PB 131891—T1

CENTRAL INTELLIGENCE AGENCY

(1)

SCIENTIFIC INFORMATION REPORT

Number 58-1

11 July 1958

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

Issued Semi-monthly. Price: Per year $28.00; Single issue $2.75

PLEASE NOTE

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

SCIENTIFIC INFORMATION REPORT

Table of Contents

NOTE: Items in this report are numbered consecutively.

I. ASTRONOMY

1. Radioastronomy

"Relative Intensities of Discrete Sources of Cosmic Radio Emission on 4.2-Meter Wavelength," by V.A. Sanamyan, Byurakan Astrophysical Observatory, Academy of Sciences of Georgian SSR, Dokl, AN ArmSSR. 1957, 25, No 2, 49-56 (from Referativnyy Zhurnal -- Fizika. No 3, Mar 58, Abstract No 6693)

Interference measurements of 20 discrete sources on 4.2-m wavelength were made in 1953-1956 by the method of phase inversion. The results obtained are compared with those obtained on another wavelength. The sharp difference of spectral behavior between A Tauri and A Cassiopeia is explained by the young age of the first source which continues to generate relativistic electrons of high energy (10^{11} - 10^{12}ev) responsible for increasing intensity with increasing frequency. The same increase of intensity with frequency of A Virgo may also be due to high-energy electrons and may explain the partially polarized visible light.

2. Absorption and Distribution of Radioactive Phosphorus in Tomato Plant Organs

"On the Absorption and Distribution of Radioactive Phosphorus in Tomato Plant Organs," by K. M. Sitnik; Kiev, Ukrainsk'iy Botanichniy Zhurnal, Vol 15, No 1, 1958, pp 22-24

"This paper presents the results of a study, conducted with the aid of the isotope tracer method, of phosphorus distribution in tomato plant organs with the normal interrelationships between the organs, as well as on removing the leaves or the entire aboveground part of the plant. The leaf apparatus was found to determine a more intensive absorption of mineral elements from the nutrient mixture. The disturbance of normal metabolism in the root system on removing the leaves or the entire aboveground part gives rise to grave alterations in the absorption and distribution of the elements of mineral nutrition in the plant organism." -- English abstract

3. Phylogenetic System of Green Algae Studied

"Remarks on the Phylogenetic System of Green Algae Proposed by K. I. Meyer," by A.V. Topachevskiy, Kiev, Ukrains'kiy Botanichniy Zhurnal, Vol 15, No 1, 1958, pp 88-94

"The author agrees with the assertion of K. I. Meyer (Moscow, 1951 and 1952) that the central chromatophore is the primary type of chromatophore, but considers that it could arise only in amoeboid forms. The amoeboid movement in primary organisms placed the chromatophore in the center of the cell, and only the appearance of hard cell walls caused the displacement of the central chromatophore or chromatophores to the periphery.

"The central chromatophore has survived in a considerable number of species, which in the history of their development had no flagellate forms, or which diverged at the first labile stage of the flagellate level of development.

"The author admits that an amoeboid stage of development is inevitable for all algae and outlines the probable path of development for Centroplastae and Parietoplastae, but does not agree with the assumption that the development in the subclass Parietoplastae cellulineae followed the straight line of Volvocales-Palmellales-Chlorococcales. The Palmelloid form of structure -- and, consequently, the order Palmellales as well -- is a lateral, unprogressive line of development of green algae." -- English abstract

4. Czechoslovak Academician 85 Years Old

"Academician Bohumil Nemec -- Great Friend of Slovak Science -- Reaches 85 Years," L. Pastyrik; Bratislava, Nasa Veda, No 4, Apr 58, pp 172-173

Pastyrik's article is a biography of Academician Bohumil Nemec, described as a plant physiologist with a wide view of biology, who was 85 years old on 12 March 1958. A three-quarter-view facial photograph of Nemec, who is presumably an academician in the Slovak Academy of Sciences, is given.

III. CHEMISTRY

(Chemistry and Technology of Fuels)

5. Combustion of Dispersed Liquid Fuel in Turbulent Air Flow

"On the Combustion of and Heat Transfer by Dispersed Liquid Fuel in a Turbulent Air Flow," by G. N. Delyagin and B. V. Kantorovich, Institute of Mineral Fuels, Academy of Sciences USSR; Minsk, Inzhenerno-Fizicheskiy Zhurnal, No 3, Mar 58, pp 24-39

A combined theoretical and experimental investigation has been made of the processes of combustion and heat transfer occurring when liquid fuel burns in an air stream. The specific characteristics of combustion and heat transfer in a turbulent air flow are brought out. The relationships are given which correlate the burning out of the fuel and the heat transfer between the gas and the walls of the chamber with parameters characterizing the operation of the combustion chamber and its geometric and hydrodynamic characteristics. Reasons are given for the separate consideration of the combustion zone and cooling zone in the calculation of combustion chambers or furnaces. It is shown that the use of a relationship of the type $T_2/T_{theor} = f(Bo)$ (where Bo is Boltzmann's criterion or number) in the calculation of furnaces is essentially incorrect; it can be applied only in the case of a furnace in which the fuel burns out in the whole volume, i.e., when a zone of pure cooling is absent.

Chemistry and Technology of Nuclear Fuels and Reactor Construction Materials

6. Oxidation of Tetravalent Uranium Under the Action of Gamma Radiation

"Radiation Oxidation of Solutions of Tetravalent Uranium," by V. G. Firsov and B. V. Ershler; Moscow, Atomnaya Energiya, Vol 4, No 4, Apr 58, pp 343-348

It was found that when sulfuric acid solutions of tetravalent uranium which contain 0.8 N H_2SO_4 are exposed to the action of gamma radiation emitted by Co^{60}, the yield of the oxidation of U^{4+} [i.e., the value of G] is close to 5.0 when O_2 is absent and the concentration of U^{4+} is approximately equal to 100 milligram-equivalents per liter. No oxidation of U^{4+} by the molecular ion H_2^+ is observed even when the acidity of the solution is considerably increased and the concentration of U^{4+} is lowered.

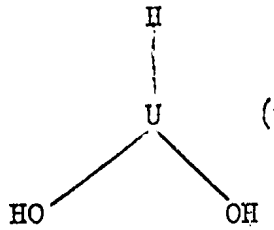
After the concentration of U^{4+} has been lowered, the yield drops principally because of the recombination of the radicals H and OH. An equation has been derived which expresses the dependence of G on $[U^{4+}]$ and is in agreement with experimental data. Furthermore, the relationship has been established between the velocity constants of the three reactions H + OH, H + H, and U^{4+} + OH. When the concentration of U^{4+} is higher than 110 milligram-equivalents per liter, there is a decrease in the yield G. This phenomenon is apparently due to the reduction of U^{4+} by H radicals. Some mechanisms are discussed by means of which uranyl ions may inhibit the oxidation of U^{4+}. On the basis of a consideration of these mechanisms, the ratios between the velocity constants of the reactions UO^{2+} + H and H + H have been calculated and the relationship determined between the velocity constants of the reactions UO_2^{+} + OH, H + OH, and H + H.

On the basis of the proposed mechanism for the oxidation of tetravalent uranium in dilute solutions in the presence of uranyl ions, an equation has been derived which describes the dependence of G on $[U^{4+}]$ and $[UO_2^{+}]$. This equation is in agreement with experimental data obtained in an extensive range of concentrations.

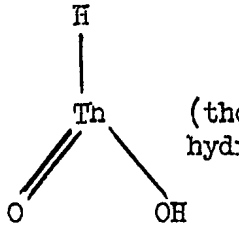
7. Nature of Insoluble Substances Which Form as Result of Interaction of Uranium and Thorium With Hydrochloric Acid

"On Some Chemical Properties of Thorium and Uranium," by A. G. Karabash; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 4, Apr 58, pp 986-995

The insoluble precipitates have been investigated which form as a result of the interaction of metallic uranium and thorium with hydrochloric acid. It was established that these precipitates have the composition of complex hydrides the constitution of which can be expressed by the following formulas:

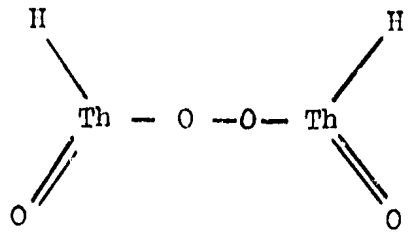


(uranium hydroxyhydride)



(thorium hydroxyhydride)

Schemes for the reactions by which the hydroxyhydrides of thorium and uranium are formed have been proposed and confirmed by determinations of the reaction balance. It was established that oxidation of the black thorium hydroxyhydride with hydrogen peroxide, oxygen of the air, or other oxidizing agents leads to the formation of the thorium peroxyhydride



, which is colored yellow.

The chemical and physical properties of the complex hydrides were investigated and some of them found similar to the corresponding properties of simple hydrides. This similarity was established by a number of characteristic reactions.

The results of the investigation described explain the unusual chemical behavior of thorium and uranium and also some errors contained in the literature.

8. Plutonyl Fluoride

"An Investigation of the Physicochemical Properties of Plutonyl Fluoride," by I. F. Alenchikova, L. L. Zaytseva, L. V. Lipis, N. S. Nikolayev, V. V. Fomin, and N. T. Chebotarev; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 4, Apr 58, pp 951-955

A method has been developed for the synthesis of plutonyl fluoride by the reaction with liquid hydrogen fluoride of hexavalent plutonium in hydrochloric acid solutions. The plutonyl fluoride is obtained as a precipitate after the hydrogen fluoride has been added to the solution of plutonyl chloride cooled with liquid nitrogen. It was established that the composition of plutonyl fluoride corresponds to the formula PuO_2F_2. Investigation of the electron and infrared absorption spectra of plutonyl fluoride indicated that Pu_2^{2+} ions are present in this compound and that quadrivalent plutonium is absent. Plutonyl fluoride was found to have a rhombohedric lattice with the constants a = 5.797±0.005 Å and $\alpha = 42°43'$. The solubility of plutonyl fluoride in water was found to be 1.07 grams per liter at 20°. It was established that the structure of this compound is modified as a result of the interaction with water.

9. Acidity of Plutonium (IV) Oxalate and Its Solubility in Water

"Investigation of the Physicochemical Properties of Aqueous Solutions of Plutonium (IV) Oxalate and Determination of Its Solubility Product," by A. I. Moskvin and A. D. Gel'man, Institute of Physical Chemistry, Academy of Sciences USSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 4, Apr 58, pp 956-961

The solubilities of the Pu (IV) oxalate in water and in H_2SO_4, HNO_3, and $HClO_4$ were determined. Data on the solubility of $Pu(C_2O_4)_2 \cdot 6H_2O$ and measurements of the p_H and electric conductivity of saturated aqueous solutions of this salt indicate that aqueous solutions of plutonium oxalate have acidic properties which, however, are not quite as pronounced as those of $U(C_2O_4)_2 \cdot 6H_2O$ (A. A. Grinberg and G. I. Petrzhak established that uranium oxalate is a rather strong acid, while thorium oxalate exhibits practically no acidity). It is assumed that the mechanism of the acid-salt dissociation of plutonium oxalate is analogous to that proposed by Grinberg and Petrzhak for uranium oxalate.

The solubility product of the Pu(IV) oxalate was calculated on the basis of experimentally determined solubilities of $Pu(C_2O_4)_2 \cdot 6H_2O$ in perchloric acid and in HNO_3 - $(NH_4)_2C_2O_4$ solutions. It was found to be equal to 4×10^{-22}.

10. Oxalate and Carbonate Complexes of Pu (IV).

"Determination of the Composition and Dissociation Constants of Oxalate and Carbonate Complexes of Plutonium (IV)," by A. I. Moskvin and A. D. Gel'man, Institute of Physical Chemistry, Academy of Sciences USSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 4, Apr 58, pp 962-674

The solubilities of $Pu(C_2O_4)_2 \cdot 6H_2O$ in ammonium oxalate solutions of different concentrations (0.001-0.35 mol per liter) in the presence of 1.0 mol of HNO_3 were determined. On the basis of the data obtained, the composition and dissociation constants of the complex oxalate ions of Pu(IV) were determined. Investigation of the solubilities of the hydroxide of Pu(IV) in potassium carbonate solutions established that there is an increased solubility of the hydroxide at increased concentrations of potassium carbonate and that this effect is due to the formation of a complex between Pu(IV) and carbonate ions. Calculations showed that in the solutions investigated the composition of the complex ion is $[Pu(CO_3)]^{2+}$ and that the dissociation constant of this ion is 1.1×10^{-47}. Investigation of the absorption

spectra of carbonate solutions of Pu(IV) confirmed that formation of complex ions takes place. Because the formation of the complexes takes place in several steps, it was concluded that Pu(IV) carbonate complexes of different composition are formed. The tendencies of plutonium in different valency states to form complexes with oxalate ions and of Pu(IV) to form complexes with different acid anions are compared.

11. Plutonium Salicylates

"Salicylates of Plutonium," by O. Ye. Zvyagintsev and B. N. Sudarikov, Moscow, Zhurnal Neorganicheskoy Khimii, Vol 3, No 4, Apr 58, pp 975-985

The behavior of salts of trivalent and tetravalent plutonium in salicylic acid solutions and ammonium salicylate solutions was investigated. It was established that in a weakly acidic solution tetravalent plutonium forms a salicylate of the composition $PuO(Sal^-)_2$ and that under the same conditions trivalent plutonium is precipitated in the form of $Pu^{3+}(Sal^-)_3 \cdot 1.5H_2O$. The optimum conditions of the precipitation of the salicylates of trivalent and teravalent plutonium were determined. It was established that the salicylate of trivalent or teravalent plutonium can be titrated with ammonia or a solution of caustic alkali; in both cases the complex anion $[PuO(Sal^{2-})_2]^{2-}$ is formed. It was furthermore established that on heating of an ammoniacal solution of a salicylate of trivalent, tetravalent, or hexavalent plutonium the oxysalicylate of tetravalent plutonium is precipitated. The optimum conditions for the precipitation of this oxysalicylate were determined.

12. Production of Zirconium by Reduction of Zirconium Chloride With Magnesium

"The Kinetics of the Metallothermic Magnesium Reduction Process for Zirconium Production," by F. G. Reshetnikov and Ye. N. Oblomeyev; Moscow, Atomnaya Energiya, Vol 4, No 4, Apr 58, pp 349-353

An experimental installation is described by means of which the velocity of the magnesium-thermic process of the production of zirconium was investigated by the method of the "floating crucible." By using a gramma-level meter with a Co^{60} radiation source, the level of a $MgCl_2$ + KCl melt was measured. This level rose because of the sinking into the melt of a magnesium-filled crucible due to the increased weight of the contents of the crucible resulting from the reaction of Mg with $ZrCl_4$ vapor. The zirconium chloride vapor pressure in the reduction apparatus was measured by an ordinary manometer which was connected over a trap filled with molten tin with the space inside the reduction apparatus.

The measurements which have been made indicated that in the $ZrCl_4$ evaporator heated to 450° the temperature of the zirconium chloride during the magnesium-thermic reduction process did not exceed 330°.

It was established that the average velocity of the magnesium-thermic reduction of zirconium chloride increases at a slower rate in the temperature range of 760-850°, as the temperature increases, than in the range of 460-490°. The factors which determine the velocity of the magnesium-thermic process of the formation of zirconium are the temperature of the evaporator and the velocity of distillation as well as the vapor pressure of zirconium chloride which both depend on this temperature.

13. Symposium on Sequestering Agents

"Symposium on the Theory of Sequestering Agents and Their Application in Analytical Chemistry," by A. A. Pozdnyakov; Moscow, Zhurnal Analiticheskoy Khimii, No 2, Mar/Apr 58, pp 261-262

A symposium on the theory of sequestering agents and their applications in analytical chemistry was held in Moscow 28-30 November 1957. This symposium was called by the Commission on Analytical Chemistry at the Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, Academy of Sciences USSR. More than 50 scientists who specialize in sequestering agents participated in the symposium. Among them were scientists from the People's Democracies, including R. P. Pribl and I. Kerbl (Czechoslovakia), L. Erdei (Hungary), Lien Shih-ch'uan and Ch'en Yin'ts'ao (China), Tutundzic (Yugoslavia), and others. Thirteen reports were presented and discussed. Some of these reports dealt with theoretical problems pertaining to the thermodynamic stability of complex compounds, the effect of the molecular structure on the color of indicators, etc. Some attention was paid to the synthesis of new sequestering agents and color indicators and to the application of sequestering agents, specifically Complexon III [the disodium salt of ethylene-diaminetetracetic acid] in the separation (for instance, by means of ion-exchange chromatography) and determination of elements.

A paper by I. M. Mustafina (Saratov) dealt with the application of phenol-carboxylic acids of the triphenyl methane series as "complexonometric" indicators in titrations with sequestering agents. The author of the paper applied these indicators for the determination of a number of cations including Be^{2+}, Mg^{2+}, Al^{3+}, Ni^{2+} and VO^{2+}. The compounds that are formed are readily soluble in water and have a very intensive and deep coloration. Some of the colored compounds are decomposed by solutions of sequestering agents.

R. Pribyl reported on the application of sequestering agents in the determination of oxidizing and reducing substances. He used the indicator xylene orange in his work. The data given in the report demonstrated that one can titrate mercury, zinc, lead, cadmium, bismuth, and indium directly and determine gallium, iron, copper, uranium, vanadium, chromium, aluminum, and tin. For instance, for the determination of vanadium this element is reduced with ascorbic acid and then bound with the aid of Complexon III. The excess of Complexon III is titrated with thorium in the presence of the indicator. The author of the paper pointed out that it is possible to determine photometrically or detect qualitatively trivalent uranium with the aid of indicators with which uranium forms very stable complexes that cannot be titrated conveniently.

The compounds that are formed are readily soluble in water and have a very intensive and deep coloration. Some of the colored compounds are decomposed by solutions of sequestering agents.

A report by P. N. Paley (Moscow) dealt with the reducing properties of Complexon III. The author of the paper was able to demonstrate that in an acidic medium under the effect of oxidizing agents the molecule of Complexon III undergoes decomposition involving the formation of four molecules of CO_2 which indicates that the carboxyl groups are split off. The paper cited examples of the reduction with Complexon III of ions of plutonium, vanadium, and chromium.

Research on the synthesis of new sequestering agents was described in a paper by R. P. Lastovskiy (Moscow). Lastovskiy reported applications of a new fluorescent sequestering agent, viz., the tetracetic acid derivative of acridine yellow. This sequestering agent is very convenient for applications in paper chromatography (for instance, in the separation of barium from strontium or of calcium from magnesium). The author of the paper also synthesized hexamethelenetetracetic acid, which can be used to mask iron without masking nickel or cobalt, and parafucsinhexacetic acid, with the aid of which one can determine lead present as an impurity in materials containing titanium. Lastovskiy pointed out that it is possible to determine neodymium, lanthanum, and gadolinium polarographically with the aid of parafucesinhexacetic acid. A report by Lien Shih-ch'un and Ch'en Yin-ts'ao (Peiping) dealt with the use for the determination of fluorine of a complex compound that was not known hitherto. The authors of the paper demonstrated that in the pH range of 4.2-10 fluorine does not decolorize the complex of pyrocatechol with ferric iron, which proves that these compounds are more stable than the complex $[FeF_6]^{3-}$. On the other hand, in the pH range of 2-4 the ferric fluoride complex is more stable.

A paper on the application of sequestering agents in ion-exchange chromatography was presented by M. M. Senyavin (Moscow). Senyavin brought out that the strong tendency of sequestering agents to form complex compounds makes it possible to use these agents in chromatographic separations, e. g., in the separation of alkali metals. He emphasized an interesting property of sequestering agents, i. e., their capacity to form complex compounds in two different ways: bonding with the oxygen atom or bonding with the nitrogen atom. The method of separating mixtures of rare-earth elements with the aid of inhibiting ions is based on this property.

During the discussion A. K. Babko proposed that Complexon III be added to slow down crystallization. Thus, zirconium phosphate precipitates slowly in the presence of Complexon III and does not capture any titanium. Furthermore, the zirconium phosphate precipitated in this manner can be filtered easily.

I. P. Alimarin, I. V. Tananayev, V. I. Kuznetsov, A. K. Babko, and N. P. Komar' participated in the symposium.

[For additional information on chemistry and technology of nuclear fuels and reactor construction materials, see Item No 22.]

Industrial Chemistry

14. Prospecting for Boron Mineral Deposits in Azerbaydzhan

"On the Prospecting for Boron in Azerbaydzhan," by A. A. Alizade, Azerbaydzhan Industrial Institute imeni M. Azizbekov; Baku, Izvestiya Vysshikh Uchebnykh Zavedeniy - Neft' i Gaz, No 4, Apr 58, pp 3-6

According to the author, prospecting for boron should not be limited to testing petroleum well waters and establishing the location of mud geysers, in the water of which boron is always present. The boron dissolved in water has been leached out of some solid deposit and it is the location of such deposits which must be determined. The relationships pertaining to solid deposits containing boron are discussed in detail under consideration of the particular geological conditions encountered in Azerbaydzhan.

15. Production of Ferrocene Compounds

"Reduction of Ferrocenecarboxylic Acids," by Academician A. N. Nesmeyanov, E. G. Perevalova, and Z. A. Beynoravichute, Moscow State University, Moscow; Doklady Akademii Nauk SSSR, Vol 112, No 3, 21 Jan 57, pp 439-440

"In our previous works [1] [bracketed numbers refer to appended bibliography] it was shown that ferrocene can be metalized with butyl lithium yielding a mixture of mono- and dilithium derivatives, formed during the carboxylation of a mixture of ferrocenemonocarboxylic and ferrocenedicarboxylic acids.

"In this work, ferrocenyllithium and ferrocenecarboxylic acids are used for the preparation of some other derivatives of ferrocene, and it is shown that ferrocene can be readily metalized with phenylsodium [2], yielding, after carboxylation, ferrocenedicarboxylic acid with a yield of 42%.

"To phenylsodium, prepared in benzene from 10 g of sodium and 21 g of chlorobenzene [3], 18.6 g of ferrocene are added. The mixture is left standing over night, after which it is heated to boiling with agitation for 8 hours and is then poured over dry ice. The benzoic acid is removed with steam distillation. The ferrocenedicarboxylic acid is dried in air and is then treated twice with benzene to remove traces of ferrocenmonocarboxylic acid. Fifty-five percent of the ferrocene is recovered without change. The yield of ferrocene-dicarboxylic acid is 42% of the theoretical and 94% of the ferrocene that entered the reaction.

"The methyl ester of ferrocenedicarboxylic acid is readily reduced with $LiAlH_4$ not only to the corresponding alcohol, but even to dimethylferrocene.[4] 1,1'-Di(oxymethyl)ferrocene is prepared by heating an ether solution of the methyl ester of ferrocenedicarboxylic acid (2 g) with an excess of lithium-aluminum hydride. $LiAlH_4$ was prepared from 0.6 g of LiH and 5 g $AlBr_3$. The yield of di(oxymethyl)ferrocene was 92% of the theoretical, and the melting point was 85-86°; it can be crystallized from alcohol and from a mixture of ether and petroleum ether.

% Found: C 58.66; 58.73; H 5.89; 5.81; Fe 22.39
$C_{12}H_{14}O_2Fe$ % Calculated: C 58.56 H 5.73 Fe 22.69

"If the methyl ester of ferrocenedicarboxylic acid is heated for 3 hours with twice the above amount of $LiAlH_4$, 1,1'-dimethylferrocene is obtained (89% yield, melting point 29-30°) which is readily soluble in organic solvents and can be crystallized from benzene by cooling to -10,° and from alcohol and a mixture of petroleum ether and ether.

% Found: C 67.53; 67.70; H 6.89; 6.81; Fe 25.73 25.36
$C_{12}H_{14}Fe$ % Calculated: C 67.31; H 6.59; Fe 26.08

"Reduction of the methyl ester of ferrocenemonocarboxylic acid with lithium-aluminum hydride results in the formation of ferrocenylcarbinol, yield 73%, melting point 74-75°, purified with chromatographic adsorption on aluminum oxide, crystallized from alcohol and a mixture of ether and petroleum ether.

% Found: C 61.61; 61.66; H 6.09; 5.83; Fe 25.67; 25.46
$C_{11}H_{12}OFe$ % Calculated: C 61.19; H 5.60; Fe 25.84

"Lithium-aluminum hydride reduces alcohols of the ferrocene series very readily. Thus 1,1'-di(diphenyloxymethyl)ferrocene, on reduction with lithium-aluminum hydride, yields 1,1'-dibenzhydrylferrocene with 87% yield. This compound was described earlier by Pauson [4]. Dibenzhydrylferrocene crystallizes readily from benzene, melting point 161-162°. Literature data [4]: melting point 162-163°.

% Found: C 83.43; 83.30; H 6.01; 6.11; Fe 11.17; 11.20
$C_{36}H_{30}Fe$ % Calculated: C 83.39; H5.79; Fe 10.81

"Di(diphenyloxymethyl)ferrocene was prepared at 51% yield by reacting the methyl ester of ferrocenedicarboxylic acid with phenylmagnesium bromide. It was also prepared by reacting benzophenone with dilithiumferrocene, but the yield in the latter case was small. The melting point is 179-180°. Both products were identical with themselves and with di(diphenyloxymethyl)ferrocene as prepared by the reaction of dibenzoylferrocene with phenylmagnesium bromide described by Riemschneider and Helm [5]. Literature data [5]: melting point 179-181°.

