about 35 percent of the food calories, while in Korea and Vietnam, about 10 percent. In addition, the food rations in Korea and Vietnam contain little sugar, while in Czechoslovakia the rate of sugar consumption is considerably higher. With the conclusion that nutrition is an important factor in the pathogenesis of atherosclerosis, the authors points out that occupation, living conditions, bioclimatic conditions, etc. are contributing factors to the development of the disease. Observations of a group of native Far East students who have been studying for 2 years in Czechoslovakia established that their biochemical blood index began to approach those of the native population of Czechoslovakia."

Epidemiology

110. Achievements in Control of Contagious Diseases in Rumania

"Sixteen Years of Great Success in Combating Contagious Diseases in Rumania" (unsigned article); Microbiologia, Parazitologia, Epidemiologia, Bucharest, Vol 5, No 4, (Jul/Aug) 1960, pp 289-290

Increased medical personnel, scientific research, available medicines, and party and government interest have solved most of the problems of contagious diseases in Rumania. Moreover, the morbidity of such widespread diseases as tuberculosis and syphilis has been reduced greatly.

Malaria has dropped from 210,000 cases in 1948 to a few hundred cases in 1958, the disease is now disappearing. Rumania is considered a model in antimalarial organization.

Typhus has dropped 99.5 percent compared with 1948 and is now on its way out. Typhoid fever has dropped 77.6 percent compared with 1945, and the present morbidity in Rumania is among the lowest in Europe. The morbidity of diphtheria is continually dropping and now stands at 44 percent less than 1948. Relapsing fever has been eliminated.

Mortalities from contagious diseases dropped 80 percent between 1944 and 1955. Typhus fever, formerly fatal in 20-50 percent of the cases, is now broken in 48-72 hours, and fatalities have dropped to zero. Prior to 1950, the mortality rate from typhoid fever was 14 percent; it is now 1-2 percent.

The diminution of contagious diseases has contributed to lower general and infant mortality. General mortality, which stayed at the high level of 20 percent in the past, fell to 8.7 percent in 1958, thus putting Rumania in a class with France, West Germany, Belgium, Italy, etc. Infant mortality has fallen from 17-18 percent to 6.9.

Geriatrics

111. Effect of Novocain on Aging Organism

"Investigation of Age Biology. VI. Experimental Investigation of the Mechanism of the Action of the Hydrochloride of p-Aminobenzoate of Diethylaminoethanol in Aging Rats," by C. I. Parhon, S. Oeriu, I. Tanase, M. Caliano-Serban, and S. Saceanu, Studii si Cercetari Biochim. Acad. RPR (Rumania), 1959, 2, No 3, 237-243 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 11, 10 June 60, Abstract No 16040, by the authors)

"Following the intramuscular administration of novocaine in quantities of 5 milligrams per kilogram of body weight for a period of 30 days it was found that the concentration of thioaminoacids and oxidized glutathione in the blood serum remained at a normal level. Novocain increased the methionine content in spleen tissue and the cysteine content in the liver and kidneys. In the opinion of the authors, some of the properties of novocain are due to the presence of paraaminobenzoic acid which is freed by hydrolysis. See Report V in Referativnyy Zhurnal Khimiya -- Biologicheskaya Khimiya, No 3, 3561."

Hematology

112. Role of Hypoxia in Respiration and Glycolysis

"The Question of the Role of Hypoxia in the Mechanism of Blood Regeneration," by B. V. Aretinskiy, Tr. Sverdl. Med. In-ta, No 21, 1958, pp 75-81; (from Referativnyy Zhurnal -- Biologiya, No 9, 10 May 60, Abstract No 41092, by L. S. Rotfel'd)

"Studies in which the Warburg method was used were conducted on the changes in respiration and in glycolysis which occurred in the bone marrow, spleen, liver, and the diaphragm muscle of normal and anemic rabbits maintained for 8-10 hours in a high-oxygen-containing chamber. Some rabbits were made anemic by acute blood letting or by a single

Irradiation by 1,000 r. Rabbits with post-hemorrhagic anemia died on the 4th day after blood letting, and those with acute radiation sickness died during the 3rd-4th week after irradiation. Normal rabbits placed in the high-oxygen chamber showed decreased respiration and glycolysis rate in the bone marrow, which is explained as a result of the inhibition of erythropoiesis.

In this case there was a decrease in the number of erythrocytes, and in the quantity of hemoglobin and reticulocytes. The coefficient of tissue respiration, Qo_2, in organ tissues was increased. Qo_2 and glycolysis were higher in the bone marrow and spleen of rabbits made anemic by blood letting than in normal rabbits. Respiration and glycolysis were somewhat diminished in the liver. When the bone marrow tissue of the rabbits that were made anemic was placed for a certain period in the high-oxygen-containing chamber it was able to absorb oxygen with greater intensity than the bone marrow of control animals. Glycolysis in organ tissue changed in a line parallel to Qo_2 of these organs. The author interprets this increased oxygen demand by the bone marrow as due to intensified regeneration."

113. Storage Period for Blood Materials Reduced in Czechoslovakia

"Changes in the Storage Transfusion Preparations"; Prague, Vestnik Ministerstva Zdravotnictvi, No 6, 1 Mar 60, p 75

An instruction of the Czechoslovak Ministry of Health, dated 11 December 1959, states that the expiration period for erythrocyte mass has been set at 21 days from the day the blood was collected.

The expiration period for resuspended erythrocyte mass, even when saccharose has been used (in the resuspension process), has been set at 16 days from the day the blood was collected.

This change is a result of research work of the Institute of Hematology and Blood Transfusion, in the course of which a study was made of the posttransfusion vitality of red corpuscles in whole blood, erythrocyte mass, and resuspended erythrocyte mass. The results of this study indicated that the previous expiration period, which had been established on the basis of literature dealing with the subject, did not correspond to the actual preservation of the quality of stored erythrocytes and that a change in the storage period was required. The instruction orders all blood transfusion centers to comply with the new prescribed storage period.

114. Bacteriophage Tested in Experimental Typhoid

"The Action of Bacteriophage on Experimental Typhoid Infection Under Conditions of Altered Reactivity of the Organism," by L. M. Lezhankina, Materialy 2-go Plenuma Sibirsk. Fil. O-va Patofiziologov (Data on the Second Plenum of the Siberian Branch of the Society of Pathophysiologists), 1958, pp 50-53 (from Referativnyy Zhurnal -- Biologiya, No 17, 10 Sep 60, Abstract No 79839, by Ya. Rautenshteyn)

"White mice were infected with a one-day culture of typhoid bacteria isolated from the blood of a patient. Polyvalent typhoid phage was introduced once or twice intraperitoneally immediately after infection, or one day before infection or six hours after infection. One group of experimental animals was subjected to the action of a soporific (urethan), and another, caffeine. The effectiveness of the phage was evaluated according to survival of the animals and the rate of elimination of bacteria from the organism. It was established that urethan-induced sleep retarded typhoid septicemia, but at the same time diminished the therapeutic effect of the phage; caffeine did not reinforce this effect and facilitated a more rapid freeing of the organism from bacteria, which was not observed in urethan-induced sleep. It is concluded that the action of phage on the infection process in the organism depends on the functional condition of the central nervous system."

