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USSR REPORT

Science and Technology Policy

No. 16

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NEW FOOD INDUSTRY DEVELOPMENTS OUTLINED

Moscow EKONOMICHESKAYA GAZETA in Russian No 28, Jul 83 p 2

[Survey prepared by the Board of the Agroindustrial Complex of the State Committee for Science and Technology of the USSR: "New Developments in the Food Industry"]

[Text] The 26th party congress set for the food industry branches--an important part of the agroindustrial complex--the task of improving the quality and the assortment and increasing the output of food products enriched with protein, vitamins and other wholesome ingredients. Outstripping development is planned for the production of baby foods and dietetic products. We need to considerably increase the thoroughness of the processing, improve the use of agricultural raw materials and extensively introduce the aseptic method of canning fruits and vegetables and the use of chilling facilities for the processing and storage of agricultural products.

All of these matters are reflected in the special, comprehensive scientific and technical program: "Development of the Production of Biologically High-Grade Food Products Through Complete Utilization and Reduced Losses of Raw Materials."

Implementation of the measures outlined in the program will bring about an increase in the production of high-quality food products, better utilization of the traditional raw materials and the obtainment of additional sources of food protein. This will contribute to the establishment of a wholesome diet, which will help to prevent many ailments, first and foremost, obesity. It is planned to conserve the work of 350,000 people by increasing labor productivity in the main branches of the food industry by 1985, and to increase food commodity stocks by a total of around 3 billion rubles worth in 1985 and as much as 4.5 billion rubles worth in 1990.

Beneficial to Health

The measures specified in the program focus on the total utilization of raw materials for the production of biologically high-grade food products. At the present time only 40 percent of the skimmed milk and buttermilk and approximately one fourth of the whey are being used in food products. This is significantly less than in many other countries.

The program calls for the continuation of projects underway and for the creation of new types of food products, new technological processes and equipment for the production and utilization of vegetable and animal proteins, including cross-linked proteins. This will make it possible to increase supplies of meat products by 1 million tons between 1981 and 1985 and to increase the industrial processing of skimmed milk, buttermilk and whey to 36 million tons in 1985. Work is now being performed in this area by the Special Problems Laboratory of the Moscow Technological Institute of the Meat and Dairy Industry and by the Elementoorganic Compounds Institute.

The stress is on replacing the missing amino acids tryptophan, lysine and methionine. This is being done by adding soy flour, milk and curds, as well as tomato paste, carrot juice and other fruit and vegetable additives, to the food products.

More and more attention has been devoted in the world in recent years to research and practical work in the area of deriving proteins from nontraditional vegetable matter as a functional additive to impart certain desirable qualities to food products.

Work is being performed on this problem by organizations of the USSR Ministry of Public Health, the USSR Ministry of the Food Industry, the USSR Ministry of the Meat and Dairy Industry and the USSR Academy of Medical Sciences under a special-purpose, comprehensive program, in cooperation with the other CEMA nations. The first batch of plant protein has been obtained for the enrichment of food products.

The baked goods industry has developed varieties of bread with deodorized soy flour and lecithin. Bread and flour products are being created with milk-protein concentrates for children. The Nutrition Institute of the USSR Academy of Medical Sciences has worked out the technology and the recipes for new macaroni products enriched with powdered eggs in combination with powered milk, as well as products including powdered eggs and low-fat curds. Work has been started on the development of protein-free vermicelli from cornstarch with the addition of the calcium and phosphorous salts required by children.

Technologies and recipes containing milk and soy protein, developed through research conducted under the program, are being introduced in the confectionery industry. This will make it possible to balance their amino acid content within specific ranges and to enhance their nutritional value. New types of confectionery items contain an average of 4 to 18.5 percent of protein additives for enrichment, which increases the protein content by the same percentage and reduces the amount of carbohydrates correspondingly.

