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CENTRAL INTELLIGENCE AGENCY

# SCIENTIFIC

# INFORMATION REPORT

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PLEASE NOTE

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

SCIENTIFIC INFORMATION REPORT

Table of Contents

I.  BIOLOGY

1.  New Theory of "Telergons" Explained

"Telergons and Their Biological Significance," by Ya. D. Kir-
shenblat; Moscow, Uspekhi Sovremennoy Biologii, Vol 66,
No 3 (6), Nov/Dec 58, pp 322-336

Explains and discusses a new biological concept which concerns the
interrelationships and interactions between the animal organism and its
environment, and between one animal organism and others.  The key to the
mechanism of this interaction is the "telergon," which the author defines
in the following paragraph:

> "We proposed the term 'telergon' [Telergona -- from Greek words mean-
> ing 'in the distance' and 'action'] for characterization of all biologically
> active organic substances which are emitted by animals into the environment,
> the basic significance of which is action on other organisms.  (Kirshenblat,
> 1957).  These substances are the opposite of hormones, parahormones, medi-
> ators of nerve action and other substances which act as chemical stimulators
> or regulators of function only in the same organism in which they are pro-
> duced."

Reference is made to Bethe's attempts (1932) to classify all these
substances as hormones; subdivisions were endo- and ectohormones, the latter
of which included the substances for which the name "telergons" is herein
proposed, in addition to fertilization substances developed by sex cells,
odoriferous substances from leaves of plants which repel animals, and
odoriferous substances from flowers which attract animals.  Some subsequent
criticism and further development of Bethe's classification by other in-
vestigators is discussed.  Kirshenblat states that his telergons are not
hormones, but are rather products of internal secretion, or sometimes prod-
ucts of excretion of the organism.  He further states:

> "Telergons play an important role in the interrelationships of the
> organism with its environment, since by means of them the animal can exert
> diverse actions on other organisms which are located within its immediate
> surroundings and which are involved in the combination of its conditions
> of existence.  One telergon serves the animal as protection against enemies,
> another -- for immobilizing prey, a third -- for attracting nutritive ob-
> jects or other members of its own species, and a fourth -- for action on
> members of the opposite sex, etc.  Parasites and symbionts develop special
> substances which cause characteristic changes in all animal organisms on
> which or in which they reside."

The article points out that the term in question is purely physiological and encompasses substances of very diverse chemical composition; telergons can be proteins, steroids, alcohols, organic acids, etc. Generally, Kirshenblat subdivides telergons into the following categories:

A. Homotelergons -- substances which act on other members of the same species

    1. Gonofions, which cause formation of or changes in sex characteristics

    2. Gamofions, which stimulate maturation of sex glands and reproductive processes

    3. Epagons which attract other members of the same species

B. Heterotelergons -- substances which act on animals of other species

    1. Progaptons, which immobilize or kill prey

    2. Aminons, which protect animals from enemies

    3. Likhneumons, which are elaborated by Myrmecophils and termitophils and expectorated by ants or termites, on which they have a stimulating or narcotic effect

    4. Xenagons, which are developed by parasites and which act on the host organism

After a detailed discussion of each of these terms, the author offers the following conclusions:

> "The range of substances called telergons is not limited to the examples selected. The interrelationship of animals with the environment is complex and multiform. Certain aspects of these interrelationships have not been sufficiently studied up to this time. Therefore, the establishment of still other paths of chemical action of animals on various organisms in their immediate environment should be expected. In connection with this, the necessity for establishing new groups of homo- and heterotelergons will undoubtedly arise.
>
> "Further study of telergons should proceed along the lines of precise determination of the site and method of the formation of these substances, explanation of their chemical structure, and discovery of the physiological mechanisms of their action on organisms which are sensitive to them.

> "This field of research promises to be most interesting in very diverse respects and can lead to the development of new methods for controlling agricultural pests and parasites, trapping wild animals, fish, and commercial invertebrates, and new methods of controlling reproductive processes in agricultural animals."

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2. Study and Use of Antibiotics in Horticulture in Yerevan

"Conference on the Study and Use of Antibiotics in Horticulture," by Ya. I. Rautenehteyn; Moscow, Mikrobiologiya, No 1, Jan/Feb 59, pp 156-160

A conference on the study and use of antibiotics in horticulture was held in Yerevan, 8-13 October 1958. It was convoked by the Institute of Microbiology, Academy of Sciences USSR, the Sector of Microbiology, Academy of Sciences Armenian SSR, and the Institute of Agricultural Microbiology, All-Union Academy of Agricultural Sciences imeni V. I. Lenin. The conference was attended by 300 persons at which 32 reports were given on the role of antibiotics and other microbial metabolites in nature, on the biological behavior and mechanism of action of antibiotics on plants, on the origin and biological significance of antibiotic resistant bacteria, on the results of the utilization of certain antibiotic preparations in controlling infectious diseases of crops, and on the use of microbes having definite antagonistic properties for the control of pathogens of infectious diseases of plants.

3. Plants in the Ukraine Showing Increased Natural Radioactivity

"On the Increase of Natural Radioactivity in Plants," by Academician P. A. Vlasyuk and O. P. Golykova, Ukrainian Scientific Research Institute of Plant Physiology; Kiev, Dopovidi Ukrayins'koyi Akademiyi Sil's'kohospodars'kykh Nauk, No 6, Nov/Dec 58, pp 6-8

After conducting a number of experiments in the study of the natural radioactivity of sugar beet and winter wheat plants, the authors arrived at the following conclusions:

a. A significant increase in the levels of natural radioactivity in plants had occurred since 1956 and was due mainly to the permeation of the rare-earth elements into the plants. They accounted for 80% of the overall radiation figure.

b. The most radioactive organs of the plants were the leaves; the least, the roots of sugar beets and the kernels and roots of winter wheat.

The authors concluded that this increase in plant natural radio-activity can be attributed to the existence of radioactive-contaminated dusts in the atmosphere and the earth crust. They urged that more attention be given to this condition.


4. Prof Ye. S. Smirnov, Soviet Entomologist, Celebrates 60th Birthday

"In Honor of Prof Ye. S. Smirnov," by Ye. N. Ivanov; Moscow, Zashchita Rasteniy ot Vrediteley i Bolezney, No 1, Jan/Feb 59, p 59

Prof Yevgeniy Sergeyevich Smirnov, Doctor of Biological Sciences, head, Chair of Entomology, Moscow State University, celebrated his 60th birthday on 24 September 1958 and his 35th year of scientific and pedagogical activities. Smirnov was born in St Petersburg and graduated from the Moscow University in 1920. He remained at the university, and in 1924 began lecturing on zoology. In 1938, he became professor of the Chair of Entomology and in 1940 its head. He was also associated with the State Scientific Research Institute imeni K. A. Timiryazev and the Institute of Malaria and Parasitology during the years 1924-1938.

He is the author of nearly 70 scientific works on comparative and experimental morphology, the systematics and theories of systems, and other entomological subjects.

II. CHEMISTRY

## Colloidal Chemistry

5. Producing an Aerosol by Dispersion of a Stream of Superheated Liquid

"On the Dispersion of a Stream of Superheated Liquid," by V. A. Fedoseyev, Odessa State University im. I. I. Mechnikov; Moscow; Kolloidnyy Zhurnal, Vol 20, No 4, Jul/Aug 58, pp 493-497

On the basis of experiments performed, the author describes the action of a superheated liquid. When the liquid has been heated above its boiling point under normal conditions (760 mm Hg) and is discharged into space which is also at atmospheric pressure, then the liquid will disperse into fine drops without any external forces or special fittings (nozzles, sprayers, etc.).

The experiments have shown that the dispersion of such a spray (aerosol) depends only on the degree of superheating applied to the liquid and the size of the outlet. It was found convenient to correlate the dispersion of the spray and the vapor pressure equilibrium in the boiler. A hyperbolic relationship exists between these two quantities. A linear dependence exists between the diameter of the simplest, round outlet and the droplet size. Experiments have shown that the disintegrating process of the superheated liquid ends several meters away from the outlet. The method described allows the dispersion of quantities of liquid which, with other methods, would have required hundreds of horse power. In one experiment 100 liters of liquid were dispersed in one to 1.5 minutes.

## Defoliants & Herbicides

6. Fruit Tree Defoliants

"Chemical Defoliation of Fruit Trees," by Yu. I. Rakitin and A. Imamaliyev, Institute of Plant Physiology im. K. A. Timiryazev, Academy of Sciences, USSR; Moscow, Fiziologiya Rasteniy, Vol 6, No 1, 1959, pp 61-66

The authors used aqueous solutions of magnesium chlorate (hexahydrate) and endothal (disodium salt of 3,6-endoxohexahyrophthalic acid) for the fall defoliation of fruit trees in the Moscow region. Effective solutions that should be used contain 0.25-0.5% of magnesium chlorate and 0.075-0.1% of endothal.

Defoliation improves the readiness of plants for wintering and increases the efficiency of fall and winter measures against plant diseases and garden pests.

Spraying of trees with defoliant solutions not only accelerates the formation of abscission layers in petioles but also lignification of the shoots, lowers transpiration, facilitates retention of water in plants and in the root zone, and makes the plants more resistent to low temperatures during the winter.

After wintering plants subjected to defoliation hardly differ from plants which were not treated.

## 7. New Herbicides Synthesized

"Synthesis of Herbidides. I. Acid Phthalate Esters of Aryloxy-ethanols," by S. I. Burmistrov and O. Kh. Vlasova, Dnepropetrovsk Chemicotechnological Institute im, F. E. Dzerzhinskiy; Kiev, Ukrainskiy Khimicheskiy Zhurnal Vol 24, No 5, 1958, pp 629-631

The authors synthesized 14 (described in the text) new acid phthalate esters of aryloxyethanols and studied their properties for the purpose of developing new herbicides. The sodium salts of several compounds were synthesized and analyzed.

The Laboratory for the Control of Weeds of the All-Union Scientific Research Institute of Corn conducted the studies of herbicidal activity. There it was found that of the compounds synthesized the acid phthalate ester of 2,4-dichlorophenoxyethanol was the most active.

The authors recommend the acid phthalate esters for use in the identification of aryloxyethanols because of their precise melting points and, additionally, they can be identified by the determination of their acid equivalents.

- 6 -

Fuels and Propellants

8. Kinetics of Nitration of Methane With Nitrogen Dioxide

"The Kinetic Mechanism of the Reaction Between Methane and Nitrogen Dioxide," by T. V. Fedorova, A. P. Ballod, Academician A. V. Topchiyev, and V. Ya. Shtern, Petroleum Institute of the Academy of Sciences USSR; Moscow, Doklady Akademii Nauk SSSR, Vol 123, No 5, 11 Dec 59, pp 860-863

The vapor-phase nitration of methane with nitrogen dioxide was investigated with the view of establishing experimentally whether this process, and processes of the nitration of alkanes in general, are of the free radical or chain reaction type. The problem had to be solved as to whether the experimentally determined reaction velocity corresponds to the bimolecular stage of a free radical process that proceeds with difficulty or represents the velocity of a complex chain process which imitates a bimolecular reaction. It was concluded on the basis of the results obtained that the primary stage of nitration, which determines the velocity of the reaction, can be represented by the equation

$$RH + NO_2 \longrightarrow R + HNO_2 \qquad (1)$$
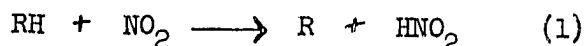
Kinetic data indicate that the nitration cannot be regarded as a complex chain process which imitates a bimolecular reaction (because every act of the formation of $RNO_2$ represents a chain termination, the maximum length of the chain can be no greater than two stages or links).

The mechanism of the nitration of methane can be visualized as follows: The stage of the initiation of alkyl radicals according to equation (1), which has an energy of activation of 30 kilocalories per mol, is followed by the interaction of these radicals with $NO_2$ (an interaction which has a low energy of activation). $NO_2$ functions as a radical-like molecule in the final stage of the nitration.

9. Incomplete Oxidation of Methane in Presence of Nitrogen Oxides

"The Problem Concerning the Mechanism of Incomplete Oxidation of Methane in the Presence of Nitrogen Oxides," by S. F. Gudkov; Moscow, Zhurnal Prikladnoy Khimii, Vol 32, No 2, Feb 59, pp 342-346

It was found that during the incomplete oxidation of methane in the presence of nitrogen oxides, the latter enter into chemical interaction with stable molecules of methane. As a result of this, free radicals are formed which give rise to chains of methane oxidation. $NO_2$ functions as an accelerating agent in this reaction.

Incomplete oxidation of natural gas in the presence of nitrogen oxides is one of the methods for the production of formaldehyde. It was known that this reaction proceeds by a chain mechanism. However, the nature of this mechanism had not been clarified hitherto.

10. Calorific Value of Jet Kerosenes

"The Calorific Value of Aviation Kerosenes Produced by the Thermal Cracking of Mazuts," by M. F. Nagiyev and  L. I. Tryapina, Petroleum Institute, Academy of Sciences Azerbaydzhan SSR; Baku, Doklady Akademii Nauk Azerbaydzhanskoy SSSR, Vol 15, No 1, Jan 59, pp 25-28

The calorific values were determined of aviation kerosenes obtained by the thermal cracking of mazuts derived from Karachukhur crude, heavy Balakhansk crude, and mazut remaining after the distillation of a mixture crudes.  It was established that the quality of the initial raw material has a greater effect on the calorific value of aviation kerosenes obtained by the thermal cracking of mazuts than the conditions of cracking. Among the aviation kerosenes investigated the highest calorific values per unit of weight were exhibited by kerosenes produced by the thermal cracking of mazut derived from Karachukhur crude while the highest calorific values per unit of volume were exhibited by aviation kerosenes resulting from the thermal cracking of mazut derived from heavy Balakhansk petroleum. It was established that the calorific values of aviation kerosenes obtained by the thermal cracking of mazuts are inversely proportional to the content of aromatic hydrocarbons  in these kerosenes.

[For additional information on fuels and propellants, see Items No 11 and 12.]

## Industrial Chemistry

11. Expansion of the Production and Application of Oxygen in the USSR Under the Current 7-Year Plan

"A new stage in the Development of the Production and Application of Oxygen," (unsigned article); Moscow, Kislorod, Vol 11, No 6, Nov/Dec 58, pp 1-2

Production increases in the principal branches of the heavy industry planned for 1959-1965 will be accompanied by an expansion of the production of oxygen in the USSR and increased applications of oxygen. At present, more than 25% of the steel produced in the USSR is smelted with the use of oxygen. Successful work has been begun on industrial applications of oxygen in the nonferrous metallurgy. In the course of this work it was established that it is advisable to use oxygen in a number of smelting processes in nonferrous metallurgy.

In the chemical industry, the application of oxygen has been introduced into processes for the conversion of methane and the production of technological gas for the synthesis of ammonia. A new very promising process that requires large quantities of oxygen is the oxidative cracking of natural gas to produce acetylene. This acetylene is to be used for the production of a number of important chemical substances, above all synthetic polymers. The process in question will become of major importance at the enterprises of organic chemical industry that are being created under the 7-year Plan and will operate on the basis of conversion of natural gas.

As a result of developments foreseen under the 1959-1965 Seven-Year Plan, the production and application of technical oxygen in the USSR will be several times greater in 1965 than in 1958. At large metallurgical plants oxygen-producing units are required the capacity of which amounts to tens of thousands of cubic meters per hour. Oxygen-producing units of equally large capacity will have to be constructed at enterprises of the chemical industry.

Although aggregates which produce 5 or 12.5 thousands of cubic meters of technical oxygen per hour have been developed during recent years, their output is insufficient for the large enterprises mentioned. For this reason, aggregates producing 30-35,000 cubic meters of oxygen per hour will be developed and constructed on a continuous ("series") basis in the near future as well as high-capacity aggregates which not only produce pure oxygen and nitrogen but also noble gases (argon and krypton) as by-products. The development of aggregates for this type will form the principal task of the oxygen-machine building industry in the coming few years.

Of decisive importance for a reduction of the cost of oxygen will be an increase in the volume of its production by building regional air fractionation plants which will supply with oxygen and nitrogen metallurgical, chemical, and other enterprises of the economic region in which they are situated.

- 9 -

12. Prospects of Producing Acetylene From Natural Gas in the USSR

"On the Basis of a New Raw Material," by V. Antonov, Chief of Administration, State Committee on Chemistry at the Council of Ministers USSR; Moscow, Promyshlennc-Ekonomiche-skaya Gazeta, Vol 4, No 22 (477), 20 Feb 1959, p 2

"During recent years, the consumption of acetylene in the chemical industry reached a very high level. It is intended to increase the capacity for the production of this crude material up to 500,000 tons between now and 1965.

"The major part of the acetylene produced industrially in the USSR is derived from calcium carbide. To produce acetylene in this manner complex equipment is necessary. The use of electric power per ton of produced acetylene gas reaches 11,000-12,000 kw hours. To produce a ton of acetylene gas, 3.7 tons of calcium carbide were used while the capital investment per ton of acetylene was comprised of 3,500-4,000 rubles.

"A short time ago, scientific research institutes initiated work on the production of acetylene from natural gas. An experimental installation for the electric cracking of natural methane was constructed at which this process was carried out on a semi-industrial scale. The technological process for the electri cracking of methane is much simpler than that for the production of acetylene from calcium carbide. The necessity of using limestone and of conducting the process in cumbersome electric furnaces are eliminated.

"An electric arc of high potential acts on the methane in the electric cracking process. The produced reaction gases contains 14% of acetylene and 57% of hydrogen. After leaving the reactor the gases are purified and then conducted into a system where acetylene is separated by extraction with selectively acting solvents (dimethylformamide, acetone, or butyrolactone).

"The new method is of great advantage from the economic standpoint. When this method is applied, the cost of acetylene is lower by 25-30% and the capital investment is lower by 50%.

"When electric cracking of methane is applied, one ton of acetylene is produced from 4,600 cubic meters of natural gas. Furthermore, 3.2 tons of synthetic ammonia can be produced from 5,650 cubic meters of by-product gases. The carbon black present in the gases resulting from the reaction can be used in the rubber industry.

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"Another promising method for the production of acetylene from hydrocarbon raw materials is the oxidative pyrolysis of methane. When this method is applied, incomplete combustion of methane in oxygen takes place in furnaces of a special design. A part of the methane is oxidized to carbon monoxide with the formation of free hydrogen, while the remaining part of the methane is converted into acetylene. The process of the partial oxidation of methane takes place within 0.005-0.01 of a second. The gases formed in the reaction contain 8.5% of acetylene and 55% of hydrogen. The by-product gases, which consist essentially of carbon monoxide and hydrogen, can be used at nitrogen fertilizer plants for the production of synthetic ammonia.

"In the oxidative pyrolysis method, one ton of acetylene is produced from 6,300 cubic meters of natural gas and 3,500 cubic meters of oxygen are used to convert this quantity of gas. In addition to that, 10 tons of steam and 3,750 kw hours of electric power are expended (including the amount of power required for the production of oxygen). From 10,000 cubic meters of by-product synthesis gas, 4 tons of ammonia can be produced. This synthesis gas can also be used for the production of methanol.

"When this method is applied the capital investment is lower by 50% than that necessary for the production of acetylene from calcium carbide. The initial cost is no greater than in the case of acetylene produced by electric cracking and may be lower than that. In the near future the Lisichansk Chemical Combine of the Voroshilovgrad Sovnarkhoz will complete the construction of a large experimental industrial installation for the production of acetylene by the oxidative pyrolysis of methane.

"Some petroleum gases (propane, butane, and heavier hydrocarbons) can be subjected to pyrolysis at 1,100° with the formation of acetylene. Twelve to thirteen percent of acetylene are then formed. Preliminary data indicate that 5.2 tons of propane or butane and 20-25 tons of steam have to be used to produce one ton of acetylene. Furthermore, 3,000 cubic meters of methane-hydrogen fraction are produced, the conversion of which can yield 1.6 tons of synthetic ammonia. In addition to that, 950 cubic meters of ethylene can be isolated from the gases of the high-temperature pyrolysis. It is proposed to apply the new process in the Bashkir Economic Region, which has extensive supplies of hydrocarbon gases.

"The application of new methods for the production of acetylene will make it possible to save hundreds of millions of rubles and to use new sources of raw materials for the production of diverse synthetic products."

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- 11 -

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13. Trends in the Development of Heat-Resistant Polymers

"Basic Problems of the Chemistry of Polymers," by Academician
V. A. Kargin; Moscow, Vestnik Akademii Nauk SSSR, Vol 29,
No 1, Jan 59, pp 32-43

One of the principal directions of research being done at present
is work on the development of polymers that will exhibit the greatest
stability at high temperatures and also will be resistant to light,
radiation, and the action of chemical agents. The best-known poly-
mers which have the required characteristics in this respect are
wholly or partially fluorinated hydrocarbons, primarily polytetra-
fluoroethylene and its copolymers, which form both solid plastics
and elastomers. The temperature at which polymers of this type de-
teriorate may be as high as $400^\circ$. This temperature apparently can
be raised still further.

Organosilicon polymers are also stable at high temperatures. For
instance, organosilicon elastomers can be used in an unusually exten-
sive temperature range (from minus $100^\circ$ to plus $300^\circ$). Improvement of
polymers of this class can be achieved by synthesizing polymer chains
which consist not only of alternating atoms of silicon and oxygen, but
also contain atoms of aluminum, zirconium, titanium, or other elements.
Another possibility is the introduction of organoelemental groups into
the side-chains.

At present, increased attention is being paid again to polymers
which contain atoms of phosphorus, nitrogen, and boron in the principal
chain. The simplest of these polymers, namely phosphonitrilic chlorides,
have been known for a long time. The many attempts to replace chlorine
with organic groups in order to protect the polymer from hydrolysis were
unsuccessful. However, a transition to more complex chains and intro-
duction of groups containing fluorine opens up new possibilities for
the development of polymers of this type, which are distinguished by a
high heat-resistance. At present, increasing attention is being paid
to purely inorganic polymers.

An interesting class of organic polymers which stand temperatures
up to $400^\circ$ are substances which contain aromatic groups in the chain,
for instance polyparaxylylene. Organoelemental polymers derived from
substances of this class appear to be very promising.

One of the methods by which polyparaxylylene can be synthesized
is direct combination of free biradicals. In experiments that have
been conducted these biradicals were produced by the pyrolysis of
p-xylene and then isolated by dissolving them in a solvent at a low
temperature. Raising of the temperature brings about polymerization
of the radicals. Attempts were made to polymerize radicals in the
same manner after they have been produced by the photochemical method.

- 12 -

In addition to the polymerization of free biradicals, polymeriza-
tion in the solid state is of interest. In the latter case polymeriza-
tion of a frozen monomer is carried out at a temperature which is close
to the melting point. It is initiated photochemically or by the radia-
tion method. Under the conditions applied there is restricted mobility
of the molecules, so that the polymerization process proceeds without
interference. The mobility is not great enough to bring about inacti-
vation of molecules that have been excited. Acetaldehyde and acetone
have been polymerized by this method.

In connection with the attempts to develop polymers which are stable
at high temperatures, there is a tendency to look into the synthesis of
organoelemental polymers. One of the lines of research followed in the
synthesis of polymers of this type will be gradual elimination of atoms
of oxygen, hydrogen, and carbon in order to achieve a gradual transition
from organic polymers to inorganic polymers. The structure of a number
of inorganic polymers is known, beginning with plastic sulfur and col-
loidal silicon dioxide. At the present time an increasing number of
investigators inclines to the view that silicon glasses and a number
of amorphous salts have the structure of polymers. However, the prin-
cipal distinguishing characteristic of this group of polymers is the
easy regrouping of molecules. One may say that the polymer chains in
glasses are polymer swarms rather than stable chain molecules. How-
ever, swarm systems of this type (e.g. those formed by naphthenic acid
salts or novalacs) exhibit a sufficient elasticity under certain con-
ditions, so that extension of the region within which silicate glasses
and vitreous salts possess an adequate elasticity is not a hopeless task.

Development of fibrous materials of the type of asbestos is also
an important problem as far as development of inorganic polymers is con-
cerned.

Almost no studies have been carried out on laminar ("plane") poly-
mers. Alumosilicates and presumably coal are polymers of this type.
Lacking characteristics which depend on the flexibility of molecular
chains, they represent systems that are intermediate between true poly-
mers and typical suspension colloids. Laminar polymers are capable of
melting and flowing. Processes connected with the destruction of poly-
mer planes or layers and also processes of radical polymerization must
occur in them. The phenomena of chemical flow presumably are also
exhibited by them. Their properties can in all likelihood be modified
by the grafting of linear polymers. Study of the laws which govern the
behavior of polymers of this class is bound to lead to unique results
as far as the possibilities of applying these polymers are concerned.

- 13 -

14. Measures Taken by the Presidium of the Academy of Sciences USSR to Expedite Work on Polymers

"Development of Theoretical Work and Research in the Field of Polymers" [unsigned article]; Moscow, Vestnik Academii Nauk SSSR, Vol 29, No 2, Feb 59, p 85-86

"The Presidium of the Academy of Sciences USSR noted that the academy has begun work on the mobilization of scientific effort in order to expedite theoretical investigations and experimental research in the field of polymers and initial monomers and also in order to solve actual scientific and technical problems with the purpose of developing technological processes for the production and application of synthetic materials that will have to be produced by the industry in the following few years. The project of a plan for scientific research that should be conducted in 1959-1965 has been prepared. This plan covers the most important lines of research to be done. A 7-year plan for the preparation of aspirants in specialties connected with the production of polymer materials has also been adopted.

"A number of organizational measures has been taken. The following new institutes have been organized within the framework of the Academy of Sciences USSR: the Institute of Petrochemical Synthesis, the Institute of the Geology and Mining of Mineral Fuels, the Institute of Organic Chemistry at Novosibirsk and Irkutsk, and the Institute of Catalysis at Novosibirsk. An Institute of Organic Chemistry is being organized at Kazan'. At the Academy of Sciences Ukrainian SSR, an Institute of the Chemistry of Polymers and Monomers has been organized. At the Academy of Sciences Uzbek SSR, an Institute of the Chemistry of Polymers has been organized.

"At the Institute of Chemical Physics, Academy of Sciences USSR, new laboratories have been opened which are active in the field of high-molecular compounds. At the Institute of Organoelemental Compounds the research done in a number of laboratories has been expanded considerably. A Laboratory of Organoaluminium Synthesis has been created at this institute. Research on polymers has been expanded at the Institute of High Molecular Compounds, the Institute of Organic Chemistry, and elsewhere.

"The publication of Express Information [Ekspress-Informatsiya] bulletins in the series of synthetic high-molecular materials has been expanded. The publication of abstracts and reviews on the most important problems of the chemistry of high-molecular compounds, the publication of the periodical Vysokomolekulyarnyye Soyedineniya, and the publication of a popular science series on polymers have been provided for.

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- 14 -

"However, the Presidium regards the work that has been done as inadequate. The institutes transfer their effort too slowly to the furthering of research on such important subjects as inorganic polymers, the scientific basis of the application of polymer materials, and natural polymers. The institutes of the Departments of Biological, Technical, and Physico-Mathematical Sciences are lagging as far as their participation in work on high-molecular compounds is concerned. In plans made for 1959, insufficient attention is paid to the precise formulation of actual problems in the theoretical field and particularly in the field of experimental research aimed at the joint solution with the industry of practical problems pertaining to the production and application of polymer materials. The coordination of research in the most important fields is inadequate.

"The Presidium approved the collated project of a plan for the most important scientific research work to be done in the field of polymers in 1959-1965. This project imposes on the institutes which work in the field of the physics and chemistry of polymers more precise formulation of subject matter plans for 1959 with the view of expanding to the greatest possible extent work in the field of high-molecular compounds. These plans must also assure a high priority for research conducted in connection with the projected work on high-molecular compounds and bring about complete clarification with respect to the formulation of problems in the theoretical field and problems that are to be solved in collaboration with the industry as far as the production and application of polymer materials which must be produced by the industry within the following few years are concerned.

"The directors of institutes must exercise constant supervision so as to make certain that assignments on high-molecular compounds are carried out and see to it that systematic discussion of the status of work in this field takes place at meetings of the scientific councils. The Council on High-Molecular compounds, the Council on the Chemistry of Naturally Occurring and Biologically Important Compounds at the Department of Chemical Sciences, and the Scientific-Technical Council for the Coordination of Scientific Research in the Field of the Chemical Conversion of Petroleum Hydrocarbons at the Presidium of the Academy of Sciences USSR must regularly subject to scrutiny the status of research conducted along the most important lines of work in this field and take care of its coordination."

15. <u>Operation of an Electrodialysis Installation for the Desalting of Sea Water on a USSR Ship</u>

"A Great Economic Advance: Electrochemical Desalting of Sea Water," by A. Khais (Odessa); Moscow, <u>Promyshlenno-Ekonomi-cheskaya Gazeta</u>, Vol 4, No 32 (487), 15 Mar 59, p 2

Up to now the supplies of fresh water required on ships during a run were replenished by operating evaporators. Evaporators are not economical in operation; the requirements for fresh water to be used in boilers and for household needs on board ship cannot be fully satisfied by distilling sea water. A new solution of the problem was found by a group of engineers of the Black Sea Steamship Company, who designed an installation for the electrochemical desalting of sea water.

Electrolytic desalting is carried out with the application of special membranes or diaphragms consisting of ion-exchange resins. Purification of the water begins instantaneously after the current has been switched on. Under the action of the current, the water that passes through the chambers and diaphragms of the installation is separated into two fractions: desalted water, which is conducted into the fresh-water tanks, and brine saturated with salts.

Electrochemical desalting is of great advantage from the economic standpoint. On vessels which will be equipped with desalting installations, the costs for repairs, the cleaning of boilers, and "antinaki-pin" (an antifouling compound) will be reduced. The expenditure of time required for taking fresh water on board will be eliminated entirely.

These conclusions are supported by practical experience. The S. S. Tula formerly took on board 200 tons of fresh water for the run from Poti to Zhdanov and 150 tons for the run from Odessa to Varna, Bulgaria. After being equipped with the new installation, this ship carries hundreds of tons of additional cargo. An annual economy amounting to 500,000 rubles is achieved thereby.

The installation for electrochemical desalting is constructed of materials which resist corrosion and the action of salt water: its principal parts are made of viniplast, polychlorovinyl plastic, and chemically resistant rubber. Preparations are being made at present for the continuous production of installation of this type.

The electrochemical method for desalting of sea water has a great future. It can be applied not only in sea transportation, but also in railroad transportation, in the industry, and in agriculture. Application of this method is particularly promising in virgin lands, where saline waters have to be treated.

The complex joints and parts of the installation where designed and constructed by the engineers Orzherovskiy, Kunitskiy, Zagoruyko, Shul'ga, and Shkolyar and the mechanics Yankovskiy, Val'ter, and Gubar'.

16. Research on Polyelectrolytes and Prospects of the Application of Substances of This Class

"Basic Problems of the Chemistry of Polymers," by Academician V. A. Kargin; Moscow, Vestnik Akademii Nauk SSSR, Vol 29, No 1, Jan 59, pp 32-43

Polymeric acids and bases are attracting increased attention of investigators in connection with work on the development of new ion-exchange resins and semipermeable membranes and also in connection with experiments in which models of biological objects are constructed. Perhaps no less interesting than problems related to ion-exchange agents are those pertaining to the development of analogous systems which exchange complexes rather than ions. It is possible that resins capable of exchanging complexes will exhibit a considerably higher selectivity than ion exchangers and will be useful for the separation of mixtures of metals. Of importance is also work on the application of optically active ion-exchange resins for the separation of racemic substances, although attempts along this line have not met with any success hitherto.

A new line of research is the development of membranes consisting of strong polymeric electrolytes. For example, films of this type which consist of a polymeric acid, repel the anions of any salt and are for this reason permeable only for cations. Semipermeable membranes of this type are of exceptional interest for use as diaphragms in electrolytic processes and for modelling biological semipermeable membranes. If the solution of a salt of a strong electrolyte is filtered through a membrane of this type, the filtrate will consist of pure water, while the solution of the salt will be concentrated above the membrane. To accomplish this, a pressure must be applied which exceeds the osmotic pressure of the salt solution. To carry out a process of this type membranes are needed which will have a sufficient strength and at the same time will be sufficiently permeable. This problem is being solved by applying ion-exchange resins in the form of powders the grains of which are cemented together with the use of a polymer adhesive. Another possibility is grafting by the radiation method of polymer electrolytes to mechanically strong membranes which serve as carriers.

It has been known for a long time that when oriented fiber consisting of polyelectrolytes are acidified or made alkaline, the fibers contract or elongate because of changes in the charge and shape of the polymer chains. Recently, W. Kuhn and his coworkers showed that expansions and contractions of this type can be brought about by changing the pH of the solution (for instance, a weakly dissociating polymeric alcohol can be oxidized to a strongly dissociating acid and this acid again reduced).

- 17 -

In this manner contraction and elongation of an oriented polymer can be accomplished at a constant value of the pH as a result of the action of oxidants and reducing agents. When Vitamin K and platinum black were introduced into a system of this type they functioned as an intermediate redox system and brought about expansion and contraction of a synthetic model of a muscle under the action of gaseous oxygen and hydrogen. If this principle is transferred to membranes, one can at a constant value of the pH change within wide limits the adsorption capacity and permeability of these membranes by merely changing the redox characteristics of the medium. Work along this line is promising not only from the standpoint of modelling biological processes but also because of the possibility that processes of this type can be usefully applied.

[For additional information on industrial chemistry see Item No 9.]

## Insecticides

17. Work on the Development of More Effective Insecticides

"In the Field of Organic Insectofungicides. XXXVII. The Synthesis of Certain Mixed Esters of Thio- and Dithiophosphoric Acids," by Ya. A. Mandel'baum, N. N. Mel'nikov, and P. G. Zaks, Scientific Institute for Fertilizers and Insectofungicides; Moscow, Zhurnal Obshchey Khimii, No 1, Jan 59, pp 283-285

For the purpose of studying the dependence of the insecticidal action of mixed esters of thio- and dithiophosphoric acids on their structure and searching for new effective insecticides, a number of mixed esters of thio- and dithiophosphoric acids, never before described in the literature, were synthesized.

The compounds are characterized by the following general formulas:

$$(C_2H_5O)_2 \overset{S}{P}\text{-XCH}_2CON\begin{matrix}R'\\R''\end{matrix} \qquad (C_2H_5O)_2 \overset{S}{P}\text{-XCH}_2COOAr \qquad (C_2H_5O)_2 \overset{S}{P}\text{-XCH}_2COSR$$
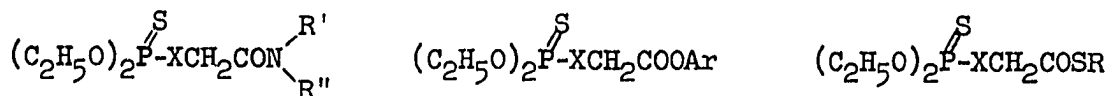
The properties of the 23 compounds synthesized are presented in a table.