115. Therapy of Paranoid Forms of Schizophrenia

"Comparative Investigation of the Results of Largactil and Serpasil Therapy of Patients Suffering From Paranoid Forms of Schizophrenia," by A. Jus, Ye. Broszkiewicz, K. Gerard, W. Kozaczewska, Neurol. Neurichirurg. i Psychiatr. Polska (Poland), 1959, 9, No 4, 511-524 (from Referativnyy Zhurnal -- Biologiya, No 16, 25 Aug 60, Abstract No 78991)

"Largactil was administered to 46, and serpasil to 27 patients with a history of the duration of the disease from several days to 20 years. In the author's opinion the degree of improvement depends on the duration of the disease and the character of its course prior to therapy with largactil and serpasil."

116. New Antibiotic

"Dihydrostreptomycin" (unsigned article); Moscow, Meditsinskiy Rabotnik, 13 Sep 60, p 3

Dihydrostreptomycin is a new antibiotic obtained by the reduction of streptomycin at the All-Union Scientific Research Institute of Antibiotics. It is indicated in some forms of tuberculosis, tubercular meningitis, in diseases of the urinary canal, tularemia, acute forms of brucellosis, and endocarditis induced by penicillin-resistant microbes. The effectiveness of the drug was established in clinical tests. It is only slightly toxic and is well tolerated by the patients. It can be administered in combination with other antibacterial drugs. It is administered intramuscularly in doses of 0.5-1.0 gram to adults and 0.2-0.5 gram to children. The drug is now being prepared at the Moscow Plant of Medical Substances No 2.

117. Inoculation of Pregnant Women Against Infantile Paralysis

"Inoculation of Pregnant Women Against Infantile Paralysis"; Prague, Vestnik Ministerstva Zdravotnictvi, Vol 8, No 12, 25 May 60, pp 139-140

On 23 April 1960, the chief hygienist of Czechoslovakia issued a resolution requiring special protective inoculation of pregnant women against contagious infantile paralysis. In accordance with this resolution, kraj hygienists are to immediately order such inoculation for all pregnant women. The inoculations are to be planned, organized, directed, and supervised by kraj and okres hygienists in accordance with instructions of the chief hygienist of Czechoslovakia and performed by physicians providing outpatient care for women. The inoculations are to be given between the 20th and 36th weeks of pregnancy and are to consist of two injections. The first injection is to be made not earlier than the 20th week (and no later than the 32nd week) of pregnancy, with the second being given 2-4 weeks later. The inoculations are free and related costs will be paid for by the state.

Health departments of the kraj national committees are instructed to initiate a program to familiarize the public with the significance of the inoculations. All health personnel who will administer the inoculations and all who will maintain records thereon are also to be informed of this order.

The resolution exempts the following classes of pregnant women from the inoculations: (1) those with serious anamnesis (habitual abortion, diagnosed or suspected latent infections, erythroblastosis); (2) those with Rh isoimmunization; and (3) those with delayed gestosis.

In correctly administered inoculations there should be no complications. In very rare cases, allergy to penicillin or streptomycin, which is added to the Salk-formula vaccine, may be manifested in a rash.

118. Aeroionotherapy Used to Treat Gastric Ulcers in Rumania

"Research and Practical Application," by Dr L Florea; Bucharest, Muncitorul Sanitar, 22 Oct 60, p 1

Dr H. Straus of the Cluj branch of the Institute of Hygiene and Public Health has been outstanding in the field of new treatment of gastric ulcers with aeroionotherapy. Aeroionozation has been studied in many population and industrial centers. However, lack of adequate apparatus has held back the detection of the small and even large ions which affect the purity of the atmosphere. The modification of the Eberth apparatus has permitted the extension of studies on aeroionization and the identification of the ions which affect the body. Research has shown that small, negative ions have a calming effect.

This discovery was the basis for aeroionotherapy relieving some afflictions, such as gastric ulcers. Successful experiments were carried out on animals and humans. Aeroionization improved the trophic changes of the gastric mucus in cases of gastric ulcers. Aeroionization has been helpful in some cases of poisoning, such as gasoline poisoning, in silicosis, and generally in pneumoconiosis.

It is difficult to study the reactivity of the body through physiological methods. Laboratory animals exposed to unfamiliar conditions often endanger the accuracy of the results.

Dr. Tiberiu Fritch developed an apparatus to register pneumoplethysmograms which, by an optical system of recording, permits the concomitant recording of the pneumogram and cardiovascular investigations.

119. Rumanians Experiment With Sarcolysine

Bucharest, Muncitorul Sanitar, Vol 11, No 37, 17 Sep 60, p 1

The Synthesis Laboratory of the Oncologic Institute in Bucharest has prepared the Rumanian drug sarcolysine, which has been used with good results in experiments. This laboratory is also using other cytostatics in experiments on animals.

120. New Oncological Hospital in Ploesti

Bucharest, Muncitorul Sanitar, Vol 11, No 37, 17 Sep 60, p 1

The new oncology section of No 2 hospital in Ploesti, Rumania, was recently put into operation. The section is located in a new pavilion and is equipped with all installations necessary for good hospitalization and adequate treatment. It has a capacity of 50 beds and will largely meet the regiune's hospitalization needs for patients with various malignant tumors.

121. Organophosphorus Poisoning of Warm-blooded Animals Studied

"Changes in the Organism of Animals Following Poisoning With Certain Organophosphorus Insecticides," Yu. S. Kagan and Ye. I. Makovskaya Kiev), Kiev Scientific Research Institute of Labor Hygiene and Occupational Diseases (director; L. I. Medved'); Moscow, Arkhiv Patologii, No 9, 1960, pp 44-49

The authors present materials on the clinical course of poisoning with the organophosphorus insecticides: mercaptophos -- both thiolo and thiono isomers, preparation M-74 (disyston) -- $(C_2H_5)_2P(S)SCH_2CH_2SC_2H_5$, preparation M-81 (ekatin) -- $(CH_3)_2P(S)SCH_2CH_2SC_2H_5$, and preparation M-82 -- $(CH_3)_2P(S)SCH_2CH_2SCH_3$. The morphological changes developing in mice, rats, cats, and rabbits following administration of these insecticides by various routes are also depicted. Fatal and toxic doses and concentrations of these drugs cause intoxications by the excitation of the cholinoreactive systems with considerable vascular disturbances, and dystrophic and focal necrobiotic changes in the cerebral nerve cells and internal organs. The morphological changes revealed in experimental animals are not specific for the action of organophosphorus insecticides.

122. Effect of Chlorine on the Organism

"On the Problem of Modifications of the Nervous System in Acute Chlorine Intoxication," by A. A. Nersesyan, S. A. Torosyan, and A. V. Stepanyan (Yerevan), Second Clinic of Nervous Diseases of the Second Medical Association; Moscow, Gigiyena Truda i Professional'nyye Zabolovaniya, Vol 4, No 10, Oct 60, p 50

"Inasmuch as the problem of the modifications of the nervous system as a result of acute intoxication by chlorine is not greatly elucidated in medical literature, the observations of a group of 18 persons suffering from acute intoxication by chlorine merit particular attention. The intoxications were of a mild and moderately expressed character. Not a single case of pulmonary edema was noted. On a background of a general irritating effect (cough, dyspnea, nausea) the patients suffered from severe headaches, adynamia, tremor of the fingers, bright-red dermographism, an increase in the mechanical irritability of the muscles, diaphoresis, depression of the tendon reflexes, asthenic reaction of the pupils to light, depressed reactions, and hypoesthesia of the extremities in some of the patients. Temporary affections of the cranial nerves (trigeminal and facial) and neuralgia of the sciatic nerve were observed in some of the more expressed

cases of intoxication. Loss of consciouseness, spasms, fibrillar jerking of the muscles, symptoms of meningitis, and manifestations of hemiparesis were noted in acute chlorine intoxications. The modifications were of a reversible character, and all the patients were discharged from the clinic either in a considerably improved condition, or completely cured."

