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LATVIAN SCIENCE IN THE SERVICE OF THE NATIONAL ECONOMY

by K. Plaude

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LATVIAN SCIENCE IN THE SERVICE OF THE NATIONAL ECONOMY

[Following is a translation of an article by K. Plaude, President, Academy of Sciences Latvian SSR, in the Russian-language periodical Kommunist Sovetskoy Latvii (Communist of Soviet Latvia), Riga, No 5, 1962, pp 27-33.]

The achievements of Soviet science and engineering are common knowledge. Last April was the first anniversary of manned orbital space flight. And the man who flew this orbit was a representative of the country of socialism -- party member Yuriy Gagarin. His space flight was followed by another, and the world learned about the creation by Soviet scientists of new artificial earth satellites, new improved rockets.

The victories of the Soviet Union in conquering the cosmos signaled a shining era in the development of human knowledge. Our Soviet scientists have made eminent accomplishments in the field of the peaceful uses of atomic energy, cybernetics, polymer chemistry, development of automation and telemechanics, and in other fields of science and engineering.

An ever increasing importance is being acquired by science and engineering during the present era of the advanced building of communism. The new Party Program stresses that: "The Party shall foster in all ways the further growth of the role of science in the building of the communist society...." This means that science should be oriented toward developing research which opens an avenue for further progress in industry, agriculture, medicine, and cultural construction.

The Soviet scientists face the task of activizing in all ways their theoretical and experimental studies so as to occupy in the immediate future the leading positions in the world as regards every branch of scientific knowledge. This requires achieving such an unprecedented

expansion of research and such an organic bond between science and production that science in our country would become to the full extent a direct productive force. Our country expects of its scientists new major developments which should lay the foundations for the further growth of the national economy and be a decisive force in the economic competition with the capitalist world.

The Soviet Union at present has numerous cadres of scientists. We have more than 354,000 scientific workers, of which more than 98,000 with candidate degrees and approximately 11,000 with doctoral degrees. A major place in the multi-national family of Soviet scientists is occupied by the scientific workers of our [Latvian] republic. The fifteen institutes of the Academy of Sciences Latvian SSR are host to 840 scientific workers, including 34 with doctoral and 309 with candidate degrees. In a number of scientific disciplines our Academy occupies a leading position among the scientific institutions of the country. This pertains to research and development work on radioactive instruments for the automation of production, development of various types of electromagnetic pumps for molten metals, development of the theory and design of a new type of contactless electrical machines, efficient utilization of microelements in agriculture, synthesis of medical preparations, hydrolysis of plant materials, and certain other trends. Now that the Party postulates the task of the further development of scientific activity not only in the center but also on the peripheries, the importance of the work of the academies of sciences of the Union republics, including Soviet Latvia, is increasing still further.

What then is the subject of the work of Latvian scientists, and what is their participation in the development of Soviet science?

It is sufficient to mention that in the last two years alone the institutes of the Academy of Sciences Latvian SSR carried out more than 240 research projects concerning the utilization of physics, chemistry, technology, and biology in the national economy, which is producing a substantial technical and economic effect.

Of considerable importance to the national economy are, among others, the following radioactive instruments and installations developed at the Laboratory of Radioactive Isotopes under the direction of V. Yanushkovskiy: flow gauges, blocking instruments, thickness gauges, batchers of granular mixtures, which are being employed at many of the country's enterprises for the automatic control and regulation of production processes and which produce substantial savings of funds.

Of major scientific value is the work of the young scientist Candidate of Engineering Sciences Yu. Mikhaylov (Institute of Power Engineering) in investigating heat and mass transfer in disperse media,

which adds to the knowledge about the phenomena of the transfer of energy and matter during dynamic cooling and during various production processes.