A study of the contact insecticidal properties against the barn weevil, conducted by V. V. Popov and N. S. Ukrainets, indicated that all the compounds of this type were inferior to O,O-diethyl-O,4-nitrophenylthiophosphate. It is interesting to note that the most active contact insecticide snythesized in this group is O,O-diethyl-O-carb-4-nitrophenoxymethylthiophosphate. A fairly active systemic acaricide is O,O-diethyl-O-diethylcarbamidomethylthiophosphate.

In addition, it was shown that the reaction of sodium and potassium diethylthiophosphates with the amides and esters of monochloroacetic and monochlorothioacetic acids in acetone leads to the formation of thiono isomers.

18.  Anthracene Insecticides

"Insecticide Preparations From Crude Anthracene: Their Preparation and Properties," by N. I. Burda, Nauchn. Tr. Ukr. N.-I. In-ta Ovoshchevodstva i Kartofelya (Scientific Works of Ukrainian Scientific Research Institute of Vegetable and Potato Cultivation), 1957, No 4, 265-271 (From Referativnyy Zhurnal-- Khimiya, No 23, 10 Dec 58, Abstract No 78827 by I. Mil'shteyn)

The insecticidal properties of the following preparations based on anthracene (I) were studied: I with the addition of 3% and 5% of hexachlorocyclohexane, the product obtained by the interaction of I with petroleum sulfonic acids, sulfonated I, and the product obtained by the interaction of sulfonated I with petroleum sulfonic acids. Aphids of cucumbers, cabbage, sorrel and apple trees were completely eliminated by a 0.3 — 0.4 emulsion of the preparations. The effect of hexachlorocyclohexane on the insecticidal properties of the preparations becomes evident in dilute emulsions ( $\leq$ 0.4%).

19.  Insect Repellent Activity of Esters of Tetrahydrophthalic Acid and Its Homologs

"Esters of Tetrahydrophthalic Acid and Its Homologs as Insect Repellents," by A. P. Terent'yev, A. N. Kost, Ye. Kh. Zolotarev, Ye. V. Vinogradova, T. V. Kalkutskaya and I. A. Yurgenson, Moscow State University im M. V. Lomonosov; Ivanovo, Izvestiya Vysshikh Uchebnykh Zavedeniy -- Khimiya i Khimicheskaya Tekhnologiya, No 4, 1958, pp 55-60

The authors synthesized and characterized nine tetrahydrophthalates to investigate their insect-repellent activity. They found that dimethyl esters of tetrahydrophthalic acid and of its homologs are practically equivalent to the dimethyl ester of phthalic acid

- 19 -

(dimethylphthalate) in repellent activity toward the mosquito Aedes aegypti. The introduction of a methyl or methylene group into the structure of dimethyltetrahydrophthalate does not substantially influence its activity.

The effects of additives on the persistence of the repellent action of dimethylphthalate and dimethyltetrahydrophthalate were also investigated.

## Nuclear Fuels and Reactor Construction Materials

20. Properties of Niobium

"Applications and Properties of Niobium," by G. V. Zakhorova, I. A. Popov, L. P. Zhorova, and G. V. Kurganov; Moscow, Tsvetnyye Metally, Vol 32, No 1, Jan 59, pp 73-82

The physical characteristics of niobium, its mechanical properties from the standpoint of metallurgical applications, and its behavior toward oxygen are reviewed on the basis of USSR and non-USSR publications. It is pointed out that addition of niobium improves the heat resistance of alloys such as chromium-nickel-aluminum and chromium-nickel-cobalt. The advantages of applying niobium in the construction of nuclear reactors are emphasized. It is pointed out that niobium exhibits a considerable strength and ductility both at room temperature and elevated temperatures; that it has a good resistance to corrosion; that it does not react with liquid metals (sodium above $800^{\circ}$, lithium, mercury, bismuth, tin, and below $800^{\circ}$ lead); and that it has a relatively low cross-section of neutron capture.

A bibliography consisting of 12 references (two of which are of Soviet origin) is appended to the article.

21. USSR Book on Borate Glasses

Boratnyye Stekla [Borate Glasses], by L. Ya. Mazelev, Publishing House of the Academy of Sciences Belorussian SSR, Minsk, 1958, 172 pp

This book attempts to investigate, and subject to systematic treatment, the technology of glass manufacture, the processes and reactions leading to glass formation, the crystallization of glasses, and the composition of the products of crystallization, the physicochemical properties of glasses and correlations between these properties, the composition and structure of glasses, and methods for

the calculation of the properties of glasses as far as borate glasses
are concerned. The introduction points out that lithium borate glasses
are applied extensively in different fields of industry and science and
are very promising from the standpoint of applications as material for
electronic vacuum tubes, optical glasses, glasses which either transmit
X-rays or absorb them, glasses which absorb neutrons, glasses to be
used as material for reactors, glasses with a high microhardness, ma-
terials for the production of glass fibers and enamels, etc. The pos-
sibility of applying glasses of this type as a shield protecting against
thermal neutrons and/or short-wave radiation is pointed out in the con-
clusion. As far as glasses containing cadmium oxide are concerned, it
is brought out on the basis of non-USSR publications that this oxide
is being applied extensively as a component for the production of
glasses absorbing neutrons. The table of contents of the book follows:

Table of Contents

22. A Method for the Production of Yttrium Metal

"The Production of Yttrium Metal," by L. A. Izhvanov and N. P. Vershinin; Moscow, Tsvetnyye Metally, Vol 32, No 1, Jan 59, pp 44-47

The method of fractional precipitation of ferricyanides is not suitable for the separation of pure yttrium in considerable quantities because of the formation of precipitates difficult to filter; ion-exchange chromotography is preferable for the isolation of yttrium.

A method for the production of metallic yttrium by the reduction of yttrium fluoride with calcium has been developed. Furthermore, a method for the purification of yttrium from calcium by remelting in vacuum was devised. The interaction of tantalum with yttrium was investigated.

[For additional information on nuclear fuels and reactor construction materials see Item No 120.]

## Organic Chemistry

23. Organophosphorus Research

"Acyldiethylentriamides of Phosphoric Acid," by L. D. Protsenko and K. A. Kornev, Ukrainian Scientific Research Sanitary Chemical Institute; Kiev, Ukrainskiy Khimicheskiy Zhurnal, Vol 24, No 5, 1958, pp 636-638

The acyl derivatives of diethylentriamides of phosphoric acid were prepared and characterized. The authors had previously reported on the aryl derivatives in Volume 22 of this same periodical (Ukrainskiy Khimicheskiy Zhurnal, Vol 22, 782, 1956).

Upon reacting dichloranhydrides with ethylenamine in the presence of triethylamine the acyldiethylentriamides of phosphoric acid are formed. As follows:

$$R-CO-NH-POCl_2 + 2 \begin{array}{c} CH_2 \\ | \quad \rangle NH \\ CH_2 \end{array} \longrightarrow R-CO-NH-P \begin{array}{c} O \\ \| \end{array} + 2HCl,$$
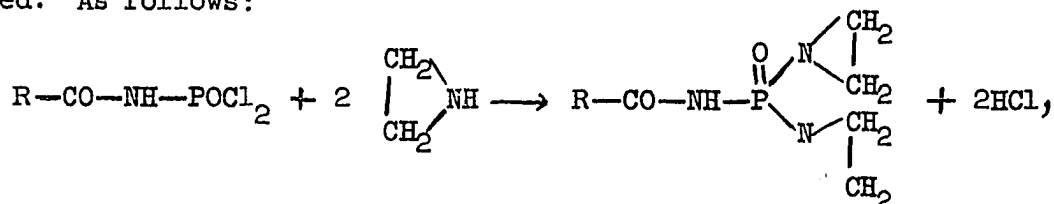
where R represents the following radical: benzoyl, para-nitrobenzoyl, para-bromobenzoyl, para-iodobenzoyl, para-chlorobenzoyl, para-fluorobenzoyl, para-methylbenzoyl and cinnamoyl.

24. Amino Esters Exhibiting Cholinolytic Properties (1)

"Investigation of Derivatives of Substituted Acetic Acids. Report XVI. Dialkylaminoethyl Esters of Beta-alkylmercaptoethylphenylacetic Acids," A. L. Mndzhoyan, G. T. Tatevosyan, and N. M. Divanyan, Institute of Fine Organic Chemistry, Academy of Sciences, Armenian SSR; Yerevan, Izvestiya Akademii Nauk Armyanskoy SSR, Khimicheskiye Nauki, No 6, Vol XI, 1958, pp 439-444

The amino esters (12 in all; not previously described in the literature) of beta-alkylmercaptoethylphenylacetic acids were synthesized and characterized. The purpose of the work was study of the cholinolytic properties of the compounds in question. These compounds have the following general formula:
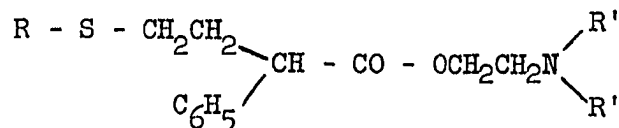
$$R - S - CH_2CH_2 \diagdown \atop C_6H_5 \diagup CH - CO - OCH_2CH_2N \diagup^{R'} \diagdown_{R'}$$

where R = $CH_3$, $C_2H_5$, $C_3H_7$, iso-$C_3H_7$, $C_4H_9$, iso-$C_4H_9$; and R' = $CH_3$, $C_2H_5$.

The formulas and the physico-chemical data are presented in three tables.

The authors propose to publish the results of the biological investigation of the synthesized compounds in a separate report.


25. Amino Esters Exhibiting Cholinolytic Properties (2)

"Investigation of Derivatives of Substituted Acetic Acids. Report XVII. Dialkylaminopropyl Esters of Beta-alkylmercaptoethylbenzyl- and Beta-alkylmercaptoethylphenylacetic Acids," by A. L. Mndzhoyan, G. T. Tatevosyan, and N. M. Divanyan, Institute of Fine Organic Chemistry, Academy of Sciences, Armenian SSR; Yerevan, Izvestiya Akademii Nauk Armyanskoy SSR, Khimicheskiye Nauki, No 6, Vol XI, 1958, pp 445-451

For the purpose of studying the cholinolytic properties of dialkylaminopropyl esters of beta-alkylmercaptoethylbenzyl- and beta-alkylmercaptoethylphenylacetic acids, the authors synthesized 12 esters of the former and 36 of the latter group. They proceeded to characterize some of their physical and chemical properties.

The aminoesters of beta-alkylmercaptoethylbenzylacetic acids were obtained by interacting aminoalcohols and the acyl chlorides of the corresponding acids in absolute benzene.

The beta-alkylmercaptoethylphenylacetic acids were transformed into aminoesters by heating the acids with aminoalcohols in absolute toluene with the simultaneous removal of the reaction-formed water.

## 26.  Adrenaline Derivatives Synthesis

"Synthesis of Several Derivatives of Adrenaline. II.  The Oxime and Semicarbazone of d,l-Adrenochrome," by A. L. Remisov, Military Medical Academy in Kirov; Leningrad, Zhurnal Obshchey Khimii, Vol 28, No 12, Dec 58, pp 3338-45

The author developed the synthesis and investigated the properties of the monoxime and the monosemicarbazone of d,l-adrenochrome, information concerning which is almost completely lacking in the  literature. According to data obtained by potentiometric titration, the  author determined the acid-dissociation constants of these compounds.

Previously undescribed picrates of the monoxime and the mono-semicarbazone of d,l-adrenochrome were prepared and analyzed by the author.

On comparing the color and the acid-base properties of adreno-chrome with its oxime and semicarbazone, assumptions were made for the probable structure of these compounds.

## 27.  Cancerolytic and Antimitotic Compounds Synthesized

"Investigation of Amines and Their Derivatives. Report VI. Methyl Esters of Alkyl-5-Alkoxymethylfurfuryl-2-Carbamino Acids," by A. L. Mndzhoyan, V. G. Afrikyan and G. L. Papayan, Institute of Fine Organic Chemistry, Academy of Sciences, Armenian SSR; Yerevan, Izvestiya Akademii Nauk Armyanskoy SSR. Khimicheskiye Nauki, No 6, Vol XI, 1958, pp 429-431

The authors synthesized 12 methyl esters of alkyl-5-alkoxymethyl-furfuryl-2-carbamino acids, not previously described in the literature, for the purpose of studying their cancerolytic and antimitotic properties.  The characteristics of the compounds in question were investigated.  This class of compounds is represented by the following  general formula:

$$ROCH_2 - \boxed{\phantom{O}} - CH_2 \diagdown N - \underset{\underset{O}{\|}}{C} - OCH_2$$
$$R'\diagup$$
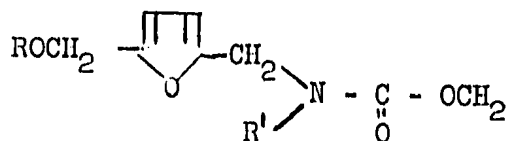
where R = $CH_3$, $C_2H_5$, $C_3H_7$, iso-$C_3H_7$, $C_4H_9$ or iso-$C_4H_9$; and R' = $CH_3$ or $C_2H_5$.

The data obtained upon investigation of the physiological activity will be the subject of a separate report.

## Organometallic Compounds

28. Organoantimony Compounds

"Synthesis of Organometallic Compounds of Pentavalent Antimony by Arylation of Organoantimony Compounds, $ArSbX_2$ and $Ar_2SbX$, with Diazo Compounds," by A. N. Nesmeyanov, O. A. Reutov, O. A. Ptitsyna, and P. A. Tsurkan, Moscow State University im. M. V. Lomonosov; Moscow, Izvestiya Akademii Nauk SSSR - Otdeleniye Khimicheskikh Nauk, No 12, Dec 58, pp 1435-1444

The authors arylated organoantimony compounds of the type, $ArSbX_2$ and $Ar_2SbX$, with the aid of diazo compounds and various double diazonium salts. They found that a satisfactory method for preparing the compounds, $ArAr'SbX_3$, appears to be the interaction of aryldiiodostibines with the double diazonium salts of antimony trichloride.

A method was developed and described for synthesizing compounds such as $Ar_2Ar'SbX_2$ by interacting $Ar_2SbX$ with diazoacetate or the double diazonium salts of metallic chlorides.

Compounds such as $ArAr SbX_3$ were isolated in the form of diaryl-stibinic acids and were identified as double diazonium salts, $ArAr'SbCl_3$. $Ar''N_2Cl$, according to a method devised by O. A. Reutov and A. Markovskaya (vide Doklady Akademii Nauk SSSR, Vol 99, p 543, 1954):

$$ArAr'Sb \xrightarrow{\text{Alcoholic HCl}} ArAr SbCl_3,$$

$$ArAr'SbCl_3 + Ar''N_2Cl \cdot FeCl_3 \longrightarrow ArAr'SbCl_3 \cdot Ar''N_2Cl + FeCl_3.$$
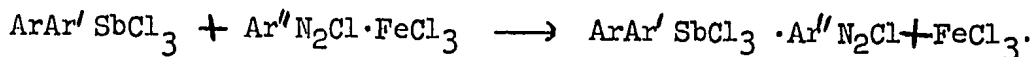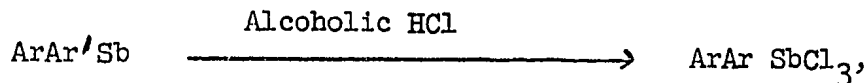
Twenty compounds are listed in a table; the percentage yield and the melting point of each are given.

Miscellaneous

29.  New Periodical "High Molecular Compounds"

"Vysokomolekulyarnyye Soyedineniya"; Leningrad, Zhurnal
Obshchey Khimii, Vol 28, No 12, Dec 1958, Back Cover

Announcement was made that a new Russian periodical, entitled
Vysokomolekulyarnyye Soyedineniya (High Molecular Compounds), would be
released in 1959.

This periodical, to be issued 12 times yearly, will be the organ
of the Academy of Sciences USSR, in the field of the chemistry and
physics of polymers and monomers. General problems concerning the
theory of high molecular compounds, which possess great value for the
development of the production, treatment and application of polymer
materials will be covered by the publication.

Original thecretical investigations will be published in the
periodical as well as the results of experimental work on high molec-
ular compounds completed in institutes and laboratories of the Acad-
emy of Sciences, USSR, higher educational institutions (VUZs), and
industrial enterprises. Foreign authors are invited to send ma-
terial for publication.

III.  ELECTRONICS

Acoustics and Audio Frequency

30.  High-Intensity Ultrasonic Waves

"Generation of High-Intensity Ultrasonic Waves in Liquids," by
A. K. Burov, Laboratory of Anisotropic Structures, Academy of
Sciences USSR; Moscow, Akusticheskiy Zhurnal, No 4, Oct/Dec 58,
pp 315-320

Until very recently the acoustic power in a parallel beam from a
piezoelectric generator was limited to 70 w/cm$^2$.  Recent research at the
Laboratory of Anisotropic Structures, Academy of Sciences USSR, under the
direction of the author has shown that it is possible to obtain a non-
focused beam of about 300 w/cm$^2$ intensity for continuous operation and as
high as 500 w/cm$^2$ for pulsed operation (pulse duration 400 microsec).

High-frequency tube oscillators were built for the fixed frequencies
of 250, 750, 1,500 and 2,000 kc to drive high-intensity piezoelectric
ultrasonic wave generators.  Such oscillators were assembled with a seven-
stage circuit with independent excitation, and were capable of delivering
30 kw power.  Analysis of the cross section of the ultrasonic beam has
disclosed the presence of two distinct zones:  the effective zone and the
zone of scattered radiation.

E. S. Zelinskiy, T. N. Zhuchkova, A. M. Il'inskiy and S. I. Zhavoron-
kin participated in this work.

Communications

31.  Noise-Immunity of Auto-Correlation Reception

"Noise-Immunity of AM Auto-Correlation Receiver," by L. Z.
Klyachkin; Moscow, Radioekhnika, No 2, Feb 59, pp 25-30

The article analyzes the effect of delay time and the filter band-
pass on the signal-to-noise ratio gain for auto-correlation reception,
and makes a comparison with the similar effect for reception with quad-
ratic detector.  It was estimated that for the conditions of optimum fil-
ter band-pass the average gain throughout the whole spectrum of modulat-
ing frequency is less than 1.5 db, and that for conditions of band-pass
greater than the optimum the gain increases to 3 db.

- 27 -

Examination of the behavior of the auto-correlation receiver leads to the conclusion that at low values of signal-to-noise ratio the auto-correlation FM receiver possesses higher noise-immunity with respect to fluctuation noises that an equivalent receiver with quadratic detector. But with an increase of signal-to noise ratio the advantage of auto-correlation reception disappears.

32. Recent Soviet Patents in the Field of Communications

"Authorship Certificates" (unsigned article); Moscow, Elektros-vyaz', No 2, Feb 59, p 78

Class $21a^1$, 32. No 115124. S. P. Khlebnikov and P. A. Anikeyev. A Method for Magnetic Head Mounting in Recording Equipment Utilizing a Stiff Carrier.

Class $21a^1$, $35_{12}$. No 115127. G. V. Braude. A Method for Compensating Non-Uniformity of Film Movement in Systems with Scanning Beam Tubes.

Class $21a^1$, $35_{30}$. No 114886. M. G. Garb and V. M. Sigalov. A Method of Centralized Synchronization.

Class $21a^1$, 36. No 114813. B. I. Strelkov. Triggering Device.

Class $21a^1$, 36. No 114890. A. I. Sapgir. Method of Pulse Subtraction from the Pulse Sequence.

Class $21a^1$, 36. No 115037. N. N. Korovyanskiy. Method of Reducing Settling Time of TV Channel Transient Characteristic.

Class $21a^4$, $8_{01}$. No 114883. S. I. Yevtyanov. Method for Increasing Stability Margin of a Self-Oscillator.

Class $21a^4$, 11. No 115027. V. M. Zhukov and G. G. Rachkov. Device for Obtaining FM Pulses.

Class $21a^4$, $22_{02}$. No 115122. L. F. Abramov and M. Ye. Gertsenshteyn. Weakly Coupled Coaxial Filters.

Class $21a^4$, $29_{01}$. No 115121. N. P. Khvorostenko. Resonant Amplifier of Shock-Excited Type Self-Oscillator.

Class $21a^4$, 71. No 115126. P. S. Seleznev and G. B. Glebovich. Construction of Magnetostrictive Transducer for Magnetostrictive Delay Line.

33. Synthesis of Optimum Binary Code

"Method for Constructing Optimum Binary Code," by V. A. Garmash; Moscow, Elektrosvyaz', No 2, Feb 59, pp 3-7

The article dwells on the subject of building optimum binary code based on the principle of utilizing a "code tree" which does not require the spacing sign. Such a method of utilizing the principle of the "code tree" was first suggested by A. A. Kharkevich.

The "code tree" is constructed in the following manner: from the initial point A (apex) a pyramid is build by successive ramification. The left ramifications are marked by unity and the right by zero. After successive K ramifications the apexes form the K-th "floor." The code combination on the K-th "floor" is obtained by adding to the code combination of the K-1 "floor" a zero or unity depending on movement to the right or left.

The general rules for the construction of a "code tree" are:

1. The given combination should not be taken up for another message.

2. The used combination should not lie on the path of movement toward the apex of an already occupied combination.

3. The selection of combinations should be such that in movement from the periphery toward the apex a maximum of the previously occupied path segments (ribs) should be utilized.

The author thanks A. A. Kharkevich and E. L. Blokh for assistance.

34. VHF Amateur Radio Station

"VHF Radio Station" (unsigned article); Moscow, Radio, No 2, Feb 59, pp 27-30

The described radio station was designed for amateur radio communication in the range of 38-40 and 144-146 Mc. The station receiver is built on the superheterodyne principle with six-volt miniature tubes (five 6Zh1P and one 6Zh4P type tubes). The sensitivity of the receiver in the 38-40 Mc range is not less than 1 microvolt, and in the 144-146 Mc range not less than 2.5 microvolts. Attenuation of the adjacent channel is about 50 db and the band-pass of the receiver is 7 kc. The intermediate frequency for both ranges is 1,800 kc. The transmitter incorporates six-volt miniature tubes (two 6Zh1P and one 6ZhsP). The output stage of the transmitter operates on the GU-29 tube. The modulator consists of a conventional five-stage AF amplifier, which also serves as an amplifier to

- 29 -

the receiver's audio channel. The modulator is built with six-volt octal-base tubes. Four 6P6S type tubes are used in the output stage of the modulator; these tubes are connected in pairs for push-pull operation. The power supply to the station is drawn from ac line through four rectifiers. In order to reduce the number of switches circuit commutation is accomplished with the aid of relays. The station can operate for transmission of telephone or telegraph messages. The whole station is built with four separate units mounted in a single housing.

## Components

35. Transmission-Line Echo Attenuator

"Attenuator of Transmission-Line Echo in TV Transmitters," by E. S. Glazman; Moscow, Radiotekhnika, No 2. Feb 59, pp 3-16

The detrimental effect of "echo" originating in the antenna-feeder system of a TV transmitter can be substantially reduced by incorporating two VHF oscillators in the TV transmitter circuit. By subsequent combining the power from two such oscillators in the transmission line with the aid of a bridge network, the echo originating in the antenna-feeder line is canceled out to a greater degree. To attain the highest attenuation of the echo, a quarterwave length difference between the two feeder-lines connecting the oscillators to the bridge network should be secured.

The utilization of a bridge system for adding up the power from two VHF oscillators is feasible not only in TV transmitters, but also in other circuits where stabilization of power fed to a load with variable parameters is required. Application of the power-adding bridge systems to long-wave transmitters permits widening the effective band-width of the antenna.

The author thanks Z. I. Model' and A. I. Lebedev-Karmanov for their assistance.

36. High-Voltage Thyratron

"High-Voltage Thyratron With Few Sections," by V. D. Andreyev, Moscow, Vestnik Elektropromyshlennosti, No 1, Jan 59, pp 9-11

A new type of thyratron was developed with an auxiliary electrode inserted in the space between the plate and grid to prevent any possible electrical beckfiring. The peak inverse voltage for the tube is

as high as 71 kv; the current for continuous operation is about 3.7a, and for short-duration (2-3 sec) operation as high as 9.7a. This thyratron would operate satisfactorily even at 120 kv when tested with periodic pulses (1 to 2 per sec) by charging a 0.01 microfarad capacitor through a 0.2-henry inductor.

The voltages impressed on the thyratron elements are as follows: grid bias, 150v; forward triggering voltage, 350 v; filament voltage, 5 v. The filament current is about 17a, and the overall dimensions are: length, 690 mm; diameter, 120 mm.

Thyratrons of this type will find application in high-voltage rectifiers supplying stabilized current.

37. Analysis of Chinese-Built Operational Amplifier

"Research on the Operational Amplifier," by Chu P'ei-chi (朱 培 基) and Ting Ping (丁 丙 ), Institute of Automation, Academia Sinica; Peiping, Tzu-tung-hua (Automation), Vol 2, No 1, 1959, pp 22-26

This paper presents a circuit analysis of the automatic null point-type operational amplifier used in the DMZ-2 computer which was built by the Institute of Automation, Academia Sinica and dedicated to the Communist Party of China in celebration of National Day, 1 October 1958.

Comparing theoretical results with their experimental measurements, the authors conclude that their operational amplifier can stand much improvement. They state: "Its principal parameters are considered satisfactory. However, it cannot yet be used by production units mainly because of its low reliability, short-lived polarized relay, and vexatious method of adjustment. To render the operational amplifier suitable for use in simulators, the quality of the polarized relay element and the accuracy of the integrator must be improved. The major obstacle in further improvement of the integrator is the large grid current of the China-manufactured 6H2π (6N2P) tube. It has been tested many times and found to be of higher order than $10^{-8}$."

The paper gives circuit diagrams and technical performance charts.

38. <u>Chinese 1955 Research on the Power Magnetic Amplifier</u>

"The Transient Characteristics of the Power Magnetic Amplifier,"
by T'ung Shih-huang (童 世 璜), Institute of Automation,
Academia Sinica; Peiping, <u>Tzu-tung-hua</u> (Automation), Vol 1,
No 2, 1958, pp 64-72

This paper presents a method for analyzing the transient characteris-
tics of a three-phase power magnetic amplifier such as is used in the
electromagnetic-type voltage regulator. Experimental data obtained sev-
eral years ago are given to show that the method is "very reliable."
According to the author, the differential equations used are derived
in the same manner as those introduced by Finzi and others in 1950,
but the results obtained by following the analysis he presents are
more reasonable.

Also described in this paper is a method for calculating the equiv-
alent time constant of the power magnetic amplifier and its amplifica-
tion factor under transient conditions when used as an element in a con-
trol system.

Footnotes and bibliographic references indicate that the work reported
in this paper was completed in June 1955 and previously presented in the
<u>1955 Research Reports of the Institute of Electromechanics</u> (機 械 电 機
研 究 所 ) <u>of the Academia Sinica.</u> The following three papers are
cited as having appeared in that publication:

"Analysis of the Transient Characteristics of the Electromagnetic-
Type Voltage Regulator," by T'ung Shih-huang, Ch'u Shou-te (瞿 寿 德),
Chou Jung-ch'and (周 荣 昌 ), and Chu T'ing-chang (朱 庭 璋).

"Analysis of the Static Characteristics of the Three-Phase Magnetic
Amplifier Used in Electromagnetic-Type Voltage Regulators," by T'ung
Shih-huang, Ch'u Shou-te, Chou Jung-ch'ang, and Chu T'ing-chang.

"Non-linear Metering Elements Used in the Electromagnetic-Type Volt-
age Regulators," by T'ung Shih-huang et al.

CPYRGHT

- 32 -

Computers and Automation

39. Book on Computer Technique Recommended for Translation Into Russian

"An Introduction to Computer Technique," by I. P. Brusentsov;
Moscow, Novyye Knigi Za Rubezhom, Seriya B, Tekhnika, No 2,
Feb 59, pp 54-56

The article analyzes the content of the book published by Van
Nostrand Co, (1957) entitled "An Introduction to Automatic Computers,"
by N. Chapin.

The concluding passage of the article reads: "In conjunction with
wider use in the USSR of automatic computers in the fields of accounting,
planning, and control of manufacturing processes, the number of people
who will have need for such a book will greatly increase in the next few
years. Therefore, it would be advisable to begin the translation and
publication of this book right now."

40. Remote-Controlled Radio-Relay Lines

"Equipment for Remote Control and Regulation of Radio-Relay
Lines," by V. M. Rodionov, V. N. Strokov and R. N. Sheberova;
Moscow, Elektrosvyaz', No 2, Feb 59, pp 15-23

At the Scientific-Research Institute of the Ministry of Communications
a system of remote control and signalization for radio-relay lines was
developed which utilizes only transistors and cold-cathode thyratrons.
The absence of vacuum tubes substantially improves the reliability of the
system. A unique method of design also permitted reducing considerably the
number of electromagnetic relays. This system permits transmission of 59
commands to any of the 10 (5 in each direction) remote-controlled stations;
the acceptance of such a command is indicated by a special signal. A signal
indicating the change of position of one or several of the 64 remote-
signalization pick-up units can be received from any of the stations; such
a signal contains information as to the station where the change has
occurred, but does not contain information on the nature of such changes.
Yet each station will respond to a request for information as to the posi-
tion of any of the 64 remote-signalization pick-up units.

The transmitter of this remote-control equipment sends commands in
the form of coded groups consisting of three successive tone-frequency
signals. The signal duration is of the order of 20 microsec and the
interval 50 microsec. By selecting frequencies for the three-pulse groups
out of four possible frequencies, it is possible to secure 64 different
code combinations. The receiver of this remote-control equipment decodes

- 33 -

the commands with the aid of a "pyramid" consisting of three tiers of thyratrons coupled to each other in such a manner that the firing of one in a lower tier initiates firing of four thyratrons in the next tier. The first tier has 4 thyratrons, the second 16 and the third 64.

The capacity of the remote-control system can be varied by changing the number of pulses in the code group or the number of frequencies used in transmission with appropriate change in the number of tiers in the decoder or the number of thyratrons in each tier. Thus, if the coded message is formed with four pulses instead of the three, the capacity of the system can be raised to 256 commands.

41. Processes of Control

"Optimal Processes of Control," L. S. Pontryagin; Moscow, Uspekhi Matematicheskikh Nauk, Vol 14, No 1 (85), Jan/Feb 59, pp 3-21

The results of V. G. Boltyansky, R. V. Gamkrelidze and the author, obtained in the works [1], [2], and [3], are summarized and presented.

[1] V. G. Boltyanskiy, R. V. Gamkrelidze, and L. S. Pontryagin, "On the Theory of Optimal Processes," DAN, Vol 110, No 1, 1956, pp 7-10.

[2] R. V. Gamkrelidze, "On the Theory of Optimal Processes in Linear Systems," DAN, Vol 116, No 1, 1957, pp 9-11.

[3] V. G. Boltyanskiy, "The Maximum Principle in the Theory of Optimal Processes," DAN, Vol 119, No 6, 1958.

42. Future Use of Ural Computer Discussed

"Application of Electronic Computers during Aerial Phototriangulation," by A. N. Uspenskiy, candidate of Technecal Sciences; Moscow, Geodeziya i Kartografiya, No 11, 58, pp 29-42

According to the author, results concerning the effectiveness of constructing grid bearings according to aerial photographs with the help of the "Ural" computer are preliminary and must be made more precise. Nevertheless, the results obtained are sufficient to recommend application of a computer to aerial surveying as a means toward automation of all the processes of phototriangulation.

43. Hertz-type Problem Considered for the Compression of Two Cylindrical Bodies

"Plane Problem of the Hertz Type Concerning the Compression of Cylindrical Bodies," by A. I. Kalandiya, Calculating Center, Academy of Sciences, Georgian SSR; Tbilisi, Soobsheniya Akademii Nauk Gruzinskoy SSR, Vol 21, No 1, Jul 58, pp 3-10

The paper deals with problems concerning the contact of two elastic bodies when the contact between the bodies is distributed over a significant part of their bounding surfaces.

44. New Chinese Publication

Title:  Tzu-tung-hua (Automation)

General Information:  This periodical, published by the K'o-hsueh Ch'u-pan She (Science Press), Peiping, is edited by the Preparatory Committee of the Automation Society of China.  The editorial board includes Yang Chia-ch'ih ( 楊 嘉 墀 ), who is chairman, and 19 other members.

Four quarterly issues were published during 1958 after the special inaugural number in October 1957.  That issue stated the intended professional level of the journal in the following words:

"This journal is to be a vehicle for scientific papers on cybernetics, automatics, telemechanics, computation techniques, automated electrical traction, and automated technical equipment; translations and review articles on automation, technical and economic reports on automated production processes, news on scientific activities, and book reviews.  It will carry original Chinese papers and provide a field where all schools of thought on automation in China will air their views."

Starting with January 1959, Tzu-tung-hua has become a monthly which will "seek to popularize and to raise the level of science in China by publishing timely reports of advanced experiences and the most advanced techniques adopted in China and abroad, and by providing basic information on automation and allied subjects."  Announcing this and other "changes in editorial policy," the January 1959 issue stated that its emphasis hereafter will be on technical achievements of urgent interest to socialist construction.  Some articles of long-range interest and others representing basic theoretical studies will be published, but the idea is to bring the theoretical into relation with the practical.

The quarterly issues of 1958 give foreign-language tables of contents and English resumes of some of the Chinese research reports published.  The first two monthly issues of 1959 give neither.

- 35 -

Articles by Chinese contributors:   Nine of the original Chinese articles published in the first six issues of this journal are described elsewhere in this issue of the <u>Scientific Information Report</u> (see below and under Electronics-Components and Engineering).

Titles and authors of other articles by Chinese authors follow:

"The Prospects for Smooth Speed-Control of Induction Motors," by Shu Sung-kuei (疏 松 桂), Institute of Automation, Academia Sinica; Vol 1, No 1, 1958 (Review article).

"Determination of the Dynamical Characteristics of Boiler Sets," by Shih K'o-k'uan (师 克 宽) et. al., Tsinghua University; Vol 1, No 2

"News on the International Federation of Automatic Control," by T'u Shan-ch'eng (屠 善 澄); Vol 1, No 3, 1958

"Resume of the Second Annual All-Soviet Conference on Pneumatic-Hydraulic Automation," by Lu Yuan-chiu (陆 元 九), Institute of Automation, Academia Sinica; Vol 1, No 4, 1958

"Report on the All-China Conference for Exchange of Experience With Analog Computer Systems," by the Editorial Department; Vol 2, No 1, 1959

"Static Pressure System for Continuous Measurement of Specific Gravities of Liquids," by Yu Chen-k'uei (俞 振 奎), Synthesis Research Institute of the Ministry of Chemical Industry, Mukden; Vol 2, No 1, 1959

"Use of Harmonic Functions in the Determination of Dynamical Characteristics of Non-linear Systems," by T'u Ch'i-lieh (涂 其 枬), Institute of Automation, Academia Sinica; Vol 2, No 1, 1959.