123. Effect of Isoniazid and Paraaminosalicylic Acid on the Organism

"Effect of Isoniazid and PAS [Paraaminosalicylic Acid] on the Ascorbic and Cholesterine Level in the Adrenal Glands of Rats," by M. Kohout and R. Krulik, Rozhl. Tuberk., 1960, 4, 286-289 (from Meditsinskiy Referativnyy Zhurnal, Section 2, No 8, Aug 60, Abstract No 1513, by V. G. Grigoryan)

"Experiments were carried out on 150-250-gram albino rats. Isoniazid was administered to the animals in doses of 50 milligrams per kilogram of body weight, and PAS, in doses of one gram per kilogram of body weight. The control group was administered physiological salt solution. The ascorbic acid and cholesterine levels were determined in the adrenals of the decerebrated animals one, 3, 7, and 14 days after the administration of the antibiotics. Following the administration of single doses of isoniazid and PAS the ascorbic acid and cholesterine levels dropped. A greater drop in the ascorbic acid was noted after the administration of PAS. This decrease continued for a period of 14 days. Fourteen days after the administration of isoniazid the ascorbic acid level was decreased by 31 percent, and cholesterine by 26 percent. After the administration of PAS the ascorbic acid level was decreased by 42 percent and that of cholesterine by 39.5 percent. The weight of the adrenals was increased. The decrease in the ascorbic acid and cholesterine levels and the increase in the weight of the adrenals indicate the stimulating effect of these preparations on the adrenal glands."

124. Pyridine Salts as Bactericidals

"Synthesis and Bactericidal Properties of Some Quaternary 4-replaced Salts of Pyridine," by St. Gaytandzhiyev, Sv. Avramov, D. Kolarov, Farmatsia (Bulgaria), 1959, 9, No 5, 25-29 (from Referativnyy Zhurnal -- Khimiya No 16, 25 Aug 60, Abstract No 66459, by the author)

"The following salts possessing bactericidal properties in relation to Bact. typhi murium were obtained through the interaction of pyridine, ethylpyridine, and the methyl ester and amide of isonicotinic acid with dodecyl bromide: bromide of 1-dodecylpyridine (I); bromide of 1-dodecyl-4-ethylpyridine (II); bromide of 1-dodecyl-4-carbomethoxypyridine (III); bromide-1-dodecyl-4-carboxamidopyrine (IV). (III) and (IV) were the

first to be synthesized. It was established that preparation (II) possesses the strongest bactericidal properties, surpassing those of ajatin. In respect to bactericidal properties, (II) is followed by (I), (III), and finally (IV). As compared with chloramine, the bactericidal properties of all these salts are relatively weak. The phenol coefficients of the synthesized preparations are as follows: (I) -- 94; (II) -- 218; (III) -- 140; (IV) -- 25 (chloramine -- 48, and ajatin -- 90). In relation to their effect on the bactericidal properties of the salts, the replacements in position 4 in the nucleus of pyridine are grouped as follows: $C_2H_5 > H \geq COOCH_3 > CONH_2$."

125. Combined Action of Furacillin and Novocain

"Furacillin-Novocain Anesthesia," by M. I. Kalinin, Ivan'kovskaya City Hopsital, Moskovskaya Oblast; Moscow, Khirurgiya, Vol 36, No 7, Jul 60, pp 72-73

Results of the application of furacillin-novocain anesthesia administered in 2,822 surgical operations are reported. The accumulation of the data was begun in 1953. It was established that the use of the furacillin-novocain combination is highly advisable as a means of preventing postoperative pyosis. In only three cases was it necessary to leave the incisions unsutured for draining purposes. In all other cases it was possible to close the incisions when the combination of furacillin-novocain was used.

126. Potentiation of Succinylcholine by Proserine

"Experimental and Clinical Prolongation of the Action Succinylcholine (Ditilin) With Proserine," by S. M. Zol'nikov and N. F. Mustakopulo, Laboratory of Anesthesiology of Institute of Thoracic Surgery; Moscow, Khirurgiya, Vol 36, No 8, Jul 60, pp 44-46

Experiments carried out on dogs established that proserine when used in conjunction with succinylcholine prolongs and potentiates the action of the anesthetic by 15-120 minutes. The effectiveness of the combined application of proserine and succinylcholine was proved in 33 operations on the abdominal and thoracic cavities. However, the authors recommend further research since as yet no correlation constant for the doses of the preparations and apnea has been established.

127. Effect of Vitamin E on Muscles

"On the Effect of Enriching the Diet With Vitamin E on the Biochemical Changes in Working Muscles," by A. F. Makarova and N. R. Chagovets, Biochemical Sector of the Leningrad Scientific Research Institute of Physical Culture; Kiev, Ukrainskiy Biokhimicheskiy Zhurnal, Vol 32, no 4, 1960, pp 560-565

The biochemical changes in the muscles and blood of albino rats were studied after the animals had been swimming for various periods (15 minutes and 5 hours). The first group of experimental animals was put on an ordinary diet; the second group received the daily supplement of 6 mg of vitamin E dispersed in 0.75 g of malt extract; and the third group of animals received pure malt extract (0.75) without vitamin E.

The results of the study showed that the supplement to the animals ration either of highly dispersed vitamin E in malt extract or of pure malt extract exerts a favorable effect on the course of the biochemical processes in the muscles during activity of various duration.

The data obtained indicated that enriching the diet of animals with vitamin E does not affect the chemistry of the working muscles. At the same time these results permit recommending malt extract as a supplementary nutritional factor when engaged in physical activity.

128. Vitamin Enrichment of Foods as a Goiter Preventive Measure

"Contents of Iodine and Bromine in the Thyroid Glands of Albino Rats Dependent on the Vitamins in the Food," by E. S. Turetskaya, Lvov Institute of Epidemiology, Microbiology and Hygiene; Kiev, Ukrainskiy Biokhimicheskiy Zhurnal, Vol 32, No 4, 1960, pp 578-587

The author studied the effect of enriching food with vitamins A, B_2, C, and D on the weight of and the iodine and bromine content in the thyroid glands of albino rats under experimental conditions.

The investigations established that food enriched with vitamins C or D furthers a more intense accumulation of iodine and bromine in normal thyroid glands. Supplementary administration of vitamin A with the food leads to a decrease in the iodine and bromine content in the thyroid glands of the experimental animals and to an increase in the average weight of the glands. This phenomenon also takes place with vitamin B_2.

In view of this, the author recommended the enrichment of food with vitamins C or D in quantities exceeding the physiological requirements of the organism in endemic goiter districts characterized by iodine and bromine insufficiency in the environment, such as the western regions of the Ukrainian SSR.