% Found: C78.53; 78.45; H 5.66; 5.91: Fe 10.30; 10.55
$C_{36}H_{30}O_2Fe$ % Calculated: C 78.54; H 5.45; Fe 10.18

"Reduction of 1,1-dibenzoylferrocene with $LiAlH_4$ under conditions at which alcohols are normally prepared, yields dibenzylferrocene, described earlier by one of us and N. A. Vol'kenau [6]; yield, 87%."

"Bibliography

"1. A. N. Nesmeyanov, E. G. Perevalova, R. V. Golovnya, O. A. Nesmeyanova, DAN, Vol 97, 459 (1954).

"2. A. N. Nesmeyanov, Substitution in the Ferrocene-Nucleus. Congress Handbook. 14th International Congress of Pure and Applied Chemistry. Zurich, 1955, p 193

"3. K. A. Kocheshkov, T. A. Talalayeva, Sinteticheskiye Metody v Oblasti Metalloorganicheskikh Soyedineniy (Synthetic Methods in the Field of Metalorganic Compounds), Vol 1, 1949, p 168.

"4. P. L. Pauson, J. Am. Chem. Soc., Vol 76, 2187 (1954).

"5. R. Riemschneider, D. Helm, Ber., Vol 89, 155 (1956).

"6. A. N. Nesmeyanov, N. A. Vol'kenau, DAN, Vol 107, 262 (1956)."

16. New Silicon-Organophosphorus Compounds Synthesized

"Reactions Between Siliconorganic Compounds and Phosphorus Acid Chlorides," by A. P. Kreshkov and D. A. Karateyev, Moscow Chemicotechnological Institute imeni D. I. Mendeleyev; Moscow, Zhurnal Obshchey Khimii, Vol 27, No 10, Oct 57, pp 2715-2720

The reactions between tetramethoxy-, tetraethoxy-, tetra(n-butoxy)-, and tetra-o-cresoxysilane and phosphorus oxychloride were investigated, as well as tetraphenoxysilane and phosphorus trichloride. Three new silicon-phosphorus organic compounds were prepared. The structures of these compounds were determined by employing chemical, physicochemical, and physical methods of analysis. New methods were developed for the preparation of triphenylphosphite and tri-o-cresylphosphate that are based on the reaction of tetraaroxysilanes with phosphorus trichloride or phosphorus oxychloride. It is suggested that the reaction between tetraalkoxysilanes and phosphorus oxychloride takes place in stepwise manner.

17. Organophosphorus Compounds

"Dealkylation of Isomeric Tributenylphosphites With Hydrogen Chloride," by A. N. Pudovik, Kazan' State University; Moscow, Zhurnal Obshchey Khimii, Vol 27, No 10, Oct 57, pp 2755-2760

The dealkylation of tri-n-butyl phosphite, triallyl phosphite, tricrotyl, phosphite, and tri-(a-methylallyl)-phosphite with hydrogen chloride without a solvent and in an ether solution was studied. At the same time the reactions between phosphorus trichloride and the alcohols n-butyl, allyl, crotyl, and methylvinyl carbinol were also studied. The results proved to be identical. In the case of the dealkylation of tributyl phosphite and the action of phosphorus trichloride on n-butyl alcohol, dibutylphosphorous acid was obtained in good yield. In analogous experiments with allyl alcohol and triallyl phosphite, diallylphosphorous acid was obtained in good yield. However, in the case of isomeric butenols and tributenyl phosphites, mixtures of isomeric chlorides and phosphorous acid are formed at lower yields.

Tributenyl phosphites appear as intermediate products in the reaction of phosphorus trichloride with butenols. Their primary dealkylation takes place in accordance with the Arbuzov rearrangement. Ideas are expressed on the possible mechanisms of furthur dealkylation of acid esters of phosphorous acid under the action of hydrogen chloride.

M. V. Ivanova participated in the experimental part of the work.

"Esters of Aminophenylsulfonamidophosphoric Acids," by A. V. Kirsanov and N. G. Feshchenko, Institute of Organic Chemistry, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 4, Apr 58, pp 1049-1052

The dimethyl and diphenyl esters of aminophenylsulfonamidophosphoric acids and the corresponding benzoylaminophenylsulfonamidophosphoric acids were prepared and the physical constants of the products listed.

"Triaroxyphosphazosulfonalkyls and Aromatic Esters of Alkylsulfonamidophosphoric Acids," by A. V. Kirsanov and N. L. Yegorova, Dnepropetrovsk Metallurgical Institute; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 4, Apr 58, pp 1052-1055

Triaroxyphosphazosulfonalkyls and diaryl esters of alkylsulfonamidophosphoric acids were prepared and their properties described. Seventeen compounds in all were prepared.

18. Addition of Esters of Phenylphosphonic Acid to Unsaturated Aldehydes and Ketones

"Addition of Complete Esters of Phosphorous and Phosphonous Acids to Conjugated Systems. IV. Addition of Esters of Phenylphosphonous Acid to a,b-Unsaturated Aldehydes and Ketones," by Gil'm Kamay and V. A. Kukhtin, Kazan' Chemicotechnological Institute; Moscow, Zhurnal Obshchey Khimii, Vol 28, No 4, Apr 58, pp 939-941

The interaction of esters of phenylphosphonous acids with a,b-unsaturated aldehydes and ketones was investigated. It was established that esters of phenylphosphonous acid add to a,b-unsaturated aldehydes and ketones in much the same way as to trialkylphosphites.

19. Mechanism of Formation and Disappearance of Free Radicals

"Mass-Spectrometric Investigation of the Mechanism of the Formation and Disappearance of Free Methyl Radicals at Metal Surfaces," by P. Le Goff and M. Letort, Superior National School of the Chemical Industries, Nancy (France); Moscow, Zhurnal Fizicheskoy Khimii, Vol 32, No 3, Mar 58, pp 481-497

In experiments conducted under dynamic conditions and at very low pressures, the decomposition at metal surfaces of vapors of different substances was investigated which are capable of yielding free CH_3 radicals (methyl iodide, tetramethyl lead, and di-tert-butylperoxide). The immediate indication of the formation of radicals generated in the primary processes of decomposition and observation of the reactions of the radicals at the walls of the vessel were accomplished by means of a mass spectrometer connected with the reaction vessel.

It was established that for each of the gases mentioned the absolute velocity of decomposition up to 1,500°K and the nature of the products formed on contact with platinum, nickel, and tungsten are the same, which is explained by the presence of a carbon layer that forms on the surface of these metals at temperatures lower than 1,500°K.

Above 1,500°K the carbon can diffuse into the tungsten, so that the mechanism of the reaction changes completely: the gas molecules collide with the free metal surface and decompose with the result that ordinary stable molecules (H_2, CO) are formed and no formation of free radicals occurs.

In the case of methyl iodide the reaction of decomposition at the carbon layer is simple: it takes place according to the equation $CH_3I \rightarrow CH_3 + I$. The corresponding reactions in the cases of tetramethyl lead and di-tert-butylperoxide are more complex, because in both cases there is formation of heavy radicals in addition to CH_3. The heavy radicals are formed as a result of the splitting off of several atoms of carbon and hydrogen from the initial substance. The O-O bond of di-tert-butylperoxide is split no more easily than the other interatomic bonds in the molecule of this substance.

The reactions of methyl radicals on the surface of metals depend to a considerable extent on the nature of the layer of substances adsorbed on this surface. The nature of the adsorbed layer is determined by the

composition of the gas phase. Under the circumstances it is very difficult to ascribe a definite meaning to the expression half life of the free radical, which is used by some investigators in the interpretation of results obtained by the mirror method of Paneth and Rice.

[SIR Note: Although this article appears to be an original contribution to Zhurnal Fizicheskoy Khimii, it lacks the customary English-language abstract which follows contributions by Russian authors.]

20. Effect of Formation of Metal Nitrides on Heat Evolved in Detonation of Explosives Containing Nitrogen

"The Reactions of Nitrogen in Explosions," by A. Ya. Apin, Yu. A. Lebedev, and O. I. Nefedova, Institute of Chemical Physics, Academy of Sciences USSR; Moscow, Zhurnal Fizicheskoy Khimii, Vol 32, No 4, Apr 58, pp 819-823

It was established that during the explosion of mixtures of lead azide with powdered Al, Be, B, Mg, or Zr additional heat is evolved as a result of the reaction of nitrogen with the metal. An explosion method for the determination of heats of the formation of nitrides is proposed. It was used in determining the heats of formation of Be_3N_2 (135 kilocalories per mol), Mg_3N_2 (110.7 kilocalories per mol), AlN (57.6 kilocalories per mol), ZrN (72 kilocalories per mol), and BN (26.7 kilocalories per mol).

In explosions of hydrazine azide ammonia was found to form as a result of the interaction of nitrogen with hydrogen, the amount of ammonia formed depending greatly on the conditions of the explosions.

It was established that during explosions of mixtures of hexogen [i.e., cyclonite = hexahydro-1,3,5-trinitro-s-triazine] with Al or Be additional heat is evolved in the calorimetric bomb because of a chemical reaction between nitrogen and the metal.

High explosives to which a small quantity (10-20%) of Al has been added are used extensively; such mixtures exhibit an increased heat of explosion (i.e., a larger amount of heat is evolved during the explosion) and are more efficient. Small additions of aluminum increase the heat of explosion without greatly reducing the specific volume of the gaseous products of the explosion. Addition of larger quantities of aluminum may bring about a strong reduction in the volume of the gases that are formed. It was assumed hitherto that the increased heat of explosion resulting from the addition of a powdered metal to a high explosive is due to the reduction of water vapor and oxides of carbon by the metal. The results obtained in this instance indicate that formation of metal nitrides is responsible to a considerable extent for the additional evolution of heat.

The possibility exists that one may initiate with the aid of explosions reactions involving the formation of nitrides and hydrides in mixtures of metals with nonexplosive substances containing nitrogen and hydrogen.

Radiation Chemistry

21. Radiation-Chemical Oxidation

"Oxidation Processes in Organic Systems Under the Influence of Ionizing Radiation," by N. A. Bakh and V. B. Sarayeva, Institute of Physical Chemistry, Academy of Sciences USSR, and Moscow State University; Moscow, Zhurnal Fizicheskiy Khimii, Vol 32, No 2, Feb 58, pp 209-218

Among reactions which take place under the influence of ionizing radiation, oxidative processes attract particular attention because of the possibility of applying them practically and because of the important role which they play in radiobiological phenomena.

There are two types of radiation-chemical oxidation processes: oxidation of individual compounds under conditions involving direct absorption of radiation energy by the molecules being oxidized and oxidation in aqueous solutions. Processes of the first type are considered in this article, which summarizes work done during recent years by teams active at the Laboratory of Radiation Chemistry of the Institute of Physical Chemistry, Academy of Sciences USSR, and the Laboratory of Radiation Chemistry of Moscow State University.

A considerable amount of information has already been accumulated on the radiation oxidation of hydrocarbons. In work published by the authors of this article it was shown for the first time that under the action of ionizing radiation on liquid hydrocarbons which have been saturated with oxygen different oxidation products such as peroxides, carbonyl compounds, alcohols, acids, and other products are formed at room temperature and temperatures lower than that. In the experiments that have been conducted X rays, electron radiation, and nuclear reactor radiation was used. The results that have been obtained indicate that the yields of the oxidation products based on the absorbed radiation energy depend on the structure of the hydrocarbons: the highest radiation yields are obtained in the oxidation of normal aliphatic hydrocarbons and the lowest in the oxidation of benzene.

A characteristic trait of radiation-chemical oxidation is the simultaneous formation at the very beginning of all products that are formed. The accumulation of these products is directly proportional to the energy that has been absorbed in a definite range of doses. This can be seen on the example of n-heptane. Exactly the same relationships have been observed in the oxidation of all other hydrocarbons that have been investigated (isooctane, cyclohexane, benzene, etc.) This indicates that the stable products of oxidation which have been identified are formed only in primary processes and that they are formed independently of each other rather than by mutual transformation. Only when higher doses of radiation are applied do deviations from the linear law occur, indicating that secondary processes develop, such as oxidation of carbonyl compounds to acids and decomposition of peroxides.

In view of the fact that the products of radiation-chemical oxidation are substantially the same as those of photochemical or liquid-phase noncatalytic oxidation, the question arises as to whether there is a specific action of ionizing radiation and in what respect this action is specific. To answer this question, one must compare oxidation processes taking place under the effect of different influences exerted on the reacting mixtures.

If it is assumed that in photochemical, thermal, and radiation-chemical oxidation the primary chemical process is the addition of oxygen molecules of free radicals, then the simultaneous appearance of hydroperoxides, peroxides, carbonyl compounds, alcohols, and acids must take place as a result of parallel transformations of primary peroxide radicals of the same type or of the simultaneous formation of peroxide radicals of different types.

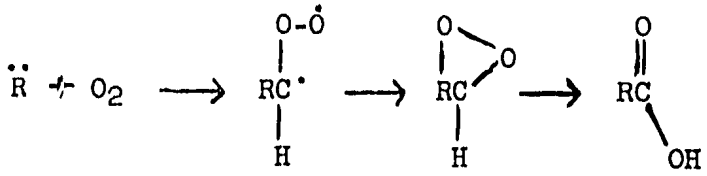
The general scheme of these reactions, in which monoradicals $\dot{R}$ have the structure R' R'' R''' 'C, where R', R'', and R''' are alkyl radicals or hydrogen atoms and the biradicals $\dot{\dot{R}}$ have the alkylidene structure $\dot{R}\dot{C}H$, can be represented as follows:

$$\dot{R} + O_2 \longrightarrow R\dot{O}_2 \qquad (1)$$

$$R\dot{O}_2 + RH \longrightarrow ROOH + \dot{R} \qquad (2)$$

$$R' - \overset{\displaystyle R''}{\underset{\displaystyle O - O}{C}} - R''' \longrightarrow R' - \underset{\displaystyle O - OR'''}{C} - R'' \longrightarrow R' - \underset{\displaystyle O}{\overset{\displaystyle \|}{C}} - R'' + OR''' \qquad (3)$$

$$R\dot{O}_2 + R' \longrightarrow ROOR' \qquad (4)$$



(5)

Unfortunately, there are no direct experimental results which characterize the nature and yields of products of photochemical and radiation-chemical oxidation for the same systems. One can, nevertheless, consider the available data on photo-oxidation, using the relationship established for the case of pure hydrocarbons to the effect that the results obtained by photolysis in the gas phase correspond to the results of radiolysis in the liquid phase (cf. R. R. Henz and M. Burton, Journal of the American Chemical Society, Vol 73, 1951, p 532).

In work done by N. V. Fok and A. B. Nalbandyan it was demonstrated that in the mercury-sensitized photochemical oxidation of propane, methane, or ethane only the hydroperoxide is formed at room temperature and that the formation of this compound is determined primarily by the direct utilization of absorbed light energy: the formation of chains is very limited at room temperature. As far as carbonyl compounds are concerned, they form only at elevated temperatures in this type of oxidation.

No less different from radiation-chemical oxidation with respect to the accumulation of oxidation products and their quantitative interrelationship is the liquid phase noncatalytic oxidation of hydrocarbons, which becomes possible at temperatures of 60-140° depending on the structure of the hydrocarbon. In this type of oxidation the primary products are hydroperoxides which are formed by a chain mechanism according to formulas 1 or 2 and which then are transformed into stable products, i.e., carbonyl compounds and alcohols.

Radiation-chemical oxidation at room temperatures is possible only because the primary radicals R which are formed as a result of the action of ionizing radiation possess at the moment of their formation a considerable excess of energy which is preserved in the radicals RO_2 that are formed from the primary radicals according to the equation (1). Because of the excess of energy retained by them, the radicals RO_2 can participate in reactions which require a significant activation energy (i.e., the reactions 2 and 3). However, no chains develop, because the R radicals formed in reactions of the type (2) do not yield RO_2 radicals which have a sufficient excess of energy. The radical RO_2, which cannot bring about reactions that require an activation energy, may add R radicals and form dialkyl peroxides according to equation (4). This process is quite typical for radiation-chemical oxidation and is not observed in photo-oxidations that take place at elevated temperatures under conditions

inducing reaction (2). Equation (5) explains the formation of acids. The energy of activation necessary for the isomerization into acids is apparently available.

If the formation of radicals with a sufficient excess of energy is typical for oxidations that take place under the effect of ionizing radiation, the formation of such radicals must be connected with the occurrence of exothermic reactions in which ions participate. Reactions of this type involving either the neutralization of charges or interactions between ions and molecules may occur.

It has been shown by V. L. Tal'roze and Ye. P. Frankevich, by using mass-spectrometric methods, that after bombardment with electrons excited radicals may form as a result of reactions of the following types:

$$M^+ + RH \longrightarrow MH^+ + \dot{R}^* \qquad (6)$$

$$M^+ + R'R'' \longrightarrow (MR')^+ + (\dot{R}'')^* \qquad (7)$$

These reactions must be particularly pronounced in the liquid phase.

In view of the fact that molecular oxygen is a very active accepter of free radicals, one may expect that the structure of the carbon skeleton of primary radicals will be preserved in the peroxide radicals and consequently also in the final products formed by further transformation. Thus, the structure of the final products must reflect the nature of the primary processes of radiolysis if the oxidation processes do not proceed by a chain mechanism.

Chromotographic separation and identification of the carbonyl compounds and carboxylic acids formed as a result of the radiation-chemical oxidation of n-heptane and isooctane showed that the carbonyl compounds which form are very specific: 70% of the total quantity of carbonyl compounds formed from n-heptane consist of methylbutyl ketone and of those formed from isooctane of ethylisobutylketone.

In this respect, radiation-chemical oxidation differs significantly from the liquid phase noncatalytic oxidation in which, as has been shown in the case of n-decane, ketones corresponding to the scission of the carbon chain at any carbon atom formed with an equal probability at 145°.

The distribution according to the number of carbon atoms of the carbonyl compounds formed in the radiation-chemical oxidation of n-heptane and isooctane was correlated with the distribution of primary radicals found on the basis of mass-spectrometric data. It was established that the primary radicals which determine the development of processes of radiation oxidation in the liquid phase do not correspond at all to those which

form in rarefied gases on bombardment with electrons. This finding can be interpreted by using the scheme proposed by Tal'roze and Frankevich. If reactions (6) and (7) take place readily in the liquid phase, the diversity of the structures of primary ions must disappear very rapidly and the principal primary radicals must be of a limited number of types, possibly one or two, corresponding to the transfer of a hydrogen atom or a methyl radical from a molecule to an ion. The products formed as a result of the irradiation of n-heptane and isooctane correspond to the formation of the excited radicals $C_6 H_{13}$ and $C_7 H_{15}$.

The effectiveness of the action of ionizing radiation on chemical compounds is obvious from the fact that one can bring about by irradiation at room temperature not only the oxidation of aliphatic hydrocarbons, i.e., compounds the thermal oxidation of which begins at as low as 100-130°, but also the oxidation of a compound which is as difficult to oxidize as benzene. As a result of the radiation-chemical oxidation of liquid benzene with molecular oxygen, phenol and aldehyde are formed with equal yields, which indicates that scission of the nucleus must occur. Furthermore, condensation products, hydrogen, acetylene, carbon monoxide, carbon dioxide, and other compounds are also formed.

One may conclude on the basis of what has been said above that the specific nature of ionizing radiation consists in the capacity to bring about oxidation under conditions when chain processes do not develop. In reactions of this type the yields of the products which are formed depend directly on the amount of radiation energy that has been supplied. One can, however, induce branched chain processes in the radiation-chemical oxidation of hydrocarbons which are distinguished by a high yield of products with reference to the energy absorbed, if the temperature is raised and the reaction facilitated thereby. This has been done in the case of paraffin wax and n-cetane.

The formation of $R\mathring{O}_2$ radicals under the action of ionizing radiation is a general property of all organic compounds exhibited whenever oxygen is present. The development after this of a chain reaction involving the formation of hydroperoxides and of other products is possible also at room temperature if the molecules of the substance being irradiated contain a sufficiently mobile atom of hydrogen. Ethyl alcohol, benzyl alcohol, and acetone, which have mobile hydrogen atoms, undergo chain oxidations under the effect of ionizing radiation.

Data available in the literature on the effect exerted by the density of ionization on radiation-chemical processes in organic substances are very few and pertain only to evacuated systems. On the typical case of the radiolysis of benzene and cyclohexane in the presence and absence of molecular oxygen, research was done at the laboratory of the authors of the article in which the action of the radiation emitted by a nuclear

reactor (i.e., radiation consisting of fast neutrons and gamma rays), under conditions when recoil protons play an important role, was compared with the action of radiation of lower energy (X rays and gamma rays as well as electron radiation). The results obtained indicated that the effect of the density of ionization is noticeable only in some reactions. For instance, the yield of condensation products in the absence of oxygen is significantly greater when irradiation by means of a nuclear reactor is applied than in the case of exposure to radiation of lower energy. Similarly, the yield of hydrogen from benzene in the presence of oxygen is sharply increased on transition from low-energy irradiation to nuclear reactor irradiation, whereas the yields of phenol and aldehyde are unchanged. One may expect that the density of ionization will have an effect on the yield in cases when the products are formed as a result of an interaction between two radicals rather than between a radical and a molecule.

The effect of the intensity of radiation on the yield has been investigated on the formation of aldehydes during the liquid phase radiation-chemical oxidation of acetone. It was established that the yield of primary products of the oxidation does not depend on the intensity of radiation, while the yield of secondary products exhibits a pronounced dependence on the intensity.

In the reactions mentioned above and their interpretation, the reactivity of peroxide radicals in detaching hydrogen atoms from hydrocarbon molecules plays a significant role. Values for the energy of activation of this reaction that were determined by different investigators are cited in an article by D. G. Knorre, Z. K. Mayzus, L. K. Obukhova, and N. M. Emanuel', Uspekhi Khimii, Vol 26, 1957, p 416. For a number of unsaturated hydrocarbons, this activation energy lies within the range of 5-7 kilocalories per mol while for alkanes (for instance, decane) it amounts to 12-14 kilocalories per mol.

The difficulty involved in this process, even in the case of a sufficiently mobile hydrogen atom of a secondary hydrocarbon, can be illustrated by some new experimental data obtained in work done by the authors of the article. Although these data apply to the hydroperoxide radical, the conclusions which can be made in regard to the behavior of this radical in the reaction

$$HO_2 + RH \longrightarrow HOOH + \dot{R}$$

may also be transferred to alkyl peroxide radicals.

In work done by N. S. Kolosova, which is described in a dissertation submitted at Moscow State University in 1957, the oxidation of diisopropyl ether in aqueous solutions saturated with oxygen, nitrogen, or hydrogen

was investigated. It was established in this work that in the solutions saturated with hydrogen, only acetone is formed after irradiation. In solutions saturated with nitrogen, acetone and alcohol are formed, while in solutions saturated with oxygen, acetone, alcohol, and hydrogen peroxide are formed. It was found that the yield of acetone, which is a product of the oxidation of diisopropyl ether, is only half as large in the presence of oxygen as in the presence of nitrogen or hydrogen. The explanation is that the free hydrogen atoms which participate in the reaction are completely removed from the reaction system by the oxygen, while the HO_2 radicals which form as a result are incapable of removing hydrogen atoms from the secondary carbon of isopropyl ether as the radicals H and OH do. By reacting according to the equation

$$HO_2 + HO_2 \longrightarrow H_2O_2 + O_2$$

these radicals form hydrogen peroxide.

The experimental data that have been obtained can be interpreted as a direct proof of the great inertness of the radical HO_2 as far as removing of hydrogen atoms from organic molecules is concerned. The very low yield of hydrogen peroxide in processes of the radiation-chemical oxidation of hydrocarbons is explained by this behavior of HO_2.

The ideas developed in this article in regard to the mechanism of radiation-chemical oxidation can be summarized as follows. Radiation-chemical oxidation of organic compounds differs from photochemical and noncatalytic thermal oxidation by the circumstance that it is capable of proceeding with a definite yield under conditions at which a chain process does not develop with a measurable velocity. Another characteristic is that the products of oxidation are formed simultaneously rather than successively. This characteristic can be explained by assuming that the primary $\dot{R}$ radicals and the peroxide radicals $\dot{R}O_2$ which are formed from them have an excess of energy sufficient for bringing about isomerization and interaction with nonexcited molecules at room temperature and lower temperatures, while the secondary radicals that form are not capable of repeating these reactions. Results obtained in recent investigations on the processes of interaction between ions and molecules indicate that the necessary energy of excitation of radicals can be supplied by primary reactions of radiolysis.

Only the first steps have been made in the investigation of radiation-chemical oxidation. Clarification of the nature of the stable products that are formed and of the influence of various factors on the formation of these products is a prerequisite for the mastery of processes of this type. However, a more profound understanding of the mechanism of these processes can be obtained only by subjecting to experimental investigation short-lived products of radiolysis, namely, the free radicals which are formed as a result of irradiation. Research along these lines must be conducted soon.

A bibliography consisting of 20 USSR references and 8 non-USSR references follows the text of the article.

Radiochemistry

22. Additional Information on December 1957 USSR Conference on Application of Radioactive Isotopes in Analytical Chemistry

"A Conference on the Application of Radioactive Isotopes in Analytical Chemistry," by A. N. Yermakov; Moscow, Zhurnal Analiticheskoy Khimii, Vol 13, No 2, Mar-Apr 58, pp 262-263

[SIR Note: This report supplements the information given in "Application of Radioactive Isotopes in Analytical Chemistry (A Conference at Moscow)," by S. S. Rodin, Vestnik Akademii Nauk SSSR, Vol 28, No 2, Feb, pp 108-110, see Scientific Information Report No 8.]

