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RESULTS OF SCIENTIFIC RESEARCH OF THE ACADEMY OF SCIENCES UKRAINIAN SSR, 1948

During 1948 the works of scientists of the Soviet Ukraine, and in particular of the Academy of Sciences Ukrainian SSR, showed considerable progress. This was announced by Comrade N. S. Khrushchev, secretary of the TsK KP (b) Ukraine, in his report to the 16th Congress of the Communist Party. This report, written into the resolutions of the congress, shows that Ukrainian scientists are approaching their tasks with greater emphasis on the needs of national economy and are rendering definite aid in solving the economic problems confronting the republic.

During 1948 the Departments of Physicomathematical and Chemical Sciences carried out important research, much of which became significant in industrial development.

The Institute of Mathematics conducted studies which resulted in effective methods of approximate conformal reflection. A general solution for a class of nonlinear problems and the theory of singular integrals was accomplished. Achievements in this field were immediately applied to the solution of a series of electrotechnical and aerodynamics problems. Research in mathematical physics clarified the role of ferromagnetic electromagnetic current conductivity. The Institute has begun to develop a field of mechanical mathematics.

The Physics Institute perfected and set up production of photoelements which were used in the automatization of numerous industries. Its work established the phenomenon of the "atomaric" (atomarnyy) layer and provided a theory of photoelements with this layer. A new type low-voltage rectifier was developed (the project was turned over to the Ministry of Communications USSR). The theory of polarons was further developed. The Physicotechnical Institute has made great progress in particle acceleration. The effect of mechanical deformation on superconductivity at high-frequencies was studied. Construction of a series of new instruments was developed, and these have been introduced for practical use. There were also many advances in the generation of centimeter and millimeter waves. The Laboratory of Metallophysics, while studying the kinetics of phase changes in condensed systems, developed methods for improving the quality of metals and alloys during their working. These methods have been put to use, particularly at the Kiev "Transsignal" Plant.

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Studies made by the Institute of Physical Chemistry imeni L. V. Pisarzhevskiy on the mechanism of Claisen regrouping, clarification of the nature of the spectra of electronic transmission, and clarification of the composition of quinhydrone are notable. The institute is introducing rapid photo-colorimetric methods of analysis in eight different production processes. The Institute of Organic Chemistry studied the synthesis and properties of new cyanin dyes, in close collaboration with the Ministry of Cinematography. Furthermore, the institute (jointly with the Institute of Microbiology) conducted important work on the study and synthesis of new physiologically active substances. The institute has developed and will introduce the technology of producing "sanasin." A series of factories for the production of carotin, and also a fructose and fruit syrup plant are planned on the basis of the institute's research.

The Institute of General and Inorganic Chemistry developed a method for determining bound water in colloidal systems, used for measuring the hydration of cellulose. A major part of the work conducted by the Institute of Geological Sciences during the past year was in the field of stratigraphy. The work of the institute has aided the accurate supervision and direction of drilling operations in prospecting for coal, petroleum, and gas deposits. A great number of projects concerned the study of the iron ore of the republic. The study of the geology, geomorphology, and hydrogeology of rivers conforms with the general plan for the utilization of rivers for electrification.

The Institute of Biochemistry explained the series of stages of carbohydrate exchange in the cerebrum and the means by which the cerebrum utilizes glucose, and studied and isolated ferments participating in and coordinating these processes. The fermentation mechanism in the formation of ammonia was explained, and the role of albumins in the combining of ammonia in the organism was established. One of the ferments (arginine-phospha-ferase) was obtained for the first time in crystalline form.

The Institute of Botany compiled the sixth volume of Flora of the Ukraine, and collected valuable material on the flora of the Transcarpathian region.

The Institute of Hydrobiology established the possibility of intensifying fish production in the Dnestr estuary and developed rational methods for fishing in the Duna estuary.

Interesting results were obtained by the Institute of Clinical Physiology. The possibility of transforming normal cells into oncogenous cells under the influence of certain substances was established.

Functions of institutes in the Department of Agricultural Sciences included fertilizer studies directed toward increasing the harvests. It was established that seed freezing and the use of a potassium fertilizer increase the harvest and caoutchouc content of kok-sagys. The Laboratory of Soil Science demonstrated that treatment with gypsum produces a radical improvement in solonets soil, increasing the yield of rye, millet, and sugar beets five to seven times. The laboratory also developed a method of salifying soil, advancing the possibility of obtaining a new building material.

The Laboratory of Machine Building and Problems of Agricultural Mechanics developed and tested a beet harvester combine which surpasses foreign combines in efficiency. The laboratory also developed and introduced a new technology for producing parts for beet machines and tractors from modified, high-strength cast iron.

Institutes of the Department of Technical Sciences correlated their work with industrial problems, and many of their accomplishments have already been introduced in industry during the past year.

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The Institute of Electric Welding imeni Ye. O. Paton ranks first in significance of accomplishment and successful introduction of results into industry. It has developed a new technology of low carbon steels for reliable welding equipment, bridge-building work, etc. The Institute of Ferrous Metallurgy obtained heat-resistant and high-strength alloys, and developed a new technology for smelting steel. The Institute of Structural Mechanics developed a method and equipment for studying the complex stress state of metals. The Institute of Electrotechnics investigated methods for automatic regulation of generator voltage with an electromagnetic amplifier and completed the theoretical and experimental study of high-frequency generators. The Institute of Thermal Power Engineering conducted theoretical and experimental studies on gas turbines, and developed the basis for computing and constructing industrial condensers. The Institute of Mining Mechanics imeni M. M. Fedorov developed a new technology for cooling the air in deep pits in the Donbas (the Donbas now employs this method), and offered a new, more effective method for open-pit mining of lignite in the Ukraine. The Institute of Hydrology and Hydrotechnics investigated the water resources of the Donbas and Krivoy Rog Basin, tabulated the characteristics of Ukrainian rivers, and completed a series of studies on hydraulics and hydrotechnical construction.

In February 1948 The Council for the Study of the Productive Forces of the Ukrainian SSR was restored its function of integrating the work of scientific institutes on fundamental problems. The council's plan included the following problems of importance to the Ukraine: arid regions of the southern Ukraine, fertilizers, the problem of utilizing Ukrainian brown coal, the problem of utilizing natural and industrial gases, the problem of utilizing small Ukrainian rivers, development of the productive forces of the Transcarpathian region, and development of the Ukrainian Poles'ye (forest region). Much data of considerable significance in the solution of these problems was obtained during 1948, but final judgment of the results of the council's work must wait until the end of 1949, when basic work on these problems will be completed.

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