129. Effect of Reserpine on the Organism

"On the Effect of the Modifications of the Tonus of the Automatic Nervous System Induced by Reserpine on the Protective Substances of the Serum," by L. Goreczky, G. Vajda, and P. Baumann, Kiserl. Orvostud, 1959, 11, No 4, 433-436 (from Referativnyy Zhurnal -- Biologiya, No 16, 25 Aug 60, Abstract No 78976)

"A considerable decrease in bactericidal activity and diminution in the titer complement was noted in blood serum obtained 3,6, and 24 hours after the administration of reserpine. In the author's opinion this is due to the modification of the tonus of the autonomic nervous system with a shift toward parasympathicotonia, caused by the adrenolytic and noradrenolytic properties of reserpine."

130. New Drugs

"New Medicinal Preparations," by J. Podlewski and A. Podleswka, Farmac. Polska (Poland), 1959, No 12, 15, 226-227 (from Referativnyy Zhurnal -- Khimiya, No 14, 25 Jul 60, Abstract No 58240, by V. Ivanova)

"The doses and actions of a number of preparations are described: ultandren (9 alpha-fluoro-11 beta-oxy-17 alpha-methyltestosterone); madribon (2,4-dimethoxy-6-sulfanilimado-1,3-diazine); eksul' -- tablets containing 2,000 units of the extract of liver, brain, and adrenals without the hormones, 14 grams of cream (55 percent fat), 0.6 milligram of vitamin B_1, 1.2 milligrams of vitamin PP, 8.7 milligrams of Fe gluconate, cacao, coconut oil, caseine, cane sugar, and extract of malt; vaskulat [the sulfate of 1,1-(4Oxyphenyl)-1-oxy-2-n-butylaminoethane], a sympathicomimetic drug; nozinan [acid maleate of 1-methoxy-3-(methyl-2 -dimethylamino-3)-propyl-10-phenothiazine (levomepromazine)], a drug used in the therapy of psychoses and having an action similar to that of largactil; and hibitane (diacetate of chlorohexidine) used as a topical bactericidal."

131. Conditioned Disinhibition Investigated

"Concerning Conditioned Inhibition and Conditioned Disinhibition. The Formation of Conditioned Disinhibition by Adding a Supplementary Agent to the Conditioned Inhibitor," by K. A. Iordanis, Chair of Higher Nervous Activity; Moscow, Vestnik Moskovskogo Universiteta, Seriya VI, Biologiya, Pochvovedeniye, No 3, May/Jun 60, pp 14-17

This article points out that results of the author's experiments showed that dogs discern conditioned inhibiting and conditioned disinhibiting excitations better than rabbits and doves. This discernment becomes more difficult when a supplementary stimulus, added to the conditioned inhibitor, inhibits the positive conditioned reflex and disinhibits the attendant discernment in the course of formation of conditioned inhibition and conditioned disinhibition. Results of these experiments on dogs, rabbits, and doves confirm the results of similar experiments on a chimpanzee, conducted by the author of this article.

It was thus noted in the experiments conducted by the author of this article, and also in the experiments conducted by L. G. Voronin and his associates, that the difference in the degree of discernment of complex excitations depends on the level of development of the nervous system.

132. Phosphorylation of Thiamine at High Altitude Condition

"The Effect of Hypoxia on Phosphorylation of Thiamine in Rat Tissues," by Yu. B. Khmelevskiy, Chair of Biochemistry, Kiev Medical Institute; Kiev, Ukrainskiy Biokhimicheskiy Zhurnal, Vol 32, No 3, 1960, pp 412-417

The author studied the effect of reduced barometric pressure on the ratio of thiamine to its phosphorus esters in rat tissues. In the course of the work the action of rutine and halascorbine was examined on the ratio between thiamine and its derivatives in tissues during hypoxia. Thiamine, labeled with S-35, was used in the experiments. Isolation and identification of the marked thiamine and its phosphorus esters were conducted by paper chromatography. The animals were examined 24 hours after the introduction of S^{35}-thiamine and after 6 hours in a chamber with a simulated altitude of 8,000 meters.

a considerable drop in the thiamine triphosphate level and a rise in the quantity of thiamine diphosphate, thiamine monophosphate, and thiamine were found in the hearts of these aminals, as compared with the controls who were kept under normal atmospheric pressures. These disturbances were less pronounced in the liver of the experimental animals. A preliminary administration of rutine and halascorbine, under the experimental conditions described, led to an increase in the thiamine triphosphate level and a reduction in thiamine diphosphate.

133. Proper Ultrasound Irradiation of Eyes Not Injurious to Cornea

"The Effect of Ulrasound on Normal Eyes of Rabbits," by F. Ye. Fridman, State Scientific Research Institute of Eye Diseases imeni Gel'mgol'ts; Moscow, Oftal'mologicheskiy Zhurnal, No 5, 1960, pp 270-273

In view of the increasing employment of ultrasound irradiation in various fields of medicine and the paucity of literature on the effect of ultrahigh-frequency sound waves on the organ of sight, especially in connection with the therapeutic treatment of certain diseases, the author conducted a number of experiments, and presents the following conclusions on this subject.

1. A single irradiation of rabbit eyes by ultrasound with a frequency of one megacycle, within the intensity range of 1.0-2.3 watts/cm^2, produces erosion in the epithelium, edema in the cornea, temporary miosis, and mild exophthalmos.

2. Following the irradiation of rabbit eyes by ultrasound within the intensity range of 2.3-1.5 watts/cm^2, the above-mentioned changes were more pronounced and a unique zone of necrosis lacking in nuclei and having a tendency to develop into an inflammatory reaction at the periphery was detected histologically in the stroma layer of the cornea.

3. A single irradiation of rabbit eyes by ultrasound with an intensity of 0.3 watt/cm^2 did not cause any stable changes; however, the daily irradiation of the eyes by the above-mentioned dose (5-6 treatments) produced keratosis, thinning of the epithelium, and necrosis of the anterior layers of the corneal stroma.

4. The course of irradiation of rabbit eyes with ultrasound with an intensity of 0.3 watt/cm^2 at 2-day intervals caused neither clinical nor morphological changes in the eyes that were tested.

134. Index for Human Reactivity Proposed

"The Significance of the Reactivity of an Organism in the Mechanism of Ultraviolet Radiation Action," by G. S. Varshaver and O. M. Vil'chur, Vopr. Fizioterapii i Kurortol. (Problems of Physiotherapy and Health Resort Study), M., Medgiz, 1959, pp 156-159 (from Referativnyy Zhurnal -- Biologiya, No 12, 25 Jun 60, Abstract No 57749, by L. El'piner)

"Information is presented on the change of skin reactivity to ultraviolet rays during various states of the central and peripheral nervous systems. The authors suggest that the reactivity of the skin to ultraviolet rays be considered along with phagocytosis of the blood and its serum protein composition as a criterion for the reactivity of an organism."

135. Shielding of Upper Third of Abdominal Region Significant in Bone Marrow Suspension Treatment of Radiation Sequelae

"A Study of the Effect of Bone Marrow Injection on the Thromboplastic Activity of X-Irradiated Rats," by V. Ye. Pastarova and B. A. Kudryashov, Nauchn. Dokl. Vyssh. Shkoly Biol. N. (Scientific Reports of the Higher Schools of Biological Sciences), No 1, 1959, pp 80-83; (from Referativnyy Zhurnal -- Biologiya, No 12, 25 Jun 60, Abstract No 57714, by N. Ryzhov)

"The intravenous administration of bone marrow suspension to rats 2 1/2-3 hours after their irradiation by 600 r did not alter the survival rate or increase the blood thromboplastic activity. Analogous administration of bone marrow to animals irradiated while the upper third of the abdominal region was shielded was accompanied by a significant increase (12-20%) of blood thromboplastic activity."