More than 4,000 tons of whey concentrates and 1.3 million tons of natural whey were used in those branches in 1982. This made it possible to turn out an additional 14 million tons of bread and other baked goods and 80,000 tons of confectionery items. The use of these materials made it possible to replace part of the sugar, the wheat flour and the powdered and condensed milk, and simultaneously to enhance the nutritional value of the products by enriching them with proteins, minerals, lactose and glucose.

The program calls for expanding the research and for mastering the industrial production of nutritionally balanced products for healthy and ill children, which will make it possible to improve their nutrition, whether they are being fed at home or at child-care facilities. It is planned by 1985 to increase the output of powdered milk mixtures--mother's milk replacements--to 9,500 tons and the production of liquid and paste products with a milk base to 100,000 tons, the production of canned homogenized meat products to 50 million standard cans and the output of canned fruits and vegetables to 900 million standard cans.

Preserving Without Losses

Freezing is considered to be one of the most progressive means in use for the prolonged storage of all types of foodstuffs, and with complete justification. This process retains to the greatest degree the basic quality indices--both organoleptic (appearance, taste, odor, color and consistency) and nutritional (content of carbohydrates, proteins, fats, minerals and biologically active substances).

The output of quick-frozen products is to be increased to 540,000 tons by 1985. A total of 55 sets of equipment will be developed for these purposes, their series production will be mastered and they will be delivered to industry.

Scientific research institutes of the USSR Ministry of the Meat and Dairy Industry, the USSR Ministry of the Fruit and Vegetable Industry, the USSR Ministry of the Fish Industry and the USSR Ministry of Trade have prepared standard technical documentation for more than 230 types of quick-frozen, ready-to-eat dishes and semi-prepared products of fruits and vegetables, meats, dairy products, fish and combinations of ingredients. This assortment is fully adequate to meet the demands of industry and the general consumer.

The general use of quick-frozen, semi-prepared and ready-to-eat dishes will make it possible to reduce losses of agricultural products by 10-20 percent and to cut water and energy consumption by 20-40 percent, compared with the present system for storing products and preparing food in public catering and in the home.

It is advisable to consume fruits, vegetables and berries evenly throughout the year. It should be noted that the canning process using modern, scientifically based technology and corresponding equipment makes it possible to retain the initial nutritional and biologically active substance of fruits and vegetables to a greater degree and significantly longer than when they are stored fresh for long periods of time. This is especially true of the aseptic canning method with its brief exposure of the product to heat and good storage conditions, which keep out light and oxygen. This method is considerably more economical than the others.

In 1985-1986, with the participation of the CEMA nations, we will master the series production of complete sets of equipment for the aseptic canning and preserving of liquid and pureed food products in tanks with capacities of 100 and 300 cubic meters, in special railcar and truck tanks, and complete sets of equipment for transporting, receiving and storing these at the sites of their consumption, as well as automatic equipment for packaging these products in small quantities for the consumer. Under the program an experimental shop for the aseptic canning of liquid and pureed semi-prepared products with a capacity of 18,000 tons is to be created in the Moldavian SSR in 1985, and an experimental shop is to be built in Murmansk for the receiving, continued storage and processing of quick-frozen and aseptically canned semi-prepared food products and their packaging in small quantities for the consumer, with a capacity of up to 30,000 tons per year.

The Raw Materials Must be Completely Processed

The program devotes a great deal of attention to the complete utilization of the agricultural products. A number of assignments focus on this. Among other things, the Grigoriopol Agroindustrial Association and the Slavyansk Canning Plant have been given the assignment of setting up and mastering an experimental industrial facility for the complete processing of apples for juice and sauce, which will make it possible to reduce the portion of by-products used for industrial and feed purposes to 8-10 percent. Experimental production lines are to be placed into operation there by the end of this year.

The Tiraspol Agroindustrial Association of the Moldavian SSR's Ministry of the Fruit and Vegetable Industry, VNIIKOP[All-Union Scientific Research Institute of the Canning and Dehydrated Vegetables Industry], "Giproplodoovoshchprom" and "Penzkhimmash" are to set up an experimental industrial facility for the total processing of apples for juice and pressed residue for the production of pectin, using continuous-action equipment with an output of 7 tons per hour.