"Radioisotope Apparatus for Measuring Film Thicknesses," by P'an Nien-te (潘 念 德), Institute of Automation, Academia Sinica; Vol 2, No 1, 1959

"A Gamma Relay," by P'an Nien-te, Institute of Automation, Academia Sinica; Vol 2, No 1, 1959

"Brief Discussion on Guidance and Control of Space Rockets," by T'u Shan-ch'eng (屠 善 澄), Preparatory Committee of the Automation Society of China; Vol 2, No 2, 1959

"Accurate Method for Determining Oscillation Parameters of Single-Loop Relay Systems," by T'u Hsu-yen (涂 序 彦) and Tai Ju-wei (戴 汝 為), Institute of Automation, Academia Sinica; Vol 2, No 2, 1959

"Study of Electronic Controllers With Several Units," by Lou Ch'i-ming (楼 启 明), Chou Hung-t'ing (周 宏 廷), and Chih Chu-chun (治 竹 君), Institute of Automation, Academia Sinica; Vol 2, No 2, 1959

"A Simple Pulse Frequency Modulated Telemetering System," by Sa Chih-t'ien (薩 支 天), Institute of Automation, Academia Sinica; Vol 2, No 2, 1959

"Moment of Error Squared Integral Criterion, a Method on Engineering Calculation for Linear Systems," by Chang Tung-han (張 东 韩), Institute of Automation, Academia Sinica; Vol 2, No 2, 1959

45. Chinese Research on Automatic Feedback Control Systems

"Synthesis of Linear Automatic Feedback Control Systems," by Wan Pai-wu (万 百 五), Chiao-t'ung University; Peiping, Tzu-tung-hua (Automation) Vol 1, No 3, 1958, pp 99-114

This paper presents a method for the synthesis of automatic feedback control systems. The method, according to the author, is an extension of the V. V. Solodovnikov method and involves the manipulation of frequency response. It purports to be the solution to many practical, complicated, and hitherto unsolved design problems encountered in the synthesis of systems with nonunit function inputs, systems under disturbances, systems with general feedback components, systems with corrective network in the main feedback path, systems with multiple inputs, and systems involved with noise.

46. Remote Signaling and Telemetering Systems of Chinese Design

"Research Notes [From the Institute of Automation] During the Leap Forward Movement," by Wang Ch'uan-shan (王 传 善) and Sa Chih-t'ien (薩 支 天), Institute of Automation, Academia Sinica; Peiping, Tzu-tung-hua (Automation), Vol 1, No 4, 1958, p 199

This item reports two recent research achievements of the Institute of Automation of the Academia Sinica: a contactless remote signaling system and a pulse frequency modulated telemetering system. The circuit designs are reportedly the original work of Chinese scientists.

A block diagram of the contactless remote signaling system shows major parts described as follows: two distributors constructed of magnetic ceramic components; two pulse generators constructed of magnetic ceramic components; a logic unit made of magnetic ceramics and semiconductors; a

- 37 -

carrier-wave section on the transmitting end, consisting of triode transistors forming a carrier frequency oscillator and a modulator; a carrier-wave section on the receiving end, consisting of a crystal detector and an amplifier; and a signal indicator section construction of neon tube(s).

Another block diagram shows the principal parts of the telemetering system. These are: an amplifier made of triode transistors and electronic tubes, a rectangular-wave generator with a highly stabilized multivibrator, the carrier-wave section, and the receiving section. The last mentioned is constructed of beryllium-magnesium alloy, contains a contact multivibrator, and has a high capacity for error correcting.

"Contactless Remote Signaling Systems," by Wang Ch'uan-shan (王 傳 善) and Lin Wen-chen (林 文 震), Institute of Automation, Academia Sinica; Peiping, Tzu-tung-hua (Automation), Vol 2, No 1, 1959, pp 13-19

This paper discusses the structure and operational principles of a contactless remote signaling system, giving block and circuit diagrams.

According to the authors, two models of this type were recently synthesized by the Institute of Automation of the Academia Sinica. Magnetic and semiconductor components were used, eliminating the need of electronic tubes and relay elements. Ferrites were used to make the magnetic components because of the scarcity of Be-Mo alloys in China. Although inferior in performance to the Be-Mo type, the ferrimagnetic components reportedly can be produced commercially at low cost.

Fragmentary information on "good" experimental results as compared with the theoretical is given. The authors state that pulse frequency of 100 cycles coming from the distributor made rapid signal transmission possible. For as many as 50 channels it took only 0.5 second; ten channels, 0.1 second. There was almost no time delay.

Problems encountered in the process of synthesizing the two models and some of their defects and disadvantages are mentioned. The authors state that intercoil induction forced them to use a low performance path for the signal indicator. Moreover, both transmitting and receiving ends have to operate on the same network. To solve these problems further research is indicated. To rectify problems created by the nonuniform characteristics of neon tubes used in the signal indicators, the authors suggest using cold cathode thyatrons instead.

- 38 -

47. Chinese Introduces Receiving Circuit for Error Correcting

"Receiving Circuits for Error Correcting," by Wang Ch'uan-shan
(王 傳 善 ), Institute of Automation, Academia Sinica; Pei-
ping, Tzu-tung-hua (Automation), Vol 1, No 1, 1958, pp 11-19.

The author presents a comparative analysis of various types of error-
detecting and error-correcting receiving circuits which have been described
in the literature and which reportedly are suitable for either systematic
or nonsystematic codes but not both. He shows that the receiving circuit
for automatic error-correcting must be a systematic relay circuit and
introduces one, "suitable for both systematic and nonsystematic codes and
more practical and simple than that described in the literature."

CPYRGHT         This paper is dated April 1956.                    CPYRGHT

48. Cybernetic Commission Established in Czechoslovakia

"A Cybernetic Commission Established in the Czechoslovak Acad-
emy of Sciences" (no author given); Prague, Podnikova organi-
sace, No 11, 24 Nov 58, p 524

Recently a cybernetic commission, headed by Professor Zich of the
Chair of Logic, Charles University, Prague, and including leading scien-
tific workers from social, natural, and technical sciences, was estab-
lished in the presidium of the Czechoslovak Academy of Sciences.

One of the chief tasks of the commission is to do theoretical work
in the field and to build up a Czech school for cybernetics on the basis
of foreign information and through Czechoslovak research. The chief sup-
port in the work of the commission will be pertinent mathematical machines
which will confirm various procedures and dependent relationships, but the
commission will be chiefly occupied with theoretical questions, leaving the
technical aspect of the matter to work centers such as the Research Insti-
tute for Mathematical Machines, which build automatic computers.

The commission will also be occupied with economic questions, the
construction of pertinent models depicting economic phenomena and opera-
tions, and confirming various dependencies and functions of relationships
in the formation of national economic plans and their variations. It may
be expected that the successful solution of the theoretical problems of
cybernetics will have a practical significance for refining and deepening
the system of planning, management, and bookkeeping in the entire national
economy.

The commission also will undertake the task of popularizing cyberne-
tics in a wider circle of leading technical groups.

49. Slovaks Construct Analog Computer

"The Rise of Cybernetics," by Juraj Bober; Bratislava, Pravda, 2 March 1959, p 2

The Institute of Machinery and Automation of the Slovak Academy of Sciences includes the Department of Machinery Dynamics, which is engaged in the basic questions of the dynamics of machinery from the point of view of proper functioning, maximum efficiency, and designs and cal- culations of machinery components and units; the Department of Auto- mation and Automatic Regulation, dealing with suggestions for new types of regulators; the Department of the Theory of Information, solving the basic problems of complex automation; and the Computer Department, sol- ving complicated engineering calculations on the problems previously mentioned, with the help of computers.

The previous name of the institute, used until 1 March 1959, was the Laboratory of Theoretical and Applied Mechanics of the Slovak Academy of Sciences. The institute now has about 160 square meters of area, includ- ing the workshop area with 11 workers; it is still disorganized, but a 1965 target date for completion is indicated.

Jan Gonda, a corresponding member, is the head of the Laboratory of Theoretical and Applied Mechanics of the Slovak Academy of Sciences. One of the four rooms of the laboratory contains the first original analog computer in Slovakia.

It was built to solve linear differential equations up to the six- teenth order algebraic equations, and a limited number of partial differ- ential equations. After being enlarged by several nonlinear computer units, the basic cells of the machine, it will be able to solve non- linear differential equations also.

One of the computer's creators is Engr Stefan Petras, who got the idea in 1952, when he was an assistant, with Engr Plander, in the engi- neering faculty. A collective group, working under Petras and Plander, made the computer when the institute was known as the Laboratory of The- oretical and Applied Mechanics of the Slovak Academy of Sciences.

Bober says the computer is a better device than domestic and even some foreign models, and was assembled from domestic components in the laboratory.

It is being used by work centers to solve problems in engineering and automation as well as by some other research institutes and some plants. These include the Automation Laboratory of the Research Institute of Acetylene Chemistry in Novaky, the "J. V. Stalin" Plant in Martin, the Department of Theoretical and Experimental Electrical Engineering of the Slovak Advanced Technical School, and various other work centers.

According to Petras, the plans for the work center at the institute include working with problems of using computers not only for calculations, but directly in the technological process of production, in automation. He recommends setting up a computer center in Czechoslovakia in the near future "not because it is the fashion, or because the Soviet Union and other advanced industrial countries have such, but because it is not possible to achieve success in theoretical research today without a computer center."

The article suggests operation of analog and digital computers in the institute, by 1965 and widespread use of cybernetics in industry, weather forecasting and announcement directly on radio, translation by machine, and automation. Semiconductors are to replace electron tubes in the computers.

## Electromagnetic Wave Propagation

50. Electric Discharge at Low Pressure

"Electric Discharge with Cold Cathode in Magnetic Field at Low Pressure," by G. V. Smirnitskaya and E. M. Reykhrudel', Moscow State University; Moscow, Zhurnal Tekhnicheskoy Fiziki, No 2, Feb 59, pp 153-162

Theoretical and experimental investigation of electric discharge in magnetic field at low pressure in tubes with cold cathode discs arranged symmetrically on both sides of the ring anode are described in the article. Theoretical calculation of the electron kinetics is carried out neglecting the field distortion caused by the space charge. The trajectories of electrons for random initial coordinates and velocities at various values of electric and magnetic fields were derived.

Such an electric discharge in magnetic field is utilized in magnetically polarized manometers, in ionic pumps for vacuum to $10^{-8}$ mm Hg, and in high-frequency noise generators. Calculations were carried out for conditions of vacuum from $10^{-6}$ to $10^{-8}$ mm Hg and current density not exceeding $10^{-6}$ a/cm$^2$.

Instruments and Equipment

51. High Selectivity Detector-Discriminator

"Detector-Discriminator With High Selectivity," by V. I. Nik-itenko, Leningrad Electrical Engineering Institute imeni V. I. Ul'yanov; Kiev, Izvestiya Vysshikh Uchebnykh Zavedeniy, Radio-tekhnika, No 5, Sep/Oct 58, pp 527-532

In the multichannel communication systems operating on the principle of frequency division of channels, a problem of interference elimination from adjacent channels arises when the interval between the channels is reduced to a minimum. Such a problem was partly solved at the Moscow Phys-icotechnical Institute. Under the direction of Ye. I. Manayev a network was developed in which by proper selection of intercoupling circuits and by adjusting the gain of each amplifier it was possible to attenuate the interference from the adjacent channels to a minimum. This network detects separately and subtracts voltages of two coupled circuits; the coupling between the circuits is selected in such a manner that the resonance response of the first circuit has the appearance of a two-humped curve, and that of the second has the appearance of a single-humped curve.

It was shown experimentally that this detector-discriminator permits reducing the frequency intervals between adjacent channels without the use of complex multisection filters.

Miscellaneous

52. Research at Moscow Engineering-Physics Institute

"At the Moscow Engineering-Physics Institute," by B. N. Kononov; Kiev, Izvestiya Vysshikh Uchebnykh Zavedeniy, Radiotekhnika, No 5, Sep-Oct 58, pp 622-623

The following research in the field of radioelectronics was completed in 1957 at the Moscow Engineering-Physics Institute:

"Development of Standard Semiconductor Components for Discrete Type Computers"; participants: A. G. Filippov, T. M. Agakhanyan, B. N. Kononov, L. A. Serkin, Yu. A. Volkov, V. I. Lebedev. L. N. Patrikeyev, A. V. Nik-olayev and Yu. N. Fost; scientific supervisor I. P. Stepanenko.

"Development of a Device for Determining and Recording Amplitude-Phase Characteristics"; participants: Yu. I. Grashin, V. I. Zaytsev and A. M. Kostantinov; scientific supervisor K. E. Erglis.

- 42 -

"Theoretical Calculation of a 5-Mev Linear Electron Accelerator"; participants: A. V. Shal'nov, Ye, T. Pyatnov, A. A. Glazkov and S. P. Lomnev; scientific supervisor O. A. Val'dner.

"Design of a System for Digital Control of Machine Tools"; participants: A. I. Voitelev, B. I. Kal'min and Ye. A. Aksenov; scientific supervisor Ya. A. Khetagurov.

[For information on materials see item No 120.]

- 43 -

IV.  ENGINEERING

## 53.  Induction-Type Torsiometers

"Induction-Type Noncontact Torsiometers," by Ye. S. Levshina,
P. V. Novitskiy and A. M. Turichin; Moscow. Izmeritel'naya
Tekhnika, No 1, Jan 59, pp 16-20

At the Laboratory for Electrical Measurement of Nonelectrical Magnitudes, the Leningrad Polytechnic Institute imeni M. I. Kalinin, under the direction of the authors several types of induction-type transducers for the measurement of torque were developed.

The operation of the torsiometer's induction transducer is as follows: three streel-toothed rings are fastened to the shaft to be tested; working clearances are formed between the teeth of the middle and the outside rings.  When torque is applied to the shaft, one of the clearances will widen while the other will contract.  Two electric coils are fastened on a stator above the clearances.  A change in the width of one of the clearances will decrease the permeability to magnetic flux in one of the coils, and will increase permeability in the other coil.  Such a change in magnetic permeability also causes corresponding changes in the electric resistance of the coils.  The change in coil resistance is proportional to the torque applied to the shaft.  The following designations were given to the new non-contact torsiometers:  IKM-50, IKM-51, IKM-51A, IKM-52, and IKM-53.

Such noncontact induction torsiometers should find application for measurement of a wide range of torque from 20 g·cm to 500 kg·m.  The torsiometer can be used for measurement of slowly changing torque with an accuracy up to 0.5%, as well as for dynamic measurements with an accuracy up to 3%.

## 54.  New Soviet Super-High Steam Parameter Turbogenerator

"Some Problems in Thermal Schemes for Super-High-Steam-Parameter Block Installations," by A. E. Gel'tman; Moscow,
Teploenergetika, No 3, Mar 59, pp 3-8

The article discusses the problem of selecting feed-water temperature and optimum vacuum at the condenser for the newly designed super-high steam-parameter SKK-300 turbogenerator-boiler unit.  This new unit was

designed at the Central Boiler-Turbine Institute for the following operating parameters: capacity, 300,000 kw; steam pressure, 300 atmospheres absolute; steam temperature, 650°C; intermediate reheating of steam to 565°C, feed-water heating to 270°C, air preheating to 425°C and pressure at the condenser of about 0.04 atmosphere absolute.

## 55. Combined Gas and Steam Turbine Electric Stations

"Steam-Gas Turbine Condenser Electric Stations and Their Comparative Thermal Efficiency," by M. L. Zaks and A. V. Stolyarov, Moscow Engineering-Construction Institute and Power Engineering Institute, Academy of Sciences USSR; Moscow, Teploenergetika, No 3, Mar 59, pp 19-25

During the coming few years a wider utilization of natural gas for power generating purposes is contemplated in the USSR; a similar increase in utilization of "underground" produced coal gas will take place.

It is suggested that the most efficient method for utilization of gaseous fuel in electric-power production is through incorporation of both steam and gas turbines in the same electric power generating stations. In such a steam turbine and gas turbine combination system the feed water is heated by steam extracted from the low-pressure turbine stage, while the fuel and air are preheated by the exhaust gases. Study has revealed that the over-all efficiency of such a steam and gas turbine combination system is higher than for a straight turbine system, especially for operating conditions at high or super-high steam parameters.

## 56. Effective Illumination of Dam Construction Sites

"Construction Work Illumination During Gap-Filling Operations on a River Channel in Building Hydroelectric Stations," by M. S. Dadiomov, Leningrad Affiliate of Orgenergostroy" Svetotekhnika, No 3, Mar 59, pp 14-17

The rock-filling operation on a river channel in the final stage of building dams across large rivers requires a well-designed illumination system to permit efficient day and night operation. Such a final operation of river channel filling from floating (pontoon) bridges can be carried out in a very short time, even for very large rivers, if favorable conditions are created for uninterrupted day and night operations.

The Volga River channel was rock-filled at Kuybyshev (340 meters) in 4 days, at Stalingrad in one day, and the Angara River at Irkutsk in one day. The efficiency and speed of these operations depend to a great degree on proper illumination of the construction site to secure good visibility of obstacles, signals, and the water surface.

Satisfactory illumination at the Stalingrad dam construction site was obtained by the use of 200-w, type SPU-300, pole-suspended lamps spaced about 9 meters along the pontoon bridge, and more than one hundred 1,000 w searchlights (type PZS-45) placed along the cable way.

57.  Increasing Voltage on Existing Transmission Lines

"Transferring Electric Power Transmission Lines to a Higher Rated Voltage Without Increasing the Existing Insulation," by V. V. Burgsdorf and N. N. Belyakov", Moscow Elektrichestvo, No 2, Feb 59, pp 1-5

Examines the possibilities of increasing the rated voltage on electric power lines without any substantial changes in the existing equipment or increase in the insulation. Such a procedure would substantially increase the power carrying capacity of an electric line without any great capital investment.

The 110-, 150-, and 220-kv power lines could be transferred to rated voltages of 150-, 220-, and 330-kv, respectively. Such a transfer is possible without any increase in the existing insulation provided some supplementary airblast circuit-breakers and oil circuit-breakers with low ohmic shunting resistors are added to the network. The article concludes with a statement that the industry will be responsible for providing the needed quantity of such circuit breakers.

58.  Chinese Report 1956 Work on Selsyns

"Calculation of the Complex Selsyn Circuit," by Yeh Cheng-ming (叶 正 明 ) and Ch'u Shou-te (瞿 寿 德), Institute of Automation, Academia Sinica; Peiping, Tzutung-hua (Automation), Vol 1, No 2, 1958, pp 73-82

This paper, published with an English abstract, presents simplified methods for calculating complex parallel and series selsyn circuits. The authors use the "general coordinate transformation method for forward-backward-zero position systems" advanced by A. G. Iosif'yan and B. M. Kagan, but neglect several insignificant terms in the general formulas. They provide experimental data to show that the results obtained by their method of calculation are still within engineering accuracy.

"A Supplement to the Article, 'Calculation of the Complex
Selsyn Circuit,'" by Yeh Cheng-ming; Peiping, <u>Tzu-tung-hua</u>
(Automation), Vol 1, No 2, p 83

This "supplement," Dated December 1957, refers to the paper described
above. Yeh Cheng-ming states that the information contained in that paper
was extracted from another work, "by the same title and authors," which
had appeared in the <u>1956 Report on Electrical Research Project No 56-3</u>
<u>of the Institute of Electromechanics, Academia Sinica</u> (1956 年 中 國 科 學
院 機 械 电 機 研 究 所 56-3 号 研 究 工 作 報 告 ).

According to Yeh, in 1956, there was a paucity of literature on the
subject of calculating selsyn circuits. In the literature of 1957, he
found two papers dealing with the subject. However, the methods presented
by the Soviet authors of those papers" cannot be applied to selsyns in
general but only when certain conditions obtain." He discusses specific
weaknesses of the Soviet methods.

59.   <u>Chinese Proposes Engineering Method for Sequential Relay Circuits</u>

"On the Realizability of Sequence Tables of Relay Circuits,"
by Wang Ch'uan-shan ( 王 傳 善 ), Institute of Automa-
tion, Academia Sinica; Peiping, <u>Tzu-tung-hua</u> (Automation),
Vol, 1, No 4, 1958, pp 163-171

By way of introduction, the author states that the synthesis of se-
quential relay circuits is a difficult problem often requiring a study
of sequence tables in order to pinpoint the unrealizable ones. These
can be converted into realizable tables by introducing extra relays in
the proper places along the circuit. Present methods of conversion, how-
ever, require the tedious checking of each relay for conflicts between
conditions of operation and of release. None is applicable to all se-
quential    lay circuits.

In this paper the author presents a "new approach" to the problem.
He describes a "simple" method for determining both the number and the
positions of auxiliary relays which should be added to a sequential relay
circuit in o. 'r to render its unrealizable sequence tables realizable.
The new approach involves the study of conditions of repetitions of posi-
tion numbers.

As an engineering method for the synthesis of all sequential relay
circuits, the author considers his procedure more suitable and easier
than other methods described in the literature. His paper is dated
December 1957.

60.   Russian Underground Rocket

"Underground Rocket"; Budapest, Magyar Nemzet, 14 Mar 59

The first underground rocket has been prepared in the Soviet Union; it is being used to dig tunnels. The first part of the rocket has a pulverizing device which contains liquid fuel and compressed air. Powerful flames spout from openings in the pulverizer, these open a path for the rocket in a predetermined direction. In this way, a cylinder-like tunnel develops behind the rocket.

Tadzhik engineers invented the rocket equipment. The first experiments have been conducted with satisfactory results. In the future they will use the device to lay underground irrigation canals and pipes.

[For additional information on Engineering subjects see also Metallurgy.]

## V. MATHEMATICS

### 61. Algorithm for Constructing a Tchebycheff Approximation

"An Algorithm for Constructing the Tchebycheff Approxima-
tion of a Continuous Function by a Polynomial," by S. I.
Zukhovitskiy, Lutsk Pedagogical Institute imeni Lesi
Ukrainki; Moscow, Doklady Akademii Nauk SSSR, Vol 120,
No 4, 1958, pp 693-696

A real, continuous function $f(q)$ and a system of n real, continuous,
and linearly, independent functions $\varphi_1(q), \varphi_2(q), \ldots, \varphi_n(q)$ are
given in a certain compact set Q. During the Tchebycheff approximation
of a function $f(q)$ with the help of a polynomial of the form $\xi_1\varphi_1(q)$
$+ \ldots + \xi_n\varphi_n(q)$ the problem arises of finding a system of coefficients
$(\xi_1^o, \ldots, \xi_n^o) = x^o$ such that the deviation

$$\max_{q \in Q} \left| \Delta(x^o, q) \right| = \max_{q \in Q} \left| \sum_{k=1}^{n} \xi_k^o \varphi_k(q) - f(q) \right|.$$

would be minimized.

Algorithms have been constructed by P. L. Tchebycheff (Poln. sobr.
soch., No 2, 1947) and S. N. Bernshteyn (Sobr. soch., No 1, 1952) for
certain problems of Tchebycheff approximation enabling one to construct
a sequence of polynomials, the deviations of which converge to the least
deviation. Several algorithms were indicated by Ye. Ya. Remez, (Pro
metody naykrashchogo, v razuminni Chebishova, nablizhenogo predstavleniya
funktsiy (On the Method of Finding the Best Approximation of a Function
in the Tchebycheff Sence), Kiev, 1935).

In the works of S. I. Zukhovitskiy (DAN, Vol 79, No 4, 1951, and
Matem. sborn., Vol 33(75), No 2, 1953) a finite monotonic algorithm
was constructed for the Tchebycheff approximation of a finite system of
incompatible linear equations. In all these works it is indicated that
it is sufficient to consider the $\eta$ grid $q_1, \ldots, q_m$ of the compact set
Q and to find by this algorithm the Tchebycheff approximation of the in-
compatible linear equations

$$\varphi_1(q_i)\xi_1 + \varphi_2(q_i)\xi_2 + \ldots + \varphi_n(q_i)\xi_n = f(q_i)$$

$$(i=1, \ldots, m),$$

that is, to find the point $x^* = (\xi_1^*, \ldots, \xi_n^*)$, for which

(1)

$$\max_{1} \left| \sum_{k=1}^{n} \varphi_k (q_1) \xi_k^* - f(q_j) \right| = \inf_{x} \max_{i} \left| \sum_{k=1}^{n} \varphi_k (q_1) \xi_k - f(q_1) \right| \,,$$

and for sufficiently small $\eta > 0$ the deviation of the polynomial $\xi_1^* \varphi_1 (q) + \ldots + \xi_n^* \varphi_n (q)$ from $f(q)$ can be made to differ as little as desired from the smallest. Using an idea of La Vallee Poussin, it is not difficult to prove how, in the case of approximation on a segment by ordinary or trigonometric polynomials according to a given $\epsilon > 0$ the actual selecting of $\eta > 0$ is such that the deviation of the approximating polynomial differs less than $\epsilon$ from the least deviation.

In the present work an algorithm is introduced for the immediate construction of a Tchebycheff approximation of a continuous function on a compact set without the preliminary transition to the system (1) and consequently, without the preliminary calculation of the values of the functions $\varphi_1 (q), \ldots \varphi_n (q)$ on the $\eta$ grid.

62. The Expansion of Roots of a Function by Series Applied to a System of Equations

"The Approximate Solution of a System of Nonlinear Equations," by Sh. Ye. Mikeladze, Tbilisi Mathematics Institute imeni A. M. Razmadze, Academy of Sciences, GeoSSR, Tbilisi State University, imeni Stalin; Tbilisi, Soobshcheniya Akademii Nauk Gruzinskoy SSR, Vol 20, No 6, Jun 1958, pp 647-653

The work of the author, "On the Problem of the Approximate Solution of an Equation by the Expansion of a Root in a Series," Izv, industr. in-ta, No 1, 1934, pp 21-47, a short account of which may be found in a second work by the author, "On the Roots of a Function, Defined by a Differential Equation," IAN, ser fiz.-matem., No 4, 1935, pp 559-586, considered various questions concerning the zeros of a given regular function. The principle which was employed in that work consisted of introducing a variable parameter, generally complex, and on the basis of the fundamental theorem concerning the conditions for the existence of an implicit function, an expansion of the root in a series was constructed.

The present work is a continuation and development of the former work referred to above. It is proved that the method of expanding roots into series, developed in the author's former work, can be fully applied to the solution of a system of equations of a completely general form, whereupon the expansions obtained are in the form of absolutely convergent series.

63. New Biorthogonal Systems Obtained From Known Biorthogonal Systems

"Several Integral-Differential Operators and Series Expansions Analogous to Series of Schloemilch," by S. A. Akopyan and A. B. Nersesyan, Institute of Mathematics and Mechanics; Yerevan, Doklady Akademii Nauk Armyanskoy SSR, Vol 27, No 4, 1958, pp 201-207

It is known (1), that it is possible to obtain from a given biorthogonal system

$$\left\{ \gamma_n(x), \psi_n(x) \right\}, \quad x \in (a,b), \ (n=0, 1, 2, \ldots)$$

new biorthogonal systems, using the operators of the fractional integration of Riemann-Liouville

$$d^{-\alpha}/d(x-a)^{-\alpha} f(x) = 1/\Gamma(\alpha) \int_a^x (x-t)^{\alpha-1} f(t) \ dt,$$

$$d^{-\alpha}/d(b-x)^{-\alpha} f(x) \equiv 1/\Gamma(\alpha) \int_x^b (t-x)^{\alpha-1} f(t) \ dt,$$

$\alpha > 0$, $x \in (a,b)$ and the analog of the formula for the integration by parts

$$\int f(x) \ d^{-\alpha}/d(x-a)^{-\alpha} g(x) \ dx = \int_a^b g(x) \ d^{-\alpha}/d(b-x)^{-\alpha} f(x) \ dx.$$

In the present work, operators of a somewhat different form are considered, with the help of which it is possible to obtain new biorthogonal systems from known biorthogonal systems. In particular, from the known orthogonal system of functions of Bessel, biorthogonal systems are obtained analogous to the biorthogonal system of Schloemilch.

(1) A. Erdelyi, On some biorthogonal sets of functions. The Quarterly Journal of Mathematics, Oxford Series, Vol 11, No 40, 1940.

(2) G. N. Watson, Teorii besselevykh funktsiy (Theory of Bessel Functions) Ch 1, M., 1949.

64. Elliptic and Parabolic Equations Discussed

"Certain Problems of the Qualitative Theory of Elliptic and Parabolic Equations," by Ye. M. Landiye; Moscow, Uspekhi Matematicheskikh Nauk, Vol 14, No 1 (85), Jan/Feb 59, pp 21-85

A series of properties of the solutions of linear, homogeneous elliptic and parabolic equations of the second order with variable coefficients is considered. The cases of two and many independent variables are considered, where the signs of the coefficients of the equation are assumed chosen such that the maximum principle holds for the solutions.

The possible velocities of growth and decline of a solution defined in an unbounded region during withdrawal from the point at infinity are established. The velocity of growth or decline depends on the form of the region and the character of the boundary conditions. The connections between the character of growth and decline of the solution and its oscillation are investigated; that is, by the number of regions in which the solution maintains a constant sign. These latter properties in the case of elliptic equations generalize theorems concerning the dependence between the distribtuion of the zeros of the analytic function and the character of its growth.

65. Convergence of Iteration Methods

"Concerning the Rate of Convergence of an Iteration Method for the Numerical Solution of an Equation of the Elliptic Type," by Yuan Chao-ting, Moscow State University imeni M. V. Lomonosov; Kazan', Izvestiya Vysshikh Uchebnykh Zavedeniy, Matematika, No 1, 1959, pp 224-230

In the present work iteration systems for the solution of algebraic systems

$$L_h u_h(x) + f(x) = 0 \qquad (x \in G_h), \qquad (1.1)$$

$$u_h(x) = \varphi_h(x) \qquad (x \in \Gamma_h), \qquad (1.2)$$

corresponding to the boundary value problem for an equation of the elliptic type

- 52 -

$$L\, u(x) + f(x) = 0 \qquad (x \in Q), \qquad\qquad (1.3)$$

$$u(x) = \varphi(x) \qquad (x \in \Gamma), \qquad\qquad (1.4)$$

are considered where $Q$ is an m-dimensional region having the boundary $\Gamma$ ; $Q_h$ and $\Gamma_h$ are the corresponding grid region and its boundary, and $L$ and $L_h$ are the the differential and difference operators.

Since a general iteration process converges quite slowly, many works [3-6] are dedicated to the rate of convergence. In the reference [3] it is proved possible to obtain a sufficiently rapid convergence process for the Laplace operator.

It is noted that the majority of the iteration processes [1-5] are based on the fact that the solution of a parabolic type equation $\partial u/\partial t = Lu + f$ with the boundary condition (1.4) and arbitrary initial conditions converges in the mean to a solution of (1.3) and (1.4) for $t$ approaching infinity.

Also considered is another iteration system based on the convergence of the solution of an equation of the type $\partial^2 u/\partial t^2 + 2a\,\partial u/\partial t = Lu + f$ $(a > o)$ with the condition (1.4) to the solution of (1.3) and (1.4).

In a third section an iteration process is considered based on the fact that the solution of the hyperbolic type $\partial^2 u/\partial t^2 = Lu + f$ with the condition (1.4) converges in the mean to the solution of (1.3) and (1.4).

[1] L. A. Lyusternik, "Concerning the Difference Approximations of the Laplace Operator," UMN, Vol 9, No 2, 1954, pp 3-66.

[2] V. S. Ryaben'kiy, A. F.Filippov, Ob ustoychivosti raznostnykh uravneniy (Concerning the Stability of Difference Equations), Gostekhizdat, Moscow, 1956.

[3] T. Douglas, H. H. Rachford, "On the Numerical Solution of Heat Conduction Problems in two-and three-space Variables," Trans. Amer. Math. Soc., Vol 82, No 2, 1956, pp 421-439.

[4] S. P. Frankel, "Convergence Rates of Iterative Treatment of Partial Differential Equations," Math. Tables and other Aids Comput., Vol 4, No 30, 1950, pp 65-75.

[5] D. Young, "On the Richardson's Method for Solving Linear Systems with Positive Metrices," T. Math. Phus., Vol 32, No 4, 1954, pp 243-255.

[6] D. Youny, "Iterative Methods for Solving Partial Differential Equations Ellyptic Type," Trans. Amer. Math. Soc., Vol 76, No 1, 1954, pp 92-111.

[7] D. Riley Tames, "Iteration procedures for the Dirichlet Difference Problem," Math. Tables and other Aids Comput., Vol 8, No 47, 1954, pp 125-131.

66.  ## The Growth of an Entire Function and its Application to Double Power Series

"The Characteristic of the Growth of an Entire Function of Two Variables and its Application to the Summation of Double Power Series," by V. K. Ivanov, Sverdlovsk; Moscow, Matematicheskiy Sbornik, Vol 47 (89), No 1, Jan 59, pp 3-16

Let

$$F(z) = \sum_{n=0}^{\infty} a_n/n! \; z^n$$

be an entire function of finite degree and

$$f(z) = \sum_{n=0}^{\infty} a_n/z^{n+1}$$

be the Borel function associated with it. In agreement with the known theorem of G. Polya, [4], the indicatrix of the growth of the function $f(z)$, $h(\varphi)$, and the supporting function $K(\varphi)$ of the convex envelope of the set of eigenfunctions of $f(z)$ are connected by the relation

$$h(\varphi) = K(-\varphi). \tag{1}$$

It is possible to import the following form to this equation. We construct the straight line $\pi(\varphi)$ at an angle of $\varphi$ to the real axis in the complex plane and exclude the semi-infinite segments $S(\varphi)$ and $B(\varphi)$, consisting of the points M defined by the conditions $OM > h(\varphi)$ and Correspondingly the segments $OM > K(\varphi)$. The equation (1) is thus equivalent to the equation

$$\overline{S}(\varphi) = \overline{B}(-\varphi), \tag{2}$$

where the line above designates closure.

- 54 -

In the form (2) the relation of Polya may be generalized to entire functions of a finite degree of n variables [3]. With the entire function $F(z_1, z_2, \ldots, z_n)$ and the function $f(z_1, z_2, \ldots, z_n)$ associated with it, it is possible to connect two n-dimensional regions $S(\varphi_1, \varphi_2, \ldots, \varphi_n)$ and $B(\varphi_1, \varphi_2, \ldots, \varphi_n)$, the defining system of angles $\varphi_1, \varphi_2, \ldots, \varphi_n$ of which satisfy the following relation between the closures:

$$\overline{S}(\varphi_1, \varphi_2, \ldots, \varphi_n) = \overline{B}(-\varphi_1, -\varphi_2, \ldots, -\varphi_n). \quad (3)$$

For proof of the relation (3) in the definition of the regions $S(\varphi_1, \varphi_2, \ldots, \varphi_n)$ and $B(\varphi_1, \varphi_2, \ldots, \varphi_n)$ it is necessary to introduce a certain additional condition (see the definitions 1 and 2 in [3] or the definitions 3 and 4 in the fourth paragraph of the present work). This condition only has sence for n greater than 1 and it is necessary to lean heavily on it during the proof of relation (3). However, with this condition the approximation of relation (3) is made difficult, and for this reason the necessity of this condition is brought to question.

In the present work we prove the possibility of removing this condition, proving that for n=2 it is always satisfied automatically, and for that reason during application of the relation (3) its necessity is dropped in its proof.

[1] E. Borel, "Lecons sur les Series Divergentes," Paris, 1928.