136. X-ray Therapy Most Effective in Treating Progressive Malignant Exophthalmos

"Progressive Malignant Exophthalmos," by Prof M. L. Krasnov and B. I. Svyadoshch, Chair of Eye Diseases, Central Institute for the Advanced Training of Physicians; Moscow, Vestnik Oftal'mologii, No 4, Jul[illegible] 60, pp 3-11

The disease described in this article appears in literature under various names, but the name progressive malignant exophthalmos was selected to stress its severity.

The authors review briefly the symptoms and the course of the disease and describe three case histories of patients treated by X-ray therapy (total doses equaled 1,150, 1,450, and 1,600 r administered over a period of 6 weeks, twice weekly). The following conclusions are presented.

1. Malignant progressive exophthalmos runs a typical clinical course, and pathologically it is closely linked with the excessive production of thyrotrophic hormone from the anterior lobe of the hypophysis. The disease is very grave and often leads to blindness.

2. Pathological and anatomic changes due to this disease are evident in the form of dense edema and cellular infiltration of the orbital tissue with subsequent transformation into fibrosis.

3. The most effective method of treating progressive malignant exophthalmos, at present, is X-ray therapy of the orbitohypophyseal area. Treatment should be initiated as early as possible in the course of the disease before the development of fibrosis.

Miscellaneous

137. Help to Underdeveloped Countries

"For a Hospital in Guinea" (unsigned article); Moscow, Meditsinskiy Rabotnik, 13 Sep 60, p 4

"A shipment of medical equipment, apparatuses, and instruments for the hospital "Donka" in Conakry with 500 beds is being sent as a gift to the people of Guinea by the Soviet Union. Included in the shipment are stationary and portable apparatuses for gas anesthesia, apparatuses for artificial respiration, equipment for the administration of uninterrupted anesthesia, improved shadowless lamps for surgeries, suturing apparatuses, and X-ray and therapeutic installations. Instruments for thoracic surgery are also being sent. The equipment is now being loaded in the Odessa port for shipment to Conakry."

138. New Research Facility: Institute of Human Morphology, Academy of Medical Sciences USSR

"Current News" (unsigned artilce); Moscow, Arkhiv Patologii, Vol 22, No 9, 1960, p 94

At a 15 June 1960 meeting, the Presidium of the Academy of Medical Sciences USSR accepted the report of the Department of Medicobiological Sciences and decided to create in Moscow the Institute of Human Morphology. The new institute would be created out of parts of the pathologoanatomical department of the Moscow Oblast Clinical Institute.

A committee was appointed to determine the structure of the new institute.

139. Czech Center for Exotic Diseases Established

"Medical Examination of Persons Sent Abroad and Those Returning From Abroad"; Prague, Vestnik Ministerstva Zdravotnictvi, No 6 1 Mar 60, pp 71-73

An instruction issued by the Czechoslovak Ministry of Health indicates that a Center for Exotic Diseases (Stredisko pro cizokrajne choroby) has been established within the Institute of National Health of the Prague Central National Committee (Faculty Hospital in Prague 12, Srobarova 50). The center will provide such necessary services to personnel being assigned to brief periods of duty abroad (as well as their families) as inoculations, as well as to those being assigned abroad for extended periods. Presumably referring to those going abroad for extended duty, the instruction states that they will be given basic and special examinations including dental examinations. Personnel (and their families) sent abroad by offices other than central offices located in Prague will be given basic examinations, including dental examinations, by an approved physician in the appropriate kraj institute of national health. An extended assignment abroad is one that exceeds 3 months in the case of European countries and 2 months in the case of countries outside Europe.

Personnel returning from abroad following their tour of duty or for vacation must be immediately examined by the center or the appropriate kraj institute of national health and any necessary treatment must be initiated at once.

140. East Berlin to Adopt Long-Range Medical and Public-Health Plan

Berlin, Der Morgen, 30 Sep 60

Under a long-range plan to be adopted by the East Berlin City Assembly in October, 1.35 billion DM is to be spent on the development of East Berlin's medical and public-health facilities between 1960 and 1965.

The plan calls for building 23 city dispensaries, 3 polyclinics, 9 children's nurseries, 2 old-age homes, and 50 nursery stations and for an increase of 900 hospital beds and 1,000 infirmary beds. A rehabilitation center is being established in Berlin/Buch. Allotments of 135 million DM have been planned for rebuilding the Charite first-aid clinic and for additional medical facilities in the Berlin/Buch Research Center alone. The plan also provides for including the highest possible number of East Berliners in preventive measures in 1961, especially the continuation of the successful polio immunization. Under the 1961 polio immunization program, all East Berliners between 20 and 40 are to be vaccinated.

The Bezirk Berlin committee of the East German Red Cross is to set up a commission for health training. The East German Magistrat, in conjunction with this commission and the East German Hygiene Museum, Dresden, is to establish a health-training center in the New City Hall during the first half of 1961.

141. New Hospital Being Built in Gera

"Gera -- Portrait of a City," by Willi Weber, Chief Burgomaster of Gera; Berlin, Stadt und Gemeinde, Vol 4, No 10, Oct 60, pp 10-17

A new hospital, the Wismut-Hospital, is now under construction in Gera as part of the Seven-Year Plan and is scheduled for completion by 1963. The main clinic (the women's and children's clinic) will contain 520 beds. The hospital complex will include a pathology institute, a [bacteriological] culture house, large kitchens, and washrooms. The article contains a picture of the building site of this hospital on page 13.

142. Postgraduate Medical Training Congress Opens in Leipzig

Berlin, Neue Zeit, 28 Sep 60

The 1960 Congress on Postgraduate Medical Training has opened in Leipzig. Among the participants in the congress are noted scientists of the East German Academy of Sciences and the Academy of Social Hygiene, Work Hygiene, and Medical Postgraduate Training, well-known medical experts of the Geat German universities, and more than 600 physicians from the two German states.

In his opening speech, Prof Dr Friedeberger, East German Deputy Minister of Health, announced that the Academy for Postgraduate Medical Training has been established in East Berlin. Friedeberger said that with the establishment of this academy the Ministry of Health has met the need for raising postgraduate medical training to a higher level. Friedeberger also reported the establishment of an East German Association for Experimental Medicine.

143. Organization of and Plans for Experimental Medical Research Institute of Hungary

"Report of the Department Directorate," by Antal Babics, Secretary of the Department of Biological and Medical Sciences of the Hungarian Academy of Sciences; Budapest, A Magyar Tudomanyos Akademia Biologiai es Orvosi Tudomanyok Osztalyanak Kozlemenyei, Vol XI, No 2-3 1960, pp 168-170

The KOKI (Kiserleti Orvostudomanyi Kutato Intezet, Experimental Medical Research Institute) was established in 1953 to act as a center and director of pathophysiology and pharmaceutical research and research in the fields of morphology and antibiotics. Because its departments have been so widely scattered, the institute has been unable to attain its goals. The departments of the institute are now located in four places. They will be brought together after the construction of the new headquarters of KOKI, which is to begin in 1960 and should be completed in 2 years. To permit the expansion of the Debrecen Department of Antibiotics, the possibility of the construction of a barrack-type building is now being investigated.

On 1 March 1960, the Department of Microbiology was transferred to KOKI from the National Institute of Public Health (Orszagos Kozegeszsegugyi Intezet). Although administratively transferred to KOKI, this department, under the direction of Dr Gyula Weisfeiler, will continue to operate in the laboratories of its original institute for the time being.