As a result of an extensive study of the operating regimes of thermal systems, the scientific workers of the Institute of Energetics developed a set of original instruments for automatic regulation: automatic heat governors, pickups, programmed heat transfer regulators for a number of production processes and for the automation of local heat supply networks. In the present year the Gidrometpribor Plant is commencing the series production of the automatic heat governors for heating systems, developed by the scientists of this institute, G. Shturman and V. Apsit. Experimental data show that the installation of these instruments in buildings connected to the district heating networks yields savings of heat (without any reduction in its level in the premises) that reach as much as 20 to 25 percent above the calculated data.

The research in the field of the theory of contactless electrical machines, under way at the Institute of Power Engineering, has led to extremely valuable results which make it possible to commence the development of a new type of contactless generators and motors distinguished by a high reliability and economy of operation. The first models of diesel-electric installations with a fly-wheel generator have been developed and have proved to be of high technical quality.

The Institute of Automation and Mechanics has suggested a new method of testing plastics for strength. The scientists of this institute, in collaboration with specialists from the REZ [Riga Electrical Plant], under the direction of Cand. Eng. Sci. Yu. Tarnopol'skiy, developed new designs of plastic large-diameter commutators for electrical machinery. At present commutators of this type are being introduced at more than 20 plants of our country.

A definite achievement in the field of construction is constituted by the fundamentally new techniques of production of concretes which were developed by scientists at the Institute of Construction and Architecture under the direction of its director, Cand. Eng. Sci. V. Latishenko. They make it possible to solve in practice the long-ripe problem of the so-called hard concrete mixes, which will make it possible to save about 20 percent of cement. Of major value to the national economy also are the vibration techniques of preparing silica mixes and sand asphalt-concrete, developed at the same institute.

Extensive research work was carried out in recent years by the Institute of Forestry Problems and Wood Chemistry as regards a number of problems of organic chemistry and chemical technology. A major research trend pursued is the investigations of methods of hydrolysis of plant materials. Conditions were developed for the hydrolysis of agricultural

wastes and top-layer peat, assuring high yields of sugars. It was also established that peat hydrolysates can be used to produce feed yeasts.

The efforts of the scientists at the Institute of Organic Synthesis to explore new biologically active substances needed by medicine were crowned with success.

In recent years they succeeded in synthesizing more than 100 drugs from the nitrofurane group, including such drugs as furacilin, furazolidone, and furadonine, which have already been introduced into medical practice. Techniques of producing certain anti-cancer drugs were developed.

There has also been an increase in the volume of work devoted to problems of agricultural production at the institutes of the Academy. The fundamental pattern of distribution of microelements in the soils of the Latvian SSR was investigated. New methods were developed for determining the humic acid, and a number of trace elements in the soil. Under the direction of Academician Ya. Peyve, the importance of the effect of trace elements on the rise in crop yields was determined and confirmed experimentally. Theoretical foundations and techniques of production of feedstuffs enriched with trace elements, vitamins, and antibiotics were determined; the use of such feedstuffs considerably increases the productivity of livestock and poultry.

Of great value are the recommendations of scientists on increasing the fish productivity of the kolkhoz and sovkhos ponds, acclimatizing valuable varieties of fish, protecting crops against pests, and so on.

The data presented above do not, of course, reflect the entire scope of the research work which the Academy is doing for the practical benefit of the national economy. Among the projects carried out during 1961 mention should also be made of such projects as, for example, apparatus for automating the production of lignin sulfonate in the paper industry, based on the use of radioactive isotopes; the substantiation of the theory of ultrasonic welding; and also the development of a system of automatic welding-on of the silver contacts of commutating devices, which saves materials and improves quality. A filter press for mechanical dehydration of peat was developed, and it will find broad application in industry.

On the basis of the tasks postulated in the Party Program, the staffs of the institutes drafted a long-range plan of development of science at the Academy for the forthcoming 20-year period and determined the tasks for 1962. The plan of 1962 activities differs considerably from the plans for the previous years. Of the 230 topics to be investigated by the scientists of our republic, more than 80 percent pertain to

important national problems. Twenty-seven representatives from our Academy were included in the membership of the all-Union councils on different problems. They include the Academicians P. Valeskali, S. Giller, A. Iyevin', A. Kalnin', Ya, Krastyn', L. Liyepin', P. Odintsov, A. Ozol, K. Strazdyn', and others.