"An All-Union Conference organized by the Department of Chemical Sciences, Academy of Sciences USSR, and the Commission on Analytical Chemistry at the Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, Academy of Sciences USSR, dealt with problems connected with the application of radioactive isotopes in analytical chemistry. This conference was held in Moscow 2-4 December 1957.

"More than 450 scientists and representatives of industrial organizations participated in this conference. In addition to Soviet investigators, foreign scientists participated who arrived from a number of countries, including England, Bulgaria, Hungary, China, Poland, Rumania, the US, Czechoslovakia, and Yugoslavia. More than 50 reports were presented at the conference. Among these reports, 26 were discussed at the conference.

"The plenary session was opened by Academician A. P. Vinogradov, who characterized the principal trends in research dealing with applications of radioactive isotopes in analytical chemistry. Academician Vinogradov emphasized that at present radioactive isotopes of the majority of elements of the periodic system are being used in analytical chemistry. Furthermore, their application has become commonplace and is no more unusual at present than the application of classical methods of qualitative and quantitative analysis.

"At the same plenary session, a report by A. V. Nikolayev, A. A. Sorokina, and A. S. Maslennikova was given on the subject of the application of radioactive isotopes in the development of methods for the separation of rare-earth elements. I. P. Alimarin and G. N. Bilimovich told about the application of the method of isotopes dilution in the determination of some rare elements. By using the radioisotopes Nb^{95}, Zr^{95},

and Ta^{182}, these investigators developed methods for the separation of tantalum from titanium, zirconium, and niobium and for the determination of titanium by the method of isotope dilution. The methods in question were tried out in the analysis of rocks and alloys.

"A report by A. N. Yermakov, V. K. Belyayeva, and I. N. Marov dealt with the application of tracer atoms (Zr^{95} and Hf^{181}) in the investigation by the anion-exchange method of the formation of complex compounds by zirconium and hafnium with the oxalate ion. On this example of work involving the application of anion-exchange resins, the possibility was demonstrated of calculating the association constants of complex compounds of ions with multiple charges which form stable complexes with weakly dissociating substances in strongly acidic solutions.

"I. M. Korenman and F. R. Sheyanova reported on the application on nonisotope indicators for the solution of a number of analytical problems. They presented extensive experimental data on radiometric titration. These investigators demonstrated that it is possible to apply nonisotopic indicators (e.g., tetrathiocyanomercuroates and nitrocobaltiates) for the determination of solubilities.

"At one of the sectional meetings, A. I. Kulak described a radioactivation method for the quantitative determination of some metals present as microimpurities in ferric oxide.

"Great interest was shown in a report by V. B. Gaydadymov and L. I. Il'ina concerning the analysis of binary tantalum-niobium alloys by the method of beta-ray reflection (reflected dispersion). This method makes it possible to analyze samples of alloys in different physical states (i.e., in the form of powder, rods, or sheets) with a precision of 0.5% absolute at tantalum contents of 2-98%. The analysis takes 3-5 minutes.

"A paper by G. S. Rozhavskiy and I. Ye. Zimakov described a method of repeated radioactive dilution for the determination of impurities present in small quantities.

"M. B. Neyman, V. Ye. Yefremov, and V. N. Panfilov discussed the determination of alcohols by the method of isotope dilution.

"Radiometric titration with the application of solutions of complex compounds of cobalt 60 was discussed by K. B. Yatsmirskiy and Ye. N. Roslyakova.

"I. P. Alimarin, A. K. Babko, V. I. Kuznetsov, N. P. Komar', K. B. Yatsimirskiy, and others participated actively in the discussion of reports.

"Prof I. M. Kolthoff (US) presented an extensive and informative report on the application of radioactive isotopes in the investigation of the aging of crystalline precipitates.

"Some characteristics of the method of radiochemical analysis were discussed by A. K. Lavrukhina. There were reports on the separation of some isotopes with a short half-life from complex mixtures (V. P. Shvedov and L. I. Ivanova) and on the application of radioactive isotopes in chromatography (M. M. Senyavin). On the basis of results obtained in an investigation of the adsorption of ruthenium by ion-exchange resins, Ye. I. Il'yenko, B. P. Nikol'skiy, and A. M. Trofimov proposed an original method for the quantitative separation of this metal from solutions. Reports dealing with the following subjects were also heard with interest: a carbonate method for the separation of microquantities of uranium from weighable quantities of iron (I. Ye. Starik, F. Ye. Starik, and A. N. Apollonova); conditions under which precipitation takes place in the ternary systems basic dyestuff — metal — halide (A. K. Babko and P. V. Marchenko); separation of uranium from sea water with the aid of organic coprecipitants (V. I. Kuznetsov and T. G. Akimova); and coprecipitation with metal hydroxides of some elements present in low concentrations (Yu. V. Morachevskiy and A. I. Novikov).

"At the last meeting of the conference, G. I. Irving (Great Britain) presented a report on the analytical chemistry of indium. This was followed by a paper on the investigation of the analytical chemistry of francium with the aid of the radioactive isotope Fr^{212} (A. K. Lavrukhina and S. S. Rodin). This report was followed by an animated discussion. In this discussion K. B. Yatsimirskiy pointed out some general laws which correlate the solubility of alkali metal elements with the radii of the cations and anions; N. B. Mikheyev discussed the problem of the isomorphism of cesium and francium salts of silicotungstic and phosphorotungstic acids; V. I. Kuznetsov made some observations on organic coprecipitants for francium; and I. V. Tananayev proposed that a number of mixed ferrocyanides be used for the coprecipitation of francium.

"In addition, reports on the following subjects were heard: application of radioactive tracers for checking methods to be used in the separation of niobium (Yu. I. Bykovskaya); the application of radioactive tracers for the control of the production of rare metals (A. A. Gridik and N. I. Marunina); application of the isotope Ca^{45} for the determination of nonmetallic inclusions in steel (M. I. Tsekhanskiy, N. I. Shishkina, K. V. Khusnoyarov, and G. D. Susloparov); application of the isotope Cl^{36} for the quantitative determination of the content of hexachlorocyclohexane isomers in technical hexachlorane (P. V. Zimakov and L. A. Krasnousov); and application of a tracer atom method for the determination of the completeness of fractionation of gaseous hydrocarbons (K. I. Karasev).

"In his concluding address A. P. Vinogradov pointed out that at present analytical chemistry has become a major user of radioactive isotopes for the solution of many chemical problems. It is proposed to discuss in the near future problems pertaining to equipment and to the dosimetry of different types of radiation applied in connection with the solution of problems encountered in analytical chemistry."

23. Research on Core Sampling With Aid of Radioactive Isotopes

"Some Results of an Experimental Verification of the Feasibility of the Application of Selective Gamma-Ray Core Sampling," by G. M. Voskoboynikov; Moscow, Atomnaya Energiya, Vol 4, No 4, Apr 58, pp 359-364

Results are described of laboratory and field investigations in which the intensity of soft dispersed gamma radiation in rocks was determined and correlated with the content in these rocks of elements with high atomic numbers. The radioactive isotopes Co^{60}, Hg^{203}, and Se^{75} were used as sources of radiation. The experimental results confirm the feasibility of using in the prospecting for deposits of heavy metals the method of selective core sampling based on the recording of soft dispersed gamma radiation. It is shown that the anomalous effects produced by ore deposits correspond to the theoretical values determined by the authors as far as the order of magnitude is concerned.

Miscellaneous

24. Soviets Attend Hungarian Chemical Conference

"The Hungarian Federation of Chemists Is 50 Years Old" (unsigned article), Budapest, Muszaki Elet, No 8, 17 Apr 58, p 2

This article reports that the Hungarian Federation of Chemists (Magyar Kemikusok Egyesulete) was planning to hold a special conference between 12 and 17 May 1958 to celebrate the 50th anniversary of its founding. Over 250 lectures were to be given from the fields of organic chemistry, physical chemistry, chemical technology, etc.

So far, 200 persons from abroad, 80 of whom will lecture, had indicated their intention of attending the conference. Soviet scientists were to give approximately 20 lectures.

Soviet speakers were to include Academicians V. I. Isagulyants, I. P. Alimarin, and A. I. Kiprianov, as well as professors from universities at Moscow, Leningrad, Khar'kov, and Kiev.

IV. EARTH SCIENCES

25. Anomalies of Electromagnetic Field Over a Lode

"Anomalies of the Variable Electromagnetic Field Over Cylindrical Heterogeneities," by V. N. Nikitina; Moscow, Trudy Geofizicheskogo Instituta, Akademiya Nauk SSSR, No 32, (159), 1956, pp 62-93

A plane problem of the diffraction of a variable electromagnetic field over a cylindrical inclusion (a strong conductor), embedded in a conducting semispace (earth) is examined. The vector potential of the anomalous part of the field is represented according to a method of source functions using functions of the distribution of linear currents of induction. The calculation of the large conductivity of the ore body is accomplished in the form of Leontovich boundary conditions. The whole problem is reduced to an integral equation which satisfies the function of distribution. The investigation and solution of the basic integral equation is fulfilled in the instance of a buried, ideally conducting, inclined vein. The results which are obtained can be used in electroprospecting for ore in variable fields.

26. Graphoanalytical Method of Wave Frequency Analysis

"Graphoanalytical Method of Seismic Wave Frequency Analysis in a Wide Range of Frequencies," by F. M. Gol'tsman; Leningrad, Vestnik Leningradskogo Universiteta, Seriya Fiziki i Khimii, Vol 22, No 4, 1957, pp 76-88

The complex spectrum of a signal is presented as a Fourier series, coefficients of which are the discrete values of a given function. The series is summed by means of special nomograms. The method allows 36 points of a complex spectrum to be obtained, each of which is equidistantly placed in a frequency band, the upper limit of which depends on the time interval between the given values of the signal.

27. Yugoslav Geographers Visit Bulgaria

"Our Geographers Have Visited Bulgaria" (unsigned article); Sarajevo, Oslobodjenje, 31 Mar 58, p 8

About 110 members of the Serbian Geographic Society (Srpsko geografsko drustvo) have been staying in Bulgaria for 3 days to familiarize themselves with the geographical problems of Sofia and a part of the Maritsa River valley. The Yugoslav geographers, mostly secondary school professors and students, came to Bulgaria at the invitation of the Bulgarian Geographic Society; this is the first contact between Bulgarian and Yugoslav geographers since 1936.

V. ELECTRONICS

Communications

28. Application of Theory of Transmitting Capacity to Real Communication Channels

"Evaluation of the Transmitting Capacity of Some Real Communication Channels," by I. A. Ovseyevich and M. S. Pinsker; Moscow, Radiotekhnika, No 4, Apr 58, pp 15-25

"Using results obtained in earlier experiments ('An Evaluation of the Transmitting Capacity of a Communication Channel, the Parameters of Which Are Random Functions of Time,' Radiotekhnika, No 10, 1957), the authors examine the transmitting capacity of a real communication channel with parameters fixed in relation to time, a channel whose changing parameters have the form of white noise, and a channel which is a combination of the first two."

It is pointed out that the evaluations obtained will be more effective "when the parametric effect is small compared with noise," and "will be near the precise value of carrying capacity if the parametric effect in the transmission band of the channel is in the form of gaussian white noise."

Components

29. Variable Scanning Speed TV Systems

"Compensation of Parasitic Amplitude Modulation in TV Systems With Variable Scanning Speed," by D. A. Novik, Moscow, Nauchno-Tekhnicheskiy Sbornik MTFL MRTP, Issue 1, 1957, pp 3-12 (from Tekhnika Kino i Televideniya, No 4, Apr 58, p 74)

In the latest TV systems the band width of the channels has been substantially reduced by application of the principle of variable scanning speed. The article discusses distortions peculiar to such systems and methods of correcting them. Such a parasitic amplitude modulation is caused by the effect of charge storage in the "memory" tubes. However, such an effect is observed also with cathode-ray tubes free of charge storage, when operating on the principle of variable-speed scanning.

30. High-Temperature Performance of Transistors

"Operation of Crystal Triodes in a High-Temperature Range," by Ya. M. Levin, Tr. Vses. Gos. n.-i. in-ta radioveshchat. priyema i akustiki, 1956, No 7, 63-80 (from Referativnyy Zhurnal -- Fizika, No 1, Jan 58, Abstract No 1549)

By analyzing the dependence of the parameters of transistors on temperature, the author shows that these parameters depend as well on direct as on indirect temperature effects. The relation between direct currents in various circuits is investigated and stabilizing designs are presented.

31. Development and Application of Long-Focus Lens for SKS-1 Camera

"Use of the High-Speed Camera 'SKS-1' for Photographing Remote Objects," by G. I. Zubovskiy, V. G. Latyshev, and L. A. Novitskiy; Moscow, Zhurnal Nauchnoy i Prikladnoy Fotografii i Kinematografii, Vol 3, No 2, Mar-Apr 58, pp 131-135

A number of disadvantages are apparent in the use of the SKS-1 camera for photographing remote objects using an ordinary high-speed lens of the "Gelios" type. The size of the image is usually insufficient and the quality is comparatively poor when it is not possible to place the camera near the object being photographed. It is therefore necessary to perform certain computations and use a special long-focus lens with a prism-compensator.

This lens and its installation in the camera are described in the article, and a method for synchronizing the operation of a number of SKS-1 cameras is presented.

A projection lens with a focal length of 250 mm and a relative aperture of 1:2 was developed by the State Optical Institute for use in these experiments. Results of photographic tests are given in tabular form.

Synchronization of several cameras was accomplished by remote control with the help of a time relay and a block of power relays through which voltage was supplied to the cameras.

32. Pulse-Code Modulation System

"Telemetering Systems With Pulse-Code Modulation," by G. V. Burdenkov; Moscow, Avtomatika i Telemekhanika, No 1, Jan 58, pp 55-63

A pulse-code modulation telemetering system developed at the Central Scientific Research Electrical Engineering Laboratory (TsNIEL) is based on the following operating parameters: number of code elements is 6; repetition rate of the coded pulses is 40; the interval between pulses, the code pulse proper, and the separating pauses are all of equal duration; the duration of the synchronizing pulse (marker) is three times that of the code pulse proper; the duration of one complete cycle is 0.2 sec.

The transmitting system consists of the following units: a multivibrator generating pulses for the control of the pulse distributor, three emitter followers (EP1, EP2, and EP3) used to match the load, a two-way pulse distributor assembled with magnetic elements having a rectangular hysteresis loop and intended for alternate switching of the coding cells, trigger units which connect to the circuit the desired conductor elements, an assortment of 6N2 miniature tubes acting as electronic switches, a zero indicator which controls the polarity of the measured and balancing voltage, a coincidence circuit which generates the break pulses for the trigger units, the code-pulse extraction circuit, and the pulse forming stages intended for shaping the input signals into square pulses.

Coding is effected in the following manner: the measured magnitude, which is changing in time, is temporarily rectified to a dc voltage. In the process of coding this voltage is compared to the balancing voltage, the latter changing in steps proportional to the power of a decreasing binary series (2^{n-1}, 2^{n-2}, 2^{n-3}.....2^{o}.). If the polarity is positive, the corresponding step is retained; if the polarity, is negative the given step is not utilized in the formation of the balancing voltage.

The described code-pulse modulation system posseses a high degree of freedom from noise interference, but has a drawback of being rather complicated. Therefore, the application of such an telemetering system is feasible for long and complex communication lines, as well as for complex automation and telemechanics utilizing computer devices.

The author expresses a belief that improvement of digital count devices is of utmost importance for further development of the pulse-code telemetering system.

33. Development of Theory of Telemechanics and Teleautomation

"Basic Problems of the Theory of Telemechanical Systems," by M. A. Gavrilov; Moscow, Vestnik Akademii Nauk SSSR, No 2, Feb 58, pp 13-22

"The development of telemechanical centralization and teleautomation has introduced a number of complicated problems in the field of creating new technical means of telemechanics and in the solution of a series of theoretical problems."

These problems of telemechanical systems are subdivided by the author into specific problems such as the development of telemechanical signals, the structural theory of relay systems, and the theory of the conversion of telemetered quantities. Each of these subjects is discussed in some detail by the author.

"One of the most important steps in the development of the structural theory of relay systems is the mechanization of processes of analysis and synthesis. In this direction the USSR has attained considerable success in comparison with foreign countries.

"A universal machine, developed by P. P. Parkhomenko, was built by the Telecontrol Laboratory of the Institute of Automatics and Telemechanics for the structural analysis of relay systems of very large capacity (up to 20 elements). This machine performs analyses of single-cycle as well as multicycle relay systems in the form of connection tables which are printed on perforated cards or which may be recorded by hand from the indications of signal lamps. The machine may be used to study circuits of relay systems arranged on a special chart, as well as systems which have already been assembled, and permits some investigation of the minimization of structures. The dimensions of the machine are 1,200 x 1,000 x 350 mm; it contains 140 ordinary telephone relays, 3 step-by-step switches, and 90 signal lamps.

"The first machine for the synthesis of relay circuits (using four elements and two outputs) was built in the Laboratory of Problems of Wire Communications of the Academy of Sciences USSR (V. N. Roginskiy, V. G. Lazarev, and A. A. Arkhangel'skaya). This machine completely builds a circuit according to the given operating conditions of its elements and shows the structure of the circuit on a lamp register. Thus, the Laboratory has proved the possibility of automatic synthesis of the structures of relay systems with prepared results obtained in the form of graphical representations."

Magnetic, Dielectric, and Semiconductor Materials

34. Experiments With Coaxial Line Isolators Using Ferrites

"The Use of Ferrites in Coaxial Isolator Systems," by A. L. Mikaelyan and M. M. Kovlova; Moscow, Radiotekhnika, No 4, Apr 58, pp 30-35

Coaxial isolator systems (devices for obtaining microwave H-vector circular polarization) are described which are designed for operation with decimeter waves. Nonreciprocal attenuation in transversely magnetized ferrite-dielectric plates located in coaxial lines is examined, and the characteristics of a coaxial isolator developed for use with 10-cm waves are given.

Resonance attenuation curves were taken for direct and return waves at three different wavelengths. The largest ratio between direct and return waves was obtained with a magnetic field intensity of 950 oersteds. At this value, return losses equaled 36 db, direct losses equaled 1.4 db, and their ratio was approximately 26.

Experiments with nonreciprocal phase shifts with the aim of using ferrites in coaxial phase isolators showed that such shifts in ferrites are insignificant.

The isolator used in the experiments was a coaxial line with a characteristic impedence of 50 ohms, terminated with standard high-frequency connectors. The length of the isolator was 170 mm, the diameter of the inner conductor was 7 mm, the diameter of the outer conductor was 16 mm, and the thickness of the ferrite plate was 3 mm.

For a frequency band of 9.8-10.8 cm, the return wave losses were more than 30 db for direct wave losses of 2 db. The standing wave ratio did not exceed 1.3.

35. Methods of Determining Cutoff Frequency in Junction Transistors

"Determination of the Cutoff Frequency of the Current Conduction Factor of a Junction Transistor," by T. M. Agakhanyan and L. N. Patrikeyev; Moscow, Radiotekhnika, No 4, Apr 58, pp 45-52

"Experimental data are provided which verify the possibility of using theoretical conclusions for determining the cutoff frequency of the current conduction factor for type P6 transistors as well as for high-frequency diffused-junction transistorsfrom the frequency-phase characteristics of the current amplification factor of a circuit with a common emitter."

Two methods are examined for measuring the cutoff frequency of a junction transistor. The first method uses the phase or frequency characteristics of the current amplification factor of a circuit with a grounded base, that is, applying a load whose value is negligible in comparison with the impedance of the emitter junction. This method may be used only for comparitively low-frequency transistors, since at higher frequencies the effects of parasitic elements leads to inaccurate measurements.

The second method, using a circuit with a common emitter, was found suitable for measuring high-frequency transistors such as the P401 through P403 whose cutoff frequencies are on the order of 20-100 Mc.

36a. Aerial Radiometric Surveying of Petroleum and Gas Fields

"Application of Aerial Radiometric Surveying in the Investigation of Petroleum and Gas Occurrences," by A. R. Laubenbakh and L. N. Skosyreva, Petroleum Institute of the Academy of Sciences USSR; Moscow, Geologiya Nefti, Vol 2, No 2, Feb 58, pp 27-33

In the introduction to the article it is stated that during recent years aerial methods for prospecting and investigation of deposits of different useful minerals have become widespread. It is pointed out that the progress achieved in radiometry and the design of instruments can be utilized for the development of more efficient methods of prospecting for petroleum and gas occurrences. An aerometric method is described on which developmental work is being done by Laboratory No 1, Petroleum Institute of the Academy of Sciences USSR. The work is being conducted under the direction of Prof F. A. Alekseyev and of G. N. Flerov, Corresponding Member of the Academy of Sciences USSR. Experimental trials of the aeroradiometric method on a production scale were conducted for the first time in 1956. Known petroleum and gas occurrences in Stalingradskaya Oblast and in Stavropol' Kray were surveyed. The results of these surveys are described in the article, which contains profile maps of petroleum and gas fields drawn on the basis of the results obtained. The method used, the interpretation of the results obtained, and the results of aerodynamic surveys of known petroleum and gas fields as well as of areas which had not been explored previously by any other method are reviewed in detail.

The aeroradiometric surveying was conducted from planes of the AN-2 type, which were equipped with instruments by means of which aeromagnetic measurements can be made simultaneously with surveying by the determination of gamma radiation. As receivers of the gamma radiation, sets were used which consist of 144 counters of the VS-9 type. The intensities of radiation and of magnetism and the flight altitude measured with an RV-2 radioaltimeter were recorded automatically by two recorders.

During the work conducted, a scintillation attachment with crystal counters and a new, highly sensitive liquid scintillator aeroradiometer were tested.

Aeroradiometric surveys of known deposits indicated that the petroleum and gas occurrences, except for individual deposits where radioactive isotopes were introduced into the test wells, can be distinguished on the basis of the lowered gamma activity corresponding to the deposits.

The following conclusions are made:

"Aerial radiometry is a new rapid method of prospecting which makes it possible to investigate huge areas in a short period of time with a minimum expenditure of effort and means. It is sufficient to point out that by using one AN-2 plane during a single field prospecting season (5-6 months) one may survey an area of 50-60,000 square kilometers.

"The principal application of the method will be in the prospecting of promising areas in new regions which had not been investigated before. The method can also be used to advantage in geological mapping.

"Of particular importance are applications of the aeroradiometric method in the surveying of difficultly accessible and remote regions, where the possibility of employment on a large scale of any surface methods of investigation is greatly limited. The extensive desert and semidesert regions of Central Asia as well as regions covered by large forests and sands can be surveyed without any difficulty by applying the aerogamma method, so that individual promising areas where surface geological and geophysical surveying should be conducted can be pinpointed."

36b. Occurrences of Germanium in Caucasus

"The Geochemistry of Germanium," by G. Kh. Efendiyev; Baku, Izvestiya Akademii Nauk Azerbaydzhanskoy SSR, Seriya Fiziko-Tekhnicheskikh i Khimicheskikh Nauk, No 1, Mar 58, pp 73-82

Data are given on the distribution of germanium in minerals and ores of different types of endogenic deposits in the "Little Caucasus" (within the boundaries of the Azerbaydzan SSR).

Miscellaneous

37. Eighth All-Union Conference on Cathode Electronics held in Leningrad

"Reports on Cathode Electronics" (unsigned article); Moscow, Vestnik Akademii Nauk SSSR, No 2, Feb 58, p 108

More than 500 representatives of scientific research establishments and industrial concerns attended the Eighth All-Union Conference on Cathode Electronics held in Leningrad from 17 to 24 October 1957. Among the major topics covered at the conference were thermionic emission, photoelectronic emission, field emission, gas discharge, ion processes, and technology.

38. All-Union Conference on Magnetic Elements

"Use of Magnetic Elements," by G. D. Kozlov; Moscow, Vestnik Akademii Nauk SSSR, No 2, Feb 58, pp 112-113

"An All-Union Conference on Magnetic Elements of Automation, Telemechanics, and Computer Technology, organized by the Institute of Automation and Telemechanics and the Committee on Magnetic Amplifiers and Contactless Magnetic Elements under the Presidium of the Academy of Sciences USSR, met in Moscow from 25 to 30 November 1957."

Representatives of the academies of sciences of Bulgaria, China, Poland, and Czechoslovakia were present in addition to Soviet scientists.

The reports were concerned mainly with the theory of magnetic amplifiers and discrete magnetic elements, computation and design of magnetic amplifiers and discrete elements, and the joint use of magnetic elements and semiconductors.

The author concludes that despite recent successes in the field of theory, development, and application of magnetic elements, "the introduction of such elements into industry is proceeding at an intolerably slow rate, mainly because of the absence of centralized production of the more necessary types and series of toroidal cores, magnetic amplifiers, and other static magnetic elements. Magnetically soft materials, manufactured by our industries, do not have sufficiently high magnetic properties or uniformity of characteristics."

39. Establishment of Institute of Electrochemistry

"On the Organization of an Institute of Electrochemistry" (unsigned article); Moscow, Vestnik Akademii Nauk SSSR, No 2, Feb 58, p 94

"In connection with the decision concerning further development of scientific research in the field of high-temperature electrolysis, the Presidium has decided to reorganize the Laboratory of Electrochemistry of the Ural branch of the Academy of Sciences at Sverdlovsk into an Institute of Electrochemistry.