In 1959, the Departmental Directorate (of the Department of Biological and Medical Sciences) recommended the appointment of Academician Istvan Rusznyak as director of KOKI and also as chairman of the Department of Pathophysiology, Academician Bela Issekutz as chairman of the Department of Pharmaceutical Research Academician Imre Toro as chairman of the Department of Morphology and Prof Tibor Valyi-Nagy as chairman of the Debrecen Department of Antibiotics.

The most important achievements of the departments have been as follows: The Department of Antibiotics has developed primycin, flavofungin, and related antibiotics. The Department of Pharmaceutical Research has developed "gastropin" and is now working on the preparation of drugs having the effect of largactil, papaverin, and novatropin. The Department of Pathophysiology is concentrating research on the lymph system, neuroendocrinology, and hematology. The Department of Morphology is studying the basic biological significance of the histophysiology of the thymus and of cell multiplication.

The expansion of KOKI will not decrease the significance of university research. Such research remains indispensable, because the medical universities perform the major part of scientific work and will continue to do so for many years to come.

"Interview From the Future," by Klari R. Farkas; Budapest, Magyar Nemzet, 8 Oct 60, p 5

The Experimental Medical Research Institute is to begin operating in a new 46-million-forint building on the Ulloi ut in Budapest in 1963. Dr Ervin Stark, Candidate of Medical Sciences, will be deputy director of the institute.

The basement of the planned building will house the mechanical installations required for research. A library, reading rooms, club rooms, and dining hall will be located on the ground floor. The management, offices, and guest rooms will be located on the second floor. The third and fourth floors will accommodate the Department of Pathophysiology. This department is now conducting research on the role of certain endocrine glands. The effect of the glands on various experimentally induced pathological conditions is being investigated.

The Department of Experimental Morphology will be on the fifth and sixth floors. It will conduct research on the basic biological phenomena of animal cells. The result of these investigations will provide clues to the problem of cell multiplication, regeneration, etc. The Department of Pharmaceutical Research will be on the eighth and ninth floors.

Once in its new headquarter, KOKI will concentrate on developing drugs to combat virus infection. Future plans also call for KOKI to conduct research on the biochemistry and physiology of the brain.

144. Rumania Sends Medical Films to Prague Congress

Bucharest, Muncitorul Sanitar, Vol 11, No 37, 17 Sep 60, p 1

The following films, produced by the Medical Documentation Center, will represent Rumania at the 14th Congress of the International Association of Scientific Films to be held 16-24 September in Prague: "Interatrial Septal Defects," "Research in Experimental Embryology," "Experimentally Induced Dystonic Motor Syndromes," and "Artificial Pulmonary Heart."

145. Organizational Changes in Medical Academy in Warsaw

"Organizational Changes in the Medical Academy in Warsaw"; Warsaw, Monitor Polski, No 61 and 62, 4 Aug and 9 Aug 60, p 574 and p 580

On the basis of Article 15 of the law of 5 November 1958 on higher schools (Dziennik Ustaw, No 68, Item 336), the following organizational changes were authorized for the Medical Academy in Warsaw on the dates indicated:

On 25 June, the present Chair of Infectious Diseases of the College of Sanitation and Hygiene was transferred to the Department of Medicine of the Medical Academy in Warsaw.

On 7 July, the establishment of a Chair of Biochemistry in the Pharmaceutical Department of the Medical Academy in Warsaw was authorized.

146. New Technology for Making Ball-Bearing Steel

"New Technology for Making ShKh15-Grade Ball-Bearing Steel Under White Slags," by N. M. Chuyko, V. B. Rutkovskiy, M. P. Konishchev, A. G. Perevyazko, A. F. Tregubenko, I. S. Yatskevich, I. P. Zabaluyev, V. V. Kurganov, T. M. Bobkov, and G. I. Antipenko, Dnepropetrovsk Metallurgical Institute and "Dneprospetsstal'" Plant; Stalinsk, Izvestiya Vysshikh Uchebnykh Zavedeniy, Chernaya Metallurgiya, No 8, 1960, pp 38-47

Descriptions are given of the various steps in a new technology for making ShKh16-grade ball-bearing steel which is distinguished by a shorter refining period and the use of white slags. The duration of a complete heat is shortened 8% and that of the refining period by 35 min. During the oxidizing period the rate of carbon burn-out is 0.4-0.5%/hr, whereas the maximum carbon drop is established to be 0.3-0.5%. Temperature of the metal before removal of the oxidizing slag is 1,545-1,565°C. Lime-alumina white slags are used in the reducing period and have the following composition upon removal: $(FeO) < 0.5\%$; $(CaF_2) = 1\text{-}2\%$; $(SiO_2 + Al_2O_3) = 31\text{-}34\%$; $(CaO) \geq 53\%$; $(MgO) \leq 12\%$ and $(CaO + MgO) = 63\text{-}65\%$. Optimum temperature of the metal before tapping is 1,550-1,570°C, whereby it is possible to bottom-pour a 2.8-ton ingot in 165-190 sec. Final deoxidation with aluminum in the ladle decreases the oxidation content by 30%. With proper organization and equipment, the reducing period may be reduced to approximately one hr 15 min, with a further improvement in the quality of the metal.

Magnetohydrodynamics

147. Shock-Wave Structure

"The Structure of Low Intensity Shock Waves in Magnetohydrodynamics," by Ye. P. Sirotina and S. I. Syrovatskiy; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 39, No 3, Sep 60, pp 746-753

A general expression has been deduced for the width of shock waves of low intensity in magnetohydrodynamics. The damping coefficient for small amplitude waves is determined, and its relation to the discontinuity width is established.

Nuclear Physics

148. Triple U-235 Fission

"Energy Distribution of the Fragments of Triple U-235 Fission," by V. N. Dmitriyev, L. V. Drapchinskou, K. A. Petzhak, and Yu. F. Romanov; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 39, No 3, Sep 60, pp 556-562

Data on the energy distribution of the fragments of triple U^{235} fission are presented. It is shown that the ratio of the triple to double fission probability does not depend on the ratio of the masses. Arguments are given which substantiate the relation $E_d = E_{tr} + E_\alpha$ where E_d and E_{tr} are the total energies of the double and triple fission fragments, E_α is the energy of the long range α particle. The mechanism of triple fission is discussed.

"The Possibility of Application of the (n,2n) Reaction in Nuclear Spectroscopy," by V. V. Komarov, A. B. Kurenin, and A. M. Popova, Scientific Research Institute of Nuclear Physics, Moscow State University imeni Lomonosov; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 24, No 9, Sep 60, pp 1145-1148

The reaction (n,2n) is analyzed as a pick-up reaction. By taking into account the strong interaction of neutrons at low relative energy, the pick-up mechanism becomes possible as a result of direct interaction of the incident neutron with the nucleus. By applying the reaction (n,2n) instead of (p,d) or (n,d), it is expected to obtain data on energy levels of nuclei by studying the curves of angular distributions within regions of medium and heavy nuclei, as well as at low energies where coulomb action is too strong for usual pick-up reactions. These pick-up reactions are of particular value for determining the characteristics of active nuclei, as well as for studying secondary excited levels of even-even reactions and for determining the splitting of nuclei into a series of states of various moments.