In 1962 the institutes of the Academy of Sciences Latvian SSR will participate in the development of 11 such important national problems as the production of polymer-based synthetics, the "chemization" of agriculture, power industry and electrification, new production processes and new high-productivity sets of machinery, chemistry of natural and biologically important compounds, comprehensive utilization of forest resources, and others.

What will then be the principal trends of activity of our Academy in the longer range?

We will name some of the below:

In the field of physics: the physics of the atomic nucleus and the utilization of short-lived isotopes and nuclear radiation in the national economy; magnetohydrodynamic and heat-physics phenomena in conducting media; physical foundations of electromagnetic methods of pumping liquid metals; solid body physics; semiconductor physics and engineering; atomic and molecular spectroscopy.

In the field of engineering cybernetics: synthesis and analysis of feedback systems of automatic control; development of electronic logical elements and specialized computers; research in the reliability of cybernetic systems.

In the field of chemistry and geology: chemistry of natural and biologically active compounds and the development, on this basis, of new drugs (synthesis of anti-tumor compounds and physiologically active biopolymers); chemistry of furfuran; chemistry of wood; utilization of pentosan-containing materials in the production of polymers, monomers, and plastics; development of the corrosion theory and development of effective measures for the corrosion-protection of metals; roentgenographic and neutron-diffraction studies of the structure of matter; formation, distribution, and efficient utilization and conservation of the water resources of the Latvian SSR; structure and tectonic development of the Baltic Maritime Region.

In the field of power and electrical engineering industry: foundations for the integrated development of the power and fuel base of the Northwestern USSR; intensification of thermal processes and synthesis of heat-supply systems; theory of contactless electrical machines;

development of new power-supply systems for electric trains; and electrification of the republic's economy.

In the field of automation and mechanics: development of new automable production processes in machine building; development of automatic production-control instruments; mechanics of deformable media.

In the field of biology and microbiology: medical microbiology and virology; biological foundations and role of microelements in the life of plants, animals, and man; biological foundations for increasing the productivity of livestock and poultry; scientific foundations of Latvia's forestry.

In the field of medicine: malignant neoplasms; rheumatism; human metabolism and nutrition.

To solve these problems we are providing the necessary conditions and concentrating scientific forces. Much already should be accomplished within the present Seven-Year Plan period. Thus, within this period, the scientists in our republic will have primarily to solve many problems of solid body physics, which is a principal trend of scientific research to be pursued actively by many institutes of the Academy of Sciences and higher schools in the republic.

The presence of an atomic reactor makes it possible to use on a broad scale radioactive isotopes for production control and measurement engineering, to investigate the biological processes of the vegetable and animal world, and to study chemical and heat- and moisture-exchange processes for various fields of clinical and experimental medicine.

Steps also have been taken to assure the further development of research in the effect of nuclear radiation on the magnetic properties of matter and in the interaction of an electromagnetic field with liquids and solids, so as to make the electromagnetic field an important means of the new technology. With the aid of this field it will be possible to smelt, shape, and cold-work metals.

This work will be accompanied by instituting extensive original research in the field of heat physics and primarily heat and mass transfer.

Among the numerous problems of modern mechanics -- this foundation of many engineering sciences -- the following will draw the principal attention of the republic's scientists: development of a general theory of the elasto-plastic deformation of solids, and development of methods of calculating structures made of synthetics.

The efforts of the scientists in the republic will be focused on developing the foundations of the heat and power balance and the organization of power supply, automation of the guidance of power systems, and prospects for the complete electrification of the republic's economy. Another complex of studies will pertain to the problems of creating new types of electric power stations within the Integrated National Power System of the Soviet Union, and also to problems of increasing the effectiveness of thermal power installations on the basis of utilization of electricity and natural gas, intensification of heat transfer, use of new types of heat transfer agents, use of the heat of atomic power stations, and complete automation of heating systems.