"The structure of the institute has been confirmed and the following fields of scientific development have been proposed: the study of electrochemical processes at high temperatures, including a study of the physiochemical properties of fused salts; clarification of the mechanism and kinetics of electrode processes on the boundary between metals and semiconductors (oxides, carbides) and fused substances; obtaining refractory metals from fused substances by means of electrolysis; improvement of existing and development of new electrolytic production methods, and the refining of a number of rare metals (zircon, titanium, beryllium, thorium, tantalum, and others); the study of high-temperature chemical sources of current with liquid and solid electrolytes; a systematic investigation of the problem of fuel elements to ascertain the possibility of the practical use of such sources of current; and the study of corrosive electrochemical processes at high temperatures, especially of molten electrolytes."

40. Soviet Supermicroscope Reported in Czechoslovak Press

"Visible Atoms" (unsigned article); Bratislava, Praca, 6 Mar 58, p 3

Soviet scientists have successfully observed individual atoms of barium by means of an electronic projection apparatus. The electronic projection apparatus is one of the types of supermicroscopes, planned and built by Soviet scientists and engineers. These microscopes magnify more than one million times.

The construction of the electronic projection apparatus is identical with a television orthicon tube. The new machine was destined primarily to study the surface of metals. However, it can also be used to observe and study molecules of many materials, such as phthalic cyanide, anthracene, and oxygen.

41. Ultrasonic Bathometer Used in Yugoslav Fishing

"Ultrasonics in the Search for Fish" (unsigned article); Belgrade, Borba, 24 Mar 58, p 3

Ultrasonic bathometers, the operation of which is based on the repulsion of ultrasonic waves from obstacles, and the automatic recording of the depth on a paper tape, have been used for several decades to measure the depths of seas, lakes, and rivers. It is difficult to conceive of a large passenger or cargo ship which is not equipped with such apparatus, since it is used to determine the relief of navigable routes and the location of reefs.

The Institute for Industrial Research (Institut za industriska istrazivanja) in Zagreb has made a prototype of a bathometer which was tested by measuring the depth of the Adriatic Sea at Boka Kotorska. The test was successful.

The first attempts to locate fish ultrasonically were made by the Japanese in 1935; the Norwegians also used ultrasonics in the search for cod. This apparatus was first adapted to deep-sea fishing, but it is now used for lake and river fishing; the first successful attempts at fishing with this apparatus were made on Plensko Jezero and Bodensko Jezero. The important feature in this type of fishing is that ultrasonics can adequately determine the number and depth of fish.

Tests have recently been made to determine, with the aid of this apparatus, the approximate number of fish caught in nets. The number of fish is indicated by short or long lines recorded on a special tablet. Use of the apparatus would shorten the time required for fishing operations, because the nets would be taken out only when they are filled with fish. Operation of the bathometer is quick and simple. One such apparatus is now being used on the Adriatic Sea.

VI. ENGINEERING

42. Self-Contained Inverter

"Self-Contained Inverter With Series Capacitors," by B. N. Vorotyntsev, Institute of Power Engineering and Automation, Academy of Sciences Uzbek SSR; Tashkent, Izvestiya Akademii Nauk UzSSR, Seriya Tekhnicheskikh Nauk, No 1, 1958, pp 5-22

The article describes an inverter in which a high degree of commutation stability is attained by connecting the commutating and compensating capacitors in series with the load. Such a self-contained inverter can be assembled with any suitable conversion circuit and does not require additional equipment. Experiments in this direction have been conducted on an extensive scale in the USSR (Scientific Research Institute for Direct Current, Ministry of Electric Power Stations) and abroad, with a view toward direct-current power transmission. The system of electric power drive with the variable frequency inverter was for the first time investigated at the Laboratory for Automatized Electric Drive of the Academy of Sciences Uzbek SSR.

The series connection of capacitors permits obtaining rather low operating frequencies, because the nature of the oscillatory system is such that it prevents a premature discharge of the capacitors through the transformer windings, which is not true in the case of a parallel inverter.

The desirable characteristics of the series-condenser inverter makes it useful as a controlled frequency generator.

43. Rhenium Discovered in Kazakhstan

"Rhenium Discovered in Kazakhstan" (unsigned article); Budapest, Technika, No 4, Apr 58, p 7

Through spectroscopic investigation, the Institute of Physics of the Academy of Sciences Kazakh SSR, has discovered rhenium in the Dzhezkazgan region of central Kazakhstan. The discovery is significant since it facilitates the production of rhenium for industrial purposes. This element can serve as a substitute for wolfram and molybdenum. Up to now, rhenium has been produced exclusively from molybdenite, which is extremely rare.

[SIR Note: This item confirms information on the discovery of rhenium deposits in Kazakhstan given in USSR sources.]

44. Czechoslovak 15-Mev Industrial Betatron

"The Czechoslovak 15-Mev Industrial Betatron," by Karel Rytina, Research Institute for Vacuum Electrical Engineering (Vyzkumny ustav pro vakuovou elektrotechniku) in Prague; Prague, Jaderna Energie, No 4, Apr 58, pp 85-92

This article describes the dimensions and performance characteristics if a 15-Mev industrial betatron, the prototype of which was built at the end of 1957 by the Research Institute for Vacuum Electrical Engineering in Prague, the "CKD Stalingrad" Plant in Prague, the Vrsovice plant of "Tesla" National Enterprise, the "J. Fucik" Plant of "Tesla," and the Electric Furnaces (Elektricke pece) Plant, at the end of 1957. The betatron is to be used for defectoscopy and for deep therapy.

VII. MATHEMATICS

45. Integrating Gyroscopes

"Equations for the Problem of Determining the Position of a Moving Object by Means of Gyroscopes and Accelerometers," by A. Yu. Ishlinskiy, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 6, Nov-Dec 57, pp 725-739

A particular case of the problem of autonomic determination of the position of a moving object is analyzed. First the case of a nonrotating sphere moving along an arc of circle with its center coinciding with the terrestrial center is solved. The solution is reduced to a differential equation of second order of the function $\alpha = \alpha(t)$, i.e., of the angle of inclination of the stabilized platform over the horizon. A more generalized solution yields a formula showing that the error in the described autonomic determination of the position of the moving body has an oscillatory character.

VIII. METALLURGY

[For information on metallurgy, see Item No 43.]

IX. MEDICINE

Bacteriology

46. Research on Brucellar Bacteriophage

"Lysogenesis in Brucella," by M. S. Drozhevkina and T. I. Kharitonova, Scientific Research Antiplague Institute [Rostov-on-Don]; Moscow, Voprosy Virusologii, Vol 3, No 2, Mar/Apr 58, pp 93-97

This article concerns experiments with 40 strains of various types of Brucella which were performed to determine what percentage of Brucella are affected by bacteriophage. Data obtained showed that a considerable percentage of Brucella cultures carry bacteriophage, which was isolated from 16 strains of Br. melitensis, 6 strains of Br. abortus, and 2 strains of Br. suis. Experiments were also conducted to find out whether "true" lysogenic cultures exist in Brucella. The presence of latent bacteriophage was tested in irradiation experiments. Results of the research are presented in a table and three illustrations.

The authors drew the following conclusions from the results of these experiments:

"1. Study of freshly isolated cultures and experimental investigation demonstrated extensive occurrence of lysogenesis in Brucella. Evidently lysogenesis and not bacterial lysis is the most prevalent form in which Brucellar bacteria and bacteriophage coexist.

"2. The presence of latent bacteriophage was successfully demonstrated by the irradiation method, and it was obtained in pure form from completely typical Brucella cultures which were apparently free from bacteriophage.

"3. The study of lysogenesis in Brucella revealed a direct relationship between the properties of the culture and the presence of latent bacteriophage in a number of cases."

Epidemiology

47. Incidence of Brucellosis Decreased in Saratovskaya Oblast

"Experimental Decrease in the Incidence of Brucellosis in Saratovskaya Oblast," by M. G. Lokhov, Saratov Institute "Mikrob"; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 28, No 9, Sep 57, pp 21-25

This article discusses brucellosis control measures in Saratovskaya Oblast from 1940 to 1956. Three periods are delineated: before the Soviet of Ministries issued a directive on 19 February 1949 entitled "Measures for Brucellosis Control"; after the directive was issued; and after mass prophylactic inoculations with dry live brucellosis vaccine were introduced into practice. It is mentioned that planned control work was done only after the Saratov Antibrucellosis Station was set up in 1940. The success of measures employed during each of these periods is evaluated according to subsequent decreases in the incidence of the disease.

Vaccination of the population with dry live brucellosis vaccine was begun in 1950; a sharp decrease in incidence ensued. An increase in 1952 and a severe epizootological situation warranted mass inoculation of the population in certain rayons; particular attention was given to populated areas in which persons had been infected with brucellosis during the previous 2 years and in which infection had been observed among sheep and goats. In one area containing cattle, sheep, goats, and swine, all persons occupied with handling any of these animals were vaccinated; where sheep and goats were kept separately from other animals, only persons who had had contact with the sheep and goats received inoculations.

A graph showing fluctuations in the incidence of brucellosis among humans, cattle, and sheep and goats from 1945 to 1955 is included. It is noted that only one inoculated person contracted brucellosis (3 months after inoculation). On the basis of these experiments, the author concludes that extensive inoculation of humans with dry live vaccine should be performed and should be accompanied by obligatory assessment of epidemiological and epizootological conditions. To achieve the best results in decreasing the incidence of brucellosis among humans, antibrucellosis measures should be taken among animals.

48. Epidemiological Characteristics of Plague

"The Problem of the Epidemiological Characteristics of Plague," by M. A. Mikulin, Central Asian Scientific Research Antiplague Institute; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Im-
munobiologii, Vol 28, No 10, Oct 57, pp 142-144

"An article by N. R. Dyadicheva, 'Epidemiological Characteristics of Plague and Tularemia Depending on the Means of Their Transmission,' was published in Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, No 3, 1957 (p 8). Not taking it on ourselves to examine in detail all the fundamental propositions expressed by the author in this article, we consider it necessary to mention that certain of his statements concerning epidemiological and epizootological characteristics of plague contradict well-known facts.

"For example, in characterizing the conditions under which plague foci exist in nature, the author writes: 'The existence of separate epizootic foci of this infection in regions with temperate climate is substantiated by the presence of definite species of rodents (tarbagans, susliks, etc.) that hibernate in the winter, during which time infection assumes a latent character by which survival of the pathogen in the organism of a warm-blooded host is guaranteed in cold weather. Meanwhile it is known that even in such regions of temperate climate as the Northern Cis-Aral, Ustyurt, and Mangyshlak, which are distinguished by a rather cold winter (not mentioning the bleak deserts of the Turkmen, Uzbek, and Kazakh SSRs), that large Gerbillinae--rodents which do not hibernate and which remain active during the whole year--stand out as the basic source of plague infection. It is quite evident that the mechanism of prolonged suppression of natural foci of plague in those areas with temperate climates cited above is an exceptional case and there is no basis for elevating it to the rank of a general law as the author has done.

"Furthermore it is not known on what basis Dyadichev includes transmission of plague via water among possible factors. All species of rodents which are carriers of this infection (or sources of infection, in the generally accepted terminology) in foci of so-called 'wild' plague do not drink water and frequently inhabit very arid regions. Only rats drink water more or less regularly, but not one case of transmission of the plague pathogen through water has been described in the literature for these rodents.

"Finally, it is completely incomprehensible what data prompted the author to assert so categorically that 'fleas are not long-term reservoirs of the plague pathogen; therefore, transmission of it from the flea to the organism of a warm-blooded animal occurs very rapidly and this pathogen leads the greater part of its existence in nature in the organism of the warm-blooded host.' This assertion by no means agrees with the long-established concept of how the plague pathogen circulates in nature.

It is generally known that rodents suffering from plague are capable of infecting fleas only during the period when massive bacteremia is observed in them. Depending on the degree of susceptibility of a given species or a given individual rodent, this period occurs at different lengths of time from the moment the rodent is infected, but in the overwhelming majority of cases this length of time is within the limits of the 2d-10th day following infection. It is true that cases are known in which a rodent contracts a protracted (chronic) form of plague, and exacerbation of the infection process and bacteremia occur after a longer period of time; however, such cases have been recorded as unique and are not characteristic of plague. Thus the plague pathogen in ordinarily found from 2 to 10 days after having entered the organism of a warm-blooded host. Having entered the flea organism, B. pestis cannot be 'very rapidly' transmitted again to a warm-blooded animal, if only for the single fact that the flea becomes capable of transmitting the plague pathogen following infection only after a so-called period of internal incubation (the time which elapses between infection of the flea and the formation of a preintestinal block) has occurred. This period, depending on the species of flea and a number of other conditions, fluctuates from several days to 7 months; for certain species, in the marmot flea, for example, it lasts for an average of about one month, (Bibikova), and for the rat flea, 15-21 days (Eski and Haas). We add to this the fact that it is not always possible for the flea to transmit B. pestis to a warm-blooded animal even after the preintestinal block has formed, and that B. pestis is usually preserved in the organism throughout the lifetime of the mature flea. The length of preservation of B. pestis in fleas is known under experimental conditions up to 396 days, and in nature up to 411 days.

"It is also astonishing that the author, while devoting his article to epidemiological characteristics of plague and tularemia, remains silent on such important epidemiological characteristics of plague as its capacity to occur in the pulmonary form in humans and to be spread rapidly in human groups in the air-droplet form. We submit that this epidemiological characteristic of plague is extremely important, not only for epidemiological characterization of this infection but also for correct planning of measures for the prevention and eradication of plague outbreaks among humans."

Hematology

49. Development and Modern Trends in Blood Transfusion Service in Czechoslovakia Reviewed

"Development and Modern Trends of Blood Transfusion Service in Czechoslovakia," by E. Dobryy, Ya. Fiyalo, and Ye. Gutfreyndova, Prague Institute of Hematology and Blood Transfusion (Director, Y. Kidery, Doctor of Medical Sciences); Moscow, Problemy Gematologii i Perelivaniya Krovi, Vol 2, No 6, Nov/Dec 57, pp 50-54

The authors briefly review the development of blood transfusion in Czechoslovakia from 1879 up to the present. Blood groups (ABO) and the Rhesus factor, and bacteriological control as well as aseptic conditions which have greatly improved transfusion results are discussed. It is stated that between 1950 and 1955 the total number of blood, plasma, and erythrocyte mass transfusions, have increased fourfold. Presently, the glucose-citrate solution is used exclusively as blood preservative. Experiments on dogs have proved that sodium-citrate (especially in large amounts) causes spasms in pulmonary capillaries and veins.

Experimental research supports the use of placental blood and also the use of retroplacental serum for gamma globulins. Preparations from dry plasma are used as universal means of transfusion.

Many institutions, especially surgical centers, use hemostatic preparations (fibrin sponge, fibrin film, fibrin powder, and dry thrombin) which at present are prepared only for scientific purposes at the Institute of Hematology and Blood transfusion (at Prague).

Emphasis is given to the use of albumin therapy in shock conditions and in hypoproteinemia, and to the necessity for improving the examination of donors, and the use of ion-exchange adsorbents for transfusion in cases of thrombocytopenia. The authors cite that Czechoslovak dextran is a more effective antishock preparation than other dextran preparations.

The authors conclude that in order to correctly understand the problems of blood preservation and the use of blood and blood substitutes and to correctly diagnose donors, it is necessary to understand the biochemical, the isoserological, the microbiological, and the immunological indexes of normal and pathological blood physiology and blood circulation, and also to understand the clinical field and internal medical significance of blood in an organism.

50. New Methods for Study of Blood Coagulation System Described

"New Methods for the Study of the Blood Coagulation System," by E. Sirmai (Budapest); Moscow, Problemy Gematologii i Perelivaniya Krovi, Vol 2, No 6, Nov/Dec 57, pp 38-44

Because factors influencing blood coagulation are of vital importance in all fields of medicine, it is important to determine the blood coagulation state accurately. Methods for the study of blood coagulation processes may be divided into three groups: micromethods, macromethods, and the use of special apparatus.

Blood coagulation factors studied using micromethods include prothrombin time, recalcification time, free blood heparin level, rate for blood thrombin inactivation, and the determination of factors V, VII, VIII, IX, and X.

Blood coagulation factors using macromethods include fibrinogen, prothrombin, thrombokinase, thrombocytokinase, calcium, and the determination of factors V and VIII, and the uptake of prothrombin.

Various reagents used in these determinations are enumerated.

The micromethods modified by the author make it possible to use very small samples of the original material for accurate determinations.

51. Factors Influencing Viability of Transfused Blood in Recipients' Blood Stream

"The Study of the Viability of Transfused Blood in the Blood Stream of the Recipient," by L. S. Shulutko, Leningrad Scientific Research Institute for Blood Transfusion (director, Docent A. D. Belyakov; and Scientific Leader, Prof A. N. Filatov, Corresponding Member of Academy of Medical Sciences USSR); Moscow, Problemy Gematologii i Perelivaniya Krovi, Vol 2, No 6, Nov/Dec 57, pp 45-50

Considering that preserved blood may be kept for long periods, the question of its biological wholesomeness after various periods of preservation becomes very significant. To determine blood viability, the erythrocytes of the preserved blood were tagged with Fe^{59}, S^{35}, and C^{14}, and the following three series of experiments were conducted on rabbits:

1. The effect of the length of preservation of blood on the viability of transfused erythrocytes in the blood stream of the recipients.

2. The effect of the composition of preserving solutions on the viability of transfused blood, (some new solutions were used, such as antiseptics, glucose polymers, saccharose, and alcohol) as compared with blood preserved in the usual glucose-citrate solution.

3. The relationship between the mechanism of inclusion of transfused blood into the general circulation, and the process of its deposition.

It was noted that blood preserved at negative temperatures had a higher viability than blood preserved at 4-6°C. Furthermore, results indicate that the viability of transfused blood depends on the composition of preserving solutions, the length of storage, and the initial state of the recipient. Highest viability was observed in freshly preserved blood (and this decreased with time), as well as blood preserved in glucose-citrate solution. Transfused blood was incorporated into the general circulation or deposited in the blood depots depending on the need for blood, i.e., less blood was deposited after blood loss than under normal conditions.

52. Problems of Immunohematology Studied

"The Present Status of the Problem of Immunohematology," by Prof A. Bagdasarov, Active Member of Academy of Medical Sciences, USSR; Moscow, Meditsinskiy Rabotnik, No 96, 29 Nov 57, p 2

Professor Bagdasarov touches on the immunological significance of the blood groups (A, B, AB, and O) and the problem of Rhesus-sensitization. It is stated that the Rhesus-antibody is fixed on the surface of the erythrocytes. Serological studies of leukocytes and thrombocytes conducted by the author and by B. M. Urinson prove that the leukocytes are carriers of A and B factors, just as the erythrocytes are. This same property is evident in the thrombocytes.

The principle of autoantigenicity with regard to autoagressive diseases is reviewed. Decreased incidence of posttransfusion reactions is attributed to testing donors' erythrocytes against recipients' blood for agglutination according to the Coombs' method

Finally the author thinks that the necessity of having a new branch of medicine--immunohematology is clear.

53. Comparative Study of the Properties of Thrombotropin, Ac-Globulin, and Factor VII Under the Effect of X Rays, Dicoumarin, and Temperature

"A Comparative Study of the Properties of Thrombotropin, Ac-Globulin, and Factor VII," by Ye. Ye. Shimonayeva, Moscow State University imeni M. V. Lomonosov; Moscow, Doklady Akademii Nauk SSSR, Vol 115, No 3, 21 Jul 57 pp 572-575

The aim of this research was to compare the properties of thrombotropin, Ac-globulin, and Factor VII and to explain their similarities and differences.

In vivo and in vitro experiments were conducted on albino rats. Thrombotropin concentration was determined according to the method of B. A. Kudryashov, Ac-globulin concentration according to Quick, and Factor VII according to B. Alexander and others. Conditions for studying these three factors included radiation sickness, injection of dicoumarin, and differing temperature effects. The results were as follows:

1. Results of 213 experiments on rats subjected to 500 r from X rays indicate that the concentration of Factor VII is decreased by 7-8 days after radiation sickness, that of Ac-globulin remains within physiological limits although slightly decreased, but that of thrombotropin remains at the preirradiation level all during the experimental period. At 9-10 days after irradiation the concentration of Factor VII is further decreased and the concentration of Ac-globulin is lowered to 53% of the preirradiation level. At 12-13 days after irradiation, the concentration of both Factor VII and Ac-globulin rises gradually and attains normal physiological levels by the 15th day.

2. Tests conducted on 180 rats injected with a solution of dicoumarin at 10 mg per 200 g body weight indicate that 24 hours after the injection of dicoumarin, both the Factor VII and thrombotropin disappear completely, while Ac-globulin remains within physiological limits all during the experiment (96 hours). Factor VII and thrombotropin begin to appear at 48 hours after the injection of dicoumarin, and attain the physiological level at 96 hours. The author concludes that the injection of dicoumarin disturbs the biosynthesis of Factor VII and thrombotropin, while that of Ac-globulin is undisturbed.

3. In vitro experiments were conducted on 75 rats; and oxallated plasma was used to study thrombotropin activity, plasma to which prothrombin was added was used to study Ac-globulin and serum was used to study Factor VII. Serum and plasma were warmed in a water bath to 45, 47, and 50° at which they were kept for 10 minutes. Results verify that Ac-globulin is most labile to temperature, for at 45° it loses more than half its activity, while no great changes occur in either thrombotropin or Factor VII. At 50° the activity of both thrombotropin and Ac-globulin was almost completely lost (7% of the original), while that of Factor VII was still significant (35% of the original).

These results confirm that thrombotropin, Ac-globulin, and Factor VII are three different components of the blood but they do possess certain common properties. Ac-globulin is the component necessary for the conversion of prothrombin into thrombin, and it is not identical with any of the other blood coagulation factors. Factor VII is similar to thrombokinase in a number of respects and probably is identical with blood thrombokinase.

Furthermore, these results prove that thrombotropin is not the cause for decreased blood coagulation in radiation sickness. These data agree with earlier results reported by B. A. Kudryashov stating that Ac-globulin does not exert a great influence on the disturbance of the process of blood coagulation during radiation sickness, nor does it belong to fundamental components in blood coagulation. Factor VII may be considered as one of the components whose decreased concentration in radiation sickness causes hemorrhage. Since the administration of dicoumarin decreases blood thrombotropin content and Factor VII, dicoumarin therapy should be strictly controlled by determining the concentration of thrombotropin and Factor VII.

54. Polish Hematological Society Holds Conference at Wroclaw on Heparin

"Eighth Scientific Conference of Polish Hematological Society" (from the Meditsinskiye Izvestiya) by Yu. I. Rafes; Moscow, Problemy Gematologii i Perelivaniya Krovi, Vol 2, No 6, Nov/Dec 57, pp 55-56

More than 500 people participated in the Eighth Scientific Conference of the Polish Hematological Society, held at Wroclaw on 17 February 1957.

The first report was entitled, "The Role of Heparin in an Organism," by Professor Kovarzhik. He proposed that heparin was manufactured in heparinocytes, i.e. basophilic cells of blood and tissues. It was stated that heparinemia, which accompanies hemorrhagic diathesis, may be met in clinical practice and that deficiency of blood coagulation in peptone shock may be due to heparin.

Zakshevskiy reported on the cytostatic effect of heparin which inhibits the growth of cell colonies. This effect was compared with the anticoagulation effect, although the two mechanisms are quite different.

A. Troyanovskiy reported on "Heparin in Surgical Clinic." Preparations related to heparin mentioned were "depoheparin, raritol, and trombotsid." The author describes an improved method of using anticoagulants during the postoperative period. Starting with the fourth day after the operation, first heparin is used, then dicoumarin, and "pelentan." Course of therapy is determined by prothrombin time (Quick's method).

Ye. Shchekilk reported on "The Use of Heparin in Internal Diseases." It was stated that heparin used as an anticoagulant decreases mortality by half. Heparin dose consists of 50 mg per day for 20 days. Heparin, is more expensive than dicoumarin, less accessible, and its effect is of a shorter duration, but it is less harmful.

In two cases of postoperative shock, it was shown that prothrombin level was very low; therefore, Feygin proposes that prothrombin level is of diagnostic significance with regard to the onset of thrombosis.

F. Labendinskiy, reporting on "The Influence of Certain Drugs on the Level of Heparin," noted that heparin level is decreased under the effect of ACTH and is increased under the effect of atropine.

A report by M. Feygin and others entitled "A Critical Evaluation of the Various Laboratory Tests Used for Anticoagulants" recommends a modification of Quick's method.

Other reports included the effect of heparin on blood lipids and the fibrinolytic effect of heparin. Finally, a possibility was mentioned for using heparin rectally, in the form of suppositories.

Immunology and Therapeutics

55. Growing Vitamin Therapy Stresses Therapeutic Importance of Vitamins B_{12} and C

"Therapeutic Use of Vitamins," by Prof V. Yefremov; Moscow, Meditsinskiy Rabotnik, No 98, 5 Dec 57, p 3

A short summary is given of the therapeutic use of vitamins A, B_1, B_2, and B_6. Vitamin PP is considered important in influencing the dynamics of nervous processes of the cerebral hemispheres. Its intensification and concentration effects on internal inhibition which are similar to those of bromine are important in the process of directing human behavior.