[2] G. A. Coon, D. L. Bernstein, "Some Properties of the Double Laplace Transformation," Trans. Amer. Math. Soc., Vol 74, No 1, 1953, pp 137-176

[3] V. K. Ivanov, "Connection Between the Growth of an Entire Function of Many Variables and the Distribution of the Singularities of the Function Associated with It," Matem. sb., No 43 (85), 1957, pp 367-378

[4] G. Polya, "Untersuchungen ueber Luecken and Singularitaeten von Potenzreihen," Math. Zeitschr., Vol 29, 1929, pp 549-600

[5] B. A. Fuks, Teoriya analiticheskikh funktsiy mnogikh kompleksnykh peremennykh (Theory of Analytic Functions of Many Complex Variables), Goste-khizdat, M.-L., 1948

VI.  MEDICINE

Bacteriology

67.  Cholera Bacteriophage Studied

"Cholera Bacteriophage," by A. G. Nikonov, A. M. Khokhlova,
K. G. Bichul', and R. I. Timofeyeva, Rostov-na-Donu Scientific
Research Antiplague Institute; Moscow, Zhurnal Mikrobiologii,
Epicemiologii i Immunobiologii, Vol 30, No 1, Jan 59,  pp 90-96

The authors of this article attempted to restore lost capability of
cholera bacteriophage to lyse cholera Vibrio in the human organism by
altering the conditions under which culturing in test tubes was carried out.
The bacteriophage selected for the experiments (A, B, D, E, FA, G,  and
Yermol'yeva) had been cultured for many years on Vibrio in Marten and Hot-
tinger bouillon and were very weakly lytic.  Experiments performed on guinea
pigs and rabbits infected via the duodenum and gall bladder provided  con-
vincing evidence that this bacteriophage was incapable of proliferating on
cholera Vibrio in the organism or of eliminating vibrio from animals.  The
subsequent restorative experiments are described in detail; results  are
summarized in seven tables entitled:  1.  Lytic Strength of a Production
Series [No 2] of Cholera Bacteriophage.  2.  Activity of Cholera Bacterio-
phage in the Animal Organism.  (3)  The Dynamics of Proliferation of Cholera
Vibrio (strain No 1) and Bacteriophage in Isolated Parts of the Small in-
testines of Guinea Pigs.  4.  Proliferation of Cholera Vibrio in Isolated
Loops of Small Intestine From Guinea Pigs (10,000 Vibrio from an agar cul-
ture were introduced into a loop) Upon Examination One Day After Infection;
5.  The Action of Typed Cholera Phage on Isolated Loops of Guinea Pig Small
Intestine on Examination One Day After Infection.  6.  The Action of Cholera
Bacteriophage on Cholera Vibrio in Isolated Loops of Guinea Pig Small In-
testine on Examination One Day After Infection.  7.  The Action of Cholera
Bacteriophage on Cholera Vibrio in the Guinea Pig Bile System on Examina-
tion One Day After Infection.

The following conclusions are presented on the basis of results ob-
tained in the experiments:

"1.  Repeated culturing of typed cholera bacteriophage on Vibrio in
bile and on the contents of guinea pig small intestine brought about an
increase in their lytic strength, determined by titration according to
Apple'man, and increased their capability of lyse cholera Vibrio and to
proliferate in the animal organism.

"2. On passage of cholera bacteriophage on cholera Vibrio in guinea pig small intestines, its lytic activity in the organism was increased. One strain of cholera Vibrio in the intestines and bile systems of the animals was completely destroyed by bacteriophage, while the activity of others was found to be acutely suppressed.

"3. Activity of the passed bacteriophage was observed in the animal organism."

68. Paratyphoid Pathogens Detected With Fluorescent Antibodies

"Observation of the Pathogens of Paratyphoid Toxicoinfections With the Help of Fluorescent Antibodies," by A. P. Larionov and N. A. Kuz'min; Moscow, Veterinariya, Vol 36, No 3, Mar 59, pp 68-73

The authors applied the method of detecting microorganisms with fluorescent-dye tagged sera to observing pathogens of paratyphoid toxicoinfections in meat and meat products. Preparation of tagged antibodies and testing of their diagnostic characteristics on standard and passed cultures (also on pathological material from experimentally infected animals) is discussed. Aid in the technology of preparing tagged globulins was received from the Departments of Biochemistry and Epidemiology, Institute of Epidemiology and Microbiology imeni Gamaleya. It is stated that in 1957 and 1958, highly active specific tagged sera were prepared from B. suipestifer, B. gartneri, and B. Breslau, and from normal horse serum. Natural hyperimmune serum from colts, prepared in the authors' laboratory, and dry agglutinating serum from the Institutes imeni Gamaleya and Mechnikov, were used to extract the globulin fractions. It was found that the method of Kuntz and Kaplan was the simplest and most successful for tagging globulins with dyes. The mixture employed consisted of globulins, carbonate-bicarbonate buffer, dioxane, acetone, isocyanate-fluorescein, and sodium chloride. Details of preparing the tagged serum are given. After tagging, the sera were tested by test tube and droplet agglutination reactions, by determining the protein content, and by establishing working dilutions. A table shows data on several series of sera.

In a discussion of the results obtained in testing the tagged sera, it is stated that the sera are polyspecific: tagged antibodies of suipestifer serum demonstrated (although weakly) a number of paratyphoid pathogens from groups B and D. Further experiments on adsorption of tagged sera, on the use of fixed and dried preparations, and on various representatives of the colityphoid group are described. These data are also presented in a table.

CPYRGHT  The following conclusions based on this research are given:

> "1.  Luminescent sera are completely suitable for specific identification of paratyphoid bacteria in microscopic preparations.
>
> "2.  The use of tagged, adsorbed sera is the most rapid and precise method of demonstrating paratyphoid bacteria in cultures and in pathological material."

## Immunology and Therapy

69.  ### Experimental Type A Botulinus Toxicoinfection

"Neutralization of Toxin Formed in the Digestive Tract in Experimental Type A Botulinus Toxicoinfection by Enterally Introduced Antiserum," by L. M. Shvedov, Odessa State Medical Institute imeni N. I. Pirogov; Moscow, Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii, Vol 30, No 1, Jan 59, pp 72-77

Data accumulated in studies of the toxicoinfectious nature of the pathogenesis of botulism formed the basis for the research discussed in this article.  Specifically, the author attempted to determine the effectiveness of the intramuscular method of introducing serum, used at present, and the combined method of intramuscular and enteral administration.  The experiments were performed on rabbits, white mice, and guinea pigs.  Three groups of animals were used in each experiment:  the first was a control group, the second was given serum intramuscularly, and the third was given serum intramuscularly and intraduodenally.

A special operative procedure, suturing of the duodenum to a cut in the abdominal wall, permitted direct introduction of antiserum into the duodenum with a syringe.  No postoperative complications were apparent. A few days after the operation, the animals were infected with a whole 9-day culture of B. botulinus, type A-98 (cultured in Martenovskiy bouillon with glucose and liver under anaerobic conditions.  In addition to observing the severity of symptoms and keeping track of deaths, the author determined phagocytic indexes for evaluation of the results.  The experiments differed only in the amounts of serum introduced and the number of times serum was introduced.  The experimental procedure and results of the test series are described in detail.

Analysis of the results obtained showed that 15 out of 19 untreated control animals died; 10 out of 19 animals treated intramuscularly died; and only 2 out of 18 animals treated both intramuscularly and intraduodenally died.

In discussing the results of these experiments, the author states that no direct observations concerning the ratio of toxin neutralization in rabbit small intestines were possible since all of the rabbits usually survived. Information is given on white mice and guinea pigs. The fact that antitoxic serum in the small intestines of animals poisoned with botulinus toxin disappears more slowly than in normal animals is explained by a decrease in the activity of digestive enzymes in the poisoned animals.

As a result of these studies, the author considers that the use of the combined method of intramuscular-enteral serum therapy in botulism is experimentally substantiated.

70. Survival of Smallpox Virus Studied

"A Study of the 'Take' of the Virus of Smallpox Vaccine Cultured in Developing Chick Embryos," by S. S. Maremmikova and Yu. M. Mastyukova, and Z. I. Ogorodnikova, Tr. Mosk. N.-I. In-ta Vaktsin i Syvorotok (Works of the Moscow Scientific Research Institute of Vaccines and Sera), No 9, 1957, pp 144-147 (from Referativnyy Zhurnal -- Biologiya, No 20, 25 Oct 58, Abstract No 90652)

"The smallpox vaccine virus was cultured in chick embryos for 319 successive passages. The virus maintained high 'take' for children. The vaccinal process progressed as in immunization with dermovaccine."

CPYRGHT

## Oncology

71. Tobacco as a Ca      ogenic Agent

"Cancerogenesis Due to Tobacco Smoke in Relation to Radioactivity," by J. R. Chojnowski, A. Dorabialska, Polski tygod. lekar. (Poland), 1957, 12, No 31, 1181-1184 (from Referativnyy Zhurnal -- Biologiya, No 17, 10 Sep 58, Abstract No 80289)

"Tobacco (the plant) assimilates $C^{14}O_2$ from the atmosphere. When burned the $C^{14}$ is converted into smoke. After 101 cigarettes were burned, three fractions were collected and their radioactivity studied. One gram of C from tobacco tar provided 154, from $CO_2$ -- 95, and from CO -- 62 pulses a minute. Because of its capacity to selectively concentrate $C^{14}$ tobacco smoke is cancerogenic."

CPYRGHT

72. <u>Development of Osseous Tumors Due to Strontium 90</u>

"Investigation of the Development of Osseous Tumors in Animals Due to the Effect of Radioactive Substances," by N. A. Krayevskiy and N. N. Litvinov, <u>Tr. Vses, konferentsii po med. radiol. Eksperim. med. radiol.</u> (Works of the All-Union Conference on Medical Radiology. Experimental Medical Radiology), M., Medgiz, 1957, 197-201 (from <u>Referativnyy Zhurnal -- Biologiya,</u> No 17, 10 Sep 58, Abstract No 80293, by K. P. Markuze)

"Rats (100) were administered $Sr^{90}$ intraperitoneally in doses of 0.4 microcurie per gram body weight. The animals were killed within one to 200 days. The initial disturbance of osteogenesis was noted within 3 or 4 months. Within 4 months large accumulations of nondifferentiated osteogenic tissue were observed; within 5 months further perversion of osteogenesis was noted; and only at the end of the 5th and the beginning of the 6th months was there any appearance of tumorlike sections which were rapidly increasing in size, filling the bone marrow area and spreading beyond the bone area."

73. <u>Cancerogenesis Due to Irradiation by Artificial Radioactive Substances</u>

"On the Problem of the Significance of Irradiations by Artificial Radioactive Substances in the Process of Cancerogenesis," by E. Ya. Smoylovskaya, Laboratory of Experimental Oncology of Institute of Experimental Pathology and Therapy, Academy of Medical Sciences USSR, and Laboratory of Radiology of Institute of Oncology, Academy of Medical Sciences USSR; Moscow-Leningrad, <u>Voprosy Onkologii,</u> Vol 5, No 1, 1959, pp 38-43

The problem of the cancerogenic effect of irradiation by artificial radioactive substances on the organism is now a very important matter because of the ever-growing utilization of the energy of nuclear decomposition in industry and medicine. Penetration of tissue by fragments of radioactive metals or powderlike substances is one of the ways by which radioactive substances enter the organism. As yet there are little literary data on the doses of absorbed energy necessary to produce a cancerogenic effect, and experiments were begun to clarify this problem. Rats were used in the experiments. Six insoluble isotope preparations were introduced into the organism of the animals. These were $Ag^{110}$, $Zn65$, and $Tl204$ in the form of small pieces of metal emitting beta and gamma rays; $Co^{60}$ in the form of small pieces of wire emitting beta-rays; $W185$ in the form of a powderlike metal, and the carbonate of $Ca^{45}$ in powder form, both emitting beta rays. Thirty-eight rats were used as control animals. These were not subjected to irradiation in any form. The results of the experiments were as follows:

1. Tumors of the mammary glands developed in 10 female rats of 32 that survived 6 months from the beginning of the experiments; eight of these were of the adenocarcinoma type, two of the sarcoma type.

2. The gamma rays emitted by $Co^{60}$ were found to be more effective in inducing adenocarcinomas of the mammary gland than the other isotopes.

3. The cancerogenic effect produced by the mixed beta and gamma rays of $Ag^{110}$ was slight.

4. Small quantities of isotopes, and therefore small doses of energy absorbed by the organism failed to produce tumors. No tumors were found in the control animals.

74. Renal Tumors Experimentally Induced

"Experimental-Morphological Investigation of Renal Tumors Induced in Cricetus auratus by Diethylstilbestrol," by R. I. Polkina, Laboratory of Experimental Oncology of the Institute of Oncology, Academy of Medical Sciences USSR; Moscow-Leningrad, Voprosy Onkologii, Vol 5, No 1, 1959, pp 32-37

This article is a report on the results of experiments made on hamsters to establish the possibility of inducing experimental renal tumors in male hamsters by the administration to the animals of diethylstilbestrol, a synthetic estrogen preparation. Renal tumors produced by the administration of diethylstilbestrol in male hamsters are of considerable interest, for they represent a new type of neoplasms not yet experimentally induced in animals in the Soviet Union. Twenty-four hamsters (Crisetus auratus) -- 15 males and 9 females -- were used in the experiments. Pills containing 20 milligrams of estrogen, 10 milligrams of paraffin, and 10 milligrams of lanolin were inserted laterally under the skin of the animals, until a total of 80 — 280 milligrams of diethylstilbestrol was administered to the hamsters. The animals were kept under observation for periods of 194 — 463 days, and then were killed. An examination of their organs revealed the following:

1. The prolonged administration of diethylstilbestrol induced renal tumors in the male animals.

2. Similar doses administered to the female animals failed to produce renal tumors.

3. Histologically the renal tumors were adenomas, capillary cysto-adenomas, or adenocarcionomas.

4.  Experimental renal tumors were capable of infiltrative growth and were of a metastatic nature.

75.  Cancer Therapy

"The Combined Effect of Radioactive Methionine and Sarcolysin on Tumors in Animals," by Il G. Spasskaya, Laboratory of Experimental Chemotherapy of the Institute of Experimental Pathology and Cancer Therapy, Academy of Medical Sciences USSR; Moscow-Leningrad, Voprosy Onkologii, Vol V, No 1, 1959, pp 44-47

Mice and rats were used in experiments which were carried out to determine the effectiveness of the combined application of methionine $S^{35}$ and sarcolysin [ll-di(2-chlorethyl)-aminophenylalaline] when used in the therapy of sarcoma M-1 and Ehrlich's tumor.  A total of 350 rats and 250 mice were used in the experiments.  Transplants of sarcoma M-1 and Ehrlich's tumor were used in the animals.  Treatment was begun 5-7 days after the transplantations were completed.  The animals were divided into seven groups.  Control animals made up group one; these animals were given no therapeutic treatment.  Therapeutic doses of methionine $S^{35}$ only were administered to the animals of group two.  Group three animals received treatment with therapeutic doses of sarcolysin.  Combined treatment with methionine $S^{35}$ and sarcolysin was administered to the animals in group four.  Only half therapeutic doses of both radioactive substances were used in the therapy of the remaining three groups of animals.  The preparations were administered intraperitoneally in physiological salt solution.  The results of the experiments established that the therapeutic effect obtained when the two preparations were used in combination was greater than that obtained when they were applied separately in the therapy of sarcoma M-1 and Ehrlich's tumor; that the combined therapy with therapeutic doses of the preparations intensifies their antitumor action, however, intensifying their toxicity at the same time; the degree of their toxicity, however, is smaller than their effect on the tumors; and that the effectiveness of the preparations depends on the method of therapy used and on the method of application of the therapeutic agents.

76.  Use of Mercamine in Tumor Therapy

"Investigation of the Effect of Mercamine on the Antitumor Action of Dopan," by A. B. Syrkin, Laboratory of Pharmacology of the Institute of Experimental Pathology and Therapy of Cancer, Academy of Medical Sciences USSR; Moscow-Leningrad, Voprosy Onkologii, Vol 5, No 1, 1959, pp 47-51

Observations established the fact that in the therapy of neoplasms with roentgen rays and chlorethylamines, dopan [4-methyl-5-di(2-chlorethyl)-aminouracil] among them, leukopoiesis is depressed.  It was also established

that mercamine (beta-mercaptoethylamine) administered in doses of 200 milligrams before irradiation considerably abated the symptoms of radiation sickness without affecting the therapeutic effects of irradiation, and reduced the sensitivity of the organism to chlorethylamines.

Rats were used in experiments which were conducted to determine whether mercamine when used to counteract the side reactions of dopan at the same time reduces the therapeutic effect of the latter. The animals were inoculated with sarcoma 45. On the seventh day after the inoculation, dopan in doses of 0.75 milligram per kilogram body weight every 72 hours was administered to the rats. Mercamine in doses of 10, 20, 50, and 100 milligrams per kilogram body weight was injected into the animals simultaneously with the dopan. Eighteen to 20 days later the animals were killed and their organs examined. The results of the experiments were as follows:

> 1. Mercamine in doses of 50-100 milligrams per kilogram body weight, administered simultaneously with dopan, lowered the antitumor action of the latter by 21—23 percent, completely preventing the depression of leukopoiesis caused by dopan.
>
> 2. Smaller doses of mercamine (10-20 milligrams per kilogram body weight) administered simultaneously with dopan had practically no effect on the antitumor action of the latter and at the same time somewhat depressed the antileukopoietic activity of the dopan.

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## 77. Desoxyribonuclease in the Therapy of Carcinoma

"Effect of Desoxyribonuclease of Bacteria on Ehrlich's Ascitic Carcinoma in Mice," by N. K. Gizatullina, Chair of the Physiology of Plants and Microbiology, Kazan State University imeni V. I. Ul'yanov (Lenin); Moscow-Leningrad, Voprosy Onkologii, Vol 5, No 1, 1959, pp 51-54

Experiments were conducted at a laboratory of Kazan University to determine the effectiveness of the application of desoxyribonuclease, extracted from a strain of bacteria isolated from the soil, in the therapy of Ehrlich's ascitic carcinoma. The experiments were based on the premise that disturbed nucleic metabolism plays an important role in the formation of neoplasms. The mice which were used in the experiments were inoculated intraperitoneally and subcutaneously with Ehrlich's ascitic carcinoma. The desoxyribonuclease from the bacteria was then administered to the animals at different periods of time. The experiments demonstrated that desoxuribonuclease, an enzyme obtained from bacteria, has an inhibiting effect on the development and growth of Ehrlich's ascitic carcinoma.

78. <u>Cancer Congress Held in Berlin</u>

Berlin, <u>Neues Deutschland</u>, 13 Mar 59

On 12 March 1959, Prof Dr Martius of Goettingen, president of the German Central Committee for the Fight Against Cancer and Cancer Research, opened the Sixth German Cancer Congress in Berlin-Dahlem. The congress was attended by some 500 scientists and physicians from East and West Germany and by more than 100 from 14 European and other countries.

During the first day of the congress, Prof Dr Oberling of Paris-Villejuif, spoke on virus and cancer and pointed out that many clearly virus-caused malignant tumors have been found in various animal species and that it is justified to assume, as a "working hypothesis," that viruses could also play a part in the cancer of humans. Prof Dr Edlinger, director of the Virological Institute of Humboldt University, Berlin, supported Oberling's report by calling attention to the findings of Soviet and American scientists who were able to produce malignant tumors in animals with "cell-free" filtrates from human tumors. He also stated that Professors Dr Graffi and Dr Krautwald of Berlin and their collaborators had succeeded in detecting viruslike particles in a cancer of human hemopoietic organs (Lymphogranuloma).
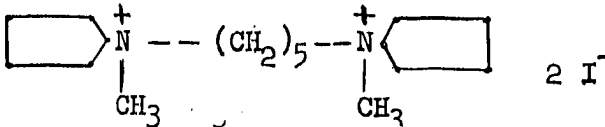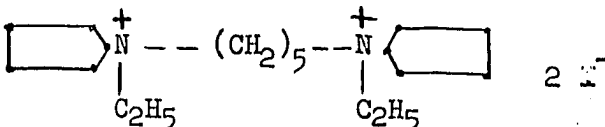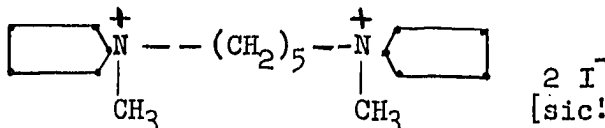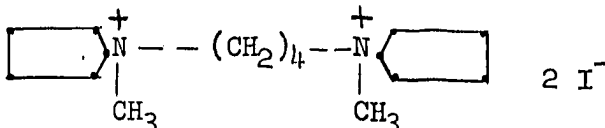
<u>Pharmacology and Toxicology</u>

79. <u>Ganglioblocking Drugs</u>

"Comparative Sensitivity of Sympathetic and Parasympathetic Ganglia to Some Ganglioblocking Drugs," by Ya. Shuster, <u>Sb. nauchn. rabot Rizhsk. med in-t</u> (Collection of Works of the Riga Medical Institute), 1956, No VI, 8-21 (from <u>Referativnyy Zhurnal -- Biologiya</u>, No 17, 10 Sep 58, Abstract No 80565, by K. M. Lakin)

"In experiments on cats and the musculus rectus of a frog's abdomen it was shown that the sympathetic ganglia are more sensitive to bis-ammonium heterocyclic bases than are the parasympathetic ganglia. The following substances were investigated:

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- 64 -

| Preparation | Chemical formula |
|---|---|
| P-1 |  |
| P-2 |  |
| P-3 |  |
| T-3 |  |

P-1 has been found to be particularly energetic. On the basis of their ability to block the conductivity of nervous impulses in the ganglia and their ability to produce a hypotensive effect, the substances under investigation are not similar. It is assumed that the mechanism of their hypotensive action cannot be ascribed only to their effect on the sympathetic ganglia. The preparations in which the tertiary nitrogen is in the pyrrollidine cycle are more active than those in which the nitrogen atoms are in the pyperidine cycle."

80. Hexonium Described

"Hexonium," by K. D. Sedova, Annotatsii o Lekarstvennykh Sredstvakh (Annotations on Medicinal Substances); Moscow, Medgiz, No VII, 1958, pp 12-14

Hexonium is a white crystalline powder with a saline-bitter taste which dissolves readily in water, with difficulty in alcohol, and poorly in acetone. Chemically, hexonium is the diiodide of 1,6-hexamethylene-bis-(tri-methyl ammonium). Its structural formula is



- 65 -
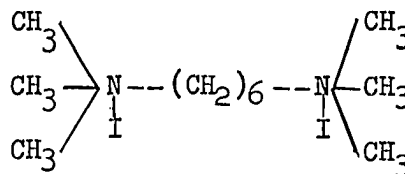
Pharmacological investigations conducted at the Institute of Experimental Medicine of the Academy of Medical Sciences USSR have shown that hexonium is a ganglioblocking drug. In large doses it affects all tissues with N-cholinoreactive systems: adrenals the carotid sinus, the neuromuscular synapses, and the central nervous system. It produces a clearly expressed ganglioblocking effect when administered intravenously to animals in doses of 0.1 milligram per kilogram body weight. Heronium is indicated in diseases connected with disturbances of nervous regulation hypertonia, ulcers, endarteritis, hyperhydrosis, and others. It can be administered internally in powder or solution form in doses of 0.1-0.25 grams, or subcutaneously and intramuscularly in doses of 0.0001-0.001 gram per kilogram body weight. Contraindications are insufficiency of renal function and expressed sclerosis of the cerebral and coronary vessels. Hexonium was clinically investigated at the Institute of Therapy of the Academy of Medical Sciences USSR by A. L. Myasnikov; the First Moscow Order of Lenin Medical Institute by Ye. M. Tareyev; Second Moscow Medical Institute by A. I. Nesterov; and the Military-Medical Academy imeni S. M. Kirov. It was approved for use in medical practice by the Scientific Council of the Ministry of Health USSR on 22 October 1955.

81. Antispasmodic, Gimalin

"Gimalin (Hymalinum)," by K. D. Sedova, Annotatsii o. Lekarstvennykh Sredstvakh (Annotations on Medicinal Substances); Moscow, Medgiz, No VII, 1958, pp 15-16

Hymalinum is a crystalline base isolated from the alkaloids of Scopolia lurida Dunal, family Solanaceae. It was first isolated and investigated at the All-Union Scientific Research Institute of Medicinal and Aromatic Plants. Its chemical composition has not yet been fully determined. It is recommended for use in cases of acute gastrointestinal spasms, spastic colitis, hepatic and renal colic, cholestasis, bronchial asthma, and in some cardiovascular diseases. Its use is contraindicated in glaucoma. Hymalinum was clinically investigated at the therapeutic clinic of the Sanitary-Hygienic Faculty of the First Moscow Order of Lenin Medical Institute and at the 17th Moscow Municipal Hospital. Approved for use in medical practice on 24 December 1955.

82. The Anticholinesterase Substance, Pyrophos

"Pyrophos," by K. D. Sedova, Annotatsii o Lekarstvennykh Sredstvakh (Annotations on Medicinal Drugs); Moscow, Medgiz, No VII, 1958, pp 40-42

Pyrophos is the ethyl ester of monothiophosphoric acid -- the tetraethylmonothiopyrophosphate, and its formula is

$$(C_2H_5O)_2 - \underset{\underset{O}{\|}}{P} - O - \underset{\underset{S}{\|}}{P} - (C_2H_5O)_2$$
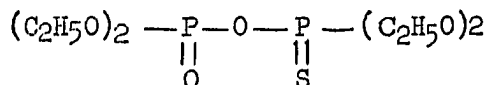
It is a colorless liquid with a specific odor which is slightly soluble in water (1:1,000) and readily soluble in fats. Its specific weight is 1.887; its melting point -- 147.5-148.5 degrees. Pharmacological investigations indicate that pyrophos belongs to the group of anticholinesterase substances and its action is similar to that of phosphacol, proserine, and eserine. Its use is indicated in all cases of glaucoma where it is necessary to reduce intraocular pressure; in cases where it is necessary to normalize intraocular pressure; in cases which call for the maximal contraction of the pupil, etc. It is contraindicated in cases of acute conjunctivitis, keratitis, iridocyclitis, and eczema of the eyelids. Pyrophos was clinically tested at the Clinic of Eye Diseases of the First Moscow Order of Lenin Medical Institute, the Faculty of Eye Diseases of the Kiev Medical Institute and the dispensary division of the Institute imeni Helmholts. Its practical use in medicine was approved on 8 October 1955.

83. Toxicity Data for Mercaptophos

"Work Hygiene When Dusting Cotton Plants With Mercaptophos," by
V. A. Kryuchkova, Materialy Ob'yedin. Nauchn. Sessii po Khlop-
kovodstvu. T. 2. (Materials From the Joint Scientific Session
on Cotton Growing, Vol 2), Tashkent, Gosizdat, Uzbek SSR, 1958,
345-349 (from Referativnyy Zhurnal -- Khimiya, No 23, 10 Dec 58,
Abstract No 78861, by I. Mil'shteyn)

The toxicity of mercaptophos (I) was studied on white rats and rab-
bits. The absolute lethal dose of (I) for white rats on administration
by chamber inhalation amounted to 0.003 g per liter after a one-time
exposure. After the use of a 30% concentrate of (I) in a dose of 40
mg/kg administered percutaneously to rabbits, death occurred in 5-10
hours; with a dose of 20 mg/kg of the thiono isomer of (I), death ocur-
red in 24 hours; 10 mg/kg of the thiol isomer of (I) caused death in 3-5
hours. From the hygienic viewpoint, aerial dusting appears to be the
most advantageous means of distribution. Dusting with (I) should cease
at least one month before harvesting. Those persons engaged in the hand-
ling of (I) should be supplied with individual protective equipment.

84. Effect of Acriquine of the Nervous System

"On the Problem of the Effect of Acriquine of the Functions of
the Higher Branches of the Central Nervous Ststem of Animals,"
by F. I. Grudev, Tr. Omskovo Med in-ta (Works of the Omsk Med-
ical Institute), 1957, No 21, 74-80 (from Referativnyy Zhurnal--
Biologiya, No 17, 10 Sep 58, Abstract No 80717, by Yu. G. Gas-
anov)

"The effect of different doses of acriquine orally administered on
salivary conditioned reflexes in dogs was investigated. A total of 511
experiments were conducted. Acriquine in doses on 1-8 milligrams per
kilogram body weight selectively intensified the process of stimulation;
in doses of 4-8 milligrams per kilogram body weight, they intensified the
stimulation process in accordance with the law of negative induction and
at the same time improved differential inhibition. Doses of 16-32 milli-
grams per kilogram body weight were toxic, causing the disappearance of
conditioned and unconditioned reflexes. Protective inhibition in the
cerebral cortex and the dissociation of subcortical activity set in. The
repeated administration of acriquine in doses of 4 milligrams per kilo-
gram body weight to animals who were previously subjected to the action
of the drug led to disturbed conditioned reflex activity. Acriquine
intoxications in dogs with a stronger type of nervous system were less
expressed and disappeared sooner than in dogs with an excitable type of
nervous system."

85. Hypnotic Drug, Tetridin

"Tetridin (Tetridinium)," K. D. Sedova, Annotatsii o Lekarstven-nykh Sredstvakh (Annotations on Medicinal Substances); Moscow, Medgiz, No VII, 1958, pp 52-53

Tetridin is 2,4-dioxo-3,3-diethyl- tetrahydropyridine. Its structural formula is

$$H_5C_2 - C - C_2H_5$$

with the ring structure bearing $O = C$ and $C = O$ groups, HN and CH, CH
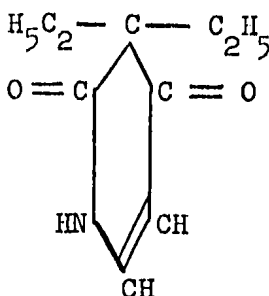
Tetridin is a white crystalline powder with a characteristic odor and is soluble in water 1:100 and in organic solvents. It has a melting point of 97 to 98°c. Tetridin was synthesized at the All-Union Scientific Research Chemicopharmaceutical Institute imeni S. Ordzhonikidze, and is recommended for use as a hypnotic drug, particularly in insomnias due to functional disturbances of the central nervous system. Sleep induced by tetridin is not as deep as that induced by barbiturates. It is to be administered in doses of 0.2-0.4 grams at night before sleep. Tetridin has been clinically investigated at the Institute of Psychiatry of the Ministry of Health RSFSR, the Clinic of Nervous Diseases of the Naval Medical Academy, the Psychiatric Clinics of the First Moscow Order of Lenin Medical Institute and the Second Moscow Medical Institute, the Leningrad Medical Institute of Pediatrics, and other establishments. The permit for use in medical practice was issued on 12 March 1955.

86. Rauwolfia Serpentina as a Hypotensive Drug

"Therapy of Hypertonia With Alkaloids of Rauwolfia serpentina," by I. Penchev and Kh. Tsvinserova, Sovrem. med. (Contemporary Medicine (Bulgaria), 1957, 8, No 10, 25-31 (from Referativnyy Zhurnal -- Biologiya, No 17, 10 Sep 58, Abstract No 80600, by the author)

"On the basis of observations of patients (28) suffering from hypertonia it was established that alkaloids of rauwolfia provide only a temporary therapeutic effect. After the administration of the drug is stopped, blood pressure gradually rises. The development of depression reactions is the most serious side effect."

87. Effect of Tranquilizers on Interoceptors

"Effect of Chlorpromazine and Hexamethonium on Interoceptors,"
by V. Chivu, P. Pechet, and M. Moisanu, Fiziol. norm  si patol.
(Rumania), 1958, 5, No 1, 29-37 (from Referativnyy Zhurnal --
Biologiya, No 17, 10 Sep 58, Abstract No 80498)

"The effect of chlorpromazine and hexamethonium on dogs' kidneys,
intestines, and spleen perfused by Tyrode's solution but retaining their
connection with the nervous system was investigated.  Vasomotor and re-
spiratory reflexes induced by the administration of 2 milliliters of a
2-percent solution of KCl were used as tests.  It was shown that hexa-
methonium had no effect on the interoceptors, and that chlorpromazine
inhibited their irritability."

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88. Aminazine Described

"Aminazine (Aminazinum)," by K. D. Sedova, Annotatsii o Lekar-
stvennykh Sredstvakh, (Annotations on Medicinal Substances);
Moscow, Medgiz, No VII, 1958, pp 5-8

Aminazine is indicated in the therapy of various psychic disturb-
ances; it is a tranquilizer and antispasmodic.  Chemically, aminazine
is the hydrochloride of N-(3-dimethylaminopropyl)-2-chlorphenothiazine.
Its structural formula is
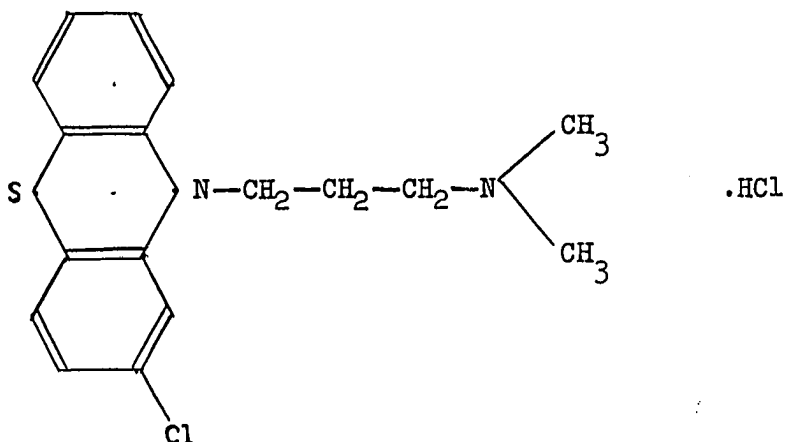
It is white or white with a yellowish tint fine crystalline powder which has a melting point of 189 to 196°C. It is hydroscopic, but turns dark on exposure to light and is readily soluble in water, alcohol, and chloroform, but poorly soluble in ether. It is relatively nontoxic and is well tolerated. Aminazine can be administered internally in the form of tablets of capsules; rectally in the form of suppositories; intramuscularly in the form of a 2.5-percent solution with novocain; and intravenously in the form of 2.5-percent solution in a 40-percent solution of glucose. Therapy begins with small doses: 50 milligrams parenterally, or 75 milligrams internally. The doses are gradually increased until they reach a maximum of 150-300 milligrams. Aminazine is contraindicated in cases of liver and kidney disease, expressed arteriosclerosis, or hypertonia in the third stage. It was clinically tested at the Institute of Psychiatry of the Ministry of Health USSR, the Hospital imeni Kashchenko, the Psychiatric Clinic of the First Moscow Order of Lenin Medical Institute, and the Psychiatric Clinic of the Central Institute for the Advanced Training of Physicians. It was approved for medical use by the Pharmacological Committee of the Scientific Council of the Ministry of Health USSR of 15 May 1955.

89. Work on Chlorpromazine Reviewed

"Chlorpromazine (Largatil)," by Ceh G., Neuropsihijatria (Yugoslavia), 1957, 5, No- 3-4, 308-321 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 2, 25 Jan 59, Abstract No 1943

"A survey of the chemical properties and pathophysiological mechanism of action of chlorpromazine with indications and contraindications for its application in the practice of psychiatry. Bibliography -- 53 titles."