150. Te-119 Isomers

"The Existence of Te-119 Isomers," by N. G. Zaytseva, M. Ya. Kuznetsova, I. Yu. Levenberg, V. N. Pokrovskiy, and V. A. Khalkin; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 24, No 9, Sep 60, pp 1083-1085

The existence of Te-119 isomers was revealed by the authors (Radiokhimiya No 4, 1960) during the study of neutron deficient iodine isotopes with $A \leq 121$. It was attempted thereafter to obtain more detailed data on the decay of Te-119 isomers and the establishment of their relative yields. The Te-119 isomers were obtained together with other isotopes from irradiation of a KI plate by 250-Mev protons on the synchrocyclotron of the Joint Institute for Nuclear Research. Two radiochemically pure Te compounds Te I and Te II were obtained. Te I was a mixture of isotopes formed by deep fission of iodine. Te II was a mixture of Te isotopes accumulated during the fission of radiochemically pure iodine. The Te-119 isomer in T II was short lived: (12 ± 1) hours.

151. New Isotopes Ir-184 and Pt-187

"New Isotopes Iridium-184 and Platinum-187," by V. I. Baranov, K. Ya. Grovov, B. S. Dzhelepov, Sung Chung-pai, T. V. Malysheva, V. A. Morozov, B. A. Khotin and V. G. Chumin, Institute of Geochemistry and Analytical Chemistry imeni Vernadskiy, Academy of Sciences USSR, and Joint Institute for Nuclear Research; Moscow, Izvestiya Akademii Nauk, Seriya Fizicheskaya, Vol 24, No 9, Sep 60, pp 1079-1082

The spectrum of conversion electrons of iridium, formed by deep 660-MeV-proton-induced fission of gold, has been studied by means of a Danish type beta spectrometer. A new isotope Ir-184 has been identified and its half life found equal to 3.1 ± 0.3 hours. Its suggested decay scheme is given. For determining the half life of a new platinum isotope Pt-187, a fraction of Pt was separated from gold irradiated by 660-MeV protons on the synchrocyclotron. Its daughter nuclide, iridium, was separated from Pt each 4 hours. The spectrum of conversion electrons of the daughter iridium was studied by means of a magnetic spectrometer with double focusing. The half life of the new isotope Pt-187 was found to be 2.0 ± 0.4 hours.

152. Waves in Plasma

"Electromagnetic Waves in a Plasma Filled Half-Space," by Yu. N. Dnestrovskiy and D. P. Kostomarov, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 39, No 3, Sep 60, pp 845-853

The propagation of electromagnetic waves across a magnetic field in half-space filled with a magnetoactive plasma is studied. It is assumed that the plasma is confined by a stationary magnetic field H, and the structure of this field is investigated for the case in which the ratio of the plasma pressure to the magnetic pressure is small. It is demonstrated that at large distances from the plasma boundary, an electromagnetic wave with an electric vector parallel to the magnetic field H has the form of a plane wave with a propagation constant which is specified by the equation for an infinite plasma. The reflection and transmission coefficients are evaluated for a plane wave striking the plasma from vacuum.

153. Plasma Stability

"Study of Plasma Stability by Means of a Generalized Energy Principle," by V. F. Aleksin and V. I. Yashin, Physico-Technical Institute of the Ukrainian Academy of Sciences; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 39, No 3, Sep 60, pp 822-826

Stability conditions are derived for a plasma possessing an anisotropic particle velocity distribution and located in a cylindrically symmetric magnetic field. Cases of longitudinal and azimuthal magnetic fields are considered.

154. Plasma Oscillations

"Proper Oscillations of a Restricted Plasma," by D. A. Frank-Kamenetskiy; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 39, No 3, Sep 60, pp 669-679

The general properties of cylindrical waves in a cold plasma are considered. The results obtained are applied to the low frequency proper oscillations of a plasma cylinder surrounded by conducting walls. The conditions of magneto-acoustic resonances which ensure an effective penetration of the oscillations into the plasma are derived. The nature of the resonance phenomena depends on the linear density of the electrons. Approximate formulas are presented for the proper frequencies of a long plasma cylinder. It is shown that in the vicinity of the mean geometrical value of the electron and ion cyclotron frequencies, purely radial oscillations are not feasible since even small angular deviations sharply change the resonance frequency.

155. Resonance in Plasma

"Magneto-Acoustic Resonance in a Plasma," by A.P. Ashmatov, P. I. Blinov, V. F. Bolotin, A. V. Borodin, P. P. Gavrin, Ye. K. Zavoyskiy, I. A. Kovan, M. N. Oganov, B. I. Patrushev, Ye. V. Piskarev, V. D. Rusanov, G. Ye. Smolkin, A. R. Stringanov, D. A. Frank-Kamenetskiy, P. A. Cheremnokh, and R. V. Chikin; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 39, No 3, Sep 60, pp 536-544

The work is dedicated to an experimental study of vibrations of a magneto-acoustic type in a cold plasma. It is shown that under certain conditions, a high frequency electromagnetic field strongly penetrates into the plasma with an attendant resonance absorption of energy of the field. The results of investigation of resonance at frequencies 12.5 and 50 mc/s by various methods are described. The results are compared with the theoretical predictions.

156. Plasma Flow

"Plasma Flow into Vacuum in Presence of a Magnetic Field," by R. V. Polovin, Physics-Mathematic Institute of the Ukrainian Academy of Sciences; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 39, No 3, Sep 60, pp 657-661

Hydromagnetic waves excited by disintegration of the boundary between the plasma and vacuum are investigated. The boundary velocity (escape velocity) is determined. The amplitude of the electromagnetic wave emitted during disintegration of the discontinuity is determined.

157. Plasma Decay

"Decay of a Plasmon at Absolute Zero," by Yu. A. Romanov, Gorkiy Physico-Technical Institute; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 39, No 3, Sep 60, pp 662-665

The decay of a plasmon in a solid body (isotropic model) due to phonon interaction between the electrons is analyzed.

158. Beam Loss in a Phasotron

"Beam Loss at the Limiting Radius in a Phasotron," by V. P. Dmitriyevskiy, B. I. Zamolodchikov, and V. V. Kol'ga; Moscow, Atomnaya Energiya, Vol 9, No 4, Oct 60, pp 303-305

A resonance interaction of radial and vertical oscillations near $n = 0.25$ is analyzed. It is demonstrated that this resonance is much more dangerous than parametric excitation of vertical oscillations, provoked by the first harmonic in the structure of the magnetic field.

159. Effect of Leakage Fields on Focusing

"Effects of the Leakage Fields of a Sectional Magnet on the Double Focusing of the Beam," by Yu. A. Kholmovskiy; Moscow, Atomnaya Energiya, Vol 9, No 4, Oct 60, pp 301-303

The effect of the leakage field on the vertical focusing of charged particles is studied. A computation method of sectional magnets with double focusing is presented with an account of the leakage field.

160. Improved Alpha-Spectrometer

"Operation of a Ionization Alpha-Spectrometer at High Loads," by A. A. Vorob'yev and V. A. Korolev; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 24, No 9, Sep 60, pp 1086-1091

The improved ionization alpha spectrometer permits work in coincidence with a gamma spectrometer. Spectrum tails disappear because the most intense spectral lines do not coincide. The instrument provides a possibility for measuring multipolarity and relative intensities of corresponding gamma transitions and a possibility of studying alpha-gamma angular correlations and hence identifications of levels. A method is given for raising the permissible load of the ionization chamber from a threshold of 100 pulses/sec to 10^4 pulses/sec.