A rather detailed use of Vitamin B_{12} is summarized in this article. Vitamin B_{12} is used in treating pernicious anemia in doses of 15-30 gamma per day, but after the reticulocyte crisis is over it is administered once or twice per week. For very severe cases of pernicious anemia, 500, up to 750, and even 1,000 gamma of vitamin B_{12} are administered twice or three times per week. The usual method is intramuscular injections, but the peroral method is applicable also. It consists of vitamin B_{12} in combination with gastromucoprotein. Vitamin B_{12} may be combined with folic acid with favorable results. Vitamin B_{12} is effective in treating both hypo- and hyperchromic anemia. Vitamin B_{12} used alone or in combination

with vitamin B_6, thiamine, and riboflavin significantly speeds the regeneration of traumatized peripheral nerves and aids in the development of motor end plates in skeletal muscles close to the injured area. Finally, vitamin B_{12} is of therapeutic use in certain skin diseases, and in cerebral paralysis (Little's disease). Various therapeutic courses are prescribed.

The field of therapeutic use of vitamin C, which seems almost limitless, is establishing its significance in immunological processes of an organism and its resistance to various infections. It has been established by Soviet scientists, for example, that vitamin C deficiency disturbs the process of phagocytosis. During vitamin C hypovitaminosis, the compliment activity of blood serum is sharply decreased, the capacity for the formation of agglutinins in the process of immunization is depressed, and both the natural and acquired nonsusceptibility toward a number of infectious diseases is decreased. In addition, vitamin C deficiency is expressed in ulcerous diseases of the stomach, duodenum, and in achlorhydria and chronic enterocholitis. In each case vitamin C therapy is effective.

It has been proved that ascorbic acid inhibits the development of alimentary hypercholesteremia, and 300-500 and up to 1,000. mg ascorbic acid per day decreases the level of cholesterol and beta-lipoproteins of the blood.

During recent years extensive therapeutic use has been made of vitamin P preparations--rutin and catechins obtained from green leaves of tea and other plants. These preparations seem most effective in diseases accompanying decreased capillary resistance: capillary toxicosis, acute and subacute nephritis, hematuria, septic endocarditis, rheumatism, and hypertonic and hypotonic diseases with increased capillary permeability.

The author concludes that the field of vitamin therapy is constantly increasing in significance and the importance of vitamins B_{12} and C in this field is becoming increasingly more prominent.

56. Sensitization and Desensitization to Rh Factors Analyzed

"Sensitization to Rhesus Factor and Attempts to Prevent and Eradicate It," by Radoy Popivanov, Chair of General Biology (head, Prof R. Popivanov) Higher Medical Institute, Sofia; Moscow, Problemy Gematologii i Perelivaniya Krovi, Vol 2, No 6, Nov/Dec 57, pp 30-38

The author describes various experiments concerning the sensitization and desensitization toward the Rh factor. Graphs illustrate blood fluctuation of agglutination titer for anti-B and anti-Rh factors for women under various conditions. Two tables illustrate results of Rh-isoimmunization of Rh-negative recipients by blood transfusion from incompatible and compatible groups of Rh-positive blood.

The author makes the following conclusions:

"1. Antigens of the ABO and the Rh system are in a state of reciprocal antagonism and stimulation.

"2. This antagonism finds its expression in that in equal amounts the group antigens inhibit the appearance of the Rh antibodies. The described relations may change in favor of the weaker antigen, i.e., of the Rh factor, provided its injection is effected in a considerably larger dose than that of the group antigen.

"3. The relations of reciprocal stimulation are apparent in the fact that sometimes variations in the titer of Rh antibodies are of the same order with variations of the group antibodies. This was revealed on several occasions in the increase of immune group antibody titer at the moment the Rh antibodies make their appearance, and this despite the cessation of group antigen injection. Conditions influencing the development of this form of antigen relations are not yet clear." English abstract

57. Specialists in Drug Therapy of Cancer Needed Because of Increasing Number of Anticancer Drugs

"Prospects of Chemotherapy of Cancer," by Prof L. Larionov, Corresponding Member, Academy of Medical Sciences USSR; Moscow, Meditsinskiy Rabotnik, No 4, 14 Jan 58, p 3

Prospects for future chemotherapy of cancer are very promising. Surgical removal and radiation therapy of cancerous growths are inadequate without chemical therapy. While radiation therapy of cancer relies on only one physiological factor, i.e., the effect of penetrating radiation, chemotherapy is based on numerous possibilities commensurate with the product of different properties and mechanisms of a great number of chemical substances.

The author presents a long list of Soviet and non-Soviet drugs used in cancer therapy; some examples are urethane, neoembichin, mercaptopurine, TEF, TIOTEF, and E39.

The author believes that with the increasing number of anticancer preparations and the varied experimental and clinical experience needed before their official acceptance into therapeutic institutions, a new specialty has arisen -- that of oncologist-chemotherapist. The author finds it very desirable for some oncologists and therapists to devote their work to the new specialty which is the drug therapy of cancer, for if they do not, even the 30-odd existing drugs will not be used correctly.

58. Method of Preparing Dry Live Tularemia Vaccine Improved

"Improvement of the Preparation of Dry Live Tularemia Vaccine," by L. S. Kolyaditskaya and A. A. Shmurygina, Institute of Epidemiology and Microbiology imeni Gamaleya; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 28, No 10, Oct 57, pp 84-89

Following a brief description of how antitularemia vaccine was prepared from Gayskiy strain No 15 by aeration at the afore-mentioned institute prior to 1956, the authors of this article discuss a method of improving and accelerating this process. The experiments were based on Emel'yanova's studies of B. tularense dissociation on fish-cystine agar and blood media. It was assumed by analogy with other cultures (dysentery, diphtheria, etc.) that serial passage of B. tularense cultures on various media might have a negative effect on the characteristics of this organism and might induce dissociation. Protracted study of vaccine cultures at all stages of production afforded convincing evidence that culturing B. tularense on media other than yolk facilitates dissociation and affects the quality of the vaccine. The first table included in the text shows the extent of B. tularense dissociation in relation to culture media (four types) and culturing conditions.

Certain changes in production technology are suggested on the basis of these results. A series of experiments was performed under similar production conditions to verify the reliability of the results and to validate the proposed technological changes. Table 2 shows "content of immunogenic cells in tularemia vaccine prepared by the aeration method and depending on the medium on which the mother culture was grown," determined in these experiments. Coagulated yolk and fish-cystine agar media were tested.

The altered method was then used for actual preparation of a vaccine production series of dry live tularemia vaccine (series No 10-109). The quality of the vaccine produced was further evaluated by determining its biological action on the living organism. Results of inoculating guinea pigs with diluted vaccine 1:10 and 1:100 in relation to the content of immunogenic cells are presented in Table 4.

Analysis of all data collected in these experiments lead to the following conclusions:

"1. As a result of a number of serial passages, Gayskiy strain No 15 of B. tularense dissociated to a great extent during production of a vaccine by the usual method, and the content of immunogenic cells in the vaccine prepared from it was sharply decreased.

"2. Study of dissociation of the B. tularense vaccine strain on different culture media demonstrated that the minimum extent of dissociation occurred on coagulated yolk medium and the greatest quantity of immunogenic cells were preserved in the culture.

"3. Abbreviation of the steps in vaccine production and the use of a mother culture grown on yolk or combined medium yielded a preparation with a high content of immunogenic cells."

59. Production of Biologicals Increased at Odessa Institute of Epidemiology and Microbiology imeni I. I. Mechnikov

"Production of Dry BCG Vaccine Increased Significantly" (unsigned article); Kiev, Vrachebnoye Delo, No 4, Apr 57, p 447

The Laboratory for Drying Bacterial Preparations of the Odessa Institute of Epidemiology and Microbiology imeni I. I. Mechnikov has been enlarged and its number of refrigeration units increased. Also within the institute a laboratory for the production of gamma globulin has been organized. These two laboratories have produced good experimental results which are expected to increase the production of BCG; an improved method of producing dry brucellosis and tularemia diagnosticums has also been adopted. "The planned production of BCG and diphtheria anatoxin is to be doubled in 1957."

60. Unitol Used for Arsenic and Mercury Poisoning

"Use of the New Antidote Unitol for Poisoning With Arsenic and Mercury Compounds," by G. A. Belonozhko, V. I. Vitte-Drozdovskaya, Ye. I. Kefeli, and B. M. Shchepotin, Vrachebn. Delo, No 1, 1957, pp 87-88 (from Referativnyy Zhurnal -- Khimiy i Biologicheskaya Khimiya, No 5, 10 Mar 58, Abstract No 6789)

"Unitol was used for treating 25 patients admitted to a clinic for poisoning with arsenic compounds (Paris green, 'osarsol,' 'miarsenol,' and others), and mercury compounds (mercuric chloride, granosan, and others). Positive results were obtained. With the aid of unitol, it is possible to stop total intoxication and to prevent the development of complications."

61. Research Proves Importance of Thyroid Gland in Adaption Reactions of Organisms

"The Influence of Temperature on Phagocytic Activity During Regeneration Proceeding Under Conditions of Different Concentrations of Thyroid Hormone," by A. A. Voitkevich, Voronezhsk Medical Institute; Moscow, Doklady Akademii Nauk SSSR, Vol 115, No 3, 21 Jul 57, p 630-632

The aim of this research was to study the effect of external temperature on wound healing as judged by changes of histological structure of the periphery of wounds and the picture of the exudate at various periods of healing. Tests were conducted on 82 full grown albino rats. Ten days before the experiment, one group of animals was maintained at 8.5° C and the other group at 24.5° C. Changes in hormonal balance were induced by the administration of methylthiouracil (10 mg daily dose) and by thyreiodine, i.e., thyroxine (5 mg daily dose).

Results confirm the inhibitory effect of low temperature on the healing of wounds and on the activity of cellular elements in the wound exudate, especially in those animals to whom methylthiouracil was administered. Methylthiouracil decreased the level of thyroid hormone, lowered basal metabolism, and intensified inhibitory processes in the nervous system. On administration of thyreoidine (thyroxine), the level of basal metabolism sharply rose, and the process of healing injured tissue was speeded up significantly. The positive effect of thyroid hormone on wound healing was apparent during both high and low temperatures, but it was greater at the higher temperature although only during the first half of the healing period.

Histological slides indicate that low temperature exerts an inhibitory effect on the intensity of migration and differentiation of cellular elements during the first half of the healing period. This inhibitory effect of low temperature is more significant in those cases where the most important link in regulation of basal metabolism, the thyroid gland, is put out of service. Reparative processes in an organism were changed little by maintaining animals at different temperatures and experimentally changing the concentration of thyroid hormone.

62. Regeneration of Lymph Nodes Along Course of Functional Lymph Vessels and at Boundary of Uninjured Adipose Tissue

"Concerning the Regeneration of Lymph Nodes in Albino Rats," by A. I. Braude, Central Institute for the Advanced Training of Physicians; Moscow, Doklady Akademii Nauk SSSR, Vol 115, No 3, 21 Jul 57, pp 626-629

The present research is a study of the possibility of the regeneration of lymph nodes after their removal. Tests were conducted on 47 young albino rats whose lymph glands (the right and left lateral aortic, the superficial inguinal, and the axillary nodes) were removed.

Serial sections at the site of lymph nodes indicate the appearance of foci of lymphatic tissue around lymph vessels 4 days after the removal of right and left lateral aortic nodes, the appearance of migrating lymph vessels, the separation of secondary nodes from regenerating lymph nodes, and the growth of lymph vessels in future medullary substance of regenerating para-aortal nodes.

Results prove that regeneration of lymph nodes is possible only along the course of functional lymph vessels. This confirms the very important morphogenetic role of circulating lymph in the regenerating process of lymph nodes. Besides, regeneration of lymph nodes occurred only at the boundary of adipose tissue which was not injured during the operation.

63. Changes in Conditioned Reflexes Due to Low Barometric Pressure

"Changes in the Conditioned Reflex Activity of Dogs During Repeated Brief Exposures to Reduced Barometric Pressure," by L. I. Ardashnikova, Laboratory of General Physiology, Institute of Normal and Pathological Physiology, Academy of Medical Sciences USSR; Moscow, Zhurnal Vysshey Nervnoy Deyatel'nosti imeni I. P. Pavlov, Vol 8, No 2, Mar/Apr 58, pp 193-199

"This article deals with experiments conducted on four dogs to determine what conditioned reflex activity takes place in them during repeated ascents in a pressurized cabin to altitudes of 4,000, 5,000, and 6,000, meters. Results of the experiments revealed that changes which take place in the higher nervous activity depend on the peculiar course of the nervous processes in the cerebral cortex. These changes arise as a result of new relationships between exteroceptors and interoceptors, provoked by lower partial oxygen pressure, and also as result of protective inhibition due to the reduced efficiency level of the cortical cells in the presence of hypoxia. Slight changes in conditioned reflex activity, which disappeared during training, were observed in two dogs with strong nervous systems.

In the two other dogs, with weak nervous systems, the conditioned reflexes changed drastically at an altitude of 5,000 meters. Collapse of the higher nervous activity occurred in one dog at an altitude of 5,000 meters.

64. Effects of Cold Showers After Exposure to Heat

"Effect of Shower Baths on Restorative Period After a Person Is Exposed to Warm Microclimatic Conditions," by N. Ye. Skurat (Moscow), Laboratory of Industrial Microclimate of Institute of Industrial Hygiene and Occupational Diseases, Academy of Medical Sciences USSR; Moscow, Gigiyena Truda i Professional'nyye Zabolevaniya, No 2, Mar/Apr 58, pp 26-31

"Investigations were conducted under the direction of V. G. Davydov to determine the effects of shower baths on restoration of physiological functions of workers who were exposed to adverse consquences of warm microclimate. It was found that shower baths taken in 36° water by a person standing in an upright position, does not lead to restoration of body temperature, pulse frequency, and maximum arterial pressure. The feeling, in 50% of the cases, was that the water was excessively warm. Shower baths taken in 33° water led to normalization of body temperature and an interchange of gases and toned up the cardiovascular system somewhat. In the greatest majority of cases the reaction was agreeable. Shower baths taken in 30°-temperature water produced somewhat greater effects. However, the reaction in more than 50% of the cases was that the water was excessively cold."

65. Transfer of Conditioned Reflexes to Audible, Visualized, Self-Pronounced Words

"Study of Relationships Between Audible, Visualized, and Self-Pronounced Words," by F. I. Ivashchenko, Chair of Pedagogics and Psychology, Stavropol Pedagogical Institute; Moscow, Zhurnal Vysshey Nervnoy Deyatel'nosti imeni I. P. Pavlov, Vol 8, No 2, Mar/Apr 58, pp 175-181

"On the basis of data obtained as a result of experiments conducted on ten adults 17-18 years old and ten children 10-11 years old, with the aid of Ivanov-Smolenskiy method, it was possible to determine the extent that a word pronounced by the subject himself, an audible word, and a visualized word can successfully replace one another in developing a conditioned reflex. The transfer from the audible word to that pronounced by the subject himself was observed in 70% of the cases and to the presented visually in 90%. A transfer of conditioned reflex from a word pronounced by the subject to a word of similar meaning, but presented

orally or visually, occurred in 10% of the subjects experimented with. Although it cannot be said that results of these experiments produced conclusive answers, it is apparent from the data collected that the effectiveness of the audible word is considerably higher than that of the word pronounced by the subject himself."

66. New Visual Acuity Meter Described

"Determination of Illumination Conditions and Fatigue by Measuring Vision," by Z. A. Ziombrovskaya (Moscow), Laboratory of Hygiene of Illumination, Institute of General and Communal Hygiene, Academy of Medical Sciences USSR; Moscow, Gigiyena Truda i Professional'nye Zabolevaniya, No 2, Mar/Apr 58, pp 36-41

Several experiments were conducted with the aid of polarizing binocular visual acuity meter of L. L. Dashkevich (PBIV) in order to determine visual fatigue during work by measuring vision. Results of the experiments showed that fatigue increased at the same time that work output and visual acuity decreased. It was noted that visual acuity at first increased and for a time remained approximately constant. The duration and severity of fatigue depended on duration of stress, intensity of visual work, condition of illumination, and the general condition of the subject.

"One experimental model of the PBIV was received by the Laboratory of Hygiene of Illumination of the Institute of General and Communal Hygiene and was tested under both laboratory and working conditions. The apparatus appeared to be practicable, convenient, and accurate in determining changes in visual acuity and visual fatigue and considerably superior to other apparatuses of this type previously known. This portable apparatus is simple, easy to use, and differs from the latest types of visual acuity meter of American make because it does not need a supplementary light source.

A photograph of the device illustrates the article.

67. Slovak Paper Contains Additional Information on Soviet Find of Third Reflex Type

"Third Type of Reflex Discovered" (unsigned article); Bratislava, Lud, 14 Feb 58, p 1

According to a Tass report, the Soviet physiologist Leonid Krushinskiy, professor at Moscow University, announced that he had succeeded in identifying a new type of reflex while he was studying animal reflex activity. On the basis of the scientific experiments, he concluded that animals have a third type of reflex, which he calls extrapolated, besides the conditioned and nonconditioned reflexes discovered by Pavlov.

According to his viewpoint, this type of reflex is the basis of mental action, the ability of highly organized living creatures to create an image of the entire process, to compare individual phenomena, and to predict future events on the basis of perceptive thought organs.

Professor Krushinskiy expresses the opinion that the recognition of the new reflex will promote a more effective fight against nervous diseases.

Nadezhda Ladyginova, Doctor of Biology, declared in a conversation with Tass correspondents that the research activities of Professor Krushinskiy have a great scientific and practical significance. She said that Professor Krushinskiy presents a new, very incisive and simple method for the study of animal behavior and positively answers the question of whether animals can form ideas.

The well-known mathematician, Professor Alexey T'apunov, announced that the knowledge of the mechanism of extrapolation in living creatures also offers mathematicians the possibility of a new attitude to the solution of important problems in the field of cybernetics.

Very soon, a cybernetic-physiological laboratory is supposed to be established in Moscow University.

68. Gelatin Foam Filter for Detecting Virus Aerosols

"Detection of a Virus Aerosol With a Gelatin Foam Filter," by S. S. Rechmenskiy and V. P. Mitchenko, Institute of Infectious Diseases; Moscow, Voprosy Virusologii, Vol 3, No 2, Mar/Apr 58, pp 101-103

"The study of biological and colloid-chemical properties of a virus aerosol is highly significant for explaining not only the mechanism of transmission of influenza, but also a number of characteristics of the pathogenesis and immunogenesis of this infection.

"This task has been experimentally resolved by using a model virus aerosol created in a hermetic chamber. Precise apparatus is employed to record the aerodynamic properties of similar aerosols, and a variety of virological investigation methods are used to determine biological characteristics.

"Methods of 'sampling' a virus aerosol assume great significance for biological analysis of the aerosol. Various apparatuses, for example, the Rosebury impinger (1) and the Rechmenskiy virus sampler (2, 3), are used for these purposes.

"Testing of sponge filter made of gelatin foam as a 'trap' for virus aersol was included among objectives of this research; the filter was prepared by A. Ye. Vershilova in accordance with Mitchell's formula (4, 5).

"Gelatin sponges are superior because of their solubility. Therefore, by using an aerosol sample obtained with the sponge alone, it is possible to perform various serological reactions. Simultaneously it is possible to carry out quantitative determination of both the aerosol cloud absorbed by the filter and of the virus contained in this portion.

"Method of Investigation. A model virus aerosol was created in a hermetic glass flask (volume 10 liters; see illustration). As a result of preliminary experiments, a model virus aerosol which was kinetically rather stable and consisted of fine-caliber droplets was formed.

"The first aerosol sample was collected from the chamber no sooner than 5-10 minutes after dispersal of the virus suspension. Subsequent samples were collected every 15 minutes.

"A glass apparatus of the 'Chicago' type was used for dispersion. The aerosol was collected in a special metal funnel of Vershigora construction. A sponge filter of gelatin foam in the form of a mushroom (stem 25 cm, cap 30 cm) was attached to the opening [of the funnel]; the filter was previously weighed with analytical weights. Aerosol from the chamber was drawn through the filter into the flask at the rate of 3 liters per minute with a low-power electric air pump.

"After withdrawal of an aerosol sample, the gelatin sponge was removed from the flask and again weighed with analytical weights. The weight of the droplet aerosol 'absorbed' by the gelatin sponge was determined by the weight of the sponge before and after the experiment.

"The gelatin sponge, slightly enlarged from the absorbed portion of aerosol, was dissolved in a phosphate buffer (pH 7.14). The sponge solution obtained was used to determine the influenza virus in it by the hemagglutination reaction and infection of chick embryos.

"Influenza virus type A, strain PR-8, adapted to chick embryos, was employed in the experiments. The virus was cultured on 11-day embryos.

"Allantoic and amniotic fluid from the preceding passage was used for infection in a dilution of 10^{-5} and a volume of 0.2 ml. The infected embryos were incubated at 37° for 48 hours.

"The allantoic fluid containing influenza virus with a titer of 1:2,048 according to the hemagglutination reaction was dispersed in an amount of 0.3-0.5 ml into the air space of the chamber; indexes of temperature and humidity in the chamber were then recorded.

"Results of a series of preliminary experiments, presented in the table below, demonstrate the suitability of gelatin filters for detection and quantitative calculation of a virus aerosol. The aerosol was almost completely absorbed by the gelatin filter and the activity of the virus in the gelatin foam solution was comparable to the activity of the initial virus suspension."

Conclusions

"1. The effectiveness of the trapping capacity of gelatin filters with respect to influenza virus in a droplet-aerosol state was determined.

"2. Influenza virus in a droplet-aerosol state, 'absorbed' by a gelatin sponge, preserves its biological characteristics.

"3. The use of gelatin sponges as filters makes it possible to determine by weight the portions of aerosol absorbed by them and to establish the extent to which biological activity is maintained in this portion of the virus in relation to the whole volume of aerosol in the air space of the chamber."

An illustration of the apparatus and the following table are included in the article:

	Experiment No 1	Experiment No 2
Wt of gelatin sponge (mg)		
Before experiment	1.747	1.047
After experiment	1.816	1.135
Percent of "trapping" of influenza virus aerosol by gelatin sponge	99.8	93.7
Biological activity of influenza virus		
Before adsorption on gelatin sponge		
Virus titer according to hemagglutination reaction	1:4,096	1:2,048
Infection titer for embryos	10^{-6}	10^{-6}
After adsorption on gelatin sponge		
Virus titer according to RGA	1:4,096	1:8,192
Infection titer for embryos	10^{-6}	10^{-6}

69. Planned USSR Medical Research for 1959-1965

"Long-Range Draft Plan for Development of Medical Science in the USSR During 1959-1965," by Corresponding Member of Academy of Medical Sciences USSR D. A. Zhdanov, Deputy Chairman of the Scientific-Planning Commission of the Presidium of the Academy of Medical Sciences USSR, Zdravookhraneniye Belorussii, No 4, Apr 58, pp 11-17

"The Presidium of the Academy of Medical Sciences USSR has compiled a long-range draft plan for scientific research in the most important fields of medical science. This long-range draft plan will be incorporated into the Seven-Year Plan (1959-1965). The present-day achievements in physics, chemistry, and biology will serve as groundwork for this plan. The draft plan for medical research, during the period 1959-1965, will be discussed at the April session of the Academy of Medical Sciences which will be held in Minsk. The following major subjects will be discussed at that session: Distribution of a network of scientific research establishments in various parts of the country, expediency of organizing affiliates of the Academy of Medical Sciences in each union republic, consolidation of certain scientific research institutes with chairs of medicine, forms of coordination of research work in the institutes of the Academy of Medical Sciences, chairs of medicine, and scientific research establishments of union republic subordination.

"After the plan is confirmed by the Academy of Medical Sciences, it will be sent to the scientific medical councils of the Ministries of Health of union republics and will serve as a basis for each of them to formulate their own long-range Seven-Year Plan of scientific medical research, conducted by medical institutes and other scientific medical establishments of union republic subordination. The Ministries of Health of each union republic must give priority to scientific medical problems that are of significance to their own area and tackle problems that flow out of regional peculiarities and are closely connected with practical needs of health service to their population.

"The draft plan calls for examination of 48 most important medical problems. The prevailing trends in research in 286 special fields are earmarked for examination. All efforts of scientists will be directed toward developing scientific principles of vaccine and serum production and toward production of synthetic and semisynthetic culture media for manufacture of new composite bacteriological preparations, anatoxins, and vaccines for use in immunization against certain infections.

"Vigorous growth of all segments of the USSR economy and steady increase in national wealth were reflected in the improved living standards and health of the Soviet population. The efforts of medical scientists and drug researchers have been continually directed toward making new discoveries and exploring a number of medical frontiers. The thinking of the Academy of Medical Sciences USSR, the scientific research institutes, health departments, and chairs of medical institutes has been channeled toward anticipated influences of future economic growth of the USSR. Therefore, a planned and purposeful scientific research program is necessary to broaden the scope of medical knowledge and is expected to result in discovery of more effective drugs for prevention and treatment of many diseases.

"The principal items that will be incorporated into the Seven-Year Plan for Development of Medical Science in the USSR are discussed below.

"Incidence of dysentery and other enteric infections must be reduced during 1959-1965. It is necessary, therefore, to continue search for methods of rapid diagnosis of those infections, taking into account the general shifts and mutations in species and types of organisms that cause dysentery. To seek out new, effective preparations for specific prophylaxis of dysentery research must be carried on to explore the effects of various factors on general resistance of the human organism and the mechanism of formation of immunity to dysentery. Experiments must also be conducted to find out if immunity can be developed against salmonellosis.