90. Psychosis Therapy

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"Information of some New Medicinal Substances Being Used in the Therapy of Psychic Patients," by Karl Libering, Med. pregled (Yugoslavia), 1957, 10, No 6, 337-344 (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 2, 25 Jan 59, Abstract No 1942, by the author)

"The chemical and pharmadynamic properties of meratran, metrotonine, serpontonil, polamidone, meprobamate, methylpentinol, doriden, and a number of other medicinal substances are reviewed. The determination of miltown in the derivation of glucuronic acid and the chromatographic investigation of doriden are described."

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91. Effect of Toxicoinfections of Cerebrosides

"Modifications of the Cerebrosides of the Brain When in a State
of Stimulation and Inhibition Produced by Some Toxicoinfec-
tions," by M. Sh. Promyslov, Vopr. biokhimii nervn. sistemy
(Problems of the Biochemistry of the Nervous -- System), Kiev,
Academy of Sciences Ukrainian SSR, 1957, 323-330 (from Refera-
tivnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 2,
25 Jan 59, Abstract No 1961, by M. Maslova)

"The effect of strychnine, prolonged anesthesic sleep, and tetanus
toxin intoxication on the brain content of cerebrosides (I) in rabbits
was studied. It was shown that prolonged strychnine-induced convulsions
and tetanus intoxication cause a decrease in the quantity of (I). The
author assumes that (I) is utilized as an energy substrata in a state of
stimulation and at the point of the extreme exhaustion of the nervous
system. The brain content of (I) did not change in the course of pharma-
cologically induced sleep. The quantity of (I) in the brain did not dif-
fer from normal when anesthesia was administered on a background of develop-
ing tetanus. During the action of tetanus toxin on brain tissue in vitro no
changes occurred in (I). It was established that two thirds of (I) in the
cerebral tissue are in a free state, and that all the changes which take
place may be ascribed to the action of free (I)."

92. Effect of the Nervous Ststem of Hemopoiesis

"Influence of the Nervous System on Hemopoiesis," by A. Batol-
ska, Sbornik trudove Institut trudove khigiyena (Collection of
Works of the Institute of Labor Hygiene) (Bulgaria), 1957, 4,
57-70 (from Meditsinskiy Referativnyy Zhurnal, Moscow, Sec-
tion IV, No 1, Jan 59, p 16)

"The influence of the functional condition of the nervous system when
affected by bromides, caffeine, and luminal on erythropoiesis was investi-
gated in rabbits. Erythropoiesis was stimulated by cobalt. Cobalt was
administered to the control group of animals, producing a considerable
increase in the number of erythrocytes and a rise in the quantity of hemo-
globin. The daily administration of 30 centigrams of potassium bromide per
kilogram of body weight to each of the animals caused a small rise in the
erythropoiesis level. The subsequent administration of cobalt produced a
delayed and weak single-phase positive reaction. The administration of
luminal in doses of one centigram per kilogram of weight to each of the
animals depressed erythropoiesis. The subsequent administration of cobalt
produced a delay but expressed two-phase rise in erythropoiesis. The
daily administration of one centigram per kilogram weight of caffeine to
each of the animals and the administration of cobalt produced a rise in

the level of erythropoiesis. Experiments carried out on animals with
artificially induced anemia produced similar results. The author pro-
poses that results obtained in his experiments be utilized in the pro-
phylaxis and therapy of diseases of the hemopoietic system and occupa-
tional intoxications."

93. Effect of Phenothiazine Derivatives on Blood Coagulation

"Correlation Between the Chemical Structure of Phenothiazine
Derivatives and Their Effect on Blood Coagulation," by M. M.
Zolotukhin, Sb. nauchn. rabot Mosk. Pharmatsevt. in-t (Collec-
tion of Scientific Works of the Moscow Pharmaceutical Insti-
tute), 1957, 1, 313-317 (from Referativnyy Zhurnal -- Khimiya,
Biologicheskaya Khimiya, No 2, 25 Jan 59, Abstract No 1985, by M.
Belenkiy)

"The effect of aminazine (I); ethyzine (II); diparcol (III); the
hydrochloride of N-(alpha-diethylaminocaproil)-2-chlorphenothiazine (mep-
azine) (IV); the hydrochloride of N-(beta-diethylaminopropionyl)-2- chlor-
phenothiazine (G-020) (V); and the hydrochloride of N-(dimethyl aminoacetyl)
-phenothiazine (G-015) (VI) on blood coagulation and prothrombin time was
studied in rabbits. Under the influence of (I), (II), and (IV) blood coag-
ulation time was prolonged; on the contrary, (V) and (VI) speeded up blood
coagulation. (III) slowed blood coagulation during the first hour after
its administration, but subsequently hastened it. None of the substances
under investigation substantially changed prothrombin time. The Authors
ascribe the hastening of blood coagulation by (V) and (VI) to the presence
of the dialkyl aminoacyl side chain in the structure of these substances.
The supposition has been advanced that there is a connection between the
effect of (V) and (VI) on blood coagulation and their adrenomimetic action."

94. The Blood Substitute, BK-8

"Blood Substitute BK-8," by K. D. Sedova, Annotatsii o Lekar-
stvennykh Sredstvakh (Annotations on Medicinal Substances);
Moscow, Medgiz, No VII, 1958, pp 25-27

BK-8 is a protein blood substitute obtained from the blood serum of
cattle. It is a transparent, light-amber colored liquid with a hemo-
dynamic, hemostatic, and stimulating action similar to that of plasma
or human blood serum. The method of its preparation was developed by
V. A. Belitse and K. A. Katkova at the Institute of Biochemistry of the
Academy of Sciences Ukrainian SSR and the Kiev Institute of Blood Trans-
fusion. Pharmacological investigations of the preparation conducted at
the Institute of Experimental Pathology and Biology have shown that it
is not toxic and may be administered repeatedly. It is indicated in cases
of shock, acute and chronic blood loss, hypoprotein conditions, severe burns,
and in the acute period of complications that may follow burns, as well as

in other cases when stimulation therapy is required. It is administered intravenously, although it can also be administered subcutaneously. A single dose of the preparations is about 2 liters. It is produced in sterile, hermetically sealed containers containing 250 milliliters of the preparation and may be kept for one year. BK-8 was clinically investigated at the General Surgery Clinic of the Therapeutic Faculty of the First Moscow Order of Lenin Medical Institute, the Central Institute of Traumatology and Orthopedics, and the Moscow Oblast Scientific Research Clinical Institute. The permit for use in medical practice issued on 28 January 1955.

95. <u>Bigumal an Effective Antimalarial Drug</u>

"Parasitocidal Effect of Bigumal in Three-day and Tropical Malaria," by Z. S. Shishlyayeva-Matova, <u>Tr. Uzb. in-ta Malyarii i med. parazitol.</u> (Works of the Uzbek Institute of Malaria and Medical Parasitology), 1956, 2, 55-69 (from <u>Referativnyy Zhurnal -- Biologiya,</u> No 17, 10 Sep 58, Abstract No 80714, by A. N. Karpov)

"Fifteen patients suffering from 3-day malaria and 20 patients afflicted with tropical malaria were treated with bigumal. Bigumal was administered twice in doses of 0.3 gram of the first day, and in doses of 0.3 gram once a day during the 4 succeeding days. It was established that bigumal is a strong schizontocide; its gametocidal properties were established in cases of 3-day malaria only. The most vulnerable forms were found to be the ring and young schizonts. The deformation and disintegration of the grown schizonts took place during the first or second 24-hour period; the disintegration of the gametocytes of 3-day malaria occurred on the third and fourth days of the treatment. The parasitocidal effect of bigumal is more dependable if applied every 6-8 hours."

96. <u>The Antimalarial Drug, Chloridin</u>

"Chloridin (Chloridinum)," by K. D. Sedova, <u>Annotatsii o Lekarstvennykh Sredstvakh</u> (Annotations on Medicinal Substances); Moscow, Medgiz, No VII, 1958, pp 58-59

Chloridin is a white crystalline powder. It is odorless, and has a melting point of 237-238°C. Chemically it is 2,4-diamino-5-parachlorophenyl-6-ethyl pyramidin, and has the following structural formula:
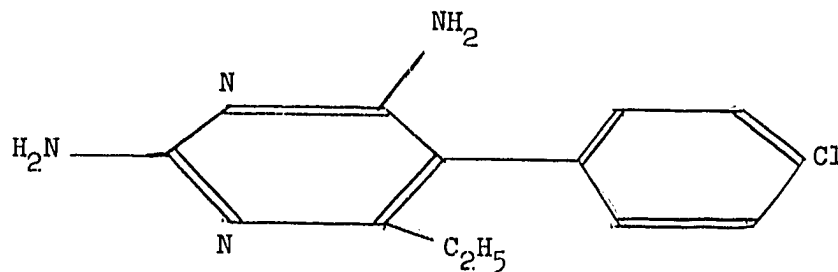
Chloridin was synthesized and pharmaiologically investigated at the Scientific Research Chemicopharmaceutical Institute imeni S. Ordzhonikidze. It is considered a highly powerful antimalarial remedy, but has no effect on exo-erythrocytic forms of malaria. It should be used with care in cases with diseases of the blood-producing, organs and kidneys. Clinical investigation of the preparation was carried out at the Institute of Malaria, Medical Parasitology, and Helmintology of the Ministry of Health USSR. It was approved for use in medical practice on 2 April 1955.

97. The Antibiotic Eusynthomycin

"Eusynthomycin (Eusynthomycinum)," by N. D. Sedova, Annotatsii o Lekrastvennykh Sredstvakh (Annotations on Medicinal Substances); Moscow Medgiz, No V11, 1958, pp 62-64

Eusynthomycin is a stearic ester of synthomycin also known as non-bitter synthomycin. It is a grayish-green crystalline powder, insoluble in water, but soluble in organic solvents which has a melting point of 83-87°C. The preparation is completely free of the bitter taste of synthomycin. It is recommended by the All-Union Scientific Research Chemicopharmaceutical Institute imeni S. Ordzhonikidze for use in cases of typhoid fever, staphylococci and pneumococci infections, diphtheria, and gas gangrene caused by Cl. perfringens. Although it is readily absorbed after being introduced into the organism, its action is considerably slower than that of synthomycin. There are no contraindications to the use of eusynthomycin. It was clinically tested at the Institute of Pediatrics of the Academy of Medical Sciences USSR and the Children's Municipal Clinical Hospital No 1. It was approved for use in medical practice on 26 July 1955.

98. Antibiotics

"New Antibiotics," by M. Neuman, Viata med (Rumania), 1958, 5, No 6, 565-572 (from Referativnyy Zhurnal--Khimiya, Biologiche-skaya Khimiya, No 2, 25 Jan 59, Abstract No 1417)

"A brief survey is made of the chemical and biological properties of carbomycin, spiramycin, novobiocin, oleandomycin, vancomycin, ristocetin, cycloserin, streptovaricin, nystatin, amphoterycin B, trichomycin, fram-icetin, and xanthocyllin."

Physiology CPYRGHT

99. Symposium on Physiological Acoustics To Be Held in September 1959

"Symposium on Physiological Acoustics" (unsigned article); Mos-cow, Akusticheskiy Zhurnal, No 1, 1959, p 129

The Commission on Acoustics of the Academy of Sciences USSR is organ-izing a symposium on the problems of the neurophysiology of hearing and the problems of the coding and differentiation of simple and complex (speech) signals by the auditory system.

Among the participants in organizing the symposium will be the Acous-tics Institute, the Institute of Physiology imeni I. P. Pavlov, the Insti-tute of Evolutionary Physiology imeni I. M. Sechenov of the Academy of Sciences USSR, and Moscow State University imeni M. V. Lomonosov.

The symposium will be held in Leningrad from the 14th through the 19th of September 1959.

Prof G. V. Gershuni is chairman of the organization committee.

Annotations of reports for the symposium must be sent before 1 May 1959 to the scientific secretary of the symposium G. B. Glekin (Moscow, V-36, p/ya 3651), or to member of the organization committee L. A. Chis-tovich (Leningrad, 164, nab. Makarova, 6, Institute of Physiology imeni I. P. Pavlov, Academy of Sciences USSR).

Radiology

100. Transmission of Products of Uranium Fission To Progeny; Duration and Effects

"On Certain Peculiarities of the Development of the Progeny of Dogs Subjected to the Effect of Products of Uranium Fission," by A. P. Novikova and S. P. Voskresenskiy (deceased); Moscow, Meditsinskaya Radiologiya, Vol 4, No 2, Feb 59, pp 15-20

The purpose of this research was to study the special characteristics of the progeny of four groups of dogs (either both parents contaminated, or both parents healthy, or one of the parents contaminated which had received a single dose of products of uranium fission calculated at one millicurie/kg body weight administered with food.

In general, results indicate the following:

1. The growth and development of the progeny of contaminated dogs is characterized by the fact that weight gain during the first 2 months of life is below normal, regardless of lack of symptoms of disturbed processes. The lag in body weight is less pronounced in the 4-6th litters than in previous litters. Viability during the 5th-6th months of life is decreased despite lack of symptoms of any structural shifts in organs and systems. The viability of later litters is greater than that of earlier litters.

2. Differences in the viability of the four different groups of dogs is not great, comparatively. Least viable were the puppies from parents both of which were contaminated and the most viable were those from contaminated males and healthy females.

3. Highest death rate occurred during birth and during the 2d-3d month of life. Percentage of death was lower in later litters than in earlier ones.

4. Products of uranium fission continued to be transmitted to the progeny over a period of from 3 1/2 to 4 months.

101.  Pathological Changes in Acute Radiation Sickness

"Pathological Anatomy of Acute Radiation Sickness Under Experimental Conditions (General Effect of Betatron Generated Rays)," by I. V. Toroptsev and N. V. Sokolova, Izv. Tomskogo Politekhn. In-ta (Izvestiya of Tomsk Polytechnical Institute), 1957, 87, 17-27; (from Referativnyy Zhurnal -- Biologiya, No 16, 25 Aug 58, Abstract No 75270)

"Experiments were conducted on guinea pigs. In experimental animals that succumbed within 12 hours after irradiation, the following symptoms appeared: necrotic changes and increased permeability and dilatation of blood and lymphatic vessels; changes in the tinctorial properties of the blood, i.e., hematoxylin-eosin staining of plasma in bright yellow light (due to changes in blood proteins); large foci of necrosis in various branches of the nervous system, although the cerebral cortex remained unaffected; necrotic changes in the sex glands and adrenal cortex; vascular injuries with symptoms of diapedesis in the lungs and the gastrointestinal tract; lymphatic tissue impoverishment of follicles from lymph elements, and a great number of large cells with basophilic granules in the cytoplasm (these were macrophages). In all cases of acute radiation sickness paraplastic structural changes were observed, i.e., protein impregnation and homogenization of vessel walls, of the intercellular tissue of the kidneys, heart, and the stomach and coarse and lumpy decomposition changes in the reticular network in the lymphatic tissue and in the bone marrow. Changes in tissues stained with picrin dyes indicated changes in protein complexes. Typical symptoms of radiation sickness are the absence of a proliferation reaction, and irreversible destructive changes in the internal organs."

102.  Changes in Cholino-Reactive Systems During Acute Radiation Sickness

"The Effect of X Rays on Cholino-Reactive Systems," by M. A. Movsesyan, Vopr. Rentgenol. i Onkol. (Problems of Roentgenology and Oncology), Vol 2, Yerevan, 1957, 179-181; (from Referativnyy Zhurnal -- Khimiya, Biologicheskaya Khimiya, No 1, 10 Jan 59, Abstract No 598)

"Studies were conducted on changes in the cholino-reactive systems during the acute form of radiation sickness. With this aim, research was conducted on changes in the sensitivity of the cholino-reactive systems toward "gangleron" (a cholinolytic preparation). The animals received

the drug intravenously at the rate of 1-3 mg/kg body weight either imme-
diately before or immediately after irradiation by a dose of 950 r. The
administration of "gangleron" caused intoxication in irradiated animals
but not in control animals. On the basis of these data, it may be con-
cluded that, due to the effect of X rays, the sensitivity of nicotine-
sensitive cholino-receptors toward "gangleron" in increased."

CPYRGHT

103. Hepato-Spleenic System and Its Role in the Pathogenesis of the Radia-
tion Syndrome

"On the Role of the Radiosensitivity of the Hepato-Spleenic
System in the Pathogenesis of Radiation Syndrome," by V. Ya.
Lavrik, and G. A. Levchik, Candidates of Medical Sciences, Lab-
oratory of Pathological Physiology, Ukrainian Scientific
Research Sanitary-Chemical Institute; Kiev, Vrachebnoye Delo,
No 11, Nov 58, pp 1169-1174

Research was conducted on dogs and rats to study the role of the
hepato-spleenic system after irradiation by lethal doses of X rays (500-
800 r). Tests included removal or shielding of the spleen before irra-
diation and the creation of a direct or reverse Eck-Pavlov fistula.

Results show that animals which were irradiated while the hepato-
spleenic system was shielded and then treated with whole blood transfu-
sion exhibited a milder form of radiation sickness than animals which
received no transfusion, although their hepato-spleenic system was shielded.
However, changes in the two groups with regard to the peripheral blood pic-
ture, the phagocytic reaction of leukocytes, and blood viscosity were sim-
ilar.

The authors conclude that protecting the hepato-spleenic system from
the direct effects of irradiation decreases toxic effects and acts favor-
ably on restoration processes which, in their turn, alleviate the course
of radiation sickness and prolong the life span of irradiated organisms.
Furthermore, the close functional link existing between the spleen and the
liver, and the high sensitivity of these two hematopoietic organs towards
ionizing radiation indicate their significant role.

104. Muscle Catalase Activity During Radiation Sickness

"The Activity of Catalase of Muscles of Rats Injured With Radiation Sickness," by V. I. Gorodyskiy and I. V. Veselaya, Tr. Vses. Konferentsii po Med. Radiol. Eksperim. Med. Radiol. (Works of the All-Union Conference on Medical Radiology, Experimental Medical Radiology); Moscow, Medgiz, 1957, 117-119; (from Moscow, Referativnyy Zhurnal -- Biologiya, No 16, 25 Sep 58, Abstract No 75284)

"Catalase activity was determined in rat muscles 1-7 days after general X-ray irradiation with 1,000 r (14 animals), and 1-2 days after irradiation with 2,000 and 3,000 r (8 animals). The values exceeded control level and rose with an increase in the time interval after irradiation. Maximum values seemed to be 2.2 times the control after irradiation with 1,000 r, and 2.4-2.5 times the control after irradiation with 2,000-3,000 r. This increase [in catalase activity] can be explained by the accumulation of $H_2O_2$ as a result of intensified tissue decomposition due to the effect of irradiation."

105. Hypoxia Combined With Chemical Protection in Prophylaxis of Radiation Sickness

"Acclimatization to Hypoxia Combined With the Administration of Cystamine and Cysteamine in Prophylaxis of Radiation Sickness," by G. A. Vasil'yev: Moscow, Meditsinskaya Radiologiya, Vol 4, No 1, Jan 59, pp 41-44

The aim of this research was to explain the protective effect of using cystamine and cysteamine combined with acclimatization of mice to hypoxia equivalent to 10,000 meters elevation, in the prophylaxis of radiation sickness.

Results indicate that acclimatization to hypoxia increases the resistance of mice toward X-ray irradiation (by 600 r), but there is no corresponding increased resistance beyond the 30-day acclimatization period. The protective effect of cystamine and cysteamine is augmented when combined with hypoxia.

The author concludes that, on the basis of this research, it may be postulated that the protective effect resulting from acclimatization to hypoxia, on the one hand, and that resulting from cystamine and cysteamine, on the other, are due to different mechanisms because viability is increased by the administration of cystamine and cysteamine even after the protective effect of hypoxia disappears.

## Surgery

106.  All-China Conference on Management of Burns

"All-China Conference for Exchange of Experience in the Prevention and Treatment of Burns," by Wu Chieh-p'ing ( 吴 阶 平 ); Peiping, Chung-hua Wai-k'o Tsa-chih (Chinese Journal of Surgery), Vol 6, No 12, 1959, pp 1313-1321

This item reports highlights at the All-China Conference for Exchange of Experience in the Prevention and Treatment of Burns which convened in Shanghai, 3-9 November 1958. The meeting was attended by 254 delegates, including 150 practioners of traditional medicine, from 27 provinces and municipalities.

The fifth day of the conference reportedly marked the beginning of sessions of committees meeting separately, each to discuss one of the following topics: treatment of shock due to burns, management of burn wounds, infection following severe burns, skin grafting, traditional Chinese medicine and pharmacology, prevention of burns, and national defense medicine. The journal publishes resumes of reports presented to the general assembly by all the above-mentioned committees except the committee on national defense medicine.

The conference unanimously voted to protest against the use of poison gas shells and bombs by US-Chiang Troops attacking China.

## Veterinary Medicine

107.  Immunity Checked in Cattle Vaccinated Against Brucellosis

"The Precipitation Reaction in Cattle Vaccinated Against
Brucellosis," by N. I. Fedotov; Kiev, Mikrobiologichniy
Zhurnal, Vol 20, No 4, Sep-Dec 58, pp 48, 49.

"We attempted to trace the dynamics of the precipitation reaction
during investigation of blood serum from cattle immunized once with vac-
cine from strain No 19.  Two types of antigens which we prepared for
the reaction (from a vaccine strain and from three types of virulent
Brucella) were found to be sensitive and strictly specific.

"A large number of the tests on blood serum in the precipitation
and agglutination reactions which were performed showed almost complete
concurrence of indexes, but only very soon after vaccination.  A longer
time after inoculation, particularly when blood serum was examined from
young (6-7 months) vaccinated cows which had calved, the precipitation
reaction was more sensitive than the agglutination reaction.

"Prolonged reaction on vaccinated animals to the precipitation
reaction a long time after vaccination establishes the possibility of
using this reaction as a test for determining the degree of reactivity
of an organism to the introduction of vaccine."

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108.  Prozone Phenomenon in Brucellosis

"The Prozone Phenomenon in the Complement-Fixation Reaction
for Bang's Disease," by A. Geissler, State Veterinary Medical
Testing Institute; Leipzig, Monatshefte fuer Veterinaermed-
izin, No 2, 15 Jan 59, pp 46-50.

In an examination of cattle sera for brucellosis, it was proved
experimentally that the occurrence of a prozone during the complement-
fixation reaction is caused by an antigen deficiency.  This deficiency
results from the presence of a univalent, specific antibody in the sera
of the particular patients.  This antibody is the same one which becomes
active in the indirect complement-fixation reaction and in the colloid-
complement-fixation reaction and which is characterized by the ability
to combine with the soluble antigen without requiring the complement.
When there are a great number of these antibodies in a serum, a strong
dimunition of antigen occurs in the first test tubes containing undi-
luted and slightly diluted serum, which disturbs the balance of the
reaction components.  Thus, indirectly, a  complement excess is produced.

This phenomenon is facilitated especially when weak antigen concentrations are used. It is avoided when the sera are heated for 1/2 hour at 62°C, when the antigen concentration is increased, or when the complement fixation is carried out in the form of a colloid-complement-fixation reaction (see Geissler, Monatshefte fuer Veterinaermedizin, No 13, 1958, p 586).

109. Gamma Globulin Used to Treat Hog Cholera

"Therapy of Hog Cholera With Specific Gamma Globulin," by P. Ya. Shcherbatykh, R. A. Tsion, A. I. Protasov, and V. P. Urban; Moscow, Veterinariya, Vol 36, No 1, Jan 1959, pp 36-40.

This report discusses the authors' experiments on therapy of hog cholera with specific gamma globulin obtained from anticholera hyperimmune serum. The experiments were suggested by previous successful research on the administration of gamma globulin for prophylactic purposes. The current tests, described in detail in the text, were performed in isolation at the infectious disease clinic. Piglets were infected with mixed hog cholera virus obtained from the Leningrad Scientific Research Veterinary Institute (series No 6) and from the State Control Institute of Veterinary Preparations (series No 3).

Results of the experiments performed led to the following conclusions:

"1. Specific gamma globulin obtained from hyperimmune serum against hog cholera had high therapeutic effectiveness, and its introduction in high doses did not produce any observable manifestations in the animals.

"2. Gamma globulin given to piglets one day after their infection with hog cholera virus protected them from disease.

"3. Therapy of hog cholera with specific gamma globulin was most effective during the first day after the appearance of high temperatures and primary disease symptoms. On later treatment, the disease was more severe and recovery was gradual.

"4. Piglets which have undergone experimental hog cholera and have recovered as a result of therapy with specific gamma globulin acquire stable immunity.

"5. Blood from piglets which have recovered after the use of specific gamma globulin does not contain the hog cholera virus; five piglets infected with this blood did not contract the disease."

Miscellaneous

110. <u>Statistics on Soviet Medical Personnel and Hospital Establishments</u>

"Statistical Material" (unsigned article); Moscow, <u>Sovetskaya</u>
<u>Zdravookhraneniye</u>, No 2, Feb 59, pp 59-64

The following statistical tables give the figures on the number of
Soviet medical personnel, hospital establishments, and hospital beds for
the USSR as a whole and for all union republics for 1940, 1950, 1955,
1956, and 1957:

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| Number of Physicians (Urban and Rural) | | | | | |
|---|---|---|---|---|---|
| | <u>1940</u> | <u>1950</u> | <u>1955</u> | <u>1956</u> | <u>1957</u> |
| USSR | 122,949 | 217,759 | 269,734 | 288,191 | 303,515 |
| RSFSR | 70,793 | 129,927 | 157,062 | 167,254 | 175,659 |
| Ukrainian SSR | 29,547 | 43,305 | 53,921 | 58,407 | 61,643 |
| Belorussian SSR | 4,245 | 5,637 | 7,269 | 7,807 | 8,313 |
| Uzbek SSR | 2,561 | 5,647 | 7,569 | 8,098 | 8,560 |
| Kazakh SSR | 2,144 | 5,173 | 7,915 | 8,406 | 9,136 |
| Georgian SSR | 4,172 | 8,426 | 10,185 | 10,671 | 11,105 |
| Azerbaydzhan SSR | 2,788 | 5,448 | 6,197 | 6,511 | 6,824 |
| Lithuanian SSR | 622 | 2,256 | 3,389 | 3,680 | 3,739 |
| Moldavian SSR | 919 | 2,112 | 2,609 | 2,817 | 3,039 |
| Latvian SSR | 1,595 | 2,433 | 3,475 | 3,775 | 3,385 |
| Kirgiz SSR | 517 | 1,632 | 2,101 | 2,207 | 2,393 |
| Tadzhik SSR | 567 | 1,173 | 1,627 | 1,771 | 1,926 |
| Armenian SSR | 850 | 2,185 | 2,844 | 2,925 | 3,141 |
| Turkmen SSR | 817 | 1,301 | 1,720 | 1,870 | 1,987 |
| Estonian SSR | 812 | 1,104 | 1,851 | 1,992 | 2,063 |

Number of Physicians According to Specialties in USSR

| | 1940 | 1950 | 1955 | 1956 | 1957 |
|---|---|---|---|---|---|
| Total | 122,949 | 217,759 | 269,734 | 288,191 | 303,515 |
| Therapeutists* | 37,479 | 49,487 | 68,328 | 74,332 | 76,931 |
| Surgeons** | 11,207 | 19,775 | 28,316 | 29,712 | 30,786 |
| Obstetricians-gynecologists | 9,490 | 14,682 | 20,669 | 21,276 | 22,012 |
| Pediatricians | 17,318 | 28,076 | 38,108 | 40,124 | 42,599 |
| Oculists | 3,212 | 4,950 | 7,285 | 7,640 | 7,972 |
| Otolaryngologists | 2,269 | 3,930 | 6,087 | 6,514 | 6,901 |
| Neuropathologists | 2,726 | 4,429 | 6,489 | 6,857 | 7,389 |
| Psychiatrists | 2,255 | 2,691 | 4,086 | 4,321 | 4,624 |
| Phthisiologists | 3,340 | 8,252 | 11,445 | 12,287 | 13,005 |
| Determato-venerealogists | 4,266 | 8,092 | 8,524 | 8,456 | 8,208 |
| Roentgenologists | 2,348 | 5,407 | 9,240 | 10,312 | 11,314 |
| Physioculturists | 222 | 707 | 1,316 | 1,358 | 1,361 |
| Stomatologists | 5,139 | 9,214 | 10,938 | 11,323 | 11,975 |
| Sanitation-antiepidemi-ological groups *** | 11,121 | 19,129 | 23,921 | 24,058 | 24,422 |
| Sanitation physicians | 4,390 | 8,856 | 10,933 | 11,402 | 11,092 |
| Epidemiologists | 2,260 | 4,633 | 6,213 | 6,132 | 6,039 |
| Dentists | 12,839 | 15,579 | 19,145 | 20,523 | 21,625 |

*Including therapists, physiotherapists, and infectionists.

**Including traumatologists, orthopedists, oncologists, and urologists.

***Including sanitation physicians, epidemiologists, malariologists bacteriologists, helminthologists, and disinfectionists.

Number of Intermediate Medical Personnel (Urban and Rural)

|  | 1940 | 1950 | 1955 | 1956 | 1957 |
|---|---|---|---|---|---|
| USSR | 433,953 | 647,700 | 845,066 | 929,608 | 1,029,250 |
| RSFSR | 264,383 | 402,213 | 506,228 | 549,863 | 605,052 |
| Ukrainian SSR | 93,394 | 123,832 | 164,960 | 186,574 | 207,051 |
| Belorussian SSR | 18,338 | 22,532 | 28,196 | 30,805 | 33,897 |
| Uzbek SSR | 11,536 | 13,835 | 21,601 | 23,856 | 27,417 |
| Kazakh SSR | 11,243 | 17,792 | 27,938 | 32,016 | 37,946 |
| Georgian SSR | 8,593 | 16,080 | 22,370 | 24,466 | 26,815 |
| Azerbaydzhan SSR | 7,043 | 12,624 | 16,550 | 18,213 | 20,691 |
| Lithuanian SSR | 649 | 5,123 | 8,734 | 9,845 | 10,797 |
| Moldavian SSR | 2,382 | 7,362 | 10,293 | 11,148 | 12,276 |
| Latvian SSR | 3,369 | 5,704 | 8,723 | 9,760 | 10,839 |
| Kirgiz SSR | 2,552 | 4,672 | 6,403 | 6,975 | 7,925 |
| Tadzhik SSR | 2,651 | 3,329 | 4,625 | 5,386 | 5,976 |
| Armenian SSR | 2,183 | 4,283 | 6,550 | 7,461 | 8,390 |
| Turkmen SSR | 4,370 | 4,878 | 6,456 | 7,110 | 8,152 |
| Estonian SSR | 1,267 | 3,441 | 5,439 | 6,130 | 7,019 |

Number of Intermediate Medical Personnel by Specialties in USSR

|  | 1940 | 1950 | 1955 | 1956 | 1957 |
|---|---|---|---|---|---|
| Total | 433,953 | 647,700 | 845,066 | 929,608 | 1,029,250 |
| Feldshers | 75,883 | 146,946 | 165,840 | 186,568 | 219,929 |
| Feldsher-midwives | 11,147 | 38,550 | 60,145 | 64,957 | 71,151 |
| Midwives | 64,173 | 61,630 | 76,233 | 87,680 | 99,921 |
| Assistants to sanitation physicians and assistants to epidemiologists | 8,637 | 15,561 | 17,998 | 19,933 | 21,155 |
| Nurses | 208,711 | 287,444 | 402,065 | 441,591 | 479,751 |
| Medical laboratory assistants | 10,814 | 22,236 | 33,330 | 36,569 | 37,784 |
| X-ray technicians and X-ray lab technicians | 3,169 | 6,616 | 10,695 | 11,907 | 12,966 |
| Dental technicians | 4,214 | 6,085 | 8,810 | 9,292 | 10,078 |

Network of Hospital Institutions (Rural and Urban)

Number of Institutions

|  | 1940 | 1950 | 1955 | 1956 | 1957 |
|---|---|---|---|---|---|
| All hospital institutions | 13,472 | 17,359 | 23,397 | 24,105 | 24,483 |
| City hospital institutions | 5,851 | 7,056 | 9,064 | 9,315 | 9,768 |
| Oblast hospitals | --* | 133 | 156 | 158 | 161 |
| City hospitals | 4,352 | 2,429 | 3,343 | 3,496 | 3,669 |

| | | Number of Institutions | | | |
|---|---|---|---|---|---|
| | 1940 | 1950 | 1955 | 1956 | 1957 |
| Special hospitals | --* | 1,044 | 1,152 | 1,189 | 1,222 |
| Rayon hospitals of rural rayons with centers in cities | --* | 1,429 | 1,491 | 1,454 | 1,618 |
| Permanent dispensaries | 131 | 794 | 1,677 | 1,774 | 1,844 |
| Infirmaries at scientific research institutes | 116 | 120 | 123 | 119 | 121 |
| Clinics attached to vuzes (higher educational institutions | 41 | 26 | 18 | 18 | 18 |
| Lying-in homes | 961 | 731 | 731 | 722 | 723 |
| Leprosaries and lupisaries | 26 | 23 | 22 | 21 | 20 |
| Psychoneurological hospitals and colonies | 207 | 179 | 239 | 255 | 276 |
| Others | 17 | 148 | 112 | 109 | 96 |
| Rural hospital institutions | 7,621 | 10,303 | 14,333 | 14,790 | 14,715 |
| Rayon hospitals | 2,104 | 2,556 | 2,532 | 2,325 | 2,091 |
| District hospitals | 4,499 | 7,126 | 11,288 | 11,914 | 12,123 |
| Special hospitals | 77 | 161 | 164 | 183 | 175 |

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### Number of Institutions

|  | 1940 | 1950 | 1955 | 1956 | 1957 |
|---|---|---|---|---|---|
| Infirmaries attached to dispensaries | --* | 31 | 200 | 234 | 214 |
| Lying-in homes | 895 | 415 | 122 | 105 | 85 |
| Others | 46 | 14 | 27 | 29 | 27 |
| Ambulatoriums, having hospital beds | 750 | 270 | 49 | 38 | 32 |

*No information available.