Our power experts should assist in finding the principle of direct conversion of heat into electrical energy, by-passing the chain of intermediate links such as the steam boiler, the steam turbine, and the electrical generator.

A substantial amount of work will be carried out to develop the theory and design of non-contacting, high-speed electrical machines for introduction into industry, and the theoretical foundations for the energy supply of means of transport.

Great prospects open before the scientists of the republic as regards electronics and computer engineering. The organization within the Academy of Sciences of a new institute and the computer center at the Latvian State University have laid the foundation for the development of these sciences in the republic and made it possible by now to launch the related research on a major scale. Work will be carried out to develop electronic automata and feedback systems of automatic regulation, the theory and methods of investigating the stability of closed systems of automatic regulation, the synthesis of electronic control computers, and also to develop specialized computers for different branches of the national economy.

The scientists of the Latvian SSR will also increase their contribution to solve such an important problem to the national economy as the establishment in our country of a strong industry of artificial fibers, plastics and other synthetics. The Academy of Sciences and the higher schools of the Latvian SSR, which already are engaged in systematic investigation of natural polymers of plant origin, are developing new and optimally efficient and profitable methods of isolating the polymers -- cellulose, lignin -- from plant raw materials. New methods of obtaining plastics and synthetic polymers on the basis of polymers and monomers of inorganic and organic origin also are being investigated. The further development of organic chemistry will be to a major degree associated with the research in the field of the chemistry of natural and biologically active compounds.

Thus, the work in the field of the chemistry of natural biologically active compounds will be ultimately oriented toward enriching the knowledge about the laws of the biological synthesis of complex compounds and utilizing the results of this research for the further upsurge of agriculture, especially animal husbandry, and chemical industry and public health in our country.

Great tasks as to intensifying agricultural production were assigned to science by the March Plenum of the CC CPSU. As early as within the present year the institutes of biology and microbiology will expand their research in methods of increasing the productivity of animal husbandry and crop yields. The scientists shall apply more effort to solve the problems of developing the production of feed yeasts and conifer meal. Our chemists will have to develop new means of weed and pest control in agriculture. The research and development work on new types of mineral and organic fertilizers should be expanded. Measures also are slated to increase the scientific assistance of the Academy to plant and animal breeders and to experimental stations in their practical work. The scientists of the Academy responded ardently to the Party's appeal and will help by their effort to further develop agriculture.

In placing new, complex tasks before science, the Party and State are attending to the strengthening of the material base of scientific institutions. In Riga an entire town is being built for scientific research institutions. During the present Seven-Year Plan period many new scientific institutions will be built within the framework of the Academy of Sciences Latvian SSR -- a radio-isotope laboratory, an institute of mathematics and mechanics, an institute of biochemistry, and a number of new laboratories in the existing institutes. Plans exist for separating from the Institute of Forestry Problems an independent Institute of Wood Chemistry.

In addition, in the immediate future several large inter-republic bases or the so-called regional institutes will be established. For example, the Institute of Nuclear Physics in Salaspils, the Institute of Forestry, the Institute for the Conservation and Harnessing of Water Resources, and certain other similar scientific institutions will be established as the regional institute for the Western Economic Region.

The successes in solving the problems posed to scientists will largely depend on the organization of scientific work and the deployment of scientist cadres. It must be admitted that the shortcomings to which Nikita Sergeyevich Khrushchev referred at the March Plenum of the CC CPSU when speaking of the performance of scientists, also exist in our republic. The Presidium of the Academy of Sciences Latvian SSR had to re-examine the thematic plans of the institutes and eliminate minor projects which are of no proper importance to the national economy. In addition,

so far the institutes have tended to extend their research to a too wide variety of topics. For this year the institutes planned to participate in research on 52 problems, which made it impossible to assure a sufficiently thorough elaboration of individual topics. For example, the Institute of Experimental Medicine alone, with its own comparatively modest resources, intended to investigate seven major problems during the present year. In this connection it could at most carry out one or two projects with regard to these problems. Such a dispersion of the effort of scientific workers leads to delays in research work and prevents the conduct of intensive and effective investigations.