"Pathogenesis, clinical picture, and therapy of enteric infections among infants is still very important. Morbidity rate among infants due to those infections is still very high.

"Reduction in incidence of children's diseases will be given a leading place in the Seven-Year Plan. It is planned to reduce incidence of diphtheria to one-third and poliomyelitis to one-third or one-fourth of the present incidence. Attempts will be made to solve many questions dealing with pathogenesis of diphtheria and its complications. Improved methods of immunization against diphtheria must be discovered. Attempts will be made to find ways of limiting incidence of whooping cough. Research workers have before them the problem of discovering the role that allergenic component plays in the pathogenesis of whooping cough, effectiveness of treatment with antibiotics, hyperimmune serums, and gamma globulin obtained from organisms infected with whooping cough. The most important trend is discovery of improved methods of preparing composite vaccines and the study of effects of preventive vaccination on the organism of children, especially infants.

"Incidence of measles may be limited only by discovering new methods of active immunization. Etiology, pathogenesis, and immunology of scarlet fever must be clarified and more light must be thrown on the role that streptococcal allergen plays in the pathogenesis of the disease. New and effective methods of active immunization against scarlet fever must also be found.

"Some progress has been made in the past few years in solving influenza and acute catarrh of the respiratory tract. Live vaccines and immune serums have been used successfully. However, the problem of influenza control cannot be considered solved, and the morbidity rate due to influenza and acute catarrh of the respiratory tract is still very high. For that reason studies of etiology of influenza, mutations of the organism that causes it, development of early and rapid methods of diagnosis of the disease, and improvement of methods of preparing and administering influenza vaccines have an important place in the plan.

"The role that adenoid viruses play in the pathology of man must be clarified and methods of diagnosis, prevention, and treatment of diseases caused by adenoid viruses must be developed. The role of influenza in the pathogenesis of both the infectious and noninfectious diseases must be pinpointed. All these problems have close relationship to training of virologists and to scientific virological establishments.

"The problem of etiology, pathogenesis, treatment, and prevention of angina and chronic tonsillitis is far from being solved. Scientists of various specialties must strive to develop methods of differential diagnosis of epizootic anginae and exacerbation of chronic tonsillitis. It is also necessary to discover methods of prevention and treatment of complications that may develop as a consequence of angina and chronic forms of tonsillitis, such as rheumatism, diseases of cardiovascular system, chronic sepsis, and kidney diseases.

"Knowledge of the role that viruses, streptococci, and streptococcal anginae play in the etiology of rheumatism is necessary. Studies must be carried on in the field of early diagnosis of rheumatism and methods must be found in making early diagnosis of rheumatic process, the nature and significance of allergy due to rheumatism and to general and infectious polyarthritis.

"There has been a sharp decline in incidence of tuberculosis in the USSR. Mortality rate due to tuberculosis dropped 90% during the past 40 years. Improvement in living conditions and in personal hygiene of the population has contributed to drop in the mortality rate. New specific methods of treatment and vaccination of children against tuberculosis will

make it possible to eradicate tuberculosis in the USSR completely by the end of 1965. Chemicals may hold the key to recovery from tuberculosis and may prevent relapse. Knowledge of resistance of causative organisms to a particular chemical, elimination of secondary effects of chemicals, and improvement in methods of surgical treatment of tuberculosis are of particular significance.

"More people die as a result of the disease of the cardiovascular system than from any other disease. The Seven-Year Plan will contain provisions for research on hypertonia and on the effects of emotional stress on the origin of that disease. In exploring the possibility for preventing hypertonia it is necessary to have more light thrown on the peripheric pathogenic conditions that follow the initial effects of nervous activating mechanisms, make a survey of the conditions that existed prior to onset of hypertonic conditions, make a note of the action of the compensatory mechanisms of hypertonia, and clarify reversibility of hypertonia during various stages and forms of the disease, taking into consideration the effects of therapeutic agents administered.

"The causes for disturbance in cholesterol and lipoprotein metabolism in the pathogenesis of atherosclerosis and the relationship between nutrition and improper metabolism and the development of that disease has not yet been sufficiently investigated. An item must be inserted into the plan covering research work in 'regional epidemiological atherosclerosis.' Experimental and clinical research must also be carried on to find active methods of diagnosis, treatment, and prevention of atherosclerosis during the so-called preclinical period of the disease.

"Research will be conducted, during 1959-1965 in developing new methods of diagnosis of initial forms of coronary insufficiency, clinical observation of various forms of cardiosclerosis and myocradial infarction. Surgical and other new methods of treatment and prevention of coronary insufficiency must also be investigated.

"A study of etiology, pathogenesis, early diagnosis, improved methods of treatment and prevention of cancerous tumors, and organization of cancer research will have an important place in the plan. The role of cancerigenic factors of immediate environment and the role of viruses in the formation of tumors will also be taken up. Recognition must also be given to development of new methods of diagnosis of initial forms of cancer and use of the newest histochemical and biophysical methods of research, as well as to improvement of surgical, radial, and combinative methods of treatment of the disease. Development of chemotherapy and hormonotherapy will receive special attention. Further research will be conducted to determine the significance of some diseases in the development of malignant formations in man and prevention of those malignant tumors.

"Clinicists and hygienists will jointly conduct studies on air pollution and contamination of food with cancerous substances and propose ways and means of elimination of harmful cancerous substances from the immediate environment of man. Statistical data will be collected which would assist in formulation of effective measures of cancer control and in the study of regional peculiarities of incidence and spread of malignant tumors.

"Prevention of traumatism in the most important branches of industry, agriculture, and sports will be provided by the plan. Studies in the fields of regeneration of tissues of various organs and transplantation of tissues will be coninued. Improved methods of preservation of tissue and organs for transplantation will be investigated.

"The plan will also cover the study of burns and improvement of treatment of burns by grafting skin, perfusion of blood, heteroserotherapy, etc. Further studdes must be conducted to improve methods of osteosynthesis in the treatment of bone fractures and biological methods of speeding up consolidation and stimulation of formation of osseous callosity.

"The greatest attention will be given to pathogenesis of diseases caused by radiation and to development of new medicaments for prevention and treatment of those diseases. It is important that research be conducted on radiation injuries that are accompanied by shock, loss of blood; by burns and frostbite; and open and closed injuries. The effects of ionizing radiation on immunity and microbial and virus diseases; problems of radiation hygiene; and radiotoxicology will also be investigated.

"Research in industrial hygiene and occupational diseases will take into account new techniques and technological prosesses such as automation, electronics, and chemical substances. Considerable attention will be given to physical factors of industrial production, effects of radioactive substances on the organism, fields of high and ultrahigh frequencies, ultrasounds, noises, and vibrations. Research will not be confined to preventive measures alone, but also to diagnosis and treatment of silicosis and other pneumoconiosis infections.

"The plan will contain provisions for study of fatigue, both mental and physical, and of proper work and rest regimens, taking into consideration the transition of industry and agriculture to mechanization and push-button operations.

"The plan must contain suggestions for solution of problems in hygiene and sanitation that may arise in populated places due to new housing projects and reclamation of lands in various climatic zones of the USSR. It is expected that the following proposals and recommendations will be made by research workers in hygiene and sanitation: creation of favorable living conditions in the areas of the far north of the USSR; protection of soil in populated areas; prevention of air pollution in cities and in industrial centers; clarification of national standards dealing with the quality of drinking water and prevention of pollution of reservoirs; promulgation of sanitary regulations dealing with decontamination and utilization of stagnant water for irrigation of fields; amending zoning regulations; proper arrangement of kolkhozes and sovkhozes; protection against overheating in hot climates of the USSR and against cooling in cold areas of the Arctic; requirements in construction of new buildings and hospitals; proper clothing and footwear applicable to various regions and climates.

"Differential standards of nutrition must be developed for various geographic areas of the country. Studies must be carried on to further determine the role that different kinds of fats play in the development of atherosclerosis, the part that nutrition plays in pathogenesis of various diseases and in premature aging of the human organism.

"Although workers in the chemical industry have a special diet which they must observe, no special diets have yet been proposed for people who come in contact with ionizing radiation, for those working in mines and exposed to quartz dust, or for other professions and trades. Tests will be made of food products that were treated with chemicals to determine if they contain toxic substances. Experiments will also be conducted in connection with new methods of food preservation.

"Problems in morphology will be explored with the idea of inquiring into general regularities of morphogenesis under normal conditions as well as under morbid conditions. Histochemical relationships between the structure and function of tissues will also be investigated. Application of the newest methods of scientific research (biophysical, histochemical, microspectroscopical, etc.) will make it possible to determine the functional morphology of the heart, blood vessels, and lymphatic system under both normal and pathologic conditions and to follow the growth and development of the living organism as a whole.

"In biochemistry, the structure, biosynthesis, and metabolism of the most important proteins will be investigated. Problems in immunochemistry, particularly involving the mechanism of formation of antibodies, will also be explored.

"Planned search for new pharmacological and chemotherapeutic preparations will continue. The following new drugs will be looked for: preparations for prevention and treatment of cardiovascular diseases, preparations against fungus infections, hypotensive preparations, stimulants of nervous activity, sedatives, vitamins, anticoagulants, curare-like substances, cardiac glucosides, antidotes, antirheumatic preparations, hormones, and antiparasitic preparations. Great efforts will also be made to discover new antibiotics that possess antibacterial, antifungoid, antiviral, and anticancerogenic action. Secondary effects of antibiotics will also be investigated and their activity in combination with chemotherapeutic substances, vitamins, and hormones will be probed.

"Successful solution of problems that are indirectly connected with medicine will inevitably result in the development of major medical and biological theories. In connection with that, the study of physiology and pathology of the higher nervous activity is of primary importance. This will be based on the materialistic application of classical Pavlovian teachings.

"And finally, the following will be incorporated into the plan: studies to broaden knowledge concerning types of nervous systems; examination of the mechanism of the most complicated nonconditioned reflexes and relationship between the cortex and the subcortical parts of the brain; profound study of characteristics of the principal nervous processes involved in stimulation and inhibition and relationship between them; investigation of dynamic localization of the functions that take place in the cerebral cortex and of the coordinating operation of the cerebral cortex so as to discover how the brain as a whole performs its functions."

70. Initial Effects of Ionizing Radiation on an Organism

"Clinical Course of Initial Stages of Chronic Effect of Ionizing Radiation on the Organism," by E. A. Drogichina, N. K. Byalko, I. A. Gel'fon, N. I. Ivanov, M. A. Kazakevich, T. B. Linevich, V. G. Osipova, V. I. Stepanova, M. N. Ryzhkova, Ye. A. Solov'yeva, and L. G. Tsenterova (Moscow), Institute of Industrial Hygiene and Occupational Diseases, Academy of Medical Sciences USSR; Moscow, Gigiyena Truda i Professional'nyye Zabolevaniya, No 2, Mar/Apr 58, pp 3-8

"Diagnosis of the initial stages of radiation sickness is very difficult because no significant specific symptoms can be observed during the early stages of that illness. Observations of a group of people working in scientific research institutes and in industrial establishments revealed that diagnosis of initial stages of chronic radiation sickness must be based on many-sided and thorough medical examinations as well as on results of detailed study of the working conditions of each patient.

"The syndrome during initial stages of the illness, caused by ionizing radiation, is quite polymorphic: it is characterized by functional shifts in various organs and systems as the illness develops. The symptoms that become manifest during early stages of chronic radiation sickness consist of changes in hematopoiesis (reticulocytosis, prolonged period of hemmorrhage, relative lymphocytosis, and leukopenia), change in vascular permeability, improper metabolism (dissociation of protein fractions, increase in histamine content, decrease in chlorides in blood, and a lowering of cholinesterase activity, and functional shifts in the nervous system. Very severe cases are characterized by persistent vascular disturbances.

"Appropriate therapeutic measures must be prescribed soon after symptoms of the effects of ionizing radiation become evident. If those symptoms persist, it is necessary to transfer the patient to some other work where he would not come in contact with radioactive substances.

"Complex therapy was effective when utilized during early stages of illness. It consisted of administration of calcium gluconicum, vitamins B_1 and C, nicotinic acid, small doses of bromide with caffeine and sedatives."

Radiology

71. "Roentgenophosphene" Term Suggested for Light Sensation Caused by X-Rays

"Roentgenophosphene," by M. Taguena, Ceskoslov, Ofthalmol., 1957, 13, 2, 86-89 (Czech) (from Meditsinskiy Referativnyy Zhurnal, No 7, Section 2, Jun 57, p 149)

"Data from literature and also personal observations support the view that the eyes are sensitive to roentgen rays. Roentgen rays falling on the retina cause a sensation of greenish or yellow-greenish light. Analogous light sensations can be caused by other inadequate stimulants (electric current, ultraviolet light, and ultrasonic waves). The author attributes the cause for this light sensation to the ionizing effect of X rays which is analogous to the ionizing effect of an electric current, and of ultraviolet rays falling on the retina.

The author suggests the term "Roentgenophosphene" for this sensation of light caused by roentgen rays falling on the retina."

72. Tagged Atoms Used at Tbilisi Institute in Urology, Oncology, Hematology, and Surgery

"With the Aid of Tagged Atoms," by V. Vol'skiy; Moscow, Meditsinskiy Rabotnik, No 99, 10 Dec 57, p 4

Great activity is described at the Tbilisi Scientific Research Institute of Experimental and Clinical Surgery and Hematology, under Prof K. Eristavi, Active Member of the Academy of Medical Sciences, USSR, and the director of the institute. The following summarizes the work of some of the institutes:

Isotopes are studied in the division of radiology, director, T. Zhvaniya, Doctor of Medical Sciences. By using isotopes, or tagged atoms, new methods are being developed for the early diagnosis of a number of diseases of the urinary excretory system, both under experimental conditions and also at the urological clinical institute. Another important research is the study of the influence of prolonged sleep induced by hibernation and hypothermia on the morphofunctional shifts in an organism under the effect of radiation sickness. As a result of research by this division, very interesting structural changes in the nervous system following skin cancer induced in albino mice have been described by R. Bulusashvili. The results indicate that long before the appearance of tumors, structural changes appear in the peripheral and central branches of the nervous system. These changes appear not only in the nerve fibers of the pertinent part of the

skin, but also in the ganglion cells of the central nervous system. An interesting conclusion concerning the function of the thyroid gland states that thyroid hyperfunction speeds the development of tumors, while hypofunction retards it.

At the division of oncology, for the first time, experimental tumors in the kidneys have been produced by the direct injection into the organ of 9,10-dimethyl-1,2-benzanthracene solution. Heterotransplants of human tumors on hamsters have resulted in cancer, also.

Active research, continues in the field of hematology, especially for solving the problem of nervous regulation of hemopoiesis. Such research over a period of many years establishes the nerve-receptor relationship between bone marrow and various parts of the gastrointestinal tract. Pathological changes in the function of the stomach result in changes of circulatory function leading to various forms of anemia. Prolonged (a year and a half) stimulation of gastric receptors brought about chronic macrocytic anemia and other forms of anemia, i.e., leukosis and hemorrhagic diathesis were induced experimentally. Research continues on the effect of destruction and stimulation of various parts of the central nervous system on hemopoiesis.

Along with the study of numerous theoretical problems, new methods of analysis are developed, among them a new computer for the simultaneous calculation of the formula for white blood cells, and the cellular elements of the bone marrow. This computer, although officially recognized, is used only at Tbilisi where it is prepared.

An example of advanced research in surgery is the original method of operation, by Professor Eristavi, to restore the flow of bile into the gastrointestinal tract after the complete removal of gall bladder and the common bile duct.

Other problems under intense study are the pathology of the heart and major blood vessels and the application of hypothermia in treating burns of various degrees and extent.

Surgery

73. Skin Grafts Taken From Corpses Prove Effective in Treating Burn Victims

"Concerning Skin Grafts During Burns," by Prof D. Arapov, Moscow, Meditsinskiy Rabotnik, No 21, 14 Mar 58, p 3

It is known that profound and extensive burns give rise to so-called burn disease which is characterized by shock, loss of plasma, toxemia, and infections. Each of these factors in extensive burns may lead to fatal danger. However, this danger is diminished in accordance with the speed of covering the surface deprived of its skin. The best skin grafts are those taken from the victim himself, but when this is not possible, external sources must be relied on (although keeping in mind that even mother-to-child grafts often do not take root).

One may doubt the usefulness of skin grafts that are known not to take root, but this is justified by the fact that in cases of severe burns the dangerous factors (loss of plasma, toxemia, and infections) are checked and overcome by skin grafts from external sources, and time is gained for repeated transplants while the burn victim is recovering. For this purpose, the author highly recommends the use of skin grafts taken from corpses and used for victims of severe and extensive burns.

The next problem to solve is the process of preserving skin transplants so that fresh skin will always be available when necessary without resorting to healthy people for donors.

74. Book on Congenital Defects of the Heart and Major Blood Vessels Published

"Atlas of Congenital Cardiac Defects" (unsigned article); Moscow, Meditsinskiy Rabotnik, No 99, 10 Dec 57, p 4

This article describes a book entitled Vrozhdennyye Poroki Serdtsa i Magistral'nykh Sosudov (Congenital Defects of the Heart and Major Blood Vessels), by A. D. Dzhagaryan, Candidate of Medical Sciences.

The book is subdivided into three major parts:

1. Anomalies of interauricular and interventricular septa, and conditions leading to a three-chambered heart (due to the absence of interauricular septum).

2. Anomalies of cardiac valves such as aortopulmonary flaws, stenosis of pulmonary arteries, ductus arteriosus, and Fallot's tetralogy.

3. Anomalies of the development of the aortic arch, for example, cases of twin arches and their structure.

The last chart in the book is of special interest to surgeons for it demonstrates a very simple way of opening the heart for careful study of cardiovascular pathology.

There are more than 100 color plates giving details of various defects of the circulatory system.

The author expresses his gratitude to Prof A. A. Vishnevskiy who assisted in the editing of this book and also wrote its preface.

75. Bone Chips Preferred Over Whole Bones for Transplantation Purposes

"Homoplastic Transplantations in Traumatology," by M. Panova, Senior Scientific Associate of Central Institute of Traumatology and Orthopedics; Moscow, Meditsinskiy Rabotnik, No 96, 29 Nov 57, p 3

The author reviews the subject of tissue transplantation. The method of quick and deep freezing (-30° to - 35° C) and storage at -3 to -4° C is recommended. The use of bone chips grafted onto bone is preferred over whole bones because a greater surface area for bone regeneration is thus created. Recently, a special laboratory has been created at the Central Institute of Traumatology and Orthopedics for the preservation of homotransplants. The homotransplants are frozen quickly at -60° C, and stored at -200 C.

76. Implantation of Artificial Teeth Successful Experimentally

"Concerning the Implantation of Artificial Teeth," by N. Bazhanov, Executive Secretary of Moscow Society of Stomatologists; Moscow, Meditsinskiy Rabotnik, No 98, 5 Dec 57, p 4

At the Plenary Session of the Moscow Society of Stomatologists, reports were heard concerning the possibility of implanting artificial teeth made of plastic material into the jaw bone. New hope for the success of this procedure arises from the fact that new metallic alloys such as tantalum, vitallium, and others which are neutral and do not cause tissue inflammation, have been prepared.

Among the important reports heard were those of Prof V. G. Yeliseyev, and physician E. Ya. Vares who reported on successful experiments conducted on animals by using artificial teeth made of plastic material and implanted into the jawbones. It was proved that connective tissue grows in the artificially created canals of plastic roots which are implanted into the jawbones of animals, and that this growth is followed by ossification.

However, attempts at implanting artificial teeth into human jawbones, so far, have been unsuccessful and require further research before implantation of artificial teeth can be introduced into the practice of therapeutic institutions.

Veterinary Medicine

77. Chinese Study Tick Vectors of Veterinary Brucellosis

"The Role of Ticks in the Transmission of Brucella melitensis and Brucella abortus," by Li Chao-hsi (李朝熙), Department of Veterinary Medicine, Peking Agricultural University; Peiping, Chung-kuo Shou-i-hsueh Tsa-chih (Chinese Veterinary Journal), No 4, 1958, pp 132-136

Following a review of Soviet research on ticks as transmitters of brucellosis, this article presents the methods and preliminary results of Chinese biological experiments undertaken in Inner Mongolia during 1956-1957. The ticks used in the experiments were collected in Chieh Meng during an April 1957 brucellosis epidemic affecting sheep and goats, and they were identified as belonging to the species Dermacenter nuttalli and Dermacentor sinicus.

Experimental results confirmed that both species can become infected with Br. melitensis and Br. abortus and subsequently transmit the disease to cattle and sheep and that the brucella has definite periods of propagation and infectivity in ticks. It was also found that the ovum and larva as well as the adult tick can be infected and transmit brucellosis to animals, and that the disease can be passed from one generation of ticks to the next through eggs. Moreover, the microorganism can maintain its life cycle indefinitely between parasitism in ticks and in susceptible animals.

According to the author, the experiments prove the existence of tick-borne brucellosis in China and this article comprises the first record of the role of Dermacentor sinicus in the transmission of veterinary brucellosis.

The author also states that the experiments are being carried further. He and his colleagues consider the following problems, among others, worthy of investigation: problems related to the parasitism of brucella in ticks, such as changes in and period of highest infectivity, life duration of brucella in various tick species, site of parasitism, transformation of brucella as a result of parasitism in ticks and how such transformation affects virulence; which parasitic ticks cannot become infected with brucellosis; and how to artificially infect healthy ticks.

Miscellaneous

78. Conference of Academy of Medical Sciences USSR on Regional Pathology

"Conference of Academy of Medical Sciences USSR With Participation of Scientific Workers and Physicians of Eastern Siberia and the Far East on Problems of Regional Pathology," by Ye. I. Sorokina; Moscow, Voprosy Kurortologii, Fizioterapii i Lechebnoy Fizicheskoy Kul'tury, No 2 Mar/Apr 58, pp 185-188

A scientific conference on regional pathology was held by the Academy of Medical Sciences USSR in Irkutsk, 25-29 June 1957. The conference was attended by scientific workers and physicians of Eastern Siberia; the Far East; the Main Administration of Resorts, Sanatoriums, and Rest Homes of the Ministry of Health RSFSR; and the Central Institute of Health Resort Studies.

Among the topics discussed were problems concerned with acclimatization and health resort problems in Eastern Siberia. The following speakers gave reports: N. N. Litvinov, G. M. Danishevskiy, Z. I. Pozenblyum (Norilsk), V. V. Yefremov, V. A. Kozlov, G. S. Yeremenko, V. V. Ivanov, A. P. Karaseva, V. G. Tkachuk, N. V. Yasnitskaya, A. A. Minkh, Ya. M. Grushko, V. V. Baranskaya, N. P. Kapustina, Ye. G. Karpova, T. N. Rupenikova, Ye. I. Sorokina, and V. K. Kotlyar.

79. Plenum of Scientific Council of Ministry of Health USSR

"Plenum of Scientific Council of Ministry of Health USSR" (unsigned article); Moscow, Meditsinskiy Rabotnik, No 38, 13 May 58, p 4

At a recent plenum of the Scientific Council, Ministry of Health USSR, the status and perspective development of Soviet medical publications were discussed. Among the speakers on this topic were I. A. Kryachko, deputy chairman of the Scientific Council; Prof A. I. Strukov, director of Medgiz; and A. P. Rodzayevskiy, director of the Medical Publishing House of the Ukraine.

According to the speakers, 2,806 medical books with a total of 34 million copies were published in 1957 in the USSR. The number of medical publications increased considerably in the union republics. Within the system of Medgiz, 53 periodicals are published annually.

The plenum also discussed the role of union republic scientific medical councils in the over-all planning of scientific research, and the relationship in the coordination of scientific research between the problem commissions and the scientific council of the Academy of Medical Sciences USSR.

80. All-Union Congress of Pathologico-Anatomists To Be Held in July 1959

"Announcement Concerning the Convocation of the All-Union Congress of Pathologico-Anatomists" (unsigned article); Moscow, Arkhiv Patologii, No 9, Sep 57, p 95

The Board of the All-Union Society of Pathologico-Anatomists has announced that in connection with the decision of the Ministry of Health USSR, the All-Union Congress of Pathologico-Anatomists will be held in Khar'kov and will open on 5 July 1959. Topics for reports will be accepted until May 1958.

81. Fifth All-Union Congress of Otorhinolaryngologists To Be Held in July 1958

"Chronicle," by A. G. Likhachev; Moscow, Vestnik Otorinolaringologii, No 2, Mar/Apr 58, p 127

The Fifth All-Union Congress of Otorhinolaryngologists will be held in Leningrad in July 1958. The congress will be attended by some 500 delegates, many from foreign countries.

The subjects to be discussed at the congress will include the following: problems of the physiology and pathophysiology of the auditory analizer; the prophylaxis and treatment of chronic suppurative medial otitis; important problems concerning tonsillitis; the significance of angina and chronic tonsillitis in the prophylaxis and treatment of rheumatism and infectious polyarthritis; and surgical treatment and radiation therapy of malignant tumors of the nose, ear, pharynx, and larynx.

An exhibit of the latest apparatus, instruments, etc. will be organized at the congress. The congress will also elect new members and officers of the All-Union Scientific Otolaryngology Society.