This spectrometer was used by the authors for studying the alpha decay of U-235. (ibid., pp 1092-1098)

161. Magnetic Recorders

"Pulse Recording by a Magnetic Tape Recorder and by an Automatic Self-Recording Potentiometer," by A. N. Silant'yev, Radium Institute imeni Khlopin, Academy of Sciences USSR; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 24, No 9, Sep 60, pp 1165-1168

The equipment is intended for recording a pulse spectrum on a magnetic tape recorder or on an automatic potentiometer. The magnetic tape recorder is used for measuring the emission of radioactive substances of short half life where the use of a multichannel pulse analyzer is impossible. The system described was developed for use with a magnetic tape recorder of the type "Melody." The permissible load of the equipment is determined by the characteristics of the head of the magnetic tape recorder. The automatic potentiometer is used for recording the emission of radioactive substances of low activity or in the case of coincidence measurements. Both recorders may be used simultaneously.

162. Improved Magnetic Spectrometer

"A Magnetic Spectrometer With Double Focusing," by N. G. Afanas'yev, Kharkov Physicotechnical Institute, Academy of Sciences Ukrainian SSR; Moscow, Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 24, No 9, Sep 60, pp 1157-1164

A new method for obtaining an ideal horizontal focusing, securing vertical focusing as well, is described. For decreasing the region of action of the scattering field, particularly for its accurate determination, magnetic screens are used at the inlet and exit of the beam. Formulas for computation of horizontal and vertical focusing, taking into account the dispersed fields, are presented. Several magnetic spectrometers based on this design have been constructed.

163. Design of a Homogeneous Boiling Water Reactor

"Neutron-Flux Distribution in a Homogeneous Boiling Water Reactor," by B. Z. Torlin; Moscow, Atomnaya Energiya, Vol 9, No 4, Oct 60, pp 257-261

The design method of a boiling homogeneous reactor in which the density of the medium varies with height is analyzed in age diffusion approximation. For the case of a cylindrical reactor, the solution can be reduced to elliptical integrals. It is demonstrated that if the radius of the reactor much exceeds its height, the solution may be expressed in elementary functions.

164. Design of a Reflector Reactor

"Effectiveness of a System of Rod Absorbers in a Reactor Fitted With a Reflector," by V. I. Nosov; Moscow, Atomnaya Energiya, Vol 9, No 4, Oct 60, pp 262-267

The conditions of criticality and distribution of neutron fluxes for a homogeneous reactor on thermal neutrons with a system of absorbing rods are obtained in a two-group approximation. The rods are immersed the whole depth of the reactor and are located around the circumference of the active zone or around the radial reflector at equal distances from each other. The results of computations are presented.

165. Poles Develop "Atomic" Lamp

"The First Polish Atomic Lamp Is Lit"; Budapest, Technika, Vol IV, No 9, Sep 60, p 12

An atomic, or rather isotope, lamp has been developed by two young Polish scientists, Adam Kazmierski and Edmund Strychalski. The lamp recently demonstrated at the Institute of Nuclear Research in Warsaw, has a container filled with a radioactive gas, Krypton 85. The inner wall of the container is coated with luminophor particles which the energy from the gas causes to shine. The light of the experimental lamp is visible from a distance of 300 meters and can be made more powerful with reflectors.

The lamp will shine at undiminished strength for 10 years and at half strength for another 10 years. It has no harmful effect on humans and can be used at sea or at great altitudes where regular lighting is not feasible. However, the lamp is too costly to replace ordinary lighting fixtures.

166. Establishment of the Institute of Nuclear Physics in Krakow

"Council of Ministers Resolution No 234"; Warsaw, Monitor Polski, No 64, 17 Aug 60, p 593

The Nuclear Physics Center in Krakow is removed from the Institute of Nuclear Research in Warsaw (organizationally subordinate to the Plenipotentiary of the Council for Uses of Nuclear Energy /RSWEJ/ and becomes a scientific institute with the name "Nuclear Physics Institute in Krakow."

The headquarters of the institute is in Krakow. It is subordinate to the Plenipotentiary of the RSWEJ. The pattern for all the scientific activity of the institute is set by the Polish Academy of Sciences through the Committee on Peaceful Use of Nuclear Energy.

The task of the institute is to carry out scientific research work in the field of nuclear physics.

Costs of maintaining the institute will be covered by the budget for the Plenipotentiary of the RSWEJ. Workers of the institute will be paid in accordance with the law on pay for workers employed by installations subordinate to the Plenipotentiary of the RSWEJ.

167. Statistical Properties of the Electron System of Ferromagnetic Transition Metals

"Statistical Properties of the Electron System of Ferromagnetic Transition Metals," by S. V. Vonsovskiy and Yu. A. Izyumov, Institute of Metal Physics, Academy of Sciences USSR; Sverdlovsk, Fizika Metallov i Metallovedeniye, Vol 10, No 3, Sep 60, pp 321-334

By the application of the method of retarding and advancing Green functions proposed by N. N. Bogolyubov and Yu. A. Izyumov, the statistical properties of the electron systems of ferrogmagnetic transition and rare-earth metals were investigated. It was shown that the system of interacting conductivity electrons and electrons belonging to inner localized incomplete and spin-unsaturated layers of shells of ions in crystals of transitional group elements has two types of elementary excitations, those of the Fermi type (conductivity electrons) and those of the Bose type (spin waves). It was established that two Bose branches exist. At a zero quasipulse of energy, one of the branches has an energy equal to zero, while the other branch has an energy of an order corresponding to exchange interaction between conductivity electrons and electrons of the inner layers. It was shown that this situation on the whole is preserved during the whole temperature range of the existence of the ferromagnetic state. The frequency of the damping of spin waves that is due to collisions with conductivity electrons has been determined.

IX. MISCELLANEOUS

168. Yugoslav Industrial Research Centers Denied Privileges of Independent Research Organizations

"An Unsatisfactory Recommendation" (unsigned article); Belgrade, Ekonomska Politika, Vol 9, No 444, 1 Oct 60, pp 928-929

The recent Law on the Method of Financing Scientific Institutions grants scientific institutions many financial privileges. For example, they do not pay taxes on their fixed or working capital or on their real estate, they set their own amortization tax, etc. However, these privileges do not apply to similar organizations in industrial enterprises. Developmental laboratories, institutes, and other scientific research organizations in industrial enterprises are treated the same as the other parts of the enterprises.

Recently the Federal Chamber of Industry advised industrial enterprises to establish developmental and research bureaus, centers, departments, and other organizations for the application of scientific and technical achievements to industrial production processes. These organizations would introduce modern technology, automation, electronics, nuclear engineering, and mechanization and would work on the development and production of modern technical equipment, tools, and their parts. The enterprises were advised to take advantage of the possibilities of obtaining credits from various sources such as the Savezni Fond za Naucni Rad (Federal Fund for Scientific Work), the Opsti Investicioni Fond (General Investment Fund), and the Savezni Zavod za Naucni Rad (Federal Institution for Scientific Work), which last finances certain projects of national importance.

Industrial enterprises are permitted to found independent scientific research organizations which are bound by contract to work primarily for the benefit of the founding enterprises. However, in modern industry scientific research is an integral part of, and one of the most important factors in, the improvement of technological processes. This work should not be separated from the work of the enterprise.

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