Another weak link in scientific work is the processing of results for practical introduction. Many discoveries of scientists long remain without practical utilization owing to the lag in design work and experimental facilities. Now measures are being taken to strengthen the experimental base. An experimental electronics and machinery plant is being organized, and the construction of a large combine for electronic, mechanical-technological, and other experimental investigations has been started.

However, we must not wait until a scientific-experimental base of our own is established. It is a task of the institutes and scientists to strengthen their bonds with the production collectives, which may prove of enormous assistance in experimental work as well as in the introduction of discoveries into practice. Many public design bureaus are active at the enterprises of the republic. They will not refuse to assist the scientists. All that is needed is to establish close business ties with these creative collectives. It is also necessary to consider and solve the problems of organizing public problem institutes, to establish complex laboratories in collaboration with higher-school scientists, and to practice more widely the organization of problem laboratories in industry, construction, transport, and agriculture.

As the Party Program points out, the role of the public in scientific work should increase. This will assist the scientists to attain the maximum harmony in coordinating and integrating their activities with the plans and tasks of the development of the national economy and in raising the scientific level of their performance. It is necessary to broaden the practice of creative reports by scientists, examination of the results of their work, discussions, and conferences, which will contribute to solving both the scientific problems ripe at present and the long-range problems.

In developing the creative discussion of scientific problems, the role of permanent scientific seminars should be increased. Seminars of this kind used to function successfully at the departments and institutes, but lately this practice has been disappearing.

In the light of the new tasks posed to science, the work of the scientific councils of the institutes should be extensively reorganized, and their activity and effectiveness should be increased, so that they could become efficacious scientific organs. So far the scientific councils of the institutes, instead of scientific problems, often discuss minor administrative problems, and some of their sessions greatly resemble production conferences.

In the final analysis, in scientific work everything depends on the cadres, on their ability to creatively utilize past achievements, to solve immediate problems, and to advance further our science. During the years of existence of our still comparatively young Academy of Sciences, many talented young scientists have grown up in the republic. However, the rate of their quantitative and qualitative increase still lags behind the higher demand of the present. We have a particular shortage of scientific cadres in the new specialties, for example, in biophysics, biochemistry, mechanics, computer engineering, cybernetics, semiconductor physics and engineering, radiobiology, heat physics, and others. It should be considered that by 1980 the number of scientific workers at our Academy alone should approximately quadruple. This means that the problem of training young specialists is becoming particularly urgent.

It would be expedient to practice on a much broader scale the practice training of students from the Latvian higher schools at the institutes and laboratories [of the Academy] so as to select from among them those most gifted for scientific work.

To occupy a worthy place among the scientific institutions of our country, the institutes of the Academy of Sciences Latvian SSR must sharply elevate the level of their basic-research work. The profile of scientific activity of every institute should be clearly determined, so that it could respond more operatively to actual needs. The efforts of scientists should be continually oriented toward solving national-economic tasks which contribute to a maximally rapid creation of the material-technical base of communism. The scientific activity of our institutes and higher schools should be tied still more closely to the tasks of developing the economy of the Latvian SSR.

The 22nd Party Congress assigned grandiose tasks to the Soviet scientists. The scientists are required to work persistently and sacrificially on every sector of activity. Therefore it is very important that their resources and energy should be applied very purposively so as to avoid duplication and re-discovery of past discoveries. For this purpose, late last year, the State Committee for Coordinating Scientific Research Work was established. This organ will help to apportion correctly the efforts of the scientists of our country, to integrate the efforts of their multi-national family in order to achieve

the paramount goal.

There is no doubt that Latvia's scientists shall devote all their effort to the great cause of building the communist society in our country and make a worthy contribution to the further florescence of Soviet science and engineering.

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