82. New Center for Institute for the Study of Poliomyelitis, Academy of Medical Sciences USSR

"Scientific Center," by M. Bagreyeva and D. Paskhin; Moscow, Vechernyaya Moskva, No 39, 15 Feb 58, p 2

"Construction of the buildings for the Institute for the Study of Poliomyelitis, Academy of Medical Sciences USSR, has been started in an area near the Vnukovo Station near Moscow. According to N. N. Ginsburg, deputy director of the Institute, a scientific center is being built for the institute. The main building, which will be utilized for experimental work, will house the following laboratories: Laboratory of Diagnostics, Laboratory of Live Vaccines, Laboratory of Immunology, Laboratory of Experimental Microscopy, Laboratory of Biochemistry, Laboratory of Epidemiology, and certain other laboratories."

This building will also house the Laboratory of Isotopes, in which scientists will use radioactive atoms for various research work. Additional area will be allocated in the main building for a library, a conference hall, and study rooms where visiting young specialists may study. This building will be the principal building of the entire center. Next to it will be an animal vivarium for laboratory animals. Two buildings will be set aside for experimental monkeys and two for guinea pigs, white mice, rabbits, and goats.

A short distance from the main buildings will be the housing units for scientific workers of the center.

The vivariums are low-lying buildings which resemble one another. Inside, the buildings are subdivided into separate areas with wide windows. All four buildings are connected with an underground tunnel which also leads to the main building of the institute. The main building will take the shape of a squared "□". In the basement of the building will be a large area housing refrigerators and other equipment. The center is slated for completion toward the end of 1958.

83. Soviet Physiotherapy and Health Resort Studies Institutes Merged

"Institute of Rheumatism in Moscow" (unsigned article); Moscow, Meditsinskiy Rabotnik, No 41, 23 May 58, p 4

The State Scientific Research Institute of Physiotherapy and the Central Scientific Research Institute of Health Resort Studies have been merged into the State Scientific Research Institute of Health Resort Studies and Physiotherapy (Gosudarstvennyy Nauchno-Issledovatel'skiy Institut Kurortologii i Fizioterapii). The new institute is located in the building which housed the old Health Resort Studies institute. Its director is G. N. Pospelova, Candidate of Medical Sciences, and its deputy director for scientific affairs is Prof A. N. Obrosov.

The building formerly occupied by the Physiotherapy Institute now houses the Moscow State Scientific Research Institute of Rheumatism, whose director is Prof A. I. Nesterov.

84. Col Med Serv V. G. Gnezdilov, Soviet Biologist and Parasitologist Dies

"In Memory of V. G. Gnezdilov" (unsigned article); Moscow Meditsinskiy Rabotnik, No 39, 16 May 58, p 4

Col Med Serv Vladimir Georgiyevich Gnezdilov, professor, chief, Chair of Biology and Parasitology, Military Medical Academy imeni S. M. Kirov, died recently in his 60th year.

Gnezdilov began work in the chair in 1930 and was the author of nearly 60 scientific works on parasitology.

X. PHYSICS

Atomic Energy Development

85. Czechoslovak Work in Nuclear Engineering

"From the Nuclear Section of the VUK" (unsigned article); Hradec Kralove, Pochoden, 28 Mar 58, p 1

One of the work centers of the Research Institute of Boilers (Vyzkumny ustav kotlu -- VUK in Hradec Kralove is called the Department of Nuclear Engineering (oddeleni nuklearni techniky), where Engineers Vladimir Krizek, Frantisek Dubsek, Josef Hosek, and others have been working on "peaceful" applications of atomic energy since 1953. The chief effort is research in the field of liquid metals and their utilization in cooling reactors in atomic electric power plants, for which the three engineers mentioned above have won recognition "for outstanding work." The department also worked out a study proposal for a 2.5-megawatt electric power train (energovlak) which would have a reactor instead of the usual boiler. Another one of their ideas is a proposal, which was worked out in cooperation with other scientific centers, for a so-called package atomic power plant (baleny atomovy central) which would have about the same output as an electric power train and which would be especially favorable for certain areas, such as large construction sites where there is a lack of electric power.

86. Conference of Czechoslovak and Polish Atomic Power Specialists

"Polish-Czechoslovak Conference of Atomic Power Specialists" (unsigned article); Prague, Jaderna Energie, No 4, Apr 58, p 112

This article reports that the Czechoslovak Academy of Sciences and the Institute of Nuclear Physics planned to hold the Second Polish-Czechoslovak Conference of Atomic Power Specialists in Liblice from

12 to 17 May 1958. The program of the conference was to be directed to the physical and technical problem of atomic electric power reactors. At the six sessions reports were to be heard on proposed electric power reactors and on the economic problems of their operation, as well as reports on experimental work. The conference was to be attended by the participating Czechoslovak UJF (Ustav jaderne fysiky, Institute of Nuclear Physics), the (presumably Polish) IBJ (probably Instytut badan jadrowych, Institute of Nuclear Research), and by observers from the Soviet Union and other People's Democracies.

According to the article, after the conference, a lecture in Prague in the framework of the VTS (possibly Vedecka technicka spolecnost, Scientific and Technical Society) was to be given by the Polish workers T. Wojcik and W. Frankowski on the theme "A Method of Comparative Computations of the Economics of Atomic Electric Power Plants and Conventional Electric Power Plants." After the lecture, there was to be a discussion open to the general public.

Atomic and Molecular Physics

87. Atomic Physics

"Self-Consistent Fok (Fock) Field for the Positive Nitrogen Ion," by T. D. Strotskite, I. I. Glembotskiy, and A. P. Yutsis, Vilna University, Tr. AN Lit. SSR, 1956, B3, pp 3-10 (from Referativnyy Zhurnal -- Fizika, No 4, Apr 57, Abstract No 8926)

Equations of the self-consistent Fock field for a simply ionized N atom are solved. For the derivation of initial wave functions the differences between functions of various states of adjacent atoms are used. The values of full energy in one- and two-configurational approximation are determined. The last approximation improves the theoretical value of energy by hundredth parts of atomic units.

"Self-Consistent Fok (Fock) Field in a Two-configurational Approximation for a Nitrogen Atom in Various Degrees of Ionization," by Ya. I. Vizbarayte, I. V. Batarunas, V. V. Kibartas, and A. P. Yutsis, Tr. AN LitSSR, 1956, 5B, pp 3-10 (from Referativnyy Zhurnal -- Fizika, No 4, Apr 57, Abstract No 8927)

Fock's equation is solved in two-configurational approximation for a radial wave function 2p of the computed configuration $1s^2 2p^{q+2}$ of the two-configurational approximation $1s^2 2s^2 2p^q - 1s^2 2p^{q+2}$ at q = 2, 3, 4 in the case of an N atom. The values of energies 2s- and 2p-electrons are determined and compared with experimental data.

"The Electron Distribution in Atoms of Rare Earth Elements," by T. I. Kakyshadze, G. S. Gordadze, and M. G. Kokonova, Tr. Tbilissk. gos. ped. in-ta, 1955, 10, pp 573-585 (from Referativnyy Zhurnal -- Fizika, No 4, Apr 57, Abstract No 8929)

In special literature the following electron configurations of neutral lanthanide atoms are accepted: $4f^{0-14}5d^1 6s^2$ and $4f^{0-14}6s^2$. In the opinion of the writer both configurations exist simultaneously. The first gives the magnetic properties and the normal valency of lanthanides, and the second, the spectroscopic characteristic of lanthanides. Therefore, both configurations should be considered in literature.

88. Molecular Physics

"Quantum-Mechanical Research of the Purely Ionic State of BeH+," by G. Vepkhvadze, Tr. Tbilissk. un-ta, 1957, 62, 1-10 (from Referativnyy Zhurnal -- Fizika, No 1, Jan 58, Abstract No 678

A four-electron wave function for the molecular ion BeH+ is derived and the energy of the system BeH+ is obtained as a function of interaction integrals. A numerical analysis of interaction integrals is made. The energy of the four-electron ion BeH+ is obtained in the form of a function of internuclear distance.

89. Quantum Statistics

"A Certain Problem in Quantum Theory of Multiple Bodies." by V. L. Bonch-Bruyevich, Tr. 3-go Vses. matem. s'yezda, Vol 1, Moscow, Academy of Sciences USSR, 1956, 218 (from Referativnyy Zhurnal -- Fizika, No 4, Apr 57, Abstract No 8972)

"Abstract of the report -- An approximation method is described based on the approximate solution of equations of Green's function in a classical external field, varying slowly. This method is applied to the analysis of the problem of a strongly degenerated nonideal Fermi gas. It is demonstrated that, while taking interactions into account, the function of electron distribution according to pulses in the ground state does not have a steplike character. This means that in the specified system at absolute zero current carriers with pulses exceeding the limit pulse of Fermi are existent. The spectrum of elementary excitations in the specified system is studied."

90. Thermodynamics

"The Problem of Determining the Thermodynamic Constants of Metals and Alloys," by L. I. Ivanov, M. P. Matveyeva, and I. S. Kulikov, Issledovaniya po zharoprochnym splavam (Research on Refractory Alloys), Moscow, 1956, pp 11-16 (from Referativnyy Zhurnal -- Fizika, No 4, Apr 57, Abstract No 8995)

Three pieces of equipment for determining the speed of evaporation of the components of liquid and solid alloys by means of radioactive isotopes are described. The evaporation speed is observed from an open surface, from the flow of vapor through a calibrated aperture, and from the speed of isotopic exchange between two specimens of similar chemical composition when one of them contains a radioactive component. The advantage of the third method for hard alloys is noticed, when the evaporation speed of the components is different. Data obtained by these means are given, concerning the elasticity of Fe and Co vapor, the sublimation heat of these metals (104.2 and 102.4 K cal/gr, respectively), the partial pressure of Fe in certain alloys, and the coefficient of self-diffusion of Fe.

"Measurement of Vapor Pressure of Liquid Indium by Means of a Mass Spectrograph," by A. P. Lyubimov and Yu. N. Lyubitov, Sb. Mosk, in-t stali, 1957, 36, 191-195 (from Referativnyy Zhurnal -- Fizika, No 2, Feb 58, Abstract No 3182)

The vapor pressure of metallic In was measured within the range of 646-1,065°K. The evaporation heat of In was found to be 55.74 kcal/mol. It was established that the mass spectrographic method makes possible the determination of the relative values of the relation P = f(T). For the determination of absolute values of vapor pressure the knowledge of the transition coefficient is required. It was found that the values of the ionic current depending on the accelerating potential of the electron gun pass through a maximum. The position of the maximum varies for various temperatures.

91. Formula for Steady Temperature of Flat Plate in Reacting-Gas Flow

"On the Steady Temperature of a Flat Plate in the Flow of a Reacting Gas Mixture," by Ye. P. Vaulin, Moscow State University imeni M. V. Lomonosov; Moscow, Doklady Akademii Nauk SSSR, Vol 113, No 6, 21 Apr 57, pp 1235-1238

The problem of the steady temperature of a flat plate in a laminar gas flow is discussed. A reaction of the type $X_2 \rightarrow 2X$ occurs in the gas.

An exact solution is obtained for a system of boundary layer equations consisting of the diffusion equation, the discontinuity equation, and the equations for conservation of energy and velocity. Velocities are assumed to be high and the heat of friction is taken to be of the same order of magnitude as the heat released in the chemical reaction. The temperature and concentration profiles are found for a heterogeneous reaction in the diffusion region.

92. Ferromagnetism

"Curie Point in Thin Laminae of Ferromagnetics," by A. S. Milner and N. L. Polyakova, Uch. zap. Kharkovsk, un-t, 1955, 64, pp 159-165 (from Referativnyy Zhurnal -- Fizika, No 4, Apr 57, Abstract No 9509)

The dependence of the Curie point on thickness of nickel lamina is tested by means of spin waves, i.e., the ratio $Is/I_0 = f(T/0)$. The laminae were obtained by vapor deposited in vacuum from a nickel wire on glass from an aluminum oxide crucible. The Curie point was measured by a relative variation of the magnetic moment of the lamina at rising temperature. It was established that the Curie point does not depend on whether the Ni is coated on cold or hot glass. The irreversibility of the first magnetization curve, its dependence on the speed of heating, and the increasing magnetic moment at room temperature for nickel lamina deposited on cold glass leads to the conclusion that these lamina are in an unstable phase state.

93. Thermal Diffusion in Porcelain

"Thermodiffusion Currents in Porcelain," by N. S. Kostyukov, Tr. Gos. issled. elektrokeram. in-ta. 1957, No 2, 23-66 (from Referativnyy Zhurnal -- Fizika, No 2, Feb 58, Abstract No 3677)

Thermal diffusion is observed in ceramic materials with ionic conductivity in all cases in which a temperature gradient occurs. The generation of currents at high temperature may be related to thermodiffusion or diffusion phenomena. Experimental data on thermodiffusion currents in porcelain may shed light on the possibility of using materials with a thermodiffusion emf as converters for measuring high temperatures. The relations of thermodiffusion currents to temperature, to time at various temperatures, and to temperature gradient were studied on samples of porcelains of varied oxide composition, ordinary window glass, and $BaTiO_3$.

Mechanics

94. Elasticity Theory

"Equilibrium of Flexible Plates Beyond the Elasticity Limit," by Yu. R. Lepik, Tartu; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 6, Nov-Dec 57, pp 833-842

The previous work by the author "Equilibrium of Flexible Elastic-Plastic Plates at Strong Buckling," Inzhenernyy Sbornik, Vol 24, 1956) is further analyzed. Formulas for auxiliary values are derived, and two problems of equilibrium of round plates are solved. The computations were processed on the "Strela" computer of the computing center of Moscow State University. The results show good agreement with the approximations found by the method of elastic solutions.

"Equations of Nonlinear Theory of Elasticity in Transfers," by L. A. Tolokonnikov, Tula; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 6, Nov-Dec 57, pp 815-822

The tensor components of deformation are replaced by derivatives of transfer. The state of the body is expressed at each point by coordinates of shape variation and by the hydrostatic stress. In the case of incompressible material the basic equation may be expressed in moduli of shape variation, and the dependence of these moduli on hydrostatic stress as parameter may be derived.

95. Subsonic Flow

"Theory of Bord's Nozzle for a Gas," by Ya. I. Sekerzh-Zenkovich, Moscow, Institute of Mechanics, Academy of Sciences USSR; Moscow Prikladnaya Matematika i Mekhanika, Vol 21, No 6, Nov-Dec 57, pp 850-855

A particular problem is chosen from S. A. Chaplygin's gas dynamics (O gazovykh struyakh [Gaseous Flow], 1933) analyzing the subsonic flow of a gas through an endless vessel with plane walls forming an angle of $q\pi$. In the particular case $q = 2$, such a problem corresponds to Bord's nozzle and it simplifies the formula expressing compression of the flow.

96. Flame Propagation

"Stability of Flame Propagation," by G. I. Barenblatt and Ya. B. Zel'dovich, Moscow, Petroleum Institute, Academy of Sciences, USSR; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 6, Nov-Dec 57, pp 856-859

The problem of stability of flame propagation in a unidimensional problem with one equation was recently examined by J. B. Rosen (J. Chem. Phys., Vol 22, No 4, 1954). He stated that unstability may occur and gave an "approximate criterion of stability." It is demonstrated that Rosen's conclusions were based on an unjustified setting of the problem of stability of laminar flame propagation. The definition of stability of flame propagation is given, and it is shown that in the case of a unidimensional problem the flame propagation is always stable. This conclusion concerns the thermal as well as the chain propagation of flames.

97. Fluid-Filled Body Rotational Stability

"Rotational Stability of a Solid Body With an Ellipsoidal Cavity Containing a Fluid," by V. V. Rumyantsev, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 6, Nov-Dec 57, pp 740-748

The stability of nonperturbed motion of a solid body with a cavity shaped as a triaxial ellipsoid fully filled with an ideal fluid in uniform vortex rotation is analyzed using formulas by Hough (Phil. Transactions [A], Vol 186, 1, 1895) and A. F. Sludskiy (Bulletin de la Societe des Naturalistes de Moscow, Vol 9, pp 285-318, 1895). The conditions of stable and unstable motion are deduced. In the particular case when the cavity is a sphere the system moves as if it were a solid body.

98. Motion in Newtonian Field

"Some Problems of the Motion of a Solid Body in a Newtonian Force Field," by V. V. Beletskiy, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 6, Nov-Dec 57, pp 749-758

Equations of motion of a solid body around a fixed point in a Newtonian gravitational field are derived. Solutions for particular cases are given; when the distance R of the body from the fixed point is very large in comparison with the dimensions of the body, or for the case when the motion is plane. The stability of the stationary rotation of the body fixed in the center of masses is analyzed. The conditions of equilibrium

require one of the axes of the ellipsoid of inertia to be directed toward the attracting center. The equilibrium is unstable if the minor or medium axis is directed toward the center. Stable equilibrium is attained when the major axis is directed toward the center.

99. Remarks on Analytical Mechanics

"Remarks on Analytical Mechanics," by A. I. Lur'ye, Leningrad; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 6, Nov-Dec 57, pp 759-768

Diverse problems somehow neglected even in basic treatises, as in mechanics manuals by Appell, Levi-Civita and Amaldi, Suslov, Whittaker, Lamb, MacMillan, and Hamel, are briefly analyzed. One of the problems mentioned is the dissipative function introduced by Rayleigh for the force of resistance in the theory of sound. Others include the following: The kinetic energy of acceleration in the case of a solid body rotating around a fixed point is found inadequately treated in courses of Appell and Roze. The generalized forces of reactions of bonds are determined in the particular case of stationary and ideal bonds. The equation of Darboux for determining parameters defining the position of a solid body rotating around a fixed point according to a specified vector of angular velocity is analyzed.

100. Stability Study

"Stability Under Permanently Acting Perturbations," by V. Ye. Germaidze and N. N. Krasovskiy, Sverdlovsk; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 6, Nov-Dec 57, pp 769-774

It is demonstrated that if a zero solution of equations of the form

$$\frac{dx_i}{dt} = X_i(x_1, \ldots x_n, t)$$

is asymptotically stable (I. G. Malkin, ibid., Vol 18, No 1, 1954), it is also stable under permanently acting perturbations, limited in magnitude.

101. Hydrodynamics Study

"Weak Waves in a Compressible Fluid With Account of Emission," by V. A. Prokof'yev, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 6, Nov-Dec 57, pp 775-782

Equations of radiation transfer in a moving medium and equations of hydrodynamics with account of heat intake from emission, mechanical action of radiation, and internal energy are analyzed. The hydrodynamic theory of the propagation of plane perturbations is expressed in linearized equations. The characteristic equation determining the damping and the propagation velocity of induced and free waves in a medium in equilibrium is derived. Some examples are drawn for scattering indicatrices.

"Some Unstabilized Motions of 'Shallow Water,'" by P. Ya. Polubarinova-Kochina, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 6, Nov-Dec 57, pp 783-794

Water streams symmetrical with respect to a vertical plane or axis are analyzed. The velocity potential is expressed in series of cosines of arcs in the case of a plane problem and in Legendre polynomials in the case of axial symmetry, while the coefficients of the series have the form of polynomials in powers of time. The problem is nonlinear and hence very cumbersome to compute; the computation is stopped at the third and no further than the fifth term. The initial shape of the protuberance is assumed to be a semicylinder or semisphere. Flattened protuberances are also analyzed, having a low height of the column, shaped as a half ellipse or rectangle. The problem has some analogy with the problem of expanding protuberances of ground waters, studied experimentally by J. C. Martin and W. J. Moyce (An Experimental Study of the Collapse of Liquid Columns on a Rigid Horizontal Plane, Phil. Trans. A, Vol 244, 1952).

"The Nonuniqueness of Possible Shapes of Stationary Flows of Heavy Fluid at Froude Numbers Near Unity," by N. N. Moiseyev; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 6, Nov-Dec 57, pp 860-864

The theorem by M. A. Lavrentyev (from the book by M. A. Lavrentyev and B. V. Shatat, Metody teorii funktsiy kompleksnogo peremeshcheniya [Methods of the Theory of Functions of Complex Transfer], 1951), is used for evaluation of the modulus of the derivative expressing narrow bands.

This theorem may be applied at Froude numbers near unity. It allows an analysis of the problem in approximation while conserving its nonlinear character. It was found that two shapes of flow over obstacles are possible. A new approximate theory of a unified wave is also derived.

102. Stress Waves in Solids

"Wave Propagation in Rubber," by N. Cristescu, Bucharest, Mathematical Institute of the Academy of the Rumanian People's Republic; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 6, Nov-Dec 57, pp 795-800

A rubber beam which can be statically stressed up to a certain limit is dynamically loaded by a homogeneous load. The initial static deformation may be arbitrarily high, but the dynamic stress should be sufficiently small, as to make the usual theory of wave propagation valid, while neglecting the effect of deformation velocity. The peculiarities of the waves, generated by the dynamic deformation, are analyzed. Two types of deformation are discussed: the concavity of the stress-strain curve is directed toward the positive stress axis, and the concavity is directed toward the strain axis, varying later and assuming an S-like shape.

The velocity of the wave front propagation in rubber may be subject to disruption at a defined distance from the beam end. The magnitude of this disruption may be computed.

103. Shell Study

"Equations of the Theory of Shells in Transfer and Functions of Stress," by A. L. Goldenveyzer, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 6, Nov-Dec 57, pp 801-814

Previous works by the author (Ibid. Vol 11, No 6, 1945; book: Teoriya uprugikh tonkikh obolechek [Theory of Thin Elastic Shells], 1953) are developed further by analyzing tensors of the middle shell and of its curvature, tensors of tangential deformation, and tensors of bending deformation. The required equations are derived and solved.

"Stability of Equilibrium of a Helicoidal Shell," by N. A. Alumyae (Tallin), Academy of Sciences Estonian SSR; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 6, Nov-Dec 57, pp 823-826

The critical load and the stressed state after stability loss of the momentless initial state of the shell, drawn on the surface of the helicoid and limited by asymptotic lines, are analyzed. To derive a simplified equation the general stressed state of the shell is expanded into elementary terms. The equation is solved by applying the method of asymptotic integration.

"Stressed State of Momentless Cylindrical Shells at Large Deformation," by A. S. Grigor'yev; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 6, Nov-Dec 57, pp 827-832

The equilibrium of momentless shells with rigid bottoms having in unloaded state the shape of a circular cylinder is analyzed. It is assumed that the structural material of the shell stands large (several tens of percent) deformation before the breaking point. The material is assumed incompressible and it is characterized by its stress-strain ratio. The initial equations are derived and solved for problems of equilibrium of shells under constant internal load pressure and under elongation.

"Stressed States in a Long Cylindrical Shell," by Huang K'o-chih, Peiping; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 6, Nov-Dec 57, pp 843-845

A. L. Goldenveyzer's method (Teoriya uprugikh tonkikh obolochek [Theory of Thin Elastic Shells], 1953) is applied to asymptotic integration of equations of the theory of elastic shells in the case of a cylindrical shell, when its length ℓ and its characteristic radius of curvature R of the cylindrical cross section are magnitudes of different orders.

"Purely Plastic Stability Loss of Thin Shells," by E. I. Grigolyuk, Moscow, Institute of Mechanics, Academy of Sciences USSR; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 6, Nov-Dec 57, pp 846-849

The stability of spherical, cylindrical, and conic shells beyond the elasticity limit is analyzed by using the equations of Prandtl-Reiss and assuming a purely plastic state during loss of stability.

"Stability of Unhomogeneous Elastic-Plastic Shells," by E. I. Grigolyuk, Institute of Mechanics, Academy of Sciences USSR; presented by L. I. Sedov on 18 November 1957; Moscow, Doklady Akademii Nauk SSSR, Vol 119, No 4, 1 Apr 58, pp 663-666

This article discusses a purely plastic loss of stability of unhomogeneous shells. For definiteness in calculating rigidity, a bimetallic shell is taken. Physical relations for bimetallic shells are obtained, and equations of stability of slanting shells of arbitrary form relative to sagging and the force function satisfying the equations of equilibrium of a plane problem are given. These results are true for the theory of plastic flow and the theory of deformations in both cases of which the compressibility of the material is considered. A formula is given for determining the critical forces of local loss of stability of shells in the case of combined loads. Certain partial results are obtained from the use of the formula.

Nuclear Physics

104. Cosmic Radiation

"Pulse Spectrum of Deuterons in a Vertical Flow of Cosmic Radiation," by M. T. Ayvazyan, Physics Institute, Academy of Sciences Armenian SSR, Izv. AN ArmSSR, ser. fiz.-matem., yestestv. i tekhn. n., 1956, 9, No 3, pp 91-101 (from Referativnyy Zhurnal -- Fizika, No 4, Apr 57, Abstract No 8874)

A magnetic mass spectrograph and a double proportional counter were used to determine the amount of deuterons in a shower of cosmic rays at a 3,200-meter altitude in a pulse interval of 0.7-1.7 Bev/sec under a lead filter 32 gr/cm^2 thick. The spectrum obtained has a sharp maximum at 1.2 Bev/sec and the maximum deuteron flow equals 0.75 ± 0.14 cm^{-2}·sec^{-1}·steradian^{-1} (Bev/sec)$^{-1}$.

105. Spin of Fe^{57} Nucleus Shown To Be 1/2

"On the Value of the Spin of the Fe^{57} Nucleus," by N. S. Garif'yanov, M. M. Zaripov, and B. M. Kozyrev, Physicotechnical Institute, Kazan' Affiliate, Academy of Sciences USSR and Kazan' State University imeni V. I. Ul'yanov-Lenin; Moscow, Doklady Akademii Nauk SSSR, Vol 113, No 6, 21 Apr 57, p 1243

Measurements of paramagnetic resonance were made of iron samples enriched with the isotope Fe^{57}. It is claimed that the experimental results can be explained by assigning a spin of 1/2 to the Fe^{57} isotope.