### Network of Establishments Rendering Ambulatory Aid
### (Rural and Urban Areas)

| | Number of Establishments | | |
|---|---|---|---|
| | 1955 | 1956 | 1957 |
| Total | 33,050 | 33,854 | 34,412 |
| Urban areas | 16,094 | 16,692 | 17,513 |
| Oblast hospitals | 154 | 155 | 156 |
| City hospitals | 3,305 | 3,463 | 3,632 |
| Rayon hospitals of rural rayons with centers in cities | 1,482 | 1,447 | 1,614 |
| Children's hospitals | 590 | 620 | 639 |
| Lying-in home | 728 | 713 | 712 |
| Dispensaries of all types | 2,208 | 2,265 | 2,312 |
| Ambulatory-polyclinic establishments, not connected with hospitals | 1,340 | 1,346 | 1,363 |

CPYRGHT

|  | Number of Establishments | | |
|---|---|---|---|
|  | 1955 | 1956 | 1957 |
| Medical health points | 6,037 | 6,415 | 6,786 |
| Independent detal establishments | 178 | 191 | 230 |
| Ambulatory-polyclinic establishments at resorts | 72 | 77 | 69 |
| Rural areas | 16,956 | 17,162 | 16,899 |
| Rayon hospitals | 2,523 | 2,321 | 2,090 |
| District hospitals | 11,283 | 11,910 | 12,121 |
| Children's hospitals | 8 | 12 | 9 |
| Lying-in homes | 110 | 96 | 76 |
| Dispensaries of all types | 213 | 243 | 222 |
| Ambulatory-Polyclinic establishments not connected with hospitals | 2,819 | 2,580 | 2,381 |

### Number of Hospital Institutions (Rural and Urban)

|  | 1940 | 1950 | 1955 | 1956 | 1957 |
|---|---|---|---|---|---|
| USSR | 13,472 | 17,359 | 23,397 | 24,105 | 24,483 |
| RSFSR | 8,226 | 9,915 | 12,816 | 13,135 | 13,319 |
| Ukrainian SSR | 2,460 | 3,393 | 4,620 | 4,740 | 4,767 |
| Belorussian SSR | 555 | 678 | 849 | 867 | 884 |
| Uzbek SSR | 368 | 560 | 717 | 773 | 797 |
| Kazakh SSR | 586 | 756 | 1,405 | 1,492 | 1,545 |
| Georgian SSR | 303 | 466 | 594 | 613 | 623 |
| Azerbaydzhan SSR | 215 | 322 | 446 | 467 | 500 |

|  | 1940 | 1950 | 1955 | 1956 | 1957 |
|---|---|---|---|---|---|
| Lithuanian SSR | 77 | 176 | 270 | 284 | 290 |
| Moldavian SSR | 108 | 226 | 314 | 315 | 318 |
| Latvian | 89 | 116 | 271 | 274 | 265 |
| Kirgiz SSR | 111 | 137 | 217 | 229 | 230 |
| Tadzhik SSR | 120 | 149 | 203 | 213 | 218 |
| Armenian SSR | 98 | 162 | 223 | 235 | 247 |
| Turkmen SSR | 98 | 148 | 220 | 237 | 256 |
| Estonian SSR | 58 | 155 | 232 | 231 | 224 |

## Number of Establishments Rendering Ambulatory Aid
### (Urban and Rural Areas)

|  | 1955 | 1956 | 1957 |
|---|---|---|---|
| USSR | 33,050 | 33,854 | 34,412 |
| RSFSR | 18,276 | 19,029 | 19,325 |
| Ukrainian SSR | 5,953 | 6,241 | 6,323 |
| Belorussian SSR | 1,181 | 1,198 | 1,209 |
| Uzbek SSR | 1,055 | 1,086 | 1,112 |
| Kazakh SSR | 1,575 | 1,659 | 1,725 |
| Georgian SSR | 239 | 1,261 | 1,259 |
| Azerbaydzhan SSR | 748 | 776 | 781 |
| Lithuanian SSR | 428 | 438 | 432 |
| Moldavian SSR | 336 | 341 | 347 |
| Latvian SSR | 424 | 450 | 466 |
| Kirgiz SSR | 262 | 259 | 259 |
| Tadzhik SSR | 237 | 240 | 249 |

|  | 1955 | 1956 | 1957 |
|---|---|---|---|
| Armenian SSR | 334 | 344 | 373 |
| Turkmen SSR | 240 | 256 | 280 |
| Estonian SSR | 278 | 276 | 272 |
| Establishments of a union subordination not distributed among republics | 484 | -- | -- |

### Bed Capacities of Hospital Institutions
### (Rural and Urban Areas)

| | Number of Available Beds | | | | |
|---|---|---|---|---|---|
| | 1940 | 1950 | 1955 | 1956 | 1957 |
| USSR | 760,843 | 964,924 | 1,225,571 | 1,292,717 | 1,376,504 |
| RSFSR | 458,332 | 580,361 | 719,113 | 754,485 | 799,077 |
| Ukrainian SSR | 153,900 | 186,734 | 238,935 | 253,465 | 272,425 |
| Belorussian SSR | 32,411 | 30,795 | 39,955 | 42,517 | 44,550 |
| Uzbek SSR | 19,493 | 30,765 | 38,670 | 41,075 | 43,435 |
| Kazakh SSR | 23,363 | 32,571 | 51,328 | 56,500 | 62,582 |
| Georgian SSR | 12,032 | 18,394 | 22,780 | 23,670 | 25,032 |
| Azerbaydzhan SSR | 12,061 | 16,423 | 19,895 | 20,615 | 22,160 |
| Lithuanian SSR | 8,888 | 10,345 | 15,350 | 16,675 | 17,760 |
| Moldavian SSR | 6,101 | 10,376 | 14,685 | 15,580 | 16,850 |
| Latvian SSR | 11,978 | 23,544 | 18,227 | 18,735 | 19,440 |
| Kirgiz SSR | 3,779 | 7,081 | 9,235 | 10,005 | 11,210 |
| Tadzhik SSR | 4,440 | 6,746 | 9,127 | 9,695 | 10,363 |
| Armenian SSR | 3,887 | 6,505 | 9,110 | 9,790 | 10,565 |
| Turkmen SSR | 5,119 | 7,053 | 9,396 | 9,875 | 10,660 |
| Estonian SSR | 5,054 | 7,231 | 9,765 | 10,035 | 10,395 |

Specialization of Beds in Hospital Institutions of the USSR

Number of Available beds

| | 1940 | 1950 | 1955 | 1956 | 1957 |
|---|---|---|---|---|---|
| Total | 760,843 | 964,924 | 1,225,571 | 1,292,717 | 1,376,504 |
| Beds for therapeutic patients | 88,581 | 160,648 | 240,448 | 254,982 | 274,768 |
| Beds for surgical patients | 90,230 | 136,935 | 175,121 | 184,760 | 198,193 |
| Beds for oncological patients | 1,499 | 12,066 | 16,163 | 17,244 | 18,173 |
| Beds for gynecological patients | 30,823 | 39,712 | 52,533 | 58,604 | 65,975 |
| Beds for children (noninfectious diseases) | 49,682 | 74,247 | 100,021 | 107,013 | 116,958 |
| Beds for eye patients | 13,015 | 15,250 | 21,268 | 22,737 | 23,815 |
| Beds for otolaryngological patients | 6,586 | 8,341 | 11,561 | 12,634 | 13,609 |
| Beds for tuberculosis patients (children and adults) | 30,056 | 72,421 | 105,350 | 111,565 | 120,445 |
| Beds for skin-venereal patients | 14,305 | 29,258 | 27,676 | 27,610 | 28,088 |
| Beds for patients with infectious diseases | 91,471 | 123,770 | 145,986 | 148,181 | 151,242 |
| Beds for psychiatric patients | 83,895 | 70,914 | 106,487 | 115,430 | 126,180 |
| Beds for neural patients | 8,584 | 12,951 | 17,153 | 18,347 | 19,959 |

CPYRGHT

|  | Number of Available Beds | | | | |
|---|---|---|---|---|---|
|  | 1940 | 1950 | 1955 | 1956 | 1957 |
| Beds for parturients | 107,827 | 116,306 | 138,441 | 142,911 | 149,162 |
| Beds for general patients | 117,897 | 70,633 | 54,677 | 57,158 | 59,151 |
| Other beds not assigned for specialties | 27,791 | 33,538 | 28,849 | 30,785 | 28,959 |

111.  Tashkent Pharmaceutical Institute

"The Needs of a Pharmaceutical Institute," by M. Azizov, director, Tashkent Pharmaceutical Institute, and M. Yagudin, senior instructor, Tashkent Pharmaceutical Institute; Moscow, Meditsinskiy Rabotnik, 17 Mar 59

During the 20 years of its existence, the Tashkent Pharmaceutical Institute has graduated nearly 1,500 specialists, who, for the most part, are assigned to duties in Uzbek SSR and other republics of Central Asia. The institute has 66 laboratories staffed by seven persons with a Doctor of Sciences degree and 30 with a Candidate of Sciences degree. The institute has published 29 monographs and nearly 200 journal articles. The staff has studied more than 80 medicinal plants. The institute, however, needs an experimental site, a large plot for cultivating rare types of plants, and a Laboratory for the Synthesis of Medicinal Preparations.

112.  Grodno Medical Institute Holds First Medical Conference

"Scientific Session of a New Vuz," by L. Suprun, director, Grodno Medical Institute; Moscow, Meditsinskiy Rabotnik, 13 Mar 59

The Grodno Medical Institute Belorussian SSR recently concluded its first medical conference. The conference was attended by nearly 200 physicians who heard the following reports:

Prof M. A. Usiyevich -- "The Influence of Acute Blood Loss and Clinical Death on Various Aspects of the Function of the Stomach in the Resuscitation of an Animal Organism (Dog)."

Prof T. V. Birich -- "The Efficacy of Oxygen Therapy in the Prophylaxis and Treatment of Progressive Myopia."

Prof G. Kh. Dovgyallo -- "Ganglerone as a Method of Treating Patients With Coronary Insufficiences."

Prof K. S. Shadurskiy -- "Serotonins and Antiserotonins."


113.  Czechoslovak Pharmaceutical Congress To Be Held 8-11 September 1959

"Current Events" (unsigned article); Moscow, Meditsinskaya Promyshlennost! No 2, Feb 59, p 64

The Czechoslovak Pharmaceutical Society is organizing a Pharmaceutical Congress to be held in Karlovy Vary between 8 and 11 September 1959 with the participation of Czechoslovak and foreign specialists. The congress will be devoted to progress in experimental work on the production and control of medicinal substances and preparations.

Both review papers and original reports on the synthesis, analysis, and control of medicines, pharmacognosy and galenic pharmacy will be read at the congress.

The program of the congress provides for a visit to well-known western Czechoslovak resorts and several pharmaceutical houses and scientific research institutes in Prague.


114.  Prof V. A. Gilyarovskiy, Soviet Psychiatrist, Dies

"In Memory of V. A. Gilyarovskiy" (unsigned article); Moscow, Meditsinskiy Rabotnik, 13 Mar 59

Prof Vasiliy Alekseyevich Gilyarovskiy, Active Member of the Academy of Medical Sciences, Honored Worker of Sciences, and one of the most famous Soviet psychiatrists, died recently following a serious illness at the age of 85. Gilyarovskiy graduated from the Medical Faculty, Moscow University, 1899 and spent his entire life in the study of the clinical manifestations anatomy, and physiology of neural and psychological diseases. He was one of the founders of Soviet psychoneurology of children. Due to his initiative, the Institute of Psychiatry, Academy of Medical Sciences, which he directed for many years was founded. He was also the scientific director of the Institute of Psychiatry Ministry of Health USSR from 1952. His scientific writings include nearly 150 works on psychiatry. His awards include three Orders of Lenin, the Order of Labor Red Banner, and medals.

115.  New Surgical Journal Published

"New Surgical Journal" (unsigned article); Moscow, Meditsinskiy
Rabotnik, No 20, 10 Mar 59, p 4; and Grudnaya Khirurgiya, Vol 1,
No 1, Jan 59

The publication of a new Soviet scientific journal, Grudnaya Khirurgiya
(Thoracic Surgery), has been announced.  According to an article which
appeared in Meditsinskiy Rabotnik, the journal will keep its readers in-
formed of achievements of Soviet medical science in surgical therapy of
the heart, lungs, esophagus, and large blood vessels.  Reports of foreign
progress in these fields and coverage of conferences and meetings devoted
to problems encountered in thoracic surgery will also be included.  The
editorial board of the journal will consist of the following members:
A. Bakulev (editor), Prof A. Busalov (assistant editor), A. Gulyayev,
S. Kolesnikov, P. Kupriyanov, and others.

The first issue of the journal contains several brief reports on new
surgical techniques.  Cases of recognition and therapy of primary cardiac
tumor, successful alloplastic replacement for aneurism of the abdominal
aorta and its bifurcations, and reconstruction of the diaphragm are de-
scribed.

Examination of the journal itself shows the following subdivisions
of information:  original papers, brief reports, inventions, and reviews.

VII.  METALLURGY

116.  The System Rhenium-Titanium

"The Constitutional Diagram of the System Rhenium-Titanium,"
by Ye. M. Savitskiy, M A. Tylkina and Yu. A. Zot'yev, In-
stitute of Metallurgy imeni A. A. Baykov, Academy of Sciences
USSR; Moscow, Zhurnal Neorganicheskoy Khimii, Vol 4, No 3,
Mar 59, pp 702-704

An investigation of the system rhenium-titanium was conducted by
the methods of metallographic and X-ray analysis, determination of the
melting points, determination of electric resistance, measurement of the
hardness of alloys, and measurement of the microhardness of structural
components. A constitutional diagram of the system was constructed. The
existence of the compound $Re_{24} Ti_5$ was established. The properties of
different solid phases are described.

117.  Stability of Cobalt-Tungsten Carbide Cermets at High Pressures

"The Application of Super-Hard Alloys as a Material for High-
Pressure Vessels," by Yu. N. Ryabinin, Laboratory of the Physics
of Super-High Pressures, Academy of Sciences USSR; Sverdlovsk,
Fizika Metallov i Metallovedeniye, Vol 6, No 5, Dec 58, pp 893-
899

Data on the strength of cobalt-tungsten carbide cermets when used as
material for high-pressure piezometers and results of work in regard to
the effect of the composition of these cermets (i.e., the cobalt content)
on the brittleness are reviewed and collated. Results obtained by P. V.
Bridgman in the US with cermets of this class (US carboloy) are compared
with those obtained in the author's own laboratory with the use of USSR
pobedit, which has the same composition as carboloy. A bibliography con-
sisting of 23 references, two of which are of Soviet origin, follows the
article.

118.  Electrolytic Deposition of Cobalt-Tungsten Alloys

"Investigation of the Electrolytic Deposition of Cobalt-
Tungsten Alloys," by A. I. Zayats and T. F. Frantsevich-
Zabludovskaya, Institute of General and Inorganic Chemis-
try, Academy of Sciences Ukrainian SSR; Kiev, Ukrainskiy
Khimicheskiy Zhurnal, Vol 24, No 5, Sep-Oct 1958, pp 584-
591

The simultaneous cathodic deposition of tungsten and cobalt from
ammonium tartrate solutions was investigated. It was found that as the
current density goes up, the current yield decreases at a constant content

of tungsten. Raising the temperature exerts a favorable effect on the increase of the tungsten content and current yield of the alloy. It was shown that the content of tungsten in cobalt alloys is higher then in electrolytically deposited nickel alloys. This can be explained by characteristics of the structure of the electron shells of these metals. The cathodic polarization during the deposition of tungsten and cobalt from the electrolyte mentioned above was investigated. It was established that reduction of cobalt to the metallic state starts from an ammonia complex of trivalent cobalt and proceeds in two stages over intermediate reduction to divalent cobalt. It was furthermore established that the potential of the deposition of cobalt is the determining factor in the deposition of the alloy. The potential of the deposition of cobalt is much more positive than the specific potential of the deposition of tungsten.

119. Investigation of the Properties of Yttrium and Its Alloys

"Yttrium and Its Alloys," by Ye. M. Savitskiy and V. F. Terekhova, Institute of Metallurgy, Academy of Sciences USSR; Moscow, Tsvetnyye Metally, Vol 32, No 1, Jan 59, pp 48-53

The microstructure, hardness, tensile strength, and ductility of metallic yttrium having a purity amounting to 96.5% were investigated. The microstructure of yttrium of this purity is characterized by the inclusion of a second phase along the grain boundaries and in the body of the grains. The Brinell hardness comprises 80-85 kilograms per square millimeter. The tensile strength is 16 kilograms per square millimeter and the compression strength 82 kilograms per square millimeter.

The interactions of yttrium with magnesium, aluminum, cerium, copper, iron, chromium, vanadium, tantalum, niobium, molybdenum, titanium, and zirconium were investigated. It was established that (a) yttrium dissolves completely in cerium; (b) yttrium interacts with aluminum, iron, and copper with the formation of eutectic mixtures; (c) in its alloys with chromium, titanium, and zirconium, yttrium dissolves to a very small extent; it exhibits peritectoid reactions in narrow ranges of concentrations and separation into layers in the solid state when the content of yttrium is high; (e) yttrium is practically immiscible with vanadium, niobium, tantalum, and molybdenum.

Introduction of small quantities (0.1-0.2%) of yttrium reduces the size of the grains of almost all cast metals that have been investigated (chromium, titanium, zirconium, molybdenum, etc.) Alloying of aluminum and magnesium with yttrium leads to improvement of the strength of alloys based on these metals. Thus, yttrium must be regarded as a very promising alloying component when added to metal alloys.

- 98 -

Yttrium, being one of the rare-earth metals, exerts a deoxidizing and modifying effect on all types of alloys. In a number of cases (e.g., those of magnesium and aluminum alloys) yttrium is a very effective alloying element that increases the strength. The effects of yttrium on alloys must be investigated in all their industrial aspects in special research carried out for this purpose at scientific institutes and plant laboratories.

120. Rolling of Metals for New Applications in Electronics, Nuclear Energy Technology

"Prospects of the Development of the Nonferrous Metalworking Industry," by M. F. Bazhenov; Moscow, Tsvetnyye Metally, Vol 32, No 1, Jan 59, pp 8-10

"The development of electronics, electrical engineering, nuclear power engineering, and other rapidly expanding fields of industry requires that rolling mills which treat non ferrous metals develop the production of novel profiles and of methods for working alloys with new and sometimes unusual characteristics. Rolled products made of tungsten, molybdenum, tantalum, zirconium, niobium, beryllium, and other metals and alloys may be required in considerable quantities. There will be an increased demand for rolled products consisting of ultra-pure metals of an order of purity amounting to 99.99-99.999%. Methods must be developed for the production of semifinished products from ultra-pure metals without lowering the purity of which these metals had in the initial ingots.

"Different types of bimetals (iron-aluminum, aluminum-copper, iron-titanium, iron-brass, iron-bronze, etc.) in the form of sheets, ribbons, profiles, wires, and tubes will be required in large quantities.

"Thermobimetals [combinations of metals having greatly different coefficients of thermal expansion] of different grades and with different characteristics will also be required."

CPYRGHT

121. Automatic Control of the Reduction of Titanium Tetrachloride With Magnesium

"Development of a Procedure for Automatic Control of the Process of Magnesium-Thermic Reduction of Titanium," by A. G. Arkad'yev, V. A. P'yankov, Kh. L. Strelets, and G. V. Forsblom; Moscow, Tsvetnyye Metally, Vol 32, No 1, Jan 59, pp 53-62

- 99 -

The temperature field of the reactor for the production of titanium was investigated. Conditions were formulated which a device for the automatic control of a process of reduction of titanium tetrachloride with magnesium must fulfill. A procedure for this type of control was developed. Some new instruments for the automatic control of the process were designed. Testing of the procedure in semiplant and full-scale plant equipment indicated that it is suitable for practical application. Application of automatic control assures a considerable increase in the output of the equipment for the production of titanium by this method.

122. Effect of Liquid Metals on the Strength of Solid Metals in Contact With Them

"The Surface Activity of Liquid Metal Coatings and Their Effect On the Strength of Metals," by N. V. Pertsov and Academician P. A. Rebinder, Chair of Chemistry, Moscow Institute of Machine Tool Building, and Chair of Colloid Chemistry, Moscow State University; Moscow, Doklady Akademii Nauk SSSR, Vol 123, No 6, 21 Dec 59, pp 1068-1070

Results obtained in an investigation of the effect exerted by liquid low-melting metals on the mechanical strength of solid higher melting metals indicated that there is a great decrease in the strength of the solid metal when the two metals (liquid and solid) are capable of forming solid solutions only within a narrow range and practically no decrease in strength when the two metals are capable of forming solid solutions within an extensive range. It is concluded from this that the effect investigated is analogous to that produced by organic surface-active compounds in aqueous solutions: the lower the solubility, the greater is the effect produced by the surface-active compound or surface-active metal. Single crystals were used in the investigation described so that the selective action exerted by the liquid metal along grain boundaries was eliminated. The results obtained are correlated with data reported by S. T. Kishkin and Ya. M. Potak, who investigated the effect of liquid metal coatings and of immersion in liquid metals on the mechanical strength of heat-resistant (refractory) alloys.

123. Some USSR Developments in the Field of Nonferrous Metallurgy

"Principal Directions of the Development of Nonferrous Metallurgy (Tasks to be Accomplished Under the 7-Year Plan)," by I. Strigin, Member of the Gosplan USSR; Moscow, Promyshlenno-Ekonomicheskaya Gazeta, Vol 4, No 27, (482), 4 Mar 59, p 2

In the economic expansion under the 1959-1965 Seven-Year Plan, an exceptionally important role will be played by non ferrous metallurgy, without which modern technology is impossible. Only the extensive application of nonferrous and rare metals will make it possible to accomplish

a complete electrification of the country, to create a single electric power system, to re-equip railroad and automobile transportation, and to develop, at a still faster rate, aviation, rocket technology, electronics, radio engineering, and automation and mechanization of production processes, as well as carry out an extensive program of work on the utilization of nuclear energy for peaceful purposes.

During the years of Soviet power industries producing aluminum, nickel and cobalt, titanium and magnesium, and tin were created. Furthermore, the production of rare metals and hard alloys was organized. Among the hundreds of enterprises that were built are an electrolytic copper plant, plants producing molybdenum and tungsten, aluminum plants, etc. As far as their capacity, technological level, and productivity are concerned, these enterprises are among the foremost in the world.

Rare metals such as germanium, zirconium, gallium, indium, thallium, niobium, tantalum, selenium, tellurium, and rare-earth elements are already being produced in the USSR. These metals are being successfully applied in the manufacture of new semiconductor devices and in the production of heat-resistance alloys, alloy steels, and materials which have superior refractory characteristics and a high resistance to corrosion.

According to the control figures of the Seven-Year Plan, the 1958 volume of the production of aluminum will be increased by a factor of 2.8-3 and that of refined copper by a factor of 1.9. To produce three times more aluminum than is being produced at present it will be necessary to open up new mines and to build new aluminum oxide and aluminum plants which will have a capacity twice as large as those which were constructed during the preceding 25 years. As far as the production of copper is concerned, it will be necessary to develop production capacities which are no smaller than those which were created during the whole preceding history of the development of copper production. The production of nickel, zinc, lead, and molybdenum will be increased. The output of titanium, magnesium, and some rare metals will be increased by several times.

Nonferrous metallurgy will expand most rapidly in Kazakhstan, Central Asia, Western Siberia, and in the Urals.

In planning the forthcoming development of the aluminum industry, the increasing demand for this metal has been taken into consideration. Furthermore, the many technological and economic advantages of an extensive use of aluminum in industry and construction were considered. The production of aluminum can be expanded more rapidly than that of other metals and the capital investment involved in this expansion is smaller.

During the current 7-year period, the aluminum industry will develop predominantly in the eastern parts of the USSR. The unlimited supplies of nepheline in Western Siberia will make possible conversion of this raw

material into alumina, cement, and sodium compounds. Nepheline will become a basis for the development of the aluminum industry in the Irkutsk Oblast' and in the Krasnoyarsk Kray. The rich deposits of high-grade bauxites of the Turgay Depression will be utilized for the development of the aluminum industry in Kazakhstan. The construction of enterprises in the eastern regions of the USSR and the expansion of production of aluminum at already existing plants will make the USSR the largest producer of aluminum in the world. The nickel industry will also expand at an accelerated rate, particularly on the Kola Peninsula and also in the Southern Urals.

The molybdenum, tungsten, and tin industries will increase their production by expanding the already existing enterprises.

At copper, lead, and zinc plants, special departments and installations are being built for the distillation of metals from slags and for the conversion of distillates and dusts by processes in which complete extraction of lead, zinc, cadmium, germanium, selenium, indium, gallium, and other accompanying metals will be accomplished.

At the new aluminum plants, electrolytic cells which are 3-4 times more powerful than those operating at established enterprises will be installed.

Oxygen will be used in the smelting of nonferrous metals. The effect which the introduction of oxygen may have is illustrated by the experience acquired at the Ust'-Kamenogorsk Lead-Zinc Combine, where the application in lead smelting of blowing with oxygen-enriched air made it possible to increase the output of blast furnaces by 20-25%. Furthermore, the process of smelting was improved considerably from the qualitative standpoint.

Treatment of ores and concentrates by the fluidized solids method will be applied extensively. By using this method, the production of roasting furnaces in the zinc industry could already be increased by a factor of 3-4. The use of mazut was eliminated entirely. During three years, more than 200,000 additional tons of sulfuric acid were produced and also 4,000 tons of zinc and a considerable quantity of cadmium. An economy of 200 million rubles was achieved by applying the fluidized solids method.

Under the current Seven-Year Plan, this method will be applied in the copper, aluminum, cobalt, antimony, and mercury industries.

"Tasks of Nonferrous Metallurgy in the Forthcoming Seven Years," by I. A. Strigin; Moscow, Tsvetnyye Metally, Vol 32, No 1, Jan 59, pp 1-7

The expansion of chemical production by a factor of almost three and the introduction of new high-pressure processes and processes carried out at high temperatures and in aggressive media increases the demand for

- 102 -

elements used as alloy constituents and as high-melting metals, i.e.,
nickel, cobalt, molybdenum, tungsten, niobium, tantalum, and zirconium.
A metal produced since recently, viz., titanium, will also be applied
more extensively.  It is necessary to increase the production of these
metals by a factor of two or more.  The production of some of the metals
mentioned will be increased to a much greater extent.

The proposed use of plastics for sheathing cables and replacement
of lead with aluminum will reduce to some extent the demand for lead.
However, smelting of lead will still be increased by a factor of 1.5
under the current Seven-Year Plan.  The solution of many major technical
problems, the development of automation, advances in electronics and
radio engineering, and the utilization of nuclear energy for peaceful
purposes depend on an expansion of nonferrous metallurgy and on the avail-
ability of a greater number of rare, dispersed, and rare-earth metals as
well as on the production of all metals in a state of high purity.  Semi-
conductor materials will acquire a particular importance from the stand-
point of technical progress in industry and transportation.

Nonferrous metallurgy will be expanded primarily in the eastern
regions of the country.  Out of a capital investment of 55 billion rubles
provided for under the Seven-Year Plan, 62% will be invested in the con-
struction of enterprises in the East in order to develop the deposits of
nonferrous metals there.

Large enterprises for the production of aluminum will be built in
the Krasnoyarsk Kray, Irkutsk Oblast, and Kazakhstan with the view of
employing the cheap electric power from the Bratsk and Krasnoyarsk hydro-
electric power plants and also from the thermal power plants using the
cheap coal that will be mined in these regions.

The nickel-cobalt enterprises already in operation will be expanded
considerably.  Their raw material  bases will be expanded by opening and
putting into operation new mines.  The increased demand of the industry
for nickel and cobalt can be satisfied only if new combines are built in
the southern Urals and in the Ukraine.

The development of new deposits of oxidized nickel ores containing
a high percentage of iron must take place in such a manner that raw
material will be also supplied to ferrous metallurgy plants.

A further expansion of the production of titanium and magnesium is
provided for.  This expansion will be accompanied by a continuous improve-
ment of the equipment used.  In this manner the cost of producing titanium
and its prime cost will be lowered so that this metal, which is superior
from the standpoint of applications as a construction material, will be
introduced widely into industrial use.  The enterprise of the tungsten-
molybdenum industry and the plants which produce hard alloys will be

- 103 -

expanded. There will be a continuous increase in the production of tungsten and molybdenum in the form of compact metals and of heat-resistant alloys based on them, doubling of the production of hard titanium and tungsten alloys, organization of a continuous method for their production, and improvement of the quality of products in this field.

More than a billion rubles will be spent on the construction of sulfuric acid departments at which the metallurgical exhaust gases of enterprises of the copper, lead-zinc, and nickel industries will be converted. As a result of measures that are being taken, the gases of all roasting and converter departments will be utilized and also partially gases from electric melting furnaces and agglomeration machines. The production of sulfuric acid at the enterprises in question will increase by a factor of almost four and will comprise 30% of the total production of sulfuric acid in the USSR.

Expansion of the production of cadmium, indium, rhenium, thallium, selenium, tellurium, gallium, germanium, and hafnium, as well as of some other metals will be based on the complete utilization of raw materials, the construction of eight slag distillation installations, the building of departments for the recovery of distilled materials equipped with appliances for the fine purification of gases, and building of departments for the complete conversion of dusts and distillates.

Realization of the measures which have been planned will also make it possible to increase the amount of lead and zinc extracted from polymetal ores. A considerable quantity of zinc will be produced from solutions obtained at departments for the conversion of dusts and distillates. The USSR industry already has experience in the conversion of slags of lead smelting. This experience was acquired at the Ust'-Kamenogorsk Lead Plant and in the complete treatment of raw materials both at this plant and at the Elektrotsila Plant where many dispersed metals accompanying polymetal ores are extracted.

Improvement of the technico-economic indices of ore enrichment and particularly more complete extraction of all metals will be assured by the preferential introduction of technological processes of enrichment by stages, collective flotation with subsequent selection, methods in which enrichment is combined with metallurgical processes, and also application of processes of enrichment in heavy suspensions and by means of screw separators.

In the metallurgy of nonferrous and rare metals electrothermic processes will be extensively applied in the production of aluminum, magnesium, and lead-zinc products. There will also be more extensive application of electric smelting of lead and copper, electrolytic deposition of aluminum in powerful electrolytic cells, and new methods for the preliminary treatment and smelting of copper, nickel, and lead charges, as well as application of processes carried out in autoclaves and vacuum in connection with the production of rare and dispersed metals.

- 104 -

At present new aluminum plants are being built in the USSR only according to standardized designs. These plants are equipped with electrolytic cells using 120-130,000 amperes and with mechanical current rectifiers.

To carry out the Seven-Year Plan in accordance with the control figures that have been published, workers in the field of nonferrous metallurgy will have to accomplish tasks of great magnitude. Expansion of the production of aluminum by a factor of 2.8 and of refined copper by a factor of 1.9 imply that during a period of seven years, capacities for the production of aluminum will have to be introduced which are almost twice as great as the capacities of plants built during the past 20 years, while a capacity for the production of copper equal to that of all plants erected during the whole preceding history of the country will have to be constructed.

The greatest amount of capital investment will be made in the nonferrous metallurgical industry of the RSFSR and of Kazakhstan. There will also be an increase in the capital invested in the nonferrous metallurgical industries of the Ukraine, Uzbekistan, Armenia, Azerbaydzhan, Kirgiziya, Georgia, and Tadzhikistan.

The most important new construction in the field of nonferrous metallurgy will be that of aluminum enterprises in the Krasnoyarsk Kray and Irkutsk Oblast', of copper enterprises in Dchezkazgan and on Balkhash, of nickel and [nickel] ore enrichment combines in the Orenburg Oblast', of the Zhdanovsk Mine and Enrichment Plant in the Murmansk Oblast, of the Karagaylinsk Combine in the Karaganda Oblast, of all enterprises that are to be built in the Almalyk region, and of many other plants.

[For additional information on metallurgy see Items No 20 and 22.]

VIII. PHYSICS

Atomic Energy Development

124. Czechoslovakia Holds National Conference on Nuclear Technology

"National Conference on Nuclear Technology" (unsigned article); Prague, Jaderna Energie, Vol 5, No 1, Jan 59, p 34

CPYRGHT

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The following is the preliminary program of the national conference on nuclear technology to be held in Prague, 28-30 January 1959, under the auspices of the Commission for Nuclear Technology of the Council of Scientific and Technical Societies.

Wednesday, 28 January 1959--Plenary Session

Engr J. Neumann, Deputy Minister of Chemical Industry, chairman of the Czechoslovak Government Delegation to the Geneva Conference. Results of the Geneva Conference.

Engr C. Simane: Thermonuclear Reaction.

Engr Dr A. Sevcik: The First Czechoslovak Nuclear-Power Plant From the Viewpoint of the Geneva Conference.

Prof Engr Dr Fr. Behounek, Corresponding Member of the Czechoslovak Academy of Sciences: World Development in Use of Radioisotopes in Science and in Technology.

Prof Dr V. Myslivec, Corresponding Member of the Czechoslovak Academy of Agricultural Sciences: Use of Statistical Methods in Low Activity Studies.

Prof Engr Dr B. Kvasil: Education and Preparation of Personnel for the Field of Utilization of Nuclear Energy (in View of the Results of the Geneva Conference).

Engr J. Fuksa: Report on the Geneva Conference Exhibit.

Docent Zd. Dienstbier, MD: Effects of Radiation on the Human Organism.

Thursday, 29 January 1959--Sectional Sessions

Power Section

0800 to 1200 Morning Session

Dr L. Trlifaj:  Physics of Nuclear Reactors.

Engr F. Klik:  Heavy Water Power Reactors.

Prof Engr O. Mastovsky, Corresponding Member of the Czechoslovak Academy of Sciences: Gas-Cooled Power Reactors Moderated by Graphite.

Prof Engr J. Becvar:  Power Reactors With Ordinary Pressurized Water.

Engr V. Stach:  Rapid Reactors.

1300 to 1700 Afternoon Session

Engr Z. Steyer:  Homogenous Water Reactors.

J. Urbanec (PhMr) [Master of Physics]:  Research Reactors.

Engr Z. Chalupa:  Fuel Cycles in Nuclear Power Plants.

Engr M. Krejci:  Regulation of Nuclear Power Plants.

Chemical Section

0800 to 1200 Morning Session

Prof Dr R. Rost:  Geological Review of Uranium Deposits.

Engr V. Jara:  Leaching of Uranium Ores and Preparation of Chemical Concentrate.

Engr K. Stamberg:  Utilization of Ion-Exchangers in the Technology of Uranium Production.

Engr Vl. Blechta:  Extraction Methods in the Technology of Uranium Production.

Engr Vl. Civin:  Refining of Chemical Concentrate and Production of Metallic Uranium.

Engr J. Kortus:  Economic Problems in the Processing of Uranium Ores.

1300 to 1700 Afternoon session

Engr V. Krivan:  Metallurgy of Metal Fuel Materials and Preparation of Semifinished Products for Fuel Links (clanky).

Engr V. Sreier:  Extraction Method of Working Irradiated Fuel.

Engr M. Talas:  Pyrometallurgical Methods of Processing Irradiated Fuel.

Engr J. Cervasek:  Physical Metallurgy of Plutonium and Its Alloys for Fuel Material.

Engr V. Vesely:  Liquidation of Radioactive Wastes.

Engr J. Beranek:  Economic Problems of Processing Irradiated Fuel.

Isotope Section

0800 to 1200 Morning Session

Engr Ant. Pulkrab:  Development of World Production of Isotopes.

J. Moravek, Graduate Chemist:  Production of Tabled Compounds.

Dr J. Rerabek:  The Use of Radioisotopes in Agriculture.

Dr. D. Grunberger:  The Use of Radioisotopes in Biochemistry.

1300 to 1700 Afternoon Session

Engr E. Plander:  The use of Radioisotopes in Chemical Industry.

Engr Cadek:  The Use of Radioisotopes in Metallurgy.

Dr J. Kuba:  Gamma Defectoscopy.

Engr J. Oppelt:  The Use of Radioisotopes in Measuring, Regulation, and Automatization.

Friday, 30 January 1959--Sectional Sessions

0800 to 1200 Morning Sessions

Power Section

Engr L. Kindl:  Economics of Nuclear Power Plants.