106. Compensated Beta Spectrometer Described

"Longitudinal Beta Spectrometer With Compensated Spherical Aberration," by K. A. Dolmatova and V. M. Kel'man, Physicotechnical Institute, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 113, No 6, 21 Apr 57, pp 1244-1247

A beta spectrometer with a longitudinal homogeneous magnetic field is described. The spherical aberration of the field is compensated by a transverse magnetic field which varies according to the law $H = H_1/r$. The shape of the turns of the windings which generates the auxiliary field was designed in such a way that electrons from the source from a linear ring focus over a large solid angle.

A ling drawing of the spectrometer and the equations of the electron trajectory are given. Tests run on the instrument are described.

107. Relativistically Invariant Equation for Particles With Spin 1/2 Given

"On the Problem of the Fundamental Relativistically Invariant Equation for a Particle With Spin 1/2," by G. A. Zaytsev; Moscow, Doklady Akademii Nauk SSSR, Vol 113, No 6, 21 Apr 57, pp 1248-1250

The fundamental relativistically invariant equation is given for a particle with spin 1/2, charge e, mass m_0, and magnetic moment $\mu_0 = e\hbar/2m_0c(1+\delta)$, where $\delta \neq 0$; and which is located in an external magnetic field. It is remarked that, since the magnetic moment of a particle is, as a rule, considerably different from the corresponding magneton, and only for the electron and positron is the difference between them small, the Dirac equation is not applicable to arbitrary particles with spin 1/2.

The equation is described a "extremely simple in form and convenient for application to the solution of concrete physical problems." The assistance of Prof L. Infel'd is acknowledged.

108. Consequences of Dipole Moment in Lambda Particles Explored

"On a Possible Dipole Moment of Transition in Λ-Particles," by B. L. Ioffe and I. Ya. Pomeranchuk, Corresponding Member of the Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 113, No 6, 21 Apr 57, pp 1251-1254

Certain consequences of assuming the existence of a dipole moment in Λ-particles are explored.

"If the assumption is made that the difference in mass between Λ_0 and Λ_π which is caused only by weak interactions is extremely small (of the order of 10^{-6} ev), then $\Lambda_0 \rightleftarrows \Lambda_\pi$ transitions under the influence of an external electromagnetic field become possible. When the magnetic field varies only slightly, transitions of the nature over a distance equal to the dimensions of a Λ-particle amount in effect to the appearance of a magnetic dipole moment directed along the spin of the Λ-particle.

The scattering of a Λ-particle by a Coulomb field is considered, and expressions are given for the scattering amplitude, and differential cross section, degree of polarization, and the wave functions outside the nucleus.

109. Interaction of High-Energy Pions and Lead Nuclei Measured

"Nuclear Interactions of High-Energy Pi-Mesons in Lead," by N. M. Kocharyan, Corresponding Member of the Academy of Sciences Armenian SSR, R. B. Begzhanov, and Kh. B. Pachadzhyan, Physics Institute, Academy of Sciences Armenian SSR; Yerevan, Doklady Akademii Nauk Armyanskoy SSR, Vol 24, No 4, 1957, pp 161-165

The total interaction cross section for pions in lead was measured for energies up to 16 Bev. A description of the experimental apparatus and technique and a table of the cross sections are given.

110. L. M. Afrikyan, Theoretical Physicist, Dies in "Freak Accident," September 1957

"Levon Melkonovich Afrikyan" (unsigned article); Yerevan, Izvestiya Akademii Nauk Armyanskoy SSR, Seriya Fiziko-Matematicheskikh Nauk, Vol 10, No 6, 1957, pp 3-5

A "freak accident" on 1 September 1957 ended the life of L. M. Afrikyan, Candidate of Physicomathematical Sciences and a senior scientific associate at the Physics Institute, Academy of Sciences Armenian SSR. He was born in 1926 and began his study of theoretical physics in 1950. He published several works on the formation and annihilation of antiprotons. During the last half year of his life, Afrikyan published works on mu-meson pair production, the structure of the proton, and the quantum-electrodynamic theory of multiple pair formation.

111. Method Given for Calculating New Cosmic-Ray Analyzer

"Probability of Recording Charged Particles in a System of a Mass Spectrometer and Two Wilson Cloud Chambers," by G. V. Badalyan, Institute of Physics, Academy of Sciences Armenian SSR, Yerevan, Izvestiya Akademii Nauk Armyanskoy SSR, Seriya Fiziko-Matematicheskikh Nauk, Vol 10, No 6, 1957, pp 75-88

A method is given for calculating the "aperture ratio," or the probability of recording charged particles, for an instrument designed for use in cosmic-ray studies at the Aragats High-Altitude Station. The instrument consists of a mass spectrometer in conjunction with two cloud chambers.

112. Stereobetatron Used in Research and Quality Control

"Stereobetatron" (unsigned article); Novosibirsk, Sibirskiye Ogni, 4 Apr 58, p 181

"The first stereobetatron in the world has been developed at the Tomsk Polytechnical Institute. It combines in a single apparatus two electron accelerators, or betatrons. The accelerators produce two intersecting beams, making it possible to conduct experiments on the interaction of accelerated electrons.

"The new machine also has great practical value in quality-control applications. It can be used to make stereophotographs where it is required to determine the exact location of a defect. The new machine will probably also receive wide application in medicine for treating malignant tumors."

113. Secondary Neutron Spectrum From Interaction of Neutrons With Fissionable Material Analyzed

"Neutron Spectra Produced in the Passage of 14-Mev Neutrons Through Layers of Fissionable Material," by Yu. S. Zamyatnin, I. N. Safina, Ye. K. Gutnikova, and N. I. Ivanova; Moscow, Atomnaya Energiya, Vol 4, No 4, Apr 58, pp 337-342

The energy distribution of neutrons produced in the passage of 14-Mev neutrons through layers of Th^{232}, U^{233}, U^{235}, U^{238}, and Pu^{239} was obtained. The secondary neutron spectrum in each case proved to have two components: fission neutrons and evaporation neutrons. A functional relationship is found connecting the coefficient for the dissociation of the secondary neutron spectra in two components and the nuclear constants of the corresponding nuclei. It is claimed that this expression can be used to obtain these coefficients without an experimental study of neutron spectra.

The work was done during the period 1950-1956.

114. Interaction of K-mesons With He Nuclei

"Interaction of K-mesons With Helium Nuclei and Isobaric Invariance," by S. G. Matinyan, Physics Institute of the Academy of Sciences Georgian SSR, Soobshch. AN GruzSSR, 1957, 18, No 4, 401-404 (from Referativnyy Zhurnal -- Fizika, No 3, Mar 58, Abstract No 5393)

By assuming isobaric invariance of strong interactions a series of equalities and inequalities is obtained between cross sections of various types of the reaction of K-meson absorption by helium with emission of a Σ-hyperon and a pi-meson. Correlations between cross sections of various reactions occurring at collisions of a K-particle with an He nucleus are derived.

115. Alpha-Particles as Structural Elements of Nucleus

"Alpha-Particles as Structural Elements of the Nucleus and Alpha Decay," by V. G. Simonov, Uch. zap, Gomelsk, gos. ped in-ta, 1957, No 5, 109-119 (from Referativnyy Zhurnal -- Fizika, No 3, Mar 58, Abstract No 5433)

An attempt is made to prove the assumption of the presence of simplest nuclear associations (alpha particles and dineutrons) in atomic nuclei. The following arguments are presented: saturation of nuclear forces in nuclei with $Z > 2$, which may be explained in that these nuclei consist of alpha particles and dineutrons; Pauli principle which reflects the tendency of conversion of uneven particles into even ones; the possibility of expressing the bond energy of nuclei from He^4 to Ti^{50} as a sum of energies of bonds of nuclear associations and the bond energy between the associations; and alpha decay. It is shown that alpha particles cannot form in nuclei if the nucleus is analyzed according to the model of independent particles, because it would involve a strong fluctuation of energy, which does not seem possible according to experimental data. The reaction (gamma-alpha) also confirms the existence of alpha particles in nuclei. The alpha particles are supposed to be bound together less than nucleons. When the nuclear charge increases, the bond of the alpha particle with the nucleon decreases, which may cause a spontaneous decay.

116. Direct Determination of (gamma, n) Reaction Cross Section

"A New Method for Determining Integral Cross Sections of ((gamma, n) Reactions," by V. A. Shkoda-Ul'yanov, Nauchn, zap, Uzhgorodsk. un-t, 1957, 18, 131-134 (from Referativnyy Zhurnal -- Fizika, No 3, Mar 58, Abstract No 5478)

A method previously suggested by Goldanskiy and Shkoda-Ul'yanov (Referativnyy Zhurnal -- Fizika, 1956, No 2, 3411) is discussed. The method is based on the measuring of the output of photoneutrons from a thick sample in which the photons multiply on account of the shower. The method allows a direct determination of the integral cross section of (gamma, n) reaction on the basis of the shower theory. The method is expected to be advantageous for work with monochromatic electrons of high energy.

117. Reactions of Light Nuclei by Means of Deuterons

"Reactions of Some Light Nuclei by Means of Deuterons and Tritons. Reactions by Means of Deuterons," by I. Kopaleyshvili, Tbilisi University, Tr. Tbilissk. un-ta, 1957, 62, 83-102 (from Referativnyy Zhurnal -- Fizika, No 3, Mar 58, Abstract No 5516)

Effective cross sections of reactions Y(p,d)X, Y(n,d)X and reverse are determined. The nuclear shell model and the Born approximation are used for computation. The neutron-proton interaction is considered of the Yukawa type. The nuclear potential is chosen as an oscillatory well and the Coulomb effect is neglected. The obtained angular distributions of reactions do not differ from those by Batler and Bkhatiy. The obtained absolute values of cross sections are, however, much smaller than the experimental ones.

118. Possibility of Increasing Accelerator Efficiency

"New Possibilities of Increasing the Efficiency of Charged Particle Accelerators," by Ye. M. Moroz, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 115, No 1, 1957, pp 78-79

The design of a new type of accelerator is suggested, provided with magnetic fields constant in time and with stable osculating trajectories of particles. Their magnetic system consists of three or more sections with homogeneous magnetic fields. The stability degree of the orbit is high and may reach 0.77.

The application of this magnetic system of osculating trajectories to cyclotrons will allow the replacement of dees by a small accelerating element fixed outside the magnetic field which will result in a reduction of the air gap between the poles, a lowering of the power supply to the magnets and of the power of the radio-frequency system, and improved intensity of the accelerated ion beam due to sharper focusing. Resonance oscillations of the beam are lower than in the system of L. H. Thomas (Phys. Rev. 54, 580, 588, 1938 or in former systems by the writer (Ibid, 108, 3, 346, 1956; CERN, Symposium, Proc., Geneve 1, p 547, 1956). The extraction of the beam is easier.

The system described is of particular interest for microtrons (V. I. Veksler, ibid., 43, No 8, 346, 1944; Ye. M. Moroz, ibid., 106, No 6, 986, 1956). Its advantages consist in reducing the distance between the poles of the microtron magnet and in improving the stability of the beam orbit with ensuing higher energy and intensity of the electron beam.

Further applications of these sectional magnetic systems with stable osculating particle trajectories should facilitate better design of instruments and their use as injectors for synchrotrons, as a generator for short (10^{-11} sec) electron pulses, generators of microradio waves, generators of gamma rays, neutron sources, etc.

119. Separation of Isotopes in Atomic Beam

"Separation of Isotopes When an Atomic Beam Passes Through an Ionization Space," by K. D. Sinel'nikov, Academician, Academy of Sciences Ukrainian SSR, B. G. Safronov, G. G. Aseyev, and Yu. S. Azovskiy, Physicotechnical Institute, Academy of Sciences Ukrainian SSR; Moscow, Doklady Akademii Nauk SSSR, Vol 115, No 1, 1957, pp 80-83

Theoretical analysis indicates the possibility of isotope separation of an atomic beam, consisting of a mixture of isotopes, by passing it through a space where it is subjected to electron bombardments. To prove experimentally the computed results, it was necessary to design a system which would ionize the atomic beam, as well as remove and bond together the formed ions. These requirements were met by the manometric triode tube LM-2. Passing through this tube the beam is ionized by electrons emitted by the cathode and accelerated by the grid. Five such tubes in series were used for the detection and study of the phenomenon. Hg vapor was used and analyzed by the mass-spectrometer MS-2 for abundance of isotopes 198 and 204. The experimental values were tabulated, and, although the results were found satisfactory, the experimental data somewhat exceeded the theoretical.

120. Inelastic Scattering of Fast Neutrons on Deuterons

"Inelastic Scattering of Fast Neutrons on Deuterons With Consideration of Spin-Orbital Interaction," by I. Sh. Vashakidze, Tbilisi University, Soobshch. AN GruzSSR, 1957, 18, No 4, 405-414 (from Referativnyy Zhurnal -- Fizika, No 2, Feb 58, Abstract No 2875)

The cross section of inelastic nd scattering is computed. For the nucleon-nucleon interaction of the Yukawa type, the spin-orbital interaction is taken into account together with the central one. The Born approximation is used for computation. In the case of semiexchangable forces at about 90 Mev a good agreement of experiment and theory is reached.

121. Fission of Light Nuclei on Collision With Heavy Nuclei

"Fission of Light Nuclei on Collision With Heavy Nuclei," by V. I. Chilashvili Tbilisi University, Soobshch. AN. GruzSSR, 1956, 17, No 10, 873-877 (from Referativnyy Zhurnal -- Fizika, No 2, Feb 58, Abstract No 2989)

Formulas for total and differential cross sections of light nuclei stripping on collision with heavy nuclei are derived. It is assumed that such light nuclei as Li^6, Li^7, Be^9, C^{13}, and O^{17} may be considered as corresponding to a two-particle model, for example, $Li^6 = He^4 + D$; $Be^9 = Be^8$ + neutron, etc. Semiclassical considerations, such as those used by Serber for his computation of deuteron stripping, are applied. However, it was assumed that the two particles forming the nucleon may move with different values of angular momenta. Formulas defining the angular distribution of emitted particles are also derived.

122. Potential of Electron-Photon Interaction

"The Character of Potential of Interaction of an Electron and Photon," by G. Wrzeciorko, Physics Institute of the Polish Academy of Sciences, Byul. Polskoy AN. 1956, Otd 3, 4, No 10, 657-663 (from Referativnyy Zhurnal -- Fizika. No 1, Jan 58 Abstract No 198)

A lower approximation of an "old" method by Tamm and Dankov is applied to the study of photon scattering on electrons to clarify the properties of potential of electron-photon interaction in various spin positions. It was noticed that in a state of full moment $j = 1/2$ at $\ell = 0$ an attracting potential occurs and at $\ell = 1$ a repulsing potential occurs. In the state $j = 3/2$ $\ell = 1$ corresponds to the repulsing potential and $\ell = 2$ to an attracting potential. Attention is paid to the analogy of character of the potential in the last of the mentioned cases with the resonance character of interaction of pi-mesons with nucleons in the state $P_{3/2}$ and $T_{3/2}$.

123. Structural Crystallography

"Electronographic Study of Semiconducting Layers of PbTe," by A. Feltynowski, I. Glass and L. Grelewicz, Byul. Polskoy AN 1955, Otd 3, No 11, pp 595-597 (from Referativnyy Zhurnal -- Fizika, No 4, Apr 57, Abstract No 9204)

Vacuum-deposited photosensitive layers of PbTe were studied by electronographic method. X-ray pictures showed that the PbTe for photosensitive emulsions in powder has a structure of the type of NaCl with a period of 6.36 A. Electronograms of the deposited layer give a ring system corresponding to the primitive lattice with a period of 3.33 A. It may be explained in that the Pb and Te atoms locate themselves statistically in the nodes of the specified lattice. By means of an electron microscope also the formation of separate little crystals in the layers of PbTe could be observed under the effect of the electron beam.

"The Effect of Excess of One of the Components on the Growth Rate of Crystals of a Double Salt From a Solution," by A. V. Blyustin, Tr. In-ta kristallogr, AN SSSR, 1956, No 12, pp 73-78 (from Referativnyy Zhurnal-- Fizika, No 4, Apr 57, Abstract No 9370)

The growth rate of crystals of potassium-aluminum alums, ammonia-aluminum alums, and ammonia-nickel sulfate from aqueous solutions, containing an excess of one or the other component of the double salt was studied. Previously weighed priming crystals were introduced into the solution. The growth rate was evaluated from its mass accretion. The growth rate of crystals increases with the addition of a component containing cations of low mobility, because the diffusion of the latter limits the growing process and, on the otherhand, decreases with excess of highly mobile cations. At a certain excess of low-mobility cations the rate reaches its maximum. The introduction into the double salt of an excess of one of the components noticeably changes the shape of the crystals.

"Effect of Admixture on Crystallization of Silicon Carbide," by N. Ye. Filonenko and V. A. Alferov, Abrazivy, 1955, No 13, pp 3-20 (from Referativnyy Zhurnal -- Fizika, No 4, Apr 57, Abstract No 9385)

The effect of Fe_2O_3 and CaO admixtures is investigated. The primary material was quartz sand and petroleum coke. The thermal treatment was carried out at 1,650 — 2,200° during 5-6 hours. The admixture causes a positive or negative effect at not very high temperatures (2,000°) at the end of the carbonization process and at about 1,800° at the start of the process. Admixtures not combining with silicon (e.g., Fe) are not harmful and may turn catalyzers.

Admixtures interacting with SiO_2 in forming SiC(CaO) negatively affect the formation of SiC, and most harmful are Al_2O_3 and CaO; if both are present they form a eutectic with a melting point at 1,170°; Al_2O_3 in an amount of 3% hinders carbide formation; a eutectic with melting point of 1,595° is formed; at a temperature over 1,750° Al_4S_3 and SiC of a third modification is formed, more useful for electrical techniques than for abrasives. The presence of free CaO reduces the output of SiC.

124. Crystal Lattice Theory

"A Problem of Crystal Lattice Theory," by S. A. Mamulov, Sb. tr. nauch. konferentsii. No 1, Kemerovo, 1957, 65-74 (from Referativnyy Zhurnal -- Fizika, No 3, Mar 58, Abstract No 5840)

A formula for the energy of the crystal lattice is suggested: $U = 256.1\, Z_1 Z_2 \sum m(r_k + r_a)^{-1} p$, differing from the Kapustinskiy formula by the coefficient p. The analysis of the parameter p shows that it increases with an increase of the anion radius according to the formula $p = a + br_a$. A table is compiled for the values of U for halides, oxides, and chalcogenides.

125. Structure of Deformed Materials

"Generalized Diagram of Creep Criteria by Using New Ratios of Stress, Creep Rate, and the Service Life of the Metal," I. A. Oding and V. S. Ivanova, Issledovaniya po zharoprochnym Splavam (Research on Refractory Alloys) Moscow, 1956, pp 52-59 (from Referativnyy Zhurnal -- Fizika, No 4, Apr 57, Abstract No 9439)

For a more full characteristic of creep of alloys, together with limits of long-term strength and creep, a new criteron, the resources of plasticity, is suggested, i. e., deformation of the specimen at a specified creep-rate during its service life, which is compared to long-term strength. The extrapolation of data is suggested in coordinates strength - logarithm of time. For the evaluation of refractory alloys a generalized diagram of creep criteria is suggested, consisting of ratios (at constant temperatures) (a) log of creep rate versus strength; (b) strength versus log of service; and (c) log of resources of plasticity versus log of service life.

126. Dynamic Properties of Dislocations

"Dynamic Properties of Dislocations," by O. Mgebryan, Tr. Tbilissk. un-ta 1957, 62, 25-52 (from Referativnyy Zhurnal -- Fizika, No 2, Feb 58, Abstract No 3541)

A method of secondary plasticity effect is suggested. It consists in that as a result of cold and thermal treatment of metals and alloys a difference of potential occurs between points which have been on an equipotential surface before the treatment. This effect occurs due to variation of metastable density, and it may therefore be used for studying dislocation properties. The secondary plasticity effect was tested on hardening and softening of Zn, Al, Al-Zn (70 : 30), Cu-Zn (70 : 30), Armco-Fe, Cu and Bi, on hardening and annealing of steel, and on aging of duralumin. It is concluded that the materials tested undergo metastable dislocations. These dislocations lower the energy value required for softening.

Theoretical Physics

127. Relation Between Classical and Quantum Mechanics

"Relation Between Classical and Quantum Mechanics," by K. I. Dolmatov, Tr. In-ta matem, i mekhan, AN UzSSR, 1956, No 17 pp 155-160 (from Referativnyy Zhurnal -- Fizika, No 4, Apr 57, Abstract No 8411)

Classical motion of a deforming particle is investigated in an external field; the energy of deformation is taken in the form A div V, where A is a certain constant, and V the velocity of the particle at the specified point. The equations of motion are derived, its Hamilton function and the equation of Hamilton-Jacobi. It is demonstrated that if $A = -ih/2$ and the action $S = -ih \log \psi$, the Schroedinger equation is obtained for the function ψ. Considering the electron as a particle which may be deformed during its motion in an external field, the writer obtains Schroedinger's equation for the electron moving in an electromagnetic field.

128. Quantum Field Theory

"Singularity of Potential in Pair Theory," by Yu. M. Lomsadze, Nauchn. zap. Uzhgorodsk. un-t, 1957, 18, 101-107 (from Referativnyy Zhurnal -- Fizika, No 2, Feb 58, Abstract No 2692)

In the first nonvanishing approximation of the perturbation theory in the case of pair interaction of two nucleons, the computation of relativistic effects and nucleon recoil does not lower the singularity of the interaction potential obtained in nonrelativistic theory; it prevents the possibility of formation of bound stationary states of a system of two nucleons.

"Effective Computation Method of S-Matrix in Quantum Field Theory," by Yu. M. Lomsadze, Nauchn. zap. Uzhgorodsk. un-t, 1957, 18, 155-175 (from Referativnyy Zhurnal -- Fizika, No 2, Feb 58, Abstract No 2693)

By assuming that the equations of Tomonag-Schwinger have analytical solutions with respect to energies of all real particles for arbitrary values of the bond constant, a process of construction of a "modified series" of the perturbation theory is suggested, each member of which is a compound function of constants of bonds.

129. Variational Principle for Dielectrics

"The Variational Principle for Dielectrics," by G. Marks, University im. Etvesh, Budapest, Byul. Polsk. AN. Otd. III, 1956, 4, No 1, pp 29-35 (from Referativnyy Zhurnal -- Fizika, No 4, Apr 57, Abstract No 8400)

The first part is devoted to the deduction of equations of motion and the tensor energy-pulse in relativistic hydrodynamics of an ideal fluid. In the second part this analysis is generalized for a dielectric fluid having a certain space charge. By complementing the lagrangian by invariants connected to the electromagnetic field there is obtained as a result of the applied variational method the tensor of energy-pulse, which is a covariant of a tensor generalization by Abraham. The The tensor obtained is analyzed in detail for the case of an incompressible fluid.

130. Classical Electrodynamics

"Field Method in the Theory of Hyperbolic Systems of Differential Equations of Mathematical Physics," by I. S. Arzhanykh, Tr. 3-go Vses. matem. s'yezda. T.I.M., AN SSSR, 1956, 42 (from Referativnyy Zhurnal -- Fizika, No 4, Apr 57, Abstract No 8397)

Methods developed by the writer for solving the problem of constructing a vector from its rotor and divergence, allowing the field to be expressed by its boundary values, are applied in finding solutions of Maxwell equations and others. The properties of the generated lagging potentials are studied, as well as integrodifferential equations of boundary problems. The physical interpretation of simple and double lagging potentials is given.

XI. MISCELLANEOUS

131. Photocopies of Foreign Patents Readily Obtainable in USSR

"How One Can Obtain Descriptions of Foreign Patents" (unsigned article); Moscow, Tekstil'naya Promyshlennost, No 2, Feb 58,

"Workers of the textile industry who are interested in foreign patents can obtain photocopies of patents including figures and drawings at the All-Union Patent-Technical Library of the Committee for Inventions and Discoveries under the Council of Ministers USSR (Vsesoyuznaya Patentno-Tekhnicheskaya Biblioteka Komiteta po Delam Izobreteniy i Otkrytiy pri Soveta Ministrov SSSR), in Moscow, Tsentr, proyezd Serova, 4, pod'yezd 7a; Telephone: B 8-64-52.

"Photocopies of foreign patents can also be obtained through the Bureau of Orders of the All-Union Institute of Scientific and Technical Information, Academy of Sciences USSR, in Moscow, D-219, Baltiyskiy pos., d. 426; Telephone: D 7-00-10, dob. 51."

132. New Belorussian Fish Economy Institute Organized

"New Scientific Research Institute" (unsigned article), Minsk, Sovetskaya Belorussiya, No 56, 7 Mar 58, p 3

A new Belorussian Scientific Research Institute Fish Economy (Belorusskiy Nauchno-Issledovatel'skiy Institut Rybnogo Khozyaystva has been organized within the system of the Administration of the Food Industry, Belorussian Sovnarkhoz (Council of National Economy). The institute has a Laboratory of Fish Procurement, a Laboratory of Hydrochemistry and Hydrology, a Laboratory of Hydrobiology, and a Laboratory of Technology and Mechanization.

* * *