Dr J. Pluhar, engineer:  Fuel Elements, Their Coating and Construction Materials in a Reactor.

Engr J. Hauer:  New Technological Findings in Power Reactor Production.

Engr J. Tomcik:  Safety Features and Experience Gained in the Operation of Nuclear Power Plants.

Chemical Section

Engr Bednar:  Progress in Radiation Chemistry.

Engr J. Kuca:  Actinium Chemistry.

Engr O. Zoch:  Moderators for Nuclear Technology, Specifically $D_2O$.

Engr M. Weber:  Hot, Radiochemical Worksite.

Isotope Section

Dr J. Klumpar:  Dosimetry of Small Doses and International Standardization.

Zd. Dpurny:  Progress in Radiochemical Dosimetry.

Engr R. Lukasek:  New Instruments for RI Laboratories.

Friday, 30 January 1959--Plenary Session

1300 to 1700 Afternoon Session

Evaluation of the work of the sections (presented by section chairmen).

Presentation and adoption of resolutions.

Concluding agenda of the conference.

Footnotes

Films of the second Geneva Conference will be shown during the conference, provided through the kindness of the International Agency for Peaceful Use of Nuclear Energy.

An exhibit of photographs and prospectuses from the Second Geneva conference of new Czechoslovak instruments will be open from 26 to 31 January 1959.

125. Meeting of East German Scientific Council for Peaceful Use of Atomic Energy

Berlin, Neues Deutschland, 14 Mar 59

On 13 March 1959, the Scientific Council for Peaceful Use of Atomic Energy under the Council of Ministers of the German Democratic Republic met under the chairmanship of Prof Dr Gustav Hertz.

During the meeting the following members of the council received certificates of appointment as members of the council: Prof Dr Peter Adolf Thiessen, chairman, Research Council of East Germany, and director, Institute for Physical Chemistry, German Academy of Sciences, Berlin; Hermann Grosse, chief, Department for Investments, Research, and Technology of the State Planning Commission; Hubert Bernicke, chief, Sector for Electrical Engineering, Department for Machine Building of the State Planning Commission; and Dr Justus Muehlenpfordt, director, Institute for Physical Material Fractionation (physikalische Stofftrennung) of the German Academy of Sciences, Leipzig.

The agenda of the conference included two important points:

1. Discussion of a draft law on the application of atomic energy in East Germany.

2. Discussion of the 1959 plan for research and development in the field of nuclear research and technology.

After a thorough discussion, the members of the council, approved the draft law and the draft ordinances and recommended that they be forwarded to the Council of Ministers.


Crystallography


126. Slipping of Beryllium Single Crystals

"Slipping of Beryllium Single Crystals at Low Temperatures," by R. I. Garber, I. A. Gindin, and Yu. V. Shubin, Physicotechnical Institute, Academy of Sciences Ukrainian SSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 2, Feb 59, pp 376-384

Very pure (99.98 o/o) beryllium single crystals were deformed at $20^\circ$ and $77^\circ K$. Slipping along the basis plane (0001) has been detected at $20^\circ$ as well as at $77^\circ K$. Two deformation stages are discerned: the initial stage when the displacement occurs in a thin layer adjacent to the slipping pole and a later stage when the deformation is localized at

the slipping pole. In regions between the poles a turning has been detected which increases with the deformation. The rotation twist of the blocks in the early stages may be ascribed to the effect of residual stresses. In the later stages when the rotation reaches 3° one must assume that twinning takes place during slipping. The largest magnitude of the relative displacement in the second stage may be explained by violation of continuity with subsequent restoration of the contacts.

127. Light Absorption and Dispersion by Crystals

"Contribution of Absorption and Dispersion of Light in Crystals," by S. I. Pekar, Kiev State University; Moscow, Zhurnal Eksperi- mental'noy i Teoreticheskoy Fiziki, Vol 36, No 2, Feb 59, pp 451- 464

The results of previous work of the author are extended to the case of a finite lifetime of the excited state of a crystal and several bands of light absorption. Absorption of light is obtained as the results of a finite lifetime of the excited state with respect to themal transitions. For an extremely long excition wave the dependence of its energy on the direction of propagation has been determined. A general theory of longi- tudinal polarization waves in crystals is developed. By performing a transition to the limit of an infinite lifetime of the excited state it has been possible to obtain all of the main results of the previous paper with the account taken of the remarks contained in reference [4].

Mechanics

128. General Method Given for Optimization of Linear Systems

"Method of Solving the Fundamental Integral Equation of
the Statistical Theory of Optimum Systems in Finite Form,"
by V. S. Pugachev, Moscow; Moscow, Prikladnaya Matematika i
Mechanika, Vol 23, No 1, Jan/Feb 59, pp 3-14

A general formula for the solution of first-order linear integral
equations is applied to the case when the kernel of the equation is a
correlation function of a stochastic function which is related to white
noise by a linear differential equation.

The case of an infinite interval of observation is first considered
and the results are applied to a finite interval of observation. Laning's
solution for the nonstationary case (J. H. Laning and R. H. Battin,
Random Processes in Automatic Control, McGraw-Hill, New York, 1956) is
then simply derived from the general formula.

It is noted that the results of the article constitute a proof of
the fact that all known methods for determining optimum linear systems
may be simply obtained by applying one general method, the method of
canonical representation of stochastic functions.

129. Solution of Various Partial Differential Equations Indicated

"Asymptotic Integration of Linear Partial Differential
Equations With Small Main Part," by A. L. Gol'denveyzer,
Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol
23, No 1, Jan/Feb 59, pp 35-57

The following problems in the theory of linear differential equations
with two independent variables are considered: the boundary-value problem
for an elliptical equation, the Cauchy problem for a hyperbolic equation,
and the problem of constructing a particular integral for an arbitrary
type of equation. It is assumed that the boundary values for the function
sought and its derivatives are functions of a large parameter k and are
rapidly oscillating functions. It is further assumed that a small para-
meter h enters into the higher derivatives. The character of the solution
of the above problems is investigated and various processes for construct-
ing approximate solutions are indicated, depending on the values of the
parameters k and h.

- 112 -

130. Method for Locating Moving Object Described

"A Self-Contained Determination of the Location of a Moving Object by Means of a Spatial Gyrocompass, Directional Gyroscope, and Integrating Device," by A. Yu. Ishlinskiy, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 23, No 1, Jan/Feb 59, pp 58-63

One method of combining a gyroscope, an acceleration meter, and an integrator to determine the location of a moving object is described. Properties of the Geckeler spatial gyrocompass are utilized.

131. Dynamical Stability of Elastic Systems Studied

"Small-Parameter Method for Canonical Systems With Periodic Coefficients," by V. A. Yakubovich, Leningrad; Moscow, Prik-Ladnaya Matematika i Mekhanika, Vol 23, No 1, Jan/Feb 59, pp 15-34

The following system of differential equations is studied:

$$dx/dt = [C + \varepsilon B(\theta t, \varepsilon)]x$$

where C is the constant matrix

$$\varepsilon B(\tau, \varepsilon) = \varepsilon B_1(\tau) + \varepsilon^2 B_2(\tau) + \ldots$$

$$B_j(\tau) \in L(0, 2\pi), \quad B_j(\tau + 2\pi) = B_j(\tau)$$

almost everywhere, and

$$\int_0^{2\pi} \| B_j(\tau) \| \, d\tau \leq B_j.$$

The series $\varepsilon \beta_1 + \varepsilon^2 \beta_2 + \ldots$ converges for $|\varepsilon^0| \leq \varepsilon_0$.

The resonance case of a canonical system is given particular attention. It is noted that in this case the eigen values of the matrix are equal modulus $i\theta$, as occurs in many problems on the theory of the dynamic stability of elastic systems.

It is shown that the characteristics of the system at stability must be pure imaginaries. These are expanded in powers of $\varepsilon^{1/p}$ and the expansion coefficients are calculated. Pure imaginary values are obtained as approximate values of the characteristic indexes.

- 113 -

132. Solution of Nonlinear Equations Near Particular Point Discussed

"On Limit Solutions Close to a Particular Point," by M. L. Lidov; Moscow, Doklady Akademii Nauk SSSR, Vol 120, No 6, 21 June 58, pp 1224-1227

The solution of nonlinear equations close to a particular point is investigated, using as an example the equations for the nonstationary adiabatic motion of an ideal gas in which a point explosion occurs. Certain considerations on constructing limit solutions in the general case are given.

## Nuclear Physics

133. Soviet Bibliography on Controlled Thermonuclear Reactions

Fizika Plazmy i Problema Upravlyayemykh Termoyadernykh : Reaktsiy (Plasma Physics and the Problem of Controlled Thermonuclear Reactions), Vol 4, Academy of Sciences USSR; Moscow, 1958, 440 pp

The following list was published in Volume 4, page 436, of the symposium "Plasma Physics and the Problem of Controlled Thermonuclear Reactions" Academy of Sciences USSR, Institute of Atomic Energy, 1958.

The symposium itself contains only data not hitherto published in printed form.

The list of articles on plasma physics and problem of controlled thermonuclear reactions presented below represents works completed by associates of the Institute of Atomic Energy, Academy of Sciences USSR, and published earlier [in Soviet scientific periodicals in the Russian language].

Abbreviations used:

Zhetf -- Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki

DAN -- Doklady Akademii Nauk SSSR

AE -- Atomnaya Energiya

1.  L. A. Artsimovich

    A. M. Andrianov
    O. A. Bazilevskaya
    Yu. G. Prokhorov
    N. V. Filippov

    "Investigation of High Current Pulse Discharges", AE, No 3, 1956, p 76

2.  L. A. Artsimovich

    A. M. Andrianov
    Ye. I. Dobrokhotov
    S. Yu. Luk'yanov
    I. M. Podgornyy
    V. I. Sinitsyn
    N. V. Fillipov

    "Hard Radiation of Pulse Discharges", AE, No 3, 1956, p 84

3.  L. A. Artsimovich

    S. Yu. Luk'yanov

    [Thermonuclear Reactions-Quest for Control of the Thermonuclear Reaction] Priroda, No 1, 1957, p 18

4.  L. A. Artsimovich

    S. Yu. Luk'yanov
    I. M. Podgornyy
    S. M. Chuvatin

    "Electrodynamic Acceleration of Plasma Bunches" ZhETF, No 3, 1957, p 33

5.  A. L. Bezbatchenko

    I. N. Golovin
    D. P. Ivanov
    V. D. Kirillov
    N. A. Yavlinskiy

    "Research on High Current Gas Discharge in a Longitudinal Magnetic Field" AE, No 5, 1956, p 26

6.  S. T. Belyayev

    G. I. Budker

    "Relativistic Kinetic Equation," DAN, Vol 107, 1956, p 807

7.  N. N. Bogolyubov

    D. N. Zubarev

"Asyptotic Approximation Method for a System With a Rotating Phase and its Utilization for Motion of Charged Particles in a Magnetic Field," Ukrainskiy Matematicheskiy Zhurnal, Vol VII, 1956. See also N. N. Bogolyubov, N. N. Mitropol'skiy, Asimptoticheskiye Metody v Teorii Nelineynykh Kolebaniy (Asymptotic Methods in the Theory of Nonlinear Oscillations), GITTL [State Publishers of Technical and Theoretical Literature] 1955, p 353

8.  N. A. Borzunov

    V. I. Kogan
    D. V. Orlinskiy

"Estimate of Electron Temperature and Degree of Ionization in the Initial Stage of a High Power Pulse Discharge," AE, No 4, 1958, p 180

9.  N. A. Borzunov

    D. V. Orlinskiy
    S. M. Osovets

"Research on a High Power Pulse Discharge in Gases by Means of High Speed Photography," AE, No 4, 1958, p 149

10. N. A. Borzunov

    D. V. Orlinskiy
    S. M. Osovets

"Research on a High Power Pulse Discharge in Conical Chambers," ZhETF, at the printers

11. S. I. Braginskiy

"Theory of Motion of Charged Particles in a Powerful Magnetic Field," Ukrainskiy Matematicheskiy Zhurnal, Vol 8, No 2, 1956, p 119

12. S. I. Braginskiy

"Transfer Phenomena in a Completey Ionized Two-Temperature Plasma," ZhETF, Vol 33, 1957, p 459

13. S. I. Braginskiy        "Behavior of a Completely Ionized Plasma in a Powerful Magnetic Field," ZhETF, Vol 33, 1957, p 645

14. S. I. Braginskiy        "Types of Plasma Oscillations in a Magnetic Field," DAN, Vol 115, 1957, p 475

15. S. I. Braginskiy        "Theory of Development of a Spark Pathway," ZhETF, Vol 34, 1958, p 1548

16. G. I. Budker        "Stabilized Electron Beam," AE, No 5, 1956, p 6 ⬧

17. N. P. Generalov        "Theory of Sondes," AE, No 4, 1958, p 184

18. B. B. Kadomtsev        "Field of Action in Plasma," ZhETF, Vol 33, 1957, p 151

19. V. I. Kogan        "Electron Temperature and Degree of Ionization in the Initial Stage of a Powerful Pulse Discharge," AE, No 4, 1958, p 178

20. V. I. Kogan        "Theory of Broadening Spectral Lines in a Plasma," DAN, Vol 118, 1958, p 907, and Izv AN SSSR, Ser Fiz, Vol 22, 1958, p 714

21. V. S. Komel'kov        "Obtaining Large Pulse Currents," DAN, Vol 110, No 4, 1956

    G. N. Aretov

22. V. S. Komel'kov        "Expansion of a Spark Pathway in Air at Currents of Approximately Two Million Amperes," DAN, Vol 111, 1956, p 1215

    D. S. Parfenov

23. V. S. Kudryavtsev        "Energy Diffusion of Fast Ions in a Plasma in State of Equilibrium," ZhETF, Vol 34, 1958, p 1558

- 117 -

24. V. S. Kudryavtsev          "Cross Section of Elastic Mutual Collision of Hydrogen Atoms," ZhETF, Vol 33, 1957, p 243

25. I. V. Kurchatov          "Possibility of Producing Thermonuclear Reactions in a Gas Discharge," AE, No 3, 1956, p 65

26. M. A. Leontovich
    S. M. Osovets          "Mechanism of Current Construction During a Rapid and Powerful Gas Discharge," AE, No 3, 1956, p 81

27. S. Yu. Luk'yanov
    I. M. Podgornyy          "Hard X-Ray Radiation Accompanying a Gas Discharge," AE, No 3, 1956, p 97

28. S. Yu. Luk'yanov
    V. I. Sinitsyn          "Spectroscopic Investigation of a High Power Pulse Discharge in Hydrogen," AE, No 3, 1956, p 88

29. S. Yu. Luk'yanov
    V. I. Sinitsyn          "Spectroscopic Investigation of a High Power Pulse Discharge in Hydrogen II," ZhETF, Vol 34, 1958, p 849

30. I. M. Podgornyy          "X-Ray Radiation at the Start of a Gas Discharge," DAN, Vol 108, 1956, p 820

31. I. M. Podgornyy
    S. A. Chuvatin          "X-Ray Radiation During a Powerful Pulse Discharge in Xenon," DAN, Vol 117, 1957, p 795

32. R. Z. Sagdeyev
    A. A. Vedenov          "Possible Mechanism of Injection in Stellar Atmospheres," Sbornik "Voprosy Kosmologii," at the printers

33. B. A. Trubnikov          "Plasma Emission in a Magnetic Field," DAN, Vol 118, 1958, p 913

34. B. A. Trubnikov          "Reduction of the Kinetic Equation in the Case of Coulomb Collisions to a Differential Form," ZhETF, Vol 34, 1958, p 1341

35.  Yu. A. Tserkovnikov

"Plasma Stability in a Powerful Magnetic Field," ZhETF, Vol 32, 1957, p 67

36.  V. D. Shafranov

"Stability of a Cylindrical Gas Conductor in a Magnetic Field," AE, No 5, 1956, p 38

37.  V. D. Shafranov

"Structure of a Shock Wave in Plasma," ZhETF, Vol 32, 1957, p 1454

38.  V. D. Shafranov

"Equilibrium MHD Configurations," ZhETF, Vol 33, 1957, p 710

39.  V. D. Shafranov

"Magnetic-Vortex Rings," ZhETF, Vol 33, 1957, p 831

40.  V. D. Shafranov

"Distribution of an Electromagnetic Field in a Medium With Special Dispersion," ZhETF, Vol 34, 1958, p 1475

134.  All-Union Conference on Nuclear Spectroscopy

Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, Vol 23, No 2, Feb 59

The entire issue of the periodical is devoted to materials presented at the Ninth All-Union Conference on Nuclear Spectroscopy, held in Kharkov, 26 January to 2 February 1959.  The following papers are covered.

"Internal Conversion Coefficients of Some Nuclear Transitions in As-75," by A. A. Bashilov and V. V. Il'in, Scientific Research Physics Institute, Leningrad State University imeni Zhdanov, pp 154-158

A. V. Zolotavin and associates (see the folowing article) have thoroughly studied conversion spectra of electrons and gamma-rays of Se-75 in their laboratory.  They provided least one reliable value of internal conversion coefficients of As-75, indispensable for further measurements.

The method used was described by V. K. Adamchuk, A. A. Bashilov and
B. K. Preobrazhenskiy (Izv. AN SSSR. Ser. Fiz., 22, 919 (1958)). The
internal conversion coefficients of nuclear transition in As-75 with
energies $E_\gamma$ =265, 280, 305, and 401 kev were determined. These transi-
tions are of special interest in that they are direct transitions from
the levels of corresponding energies to the ground level As-75. The
determination of the internal conversion coefficients and their multi-
polarity facilitate some conclusions on quanta characteristics of the
specified levels.

"Determination of Relative Intensities and Conversion
Coefficients of Transitions Occurring in Se-75 Decay,"
by Ye. P. Grigor'yev, A. V. Zolotavin, V. Ya. Klement'yev
and R. V. Sinitsyn, Scientific Research Physics Institute,
Leningrad State University imeni Zhdanov, pp 159-184

The experimental research was carried out by means of an improved
spectrometer with double focusing (Izv. AN SSSR, Ser. Fiz. 18, 127 (1954)).
The relative intensities of gamma-quanta were determined from spectra
of photoelectrons knocked out by gamma rays from thin targets of Ag, Pb,
Bi, and other elements. The obtained results were in good agreement with
those obtained by A. W. Schardt and J. W. Welker (Phys. Rev. 99, 810
(1955)) and Van den Bold and others. (Physica, 24, 1, 23 (1958)). The
tabulated relative intensities were used for the determination of con-
version coefficients and of the multipolarity of transitions. A detailed
study of As-75 and Se-75 decay yielded information on quantum character-
istics of these elements.

"Investigations of Gamma Spectra of Se-75 Within the Range
of 200-900 kev." by N. V. Voinova, B. S. Dzhelepov, and
N. N. Zhukovskiy, Radium Institute imeni Khlopin, Academy of
Sciences USSR, pp 185-187

The gamma radiation of Se-75 within the range of 200-900 kev was
investigated by means of magnetic spectrometers using recoil electrons,
the Ritron and the Elotron. The energies and relative intensities of
gamma lines of Se-75 were tabulated and compared with foreign data [A.
Schardt and J. Welker, Phys. Rev., 99, 810 (1955)] (Langevin-Joliot and
M. Langevin, J. phys. et Rad., 19, 765 (1958)).

"The Decay Yb-166 → Tu-166 → Er-166" by Ye. P. Grigor'yev,
B. S. Dzhelepov and A. V. Zolotavin, Scientific Research Physics
Institute, Leningrad State University imeni Zhdanov, pp 188-190

"Radiation of Tb-160," by Ye. P. Grigor'yeva, A. V. Zolotavin, and B. Kratsik, Scientific Research Physics Institute, Leningrad State University imeni Zhdanov, pp 191-203

"Conversion Electrons Eu-149," by N. A. Anton'yeva, A. A. Bashilov, B. S. Dzhelepov, V. V. Il'in, and B. K. Preobrazhenskiy, Scientific Research Physics Institute, Leningrad State University imeni Zhdanov, pp 204-205

"Gamma Spectrum J-131," by B. S. Dzhelepov, V. P. Prikhodtseva, and Yu. B. Khol'nov, Radium Institute imeni Khlopin, Academy of Sciences USSR, p 206

"Gamma Radiation of Br-82," by B. S. Dzhelepov, V. A. Yeliseyev, V. P. Prikhodtseva, and Yu. V. Khol'nov, Radium Institute imeni Khlopin, Academy Sciences USSR, pp 207-210

The gamma-spectrum of Br-82 was studied on a Ritron (see pp 185-187). Ten gamma lines were detected. The energies of basic gamma lines concur well with the results obtained by S. Hultberg and A. Hedgran (Arkiv fys., 11, 369 (1957)).

"Coincidences Between Conversion Electrons at Decay of Gd-146 → → Gd-151," by B. S. Dzhelepov and V. A. Sergeyenko, Scientific Research Physics Institute, Leningrad State University imeni Zhdanov, pp 211-218

"Coincidences Between Conversion Electron at Decay at Gd-147→ → Gd-149," by B. S. Dzhelepov, B. K. Preobrazhenskiy, and V. A. Sergeyenko, Scientific Research Physics Institute, Leningrad State University imeni Zhdanov, pp 219-222

The results of research of the last two articles above are compiled in tables.

"Coulomb Excitation of Nuclear Levels in Spherical Even-Even Nuclei," by D. G. Alkhazov, A. P. Grinberg, K. I. Yerokhina, and I. Kh. Lemberg, pp 223-224

Data on Coulomb excitation of first levels of isotopes Si, Ti, Cr, Fe, Ni, and Zr are studied and tabulated. The techniques applied are described in <u>Izv. AN SSSR, Ser. Fiz.</u>, 20, 1365 (1956).

"The Excited States of Ga-67 and Ga-68," by A. K. Val'ter, I. I. Zalyubovkiy, A. P. Klyucharev, and G. Ye. Krivets, Physicotechnical Institute, Academy of Sciences Ukrainian SSR, Kharkov State University imeni Gor'kiy, pp 225-226

Low energy levels of Ga-67 and Ga-68 were studied by gamma-emmission of the following reactions: Zn-66(p,$\gamma$)Ga-67, Zn-67(p,n-$\gamma$)Ga-67 and Zn-67(p,$\gamma$)Ga-68. The targets were of zinc with electrolytic deposit of enriched isotopes Zn-66 and Zn-67.

"Investigation of Gamma Rays Originating in the Bombarding by Protons of a Target Containing Ne-20," by A. K. Val'ter, V. Yu. Gonchar, A. N. L'vov, and S. P. Tsytko, Physico-technical Institute, Academy of Sciences Ukrainian SSR, pp 228-233

It was found that the spin of a 3.58-Mev nucleus of Ne-21 has the value 5/2 and the transition character is dipole.

"The Effect of Screening on Probability of E0-Conversion on K- and L-Shells at Low Energies," by M. A. Listengarten and I. M. Band, Leningrad State University imeni Zhdanov, pp 235-237

"Selection Rules at Conversion Transitions," by M. Ye. Voykhanskiy and M. A. Listengarten, Scientific Research Physics Institute, Leningrad State University imeni Zhdanov, pp 238-243

In a review of up-to-date data, it is concluded that the electric dipole conversion transitions differ from other radiation and conversion transitions at low energies by the role of the spin term.

"Equipment for Measurement and Stabilization of the Magnetic Field in Spectrometers," by Yu. S. Yegorov, D. M. Seliverstov, G. D. Latyshev, and A. N. Zhernovoy, Leningrad Institute of Railway Transport Engineers imeni Obraztsov, pp 244-250

A universal meter and stabilizer of the magnetic field of spectrometers is described. The measurement and stabilization principles of the magnetic field are based on the nuclear magnetic resonance.

"Frequency Meter for Nuclear Resonance," by Yu. S. Yegorov, D. M. Seliverstov, and G. D. Latyshev, Leningrad Institute of Railway Transport Engineers imeni Obraztsov, pp 251-254

The measuring of frequency is based on comparison of the investigated frequency with that of quartz.

"Some Problems of Linearity in Scintillation Spectrometry," by Yu. A. Nemilov, I. I. Lomonosov, A. N. Pisarevskiy, L. D. Soshin, and Ye. D. Teterin, Radium Institute imeni Khlopin, Academy of Sciences USSR, pp 257-262

The measurements were made with crystals produced by the Institute of Crystallography of the Academy of Sciences USSR and by the Kharkov plant.

"Amplification of Photomultipliers in Transient Measurements," by A. N. Pisarevskiy and Ye. D. Teterin, 263-264

An absence of correspondence between static and pulse amplification, which may be characterized by a parameter of aftereffects, was found for all types of photomultipliers.

135a. Modulated Charged Particle Beam

"Radiation From a Modulated Beam of Charged Particles When Passing Through a Circular Hole in a Plane Screen," by Yu. N. Dnestrovskiy and D. P. Kostomarov, Moscow State University imeni Lomonosov; Moscow, Dokl&dy Akademii Nauk SSSR, Vol 124, No 4, Feb 59, 792-795

The radiation originating at the passing of a modulated electron beam through a circular hole in an infinitely thin ideally conducting screen is computed within a velocity range of $\beta = 0.1$ to $\beta = 0.99$ $(\beta = v/c)$, by using the electronic computer "Strela" for the numerical solution of integral equations. These equations yield the analysis of the relation of the resistance to radiation to the current density and to the beam velocity. The results are plotted in curves. Asymptotic formulas for boundary cases are derived.

135b. Ultrarelativistic Charge Radiation

"Radiation of Ultrarelativistic Charges When Passing Through
a Circular Hole in a Screen," by Yu. N. Dnestrovskiy and
D. P. Kostomarov, Moscow State University imeni Lomonosov;
Moscow, Doklady Akademii Nauk SSSR, Vol 124, No 5, Feb 59,
pp 1026-1029

By using the asymptotic formulas derived in the above article
for ultrarelativistic velocities, computation is carried out of the radia-
tion originating at the passing of arbitrarily axially symmetrical charges
through a circular hole in a screen. It is supposed that the charge moves
in a group with a constant ultrarelativistic velocity.

The obtained results may be of value for the evaluation of energy
radiated by particles in accelerators while passing near geometrical
inhomogeneities in accelerating gaps. For synchrotrons of medium energies
(~100 Mev) the number of particles in a burst is $N = 10^9$ to $10^{10}$, the
length of the burst is $10^2$cm, the dimension of inhomogeneities, 10 cm.
As a result the energy radiated at one turn is $10^{-4}T$. ($T = mc^2$). Inasmuch
as the number of passing gaps in cyclic accelerators is high ($10^5$ to $10^6$),
the specified effect is noticeable and should be taken under consideration
in the design of accelerators of ultrarelativistic particles.


136. Diffractional Disintegration Processes

"The Diffractional Disintegration of Relativistic Processes,"
by I. I. Ivanchik, Physics Institute imeni Lebedev, Academy
of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreti-
cheskoy Fiziki, Vol 36, No 2, Feb 59, pp 617-618

An analysis started in this journal, pages 499-504, is continued.
It is demonstrated that results previously obtained from studies of non-
relativistic diffractional stripping (R. Glauber. Phys. Rev. 99, 1515 (1955))
hold for a relativistic deuteron.

137.  Scattering of $\pi$ Mesons

"Scattering of $\pi^-$ mesons on Hydrogen at 240 and 270 Mev
Energies," by V. G. Zinov and S. M. Korenchenko, Joint
Institute for Nuclear Research; Moscow, Zhurnal Eksperi-
mental'noy i Teoreticheskoy Fiziki, Vol 36, No 2, Feb 59,
pp 618-619

Elastic and exchange scattering of $\pi^-$ mesons on liquid hydrogen
at energies of 240 and 270 Mev was studied on the institute's synchrocy-
clotron.  Readings were taken by means of scintillators.  The magnitudes
of the obtained differential cross sections were tabulated in $10^{-27}$ cm$^2$/
sterad.


138.  Hysteresis of Electron Temperature in Plasma

"The Instability and Hysteresis of Electron Temperature
in Plasma in Inert Gases," by A. V. Gurevich, Physics Insti-
tute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal
Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 2,
Feb 59, pp 624-626

As a continuation of a previous work by the author (Zhurnal Eksperi-
mental'noy: Theoreticheskoy Fiziki, 35, 392 (1958)) in which he explained
some peculiarities of the heating of an electron gas, it was found that
in a constant electric field the electron gas may stay in a stationary
state with respect to the ions only at a low potential of the electric
field; exceeding a certain critical potential value the state becomes un-
stable.  The same instability occurs in a variable low frequency electric
field.  However, in the latter case a second steady state with high
electron temperature occurs.  The transition from the first state to the
second, and reverse, occurs at various amplitude values of the electric
field which leads to a hysteresis of the electron temperature relation
to amplitude.

139. Parity Conservation Law

Problem of Testing the Parity Conservation in Strong Interactions," by V. G. Solov'yev, Joint Institute of Nuclear Research; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki. Vol 36, No 2, Feb 59, pp 628-629

Whether the parity conservation law holds in the production of K-mesons and hyperons is considered of particular interest (Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, 33,537,796 (1957)). The reaction $\pi^- + p - \Sigma^- + K^+ + \pi^0$ and similar reactions are investigated because they are independent of asymmetry and longitudinal polarization. The statistical study of many cases at all angles of hyperon production yields information on the parity conservation law.

140. Isomer $Te^{125m}$

"The Cross Section of $Te^{125m}$ Formation From $(n,\gamma)$ Reaction" by V. S Gvozdev and Yu. L. Khazov, Leningrad Physicotechnical Institute, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 2, Feb 59, pp 632-633

The cross section of formation of an isomeric state of $Te^{125}$ with spin 11/2 from a $(n,\gamma)$ reaction was measured. The cross section was determined by comparison with the cross sections of the reaction $Hf^{180}$ $(n,\gamma)$ $Hf^{181}$, considered to be $(10 \pm 3)$ barns according to (D. F. Hughes and J. A. Harvey, "Neutron Cross Sections," 1955). Prepared isotopes $Te^{124}$ and $Hf^{180}$ were irradiated by neutrons. The cross section of the basic state $Te^{125}$ from the reaction $(n,\gamma)$ is according to the above reference $(6.5 \pm 1.2)$ barns. The ratio of cross sections of $Te^{125m}$ formation (spin 11/2) to $Te^{125}$ (spin 1/2) equals 0.006.

141. $T(p,n)He^3$ Reaction

"The $T(p,n)He^3$ Reaction at Proton Energies of 7-12 Mev," by G. F. Bogdanov, N. A. Vlasov, S. P. Kalinin, B. B. Rybakor, L. N. Samoylov, and V. A. Sidorov; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 2, Feb 59, pp 633-636

The cross sections and angular distribution of neutrons from $T(p,n)He^3$ reaction within the proton energy range of 7-12 Mev were measured. It was also attempted to measure the polarization of neutrons from the

- 126 -

reaction. The results showed that at $E_p < 10$ Mev the asymmetry under angles satisfying the Barshall condition (Helv. Phys. Acta, 29, 145 (1956)) does not exceed 5%. At angles of $40°$, a noticeable asymmetry was observed indicating the existence of neutron polarization.

142. Elastic Scattering of Positrons

"On Some Cases of Elastic Scattering of $\pi^+ \to \mu^+ \to e^+$ Decay Positrons on Emulsion Electrons," Z. V. Minervina and Ye. A. Pesotskaya; Moscow. Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 2, Feb 59, pp 444-446

A systematic survey of 80,000 events of $\pi^+ \to \mu^+ \to e^+$ decays in emulsion irradiated by the synchrotron of the Joint Institute for Nuclear Research revealed cases in which two electron tracks originated at the end of a $\mu$-meson track. It is suggested that such cases which occur near the $\mu$- e decay are due to elastic scattering of positrons on emulsion electrons.

143. Mean Value Lorentz Force

"Acceleration of Charged Particles in Traveling and Standing Electromagnetic Waves," by G. A. Askar'yan, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Theoreticheskoy Fiziki, Vol 36, No 2, Feb 59, pp 619-621

Conditions are studied, satisfying the existence of a mean value unidirectional force acting on particles in a traveling or standing wave. The mean value force depends on resonance properties of the particle's motion and the scattering of the lateral momentum of the particles. In general the resonant frequency and the dissipation coefficient may be changed in space. It is demonstrated that a particular selection of these quantifies may bring about a directional particle acceleration, independently of the sign of the charge, directed through the spatially periodical field of the standing wave. The efficiency of the acceleration may be enhanced by a transition from a rectilinear resonator to a ring type with multiple passing of the wave field.

144.  Photo Deuterons Energy

"Intermediate Energy Photo-Deuterons From $C^{12}$ and $Be^9$,"
by V. P. Chizhov and L. A. Kul'chinskiy, Leningrad Physico-
technical Institute, Academy of Sciences USSR; Moscow,
Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol
36, No 2, Feb 59, pp 345-352

The energy distribution of deuterons and protons and the energy
dependences of the ratios of the deuteron to proton yields are pre-
sented for the case of photodisintegration of $C^{12}$ and $Be^9$.  In the case
of $C^{12}$ the disintegration was induced by the bremsstrahlung of $E\gamma_{max} =$
80 MeV from a synchotron and $E\gamma_{max} = 90$ MeV in the case of $Be^9$.  A
semiempirical analysis of the results pertaining to deuterons is carried
out under the assumption that the deuterons are formed in the socalled
"pick-up" process.  The analysis is also extended to the experimental
results of other investigators.

145.  The Excited State of $Be^{10}$

"Determination of the Lifetime of the First Excited State of
the $Be^{10}$ Nucleus," by A. N. Boyarkina and A. F. Tulinov, Insti-
tute of Nuclear Physics, Moscow State University; Moscow,
Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36,
No 2, Feb 59, pp 353-361

A theory of the method for determining the lifetime of the excited
states of atomic nuclei based on application of recoil nuclei is presented.
An experiment is described in which the lifetime, $\mathcal{T}$, of the $Be^{10}$ nucleus
in the 3.37 MeV excited state was measured.  An upper limit for $\mathcal{T}$ has been
obtained, $\mathcal{T} = 8.10^{-14}$ sec.

146.  Internal Conversion Electrons

"Spectrum of the Internal Conversion Electrons Accompanying
the $\alpha$-Decay of Pu-238 and Pu-240," by Ye. F. Tret'yakov,
L. N. Kondrat'yev, G. I. Khlebnikov, and L. L. Goldin: Moscow,
Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 2,
Feb 59, pp 362-366

The spectrum of conversion electrons accompanying $\alpha$-decay of $Pu^{238}$
and $Pu^{240}$ was studied with a large aperture magnetic spectrometer with
toroidal field shape, measuring $\alpha - e$ -coincidences.  Transitions from
the 6 + excited levels have been detected.  The multipolarity and more
precise energy values have been determined for transitions from the 4 +
and 2 + levels.

- 128 -

147. Alphas in Proton Induced Nuclear Decay

"Cascade Alphas From Nuclear Decay Induced by 360 and 660 Mev Protons," by I. Ostroumov, N. A. Perfilov, and R. A. Filov, Radium Institute Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 2, Feb 59, pp 367-375

Stars containing tracks of $\alpha$-particles with energies above 30 MeV were studied in a nuclear emulsion irradiated by 360 and 660 MeV protons. The effective cross section for production of these stars, the angular distribution of the fast $\alpha$-particles, and their relative probability emission from light and heavy emulsion nuclei were determined. Emission of cascade $\alpha$-particles and emission from nuclei of fragments as a result of bombardment with protons of the same energies have been found to be quite similar. This seems to indicate that the $\alpha$-particles are produced by an identical type of mechanism.

148.  Dissociation of the $H_2^+$ Ion

"Dissociation of the Molecular Ion $H_2^+$ in Collisions With Gases,"
by N. V. Fedorenko, V. V. Afrosimov, R. N. Il'in, and D. M.
Kaminker, Leningrad Physicotechnical Institute, Academy of Sciences
USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki,
Vol 36, No 2, Feb 59, pp 385-392

Measurements have been made of the cross sections $\sigma_{H^+}$ for formation
of protons as a result of dissociation of molecular hydrogen ions $H_2^+$ in
single collisions occurring in helium, argon, hydrogen of air.  The energy
(T) of the $H_2^+$ ions varied between 5 and 180 keV.  For hydrogen and helium
the curves $\sigma_{H^+}$ (T)  possess two maxima.  For argon and air the
curve continually increases with increase of the energy in the interval
mentioned above.  The angular distribution of primary 24 keV $H_2^+$ ions
scattered in argon without a change of $e/m$ was investigated as well as
the distribution of $H^+$ and $H^-$ ions formed as the result of dissociation.
It is concluded that with decrease of the distance of closest approach of
the nuclei of the colliding atomic particles the relative probability of
scattering with dissociation increases.


149.  The Photoeffect in Atomic Shells

"On the Relative Probabilities for the Photoeffect in, Shells
and Subshells of an Atom," by Ye. P. Grigor'yev and A. V.
Zolotavin, Leningrad State University; Moscow, Zhurnal
Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 2,
Feb 59, pp 393-400

The relative intensities of the K, $L_I + L_{II}$, $L_{III}$ and M + N photo-
electron lines produced by $\gamma$-rays from some radioactive isotopes in various
targets were determined with a $\beta$-spectrometer possessing a resolution of
0.4 percent.  The results are compared with theoretical calculations.


150.  Scattering of $\mu$-Mesons

"Scattering of $\mu$-Mesons with Momenta of About 100 Mev/c in Copper
and Iron," by V. G. Kirillov-Ugryumov, B. A. Dolgoshein, A. M.
Moskvichov, and L. P. Morozova, Moscow Engineering Physics
Institute; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy
Fiziki, Vol 36, No 2, Feb 59, 416-423

Scattering of $\mu$-mesons was investigated in copper plates (in the
$\mu$-meson moment interval from 85 to 144 MeV/c,) and in iron plates
($\mu$-meson momenta from 81.2 to 135 MeV/c).  The $\mu$-meson angular distribu-
tion plotted on basis of 2350 scattering event satisfactorily agrees with
the distribution for a point nucleus.

- 130 -

151. Angular Distribution of Mesons and Positrons

"Investigations of $\pi^+ \to \mu^+ \to e^+$ Decay with Help of a Propane
Bubble Chamber and Scintillation Counters," by M. P. Balandin,
V. A. Moiseyenko, A. I. Mushin, and S. Z. Otvinovskiy, Joint
Institute for Nuclear Research; Moscow, Zhurnal Eksperi-
mental'noy i Teoreticheskoy Fiziki Vol 36, No 2, Feb 59,
pp 424-432

The angular distributions of $\mu+$ - mesons and positrons from $\pi^+ \to \mu^+ \to$
$\to e+$ decays were investigated with a propane bubble chamber. It was
found that the angular distribution of the $\mu+$ -mesons is isotropic,
whereas the positron angular distribution, if described by the expression
$\frac{1}{4\pi}$ $(1 - \alpha \cos \theta)$, is characterized by the quantity $\alpha = 0.116 \pm$
$0.035$. This value for $\alpha$ is much smaller than the values obtained in other
works in which propane bubble chambers were also employed. Scintillation
counter experiments carried out with the purpose of ascertaining the cause
of this discrepancy showed that the magnitude of the anisotropy significantly
depends on the degree of purification of the commercial propane which is
sometimes employed in bubble chambers. A simultaneous analysis of the data
obtained with propane of a given composition with aid of a bubble chamber
and scintillation counters showed that the quantity $\lambda (1 - W_C)$ is
equal to 0.78 $\pm$ 0.26 where $W_C$ is the probability for depolarization of
$\mu^+$ -mesons in graphite and $\lambda$ is a fundamental parameter in neutrino theory.


152. Analysis of Nucleon-Nucleon Scattering

"On Possible Sets of Experiments for a Simultaneous Analysis of
Data on Nucleon - Nucleon Scattering and Polarization in p - n
Collisions at 635 Mev," by B. M. Golovin, V. P. Dzhelepov, V. S.
Nadezhdin, and V. I. Satarov, Joint Institute for Nuclear Re-
search; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy
Fiziki, Vol 36, No 2, Feb 59, pp 433-443

It is suggested that analysis of data on n- p- and p-p-scattering be
carried out simultaneously as this should reduce the number of experiments
required to reconstruct the scattering amplitude. Sets of experiments are
presented which should yield sufficient information if the aforementioned
analysis is performed. The angular dependence of the polarization in p-n
collisions at 635 MeV has been measured. A difference has been detected
in the energy and angular dependences of the polarization for states of a
nucleon - nucleon system possessing different isotopic spins (T = 0 and T = 1).

153. Corrections to Hamiltonians

"Relativistic Corrections to Phenomenological Hamiltonians,"
by Yu. M. Shirokov, Physics Institute imeni Lebedev, Academy
of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teore-
ticheskoy Fiziki, Vol 36, No 2, Feb 59, pp 475-477

A general expression has been obtained for the relativistic correc-
tions of the order of $(v/c)^2$ to a phenomenologically described non-
relativistic Hamiltonian for the interaction between particles of arbitary mass
and spin.

154. Corrections to the Theory of Light Nuclei

"Relativistic Corrections to the Phenomenological Theory of
Light Nuclei Levels," by F. A. Zhivopistsev, A. M. Perelomov,
and Yu. M. Shirokov, Institute of Nuclear Physics, Moscow
State University; Moscow, Zhurnal Eksperimental'noy i
Teoreticheskoy Fiziki, Vol 36, No 2, Feb 59, pp 478-480

Relativistic corrections to the (phenomenologically prescribed) inter-
action between a pair of nucleons in a nucleus is computed on the basis of
the expression obtained by Yu. M. Shirokov for relativistic corrections to the
nonrelativistic two-body Hamiltonian. It is found that the relativistic
corrections strongly depend on the shape of the potential and are of the order
of 0.02-0.2 MeV for a pair of nucleons.

155. Nuclear Paramagnetic Resonance

"On the Theory of Nuclear Paramagnetic Resonance in Liquids,"
by G. V. Skrotskiy and A. A. Kokin; Moscow, Zhurnal Eksperi-
mental'noy i Teoreticheskoy Fiziki, Vol 36, No 2, Feb 59,
pp 481-487

The quantum theory of magnetic resonance absorption is applied to
describe nuclear paramagnetic resonance in liquids. Thermal motion of
the molecules which leads to narrowing of the absorption line is taken into
account on basis of diffusion theory. The transverse and longitudinal
relaxation times and the correction to the gyromagnetic ratio are computed.

156. Scattering of Polarized Electrons

"Multiple Scattering of Polarized Electrons, by I. N. Toptygin,
Leningrad Polytechnical Institute; Moscow, Zhurnal Eksperi-
mental'noy i Teoreticheskoy Fiziki, Vol 36, No 2, Feb 59, pp
488-498

Multiple elastic scattering of polarized spin 1/2 particles in a
homogeneous and isotropic medium is considered. Approximate solution of
the kinetic equations defining the distribution function and polarization
vector of the scattered particles is given. A solution which is valid
for small as well as large scattering angles has been obtained as a
series expansion in spherical functions and spherical vectors.

157. Diffractional Disintegration Processes

"Energy and Angular Distribution in Diffractional Disintegration
Processes," by I. I. Ivanshik and V. S. Popov, Physics Institute
imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperi-
mental'noy i Teoreticheskoy Fiziki, Vol 36, No 2, Feb 59, pp
499-504

The energy and angular distributions have been obtained for particles
produced in diffractional disintegration of a weakly bound quantum-
mechanical system (deuteron etc.). The energy distributions are parcti-
cally identical with those observed in stripping, whereas the angular
distributions are appreciably different. A simple physical explanation
of this difference can be proposed and it may be of importance in inter-
preting the experimental data.

158. Form Factor of the $\pi$-Meson

"Dispersion Relations for the Electromagnetic Form Factor of the
$\pi$-Meson," by I. T. Dyatlov, Leningrad Physicotechnical Institute,
Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i
Teoreticheskoy Fiziki, Vol 36, No 2, Feb 59, pp 505-507

Dispersion relations are deduced for the electromagnetic form factor
of a charged $\pi$-meson. By considering only the contribution of a state
with two $\pi$-mesons into the imaginary part, an equation has been obtained
which yields the form factor as a function of the $\pi$-$\pi$-mesons scattering
phases shift.

- 133 -

159. Paramagnetic Resonance in Electrolyte Solutions

"On the Theory of Electron Paramagnetic Resonance in Electrolyte Solutions," by A. A. Kokin, Ural Polytechnic Institute; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 2, Feb 59, pp 508-511

The transverse and longitudinal relaxation times and the correction to the gyromagnetic ratio are calculated for electron paramagnetic resonance without account of the hyperfine structure.

160. Alpha Active Nuclei

"On the Shape of Alpha Active Nuclei," by L. L. Goldin, G. I. Novikova, and K. A. Ter-Martirosyan; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 2, Feb 59, pp 512-516

The rate of $\alpha$-decay to the successive levels of the main rotational band of the daughter nucleus permits one to determine the shape of heavy nuclei. The quantities $\alpha_2$ and $\alpha_4$ which are the coefficients in the expansion of the nuclear shape in terms of Legendre polynomials are computed. The calculations are performed for four even and three odd nuclei. The results of the calculations satisfactorily agree with each other and indicate that the contribution of the term $\alpha_4 P_4$ (cos $\vartheta$ ) to the nuclear shape is significant.

161. Beta Polarization in RaE Decay

"Polarization of Betas from RaE," by B. V. Geshkenbeyn, S. A. Nemirovskaya, and A. P. Rudik; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 2, Feb 59, pp 517-525

Effects due to nonconservation of parity in $\beta$-decay of RaE are considered. A formula is derived for longitudinal polarization of $\beta$-electrons. The magnitude of the longitudinal polarization is found not to equal V/C. The complete calculation is performed with account of the possibility that time parity may not be conserved. The experimental data relating to the magnitude of the polarization of the RaE $\beta$-electrons significantly restrict the region of possible violation of time parity.

162. Neutron Exchange Interaction

"Direct Neutron Exchange Interaction of Complex Nuclei," by V. I. Gol'danskiy, Physics Institute imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 2, Feb 59, pp 526-528

It is shown that it should be possible to observe the process of direct interaction between complex nuclei in which the nuclei exchange neutrons when located on the external surface of the coulomb potential barrier. For large values of the moments of neutrons in the outer shells a consequence of such a process may be a large change of the spins of the interacting nuclei and an excitation of levels which practically should be unattainable any other way.

The exponent characterizing the probability of the process under consideration is estimated.


163. Forbidden Transitions in Oriented Nuclei

"Polarization of $\beta$ Particles and $\beta$ -$\gamma$ Correlation for First Forbidden Transitions in Oriented Nuclei," by A. Z. Dolginov and N. P. Popov, Leningrad Physicotechnical Institute, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoretiche-skoy Fiziki, Vol 36, No 2, Feb 59, pp 529-538

Explicit formulas have been obtained for the polarization of $\beta$-particles and $\beta$-$\gamma$ correlation for first forbidden transitions in oriented nuclei. All five types of $\beta$ -coupling are considered with account of parity nonconservation. The coulomb field of an extended nucleus is considered. Nonoriented nuclei are examined as a particular case.


164. Nuclear Potential Parameter

Investigation of the Average Nuclear Potential Parameters," by L. A. Sliv and B. A. Volchok, Leningrad Physicotechnical Institute, Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 2, Feb 59, pp 539-553

The parameters of the average nuclear potential have been found on basis of data pertaining to the levels of nuclei with a number of nucleons equal to that of a doubly closed shell plus or minus one nucleon. Results of the calculations are presented. It is shown that the potential para-meters are the same for all nuclei lying on the nuclear stability curve. A formula has been derived for the depth of the potential for prescribed values of N. and Z. Expansion of the nucleon functions in terms of spherical oscillator functions is considered.

165. Pseudoscalar Meson Theory

"Renormalization of the Vertex Part in Pseudoscalar Meson Theory,"
by V. N. Gribov, Leningrad Physicotechnical Institute; Moscow,
Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 2,
Feb 59, pp 554-559

Renormalization of the vertex part in pseudoscalar meson theory is
studied with aid of spectral representations for the mean (with respect
to vacuum) of the $T$-product of the three Heisenberg operators proposed
in ref. [1, 2]. The problem of the magnitude of the renormalization
constants is discussed. An expression for $Z_1$ in terms of the spectral
functions is found and the relation between these spectral functions and
the spectral functions in the Kallen - Lehman representations for single-
particle Green's functions is established.

166. Electron-Phonon Interaction

"The Influence of the Electron-Phonon Interaction on the
Cyclotron Resonance Frequency," by A. V. Tulub, Leningrad
State University; Moscow, Zhurnal Eksperimental'noy i
Teoreticheskoy Fiziki, Vol 36, No 2, Feb 59, pp 565-573

The phonon-electron interaction in the polar crystals gives rise to
the nonlinear dependence of the cyclotron resonance frequency on the
magnetic field. The calculation of this term shows that they are small
for practically used fields. The polaron effect leads also to a correc-
tion in diamagnetic susceptibility. The mass renormalization in the
presence of the magnetic field is performed without assuming the coupl-
ing constant to be small.

167. Neutron Scattering

"Scattering of Neutrons by Oriented Nonspherical Nuclei," by G. L.
Vysotskiy, Ye. V. Inopin, and A. A. Kresnin, Physicotechnical
Institute, Academy of Sciences of the Ukrainian SSR; Moscow,
Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 2,
Feb 59, pp 574-580

Scattering of neutrons by oriented nonspherical nuclei is examined.
The opaque nuclear model is employed in the calculations of the scattering
cross section. It is demonstrated that monsphericity effects are more
appreciable in oriented nuclei than in nonoriented nuclei. It is also
shown that a noticeable azimuthal asymmetry appears in the angular dis-
tribution of neutrons scattered on oriented nonspherical nuclei.

168. Condition of Beta-Decay

"On Weak Interactions Possible in the Feynman - Gell-Mann Scheme,"
by V. M. Shekter, Leningrad Physicotechnical Institute, Academy
of Sciences USSR; Moscow, Zhurnal Eksperimental'noy i Teoretiche-
skoy Fiziki, Vol 36, No 2, Feb 59, pp 581-584

It is shown that the $\beta$-decay current is uniquely defined by the
requirement that the divergence of its vector part vanishes. Moreover,
the current responsible for hyperon decay should not be conserved. If
this were not the case, the strong interaction Lagrangian would possess
such a symmetry as to contradict the experiments on simultaneour creation
of strange particles. As a result, the reaction $\Sigma \to \Lambda + e + \gamma$ can occur
only by virtue of $\Lambda$-coupling and the results of the experiments proposed
in the works of S. Weinberg, R. E. Marshak, S. Okubo, E. C. G. Sudarshan,
and W. Teutsch (Phys. Rev., Let., 1, 25, 1958) must be negative.

169. Radiative Capture

"Correlation Between the Direction of an Internal Bremsstrahlung Quantum and Circular Polarization of a gamma Quantum Emitted by an Excited Nucleus After K-Capture," by G. M. Gandelman; Moscow, Zhurnal Eksperimental'noy Teoreticheskoy Fiziki, Vol 36, No 2, Feb 59, pp 585-587

The correlation between the $\gamma$ -quantum from radiative K-capture and the circularly polarized $\gamma$ -quantum from an excited nucleus is studied. A general formula has been deduced for the correlation and its dependence on the spins of the initial, excited, and final states of the nuclei.

170. Computation of Neutron Polarization

"Computation of Polarization of 0.1 - 1 Mev Neutrons," by P. E. Nemirovskiy; Moscow, Zhurnal Eksperimental'noy Teoreticheskoy Fiziki, Vol 36, No 2, Feb 59, pp 588-593

The polarization of 0.1 - 1 MeV neutrons scattered on heavy nuclei is investigated. It is shown that the polarization can be described with satisfactory accuracy by introducing in the optical potential an additional term of the form $-\frac{x}{r}\frac{dv}{dr}(\sigma l)$ where $x = 3 \cdot 10^{-27}$ cm$^2$. The best agreement between the theory and experiment is obtained when the imaginary part of the potential is 2.5 MeV.

171. Scattering Phases

"Computation of the Scattering Phase Shifts with Account of the Second Approximation," by A. A. Sokolov, V. M. Arutyunyan, and R. M. Muradyan, Moscow State University; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 2, Feb 59, pp 594-599

The elastic scattering phase shifts for Dirac particles are determined from the interaction potential with account of the second approximation. The results of the Born approximation and of the damping theory, and also the McKinley and Feshbach formula which is a generalization of the Rutherford - Mott formula can be derived as special cases.

172.  Investigation of Particles Generated by High Energy Nucleons

"Investigation of the Nature and Spectra of Particles Produced
by High Energy Nucleons,"  A. I. Alikhanov, G. P. Yeliseyev,
V. Sh. Kamalyan, V. A. Lyubimov, B. N. Moiseyev, and A. V.
Khrimyan; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy
Fiziki, Vol 36, No 2, Feb 59, pp 404-410

The nature and moment spectra of secondary particles created in lead
by high energy cosmic ray particles were investigated at an altitude of
3250 m   above sea level with aid of a magnetic mass spectro-meter and
multilayer proportional counter.  Experimental results were plotted in
curves.

173.  The Accelerating Electric Field

"The Quantum Interaction of the Electron With the Accelerating
Electric Field in a Synchrotron," by I. M. Ternov, Moscow
State University imeni Lomonosov; Tomsk, Izvestiya Vysshikh
Uchebnykh Zavedeniy, Fizika, Vol 6, 1958, pp 123-129

Methods of quantum theory are applied to the process of energy absorp-
tion by an electron during its passing through the accelerating gap of a
cyclic resonance accelerator.

Theoretical  and  Experimental Physics

174.  Spectral Temperature Determination

"Spectral Method of Temperature Determination,"  by O. P.
Semenova, Sibirian Physicotechnical Institute, Tomsk Univer-
sity imeni Kuybishev; Tomsk, Izvestiya Vysshykh Uchebnykh
Zavedeniy, Fizika, No 6, 1958, pp 33-43

Tspectral is analyzed from relative intensities of atomic and molecular
spectral lines in relation to the radial temperature distribution in the
cross section of the arc discharge.  It is shown that in the general case
T-sp depends on the excitation energies of the selected spectral lines,
on the ionization potential of atoms (the dissociation energy of molecules)
whose emission is used for determining T-sp, and on the general composi-
tion of the arc gas.  If T-axial of the discharge is far below $T_M$, which
corresponds to the maximum of the function of the temperature excitation
of the used spectral lines, then T-sp depends on excitation energies and
is related to T-axial by a simple correlation, permitting the finding of

T-axial of the discharge. If T-axial is higher than $T_M$, the values T-sp are not related to T-axial and depend not only on the excitation energies, but also on the general composition of the arc gas and the ionization potential of atoms (dissociation energy of molecules) emitting the selected spectral lines. The concentration of emitting atoms may be expressed by means of Bolzmann's law in T-sp, found from relative line intensities belonging to atoms with a close ionization potential.


175. Combustion Zone Analysis

"Two Cases of Unstable Combustion," by K. I. Shchelkin; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 2, Feb 59, pp 600-606

A criterion of instability of the combustion zone in a plane detonation wave has been found which determines the conditions for appearance of spin detonation. Conditions are derived for the appearance of a one-headed spin, many-headed spin detonation, and a pulsating combustion front in a detonation wave. The applicability of the instability criterion (derived by considering a detonation wave) to combustion in a forced combustion chamber is demonstrated.

Loss of stability of a plane combustion zone is treated as the source of high frequency flame vibrations. The order of magnitude of the fundamental frequency of the combustion vibration has been determined and the condition of appearance of overtones has been established. The origin of resonance vibrations in a furnace is explained qualitatively and the maximal pressure during the vibrations is estimated.


176. Quantum Field Computations

"On the Scattering Matrix in an Indefinite Metric," by L. A. Maksimov, Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 2, Feb 59, pp 465-473

A method is suggested which, in the theory with an indefinite metric, excludes all nonphysical states from the initial and final states of the system. The method is applied to the Lee model and scalar photon model.

177.  Superconductivity Theory

"The Compensation Equation in Superconductivity Theory,"
by D. V. Shirkov, Mathematical Institute imeni Steklov,
Academy of Sciences USSR; Moscow, Zhurnal Eksperimental'-
noy i Teoreticheskoy Fiziki, Vol 36, No 2, Feb 59, pp 607-
612

A relation is established between the matrix elements of the varia-
tional derivatives of the scattering matrix and energy operator.  With
the help of this relation the kernel of the integral equation for com-
pensation of "dangerous"  diagrams is expressed through the usual Green's
functions.


178.  Plasma Theory

"On the Behavior of a Conducting Gaseous  Sphere in a
Quasistationary Electromagnetic Field,"  by V. V. Yankov,
Physics, Institute imeni Lebedev, Academy of Sciences
USSR; Moscow, Zhurnal Eksperimental'noy i Teoreticheskoy
Fiziki, Vol 36, No 2, Feb 59, pp 560-564

.The stability of an infinitely conducting homogeneous plasmic sphere
in an external quasistationary electromagnetic field is investigated by
perturbation theory methods.


179.  Plasma Acceleration

"Plasma Acceleration,"  by I. S. Shpigel, Physics, Institute
imeni Lebedev, Academy of Sciences USSR; Moscow, Zhurnal
Eksperimental'noy i Teoreticheskoy Fiziki, Vol 36, No 2, Feb
59, pp 411-415

A plasma has been accelerated in vacuum in an axially symmetrical,
inhomogeneous pulsed magnetic field.  The density of the plasma clusters
exceeded $10^{12}$ particles/$cm^3$.  The peak energy of nitrogen and oxygen
atomic ions was $\sim$ 190 eV, of helium ions $\sim$ 280 eV and of hydrogen
atomic ions $\sim$ 120 eV.

180.  <u>Temperature of Arc Discharge</u>

"Direct Current Arc Temperature Between Metallic Electrodes,
Burning in an Argon Atmosphere," by Ye. L. Raff, Kazan,
Med Institute; Tomsk, <u>Izvestiya Vysshikh Uchebnykh Zavedeniy,
Fizika</u>, No 6, 1958, pp 77-78

The plasma temperature of an arc measured from ionic lines of titanium
by a graphic method was found to be 6100° K.  It is demonstrated . that
iron lines cannot be used for the measurements, because their transition
probabilities were not correctly computed (N. N. Sobolev, <u>Zhurnal Eksperi-
mental'noy i Teoreticheskoy Fiziki</u>, Vol 5, 1943).


181.  <u>Ferromagnetics at Low Temperatures</u>

"Measurement of the Noise From Cyclic Remagnetization of
Ferromagnetic Substances at Low Temperatures," by N. N.
Kolachevskiy, Moscow Physico technical Institute; Moscow,
<u>Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki</u>, Vol 36,
No 2, Feb 59, pp 401-403.

Results of measurement of the noises from cyclic remagnetization of
ferromagnetic cores at temperatures between 2° and 300°K are presented.
No dependence of the noises on temperature was detected.


182.  <u>Investigations of the Fermi Surface of Metals</u>

"Measurements of the Electrical Conductivity of Metals in .
a Magnetic Field as a Method for Investigating the Fermi
Surface," by N. Ye. Alekseyevskiy and Yu. P. Gaidukov,
Institute of Physical Problems, Academy of Sciences USSR;
Moscow, <u>Zhurnal Eksperimental'noy i Teoreticheskoy Fiziki</u>,
Vol 36, No 2, Feb 59, pp 447-450

Results of investigation of the polar diagrams of the resistance of
samples of Sn, Pb, Tl, Ga, and Na, single crystals are presented.  It has
been found that with variation of the angle between the field and crystal-
lographic axes of Sn and Pb (and analogously Au and Cu) the law of increase
of the resistance in a magnetic field changes from a quadratic form to that
of saturation.  A strong anisotropy of the resistance in a magnetic field
has also been observed in Tl and Ga samples.  The results obtained are
ascribed to the presence of open Fermi surfaces in the investigated metals.

IX.  MISCELLANEOUS

183.  New Soviet Scientific and Technical Journals To Be Published

"New Journals" (unsigned article); Moscow, Novyye Knigi,
No 6, 10 Feb 59, pp 44-45

The following new journals for 1959 are listed and annotated:

Geologiya Rudnykh Mestorozhdeniy (Geology of Ore Deposits).  Organ of the Institute of Geology of Ore Deposits of the Academy of Sciences USSR.  Reports the achievements in the study of geology of metallic and nonmetallic deposits as well as in methods of searching and prospecting. The most important theoretical problems of geology will be developed in the journal, new factual materials will be published which have significance for understanding the processes of ore formation.  The mission of the journal is to promote scientific research work in the geological institutions of the USSR on the study of ore deposits.  The periodical will appear bimonthly.

Paleontologicheskiy Zhurnal (Paleontological Journal).  Organ of the Department of Biological Sciences of the Academy of Sciences USSR. The scientific problems of the study of fossil plants  and  animals, questions on the evolution and phylogeny of the organic world and the history of paleontology will be examined.  In addition to general theoretical  articles, there will be reviews, critical and discursive articles on controversial and unsolved problems in paleontology, and reviews on Soviet and foreign publications in paleontology.  Periodicity is quarterly.

Fizika tverdogo tela. (Solid State Physics).  Organ of the Department of Physicomathematical Sciences of the Academy of Sciences USSR. This journal will report on the results of research in physics of semiconductors and semiconductor devices, will elucidate questions on strength and plasticity of solid bodies, physics of polymers, and external electronics.  The periodical is a monthly.

Tsitologiya (Cytology).  Organ of the Department of Biological Sciences of the Academy of Sciences USSR.  This journal will publish materials on scientific problems connected with the study of plant and animal cells and unicellular organisms, original scientific investigations on microscopic and submicroscopic morphology of cells, cytochemistry, cytophysiology and cytogenetics, as well as the application of cytological investigations in medicine and agriculture.  Periodicity is bimonthly.

Radiokhimiya (Radiochemistry). This journal replaces Trudy Radiyevogo instituta imeni V. G. Khlopin (a nonperiodic serial) of the Academy of Sciences USSR. The mission of the journal is to publish original works in chemistry of radioactive elements, nuclear processes, methods of radio-chemical investigations, methods of investigating radioactivity, and the history of radiochemistry. Readers will become acquainted with the most important results of research in radiochemistry in a section on short reports and letters. Periodicity is bimonthly.

Kuznechno-shtampovochnoye proizvodstvo (Forge and Press Production). Organ of the State Scientific and Technical Committee of the Council of Ministers and the scientific-technical society "Mashprom." The journal in intended for engineering-technical and scientific workers of enterprises, scientific research institutes, higher technical educational institutions, and qualified workers of the forging industry. It will contain articles on the basic problems of development and theory of forging and stamping, improvement of technological processes, production of high-grade, forgings and stampings, and introduction of complex mechanization and automation of production. The journal will organize on its pages discussions on the most important problems of forging-stamping production, will acquaint readers with the latest achievements in Soviet and foreign machine build-ing. Periodicity is monthly.

Mekhanizatsiya i avtomatizatsiya proizvodstva (Mechanization and Automation of Production). This journal is designed for a wide circle of engineering-technical workers of all branches of industry and trans-portation. Problems of the complex mechanization and automation of pro-duction processes having interindustry significance will be examined. Information on the latest achievements in the field of mechanization and automation both in the USSR and in foreign countries will be published. Periodicity is monthly.

"Current Events" (unsigned article); Baku, Izvestiya Vysshikh Uchebnykh Zavedeniy - Neft' i Gaz, No 4, 1958, p 132

A new periodical Tekhniko-Ekonomicheskiy Byulleten' (Technical-Economics Bulletin), an organ of the Azerbaydzhan Sovnarkhoz, began publica-tion in 1958 and will be published monthly in both the Russian and Azerbay-dzhan languages.

The first issue contains an article by the president of the sovnarkhoz, S. Orudzhev, entitled, "On the New Levels of Azerbaydzhan Industry in 1958."

184. **New Institutes To Be Established Under Academy of Sciences Georgian SSR**

"A Document of Great Historic Importance," by A. Boch-orishvili, Vice-President, Academy of Sciences Georgian SSR, Tbilisi, Zarya Vostoka, 20 Nov 59

In the process of expansion to meet the goals of the 7-Year Plan, the Academy of Sciences Georgian SSR has planned to open the following institutes: the Institute of Machine Building (Institut' Mashinostroy-eniya); the Institute of Semiconductors (Institut' Poluprovodnikov); the Institute of Biophysics and Biochemistry (Institut Biofiziki i Biokhimii); and the Institute of Plant Physiology (Institut Fiziologii Rasteniy).

185. **Tasks Facing Czechoslovak Scientists**

"Our Scientists Are Preparing for Great Tasks," by Bretislav Jirousek; Prague, Hospodarske Noviny, No 47, 23 Nov 58, p 3

The Ninth General Assembly of the Czechoslovak Academy of Sciences was held on 17 and 18 November 1958. This assembly provided an opportunity to evaluate the development of Czechoslovak science in recent years and to prepare scientific institutions and individual scientific workers to fulfill the great tasks put before them by the Eleventh Congress of the Communist Party of Czechoslovakia.

The period just passed was marked by unusual efforts to establish better conditions for the further development of the national economy. In connection with basic changes in the organizational structure of industry and construction area, scientific work was also reorganized. This chiefly affected the network of scientific and research institutes. In harmony with the principle of bringing departmental research closer to the production base, almost half of the departmental or ministerial institutes, with 13,000 workers, were transferred to production management units. The "Slezsky ustav" (Silesian Institute) in Opava and the "Hornicky ustav" (Mining Institute) in Prague were added to the research institutes of the Czechoslovak Academy of Sciences in 1957. In 1959, the "Ustav makromolekularni chemie" (Institute of Macromolecular Chemistry) and the "Ustav teorie informaci" (Institute of Theory of Information), which will have a computer center equipped with the "URAL" mathematical machine, will come into being.

With the cooperation of the scientists of the socialist countries, particularly of the Soviet Union, Czechoslovak science has made a great advance in numerous scientific areas in recent years. In chemistry, physics, biology, and mathematics, for example, it has taken an honorable position in the international scientific forum: In 1958 alone some 19 scientific conferences with international participation, 468 of the 2,500 participants being foreign delegates, were held in Czechoslovakia.

The scientific institutes of the Czechoslovak Academy of Sciences have an entire series of good results, some of which are, or soon will be, contributing to increasing the effectiveness of the national economy. So the "Ustav technicke fyziky" (Institute of Technical Physics) has worked out a method for preparing monocrystals of highly pure silicon, with quality adequate for the requirements of electrical engineering application, and a method for preparing semiconductors for refrigeration engineering. An analyzer which determines the wolfram content of steel during melting was given to the "Spojene ocelarny" (United Steelworks) in Kladno. The "Fyzikalni ustav" (Physical Institute) worked out an original theory on the coercive forces in ferroelectric barium titanate (titanicitan barnaty), which has great significance for using this material for memory coils.

Workers of the "Chemicky ustav" (Chemical Institute), doing research in the chemical composition of brown coal, have isolated some additional crystalline compounds. The institute also achieved marked success in finding inexpensive raw materials for use in the pharmaceutical industry. A plan for pilot production of glutamine was also worked out.

The Institute of Technical Physics of the Academy worked out the stages of preparation of some ferrites, which are magnetic semiconductors and which are used as coils for memory and computing circuits of mathematical machines in automation technology, and in the millimeter wave area.

The "Polagraficky ustav" (Polarographic institute) turned over new oscillograph polarographs for production and assembled and operationally tested a zinc ion analyzer for spinning vats (spradaci lazne) used to produce synthetic fabrics and an analyzer to detect sulfur dioxide in technical gases. These instruments aroused great interest at the exhibition in Brussels.

The "Laborator anorganicke chemie" (Laboratory of Inorganic Chemistry) has finished the preparation of high percentage titanium slag as the starting substance for metal titanium and its oxides, among other things. Workers of this laboratory have completed the prospecting of a germanium raw material base in the Kladno and Rakovnik basins, and began prospecting in the Rosice-Oslavany Basin. The question of seperating magnesite and talc was solved, and fundamentals for production were prepared.

The "Ustav radiotechniky a elektroniky" (Institute of
Radio Engineering and Electronics) designed a machine for determining
random processes and an instrument for graphical solution of resonance
circuits, both instruments being distinguished at the Brussels World's
Fair  The "Hutnicky ustav" (Metallurgical Institute) has worked out
a theoretical and economical procedure for economical processing of
"Chvaletice" ore and has built an automatic instrument for determining
the ease of the reduction of ores. The "Ustav hydrodynamiky" (Institute
of Hydrodynamics) has worked on a new highly effective method of process-
ing water by a "flocculent cloud" and the application of this method in
the electric power industry. It also investigated the purification of
waste waters.

These are only a few of the results of the work of some research
institutes of the Czechoslovak Academy of Sciences. Science now faces
the very demanding tasks connected with completing socialist construction
in Czechoslovakia. To complete these tasks, as was stressed by Academician
F. Sorm, it will be necessary to concentrate scientific research activity
on the most important problems from the viewpoint of the needs of practice
and theory and to depend on extensive cooperation and coordination among
the friendly states.

The most important problems are encountered in the electric power
industry. The limited deposits of solid fuels and water power require
a change-over as soon as possible to the utilization of nuclear energy.
In addition, maximum conservation of power by means of "energochemical"
utilization of coal, electrification, and gasification must not be
neglected.

There are also important problems in the field of chemistry which
must overcome its present lag in a short time. The development of heavy
organic chemistry on a coal base will afford a large field of activity.
Production of synthetic rubber, plastics, and synthetic fabrics are fields
which demand unusual attention. Academicians must also assist in research
on the chemical composition of coal substances and the basic products of
their processing.

Atomic energy and the new developmental trends in industry in general
place great demands on metallurgy and metallurgical research. There is
a need for special highly resistant metallurgical materials, with whose
production Czechoslovakia has little or no experience.

A number of scientific disciplines will have to participate in intensifying the mechanization and implementing the full automation of production processes. Most important will be the formation of a reliable components base. This will require particular help from physicists and radio engineering workers, for the main problem concerns modern semiconductor components.

Further important tasks for the scientists lie in agriculture, health, construction, and other areas of human activity.

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- 148 -