We are continuing to actively introduce progressive technological processes for preparing items for public catering with industrial methods. The Ministry of Machine Building for the Light and Food Industry and Household Appliances is mastering the production of sets of equipment for producing, packaging, storing, transporting and selling these products, using various types of standardized containers.

The restructuring of public catering for operating with this technology will produce a significant social and economic effect, which will be reflected in improvement of the quality and the assortment of the dishes and a reduction in the amount of time spent on meals.

In accordance with assignments specified in the program, automated systems are being adopted more and more extensively for controlling the technological processes in the sugar and the meat and dairy industries, in trade and public catering. A number of the assignments focus on the development, the creation and introduction of technological processes and equipment, instruments and means of automation and mechanization for the food industry branches.

A further increase in the production of sugar and other sweet substances depends upon the improvement of the technology for storing the sugar beets. New biologically active compounds and technical means are being used for this purpose. They make it possible to increase the amount of time the beets can be stored and cut sugar losses in the beets.

For Maximum Effect

The total cost estimate for the program for the period 1981-1985 is 56.3 million rubles, including 27.2 million rubles for scientific research. Around 86 million rubles will have to be invested in the development of production capacities designated for working out the new technologies and perfecting the new equipment. All of these expenses should be returned 100-fold. The annual economic effect from the planned application of measures covered by the program will be around 630 million rubles in 1985 and more than a billion rubles in 1990.

The maximum effect should be achieved in all the areas of application. Unfortunately, there are still bottlenecks along with the successes achieved in the program's fulfillment.

The work of obtaining and utilizing protein from oil-bearing crops is advancing very slowly. In order to accelerate this work the USSR Ministry of the Food Industry (deputy minister V. Chebyshev is presently in charge of these matters) must step up the search for methods of obtaining insulated proteins and preserving their qualities in the purification process, and find additional methods using little energy and involving no drainage for purifying and concentrating the food proteins from oil-seed meal. We need to accelerate the development of the range of aromatization means.

The USSR Ministry of Machine Building for the Light and Food Industry and Household Appliances (V. Kopylov, deputy minister) and the USSR Ministry of the Meat and Dairy Industry (Yu. Sokolov, deputy minister) have dragged out the development, the manufacture and testing of a set of equipment for producing sterilized liquid and paste products with a milk base, with a capacity of 15 tons per shift.

The expanded production of quick-frozen, ready-to-eat meat dishes, semi-prepared milk products, fruits, vegetables, berries and mixed vegetables is being held up considerably by the lack of specialized production equipment, especially quick-freezing equipment.

The State Committee of the USSR for Science and Technology supported a request by the USSR Ministry of the Fruit and Vegetable Industry and allocated it the funds to conduct additional scientific research in the area of making total use of fruits and vegetables. The ministry's plans, however, did not specify limits for the planning work, the provision of the lines being created with technological and general plant equipment, cable items and materials for creating the experimental production facility and for turning out products with the new technology.

The Zhdanovtyazhmash Production Association (I. Nagayevakiy, general director) and the Ministry of Heavy and Transport Machine Building (Ye. Matveyev, deputy minister) arbitrarily altered the assignment for the creation of tank cars for hauling aseptically canned semi-prepared food items, failing to make it possible to haul pureed and paste products in them. As a result, it will be necessary to develop and master the production of two types of tanks instead of one.

All of these failings should be subjected to principled criticism in the ministries mentioned. The assignments contained in the program should be finished on time to produce the maximum national economic effect.

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SOVIET SCIENCE COORDINATION COUNCIL HOLDS 39TH SESSION

Tallinn IZVESTIYA AKADEMII NAUK ESTONSKOY SSR: OBSHCHESTVENNYYE NAUKI in Russian Vol 3, No 2, 1983 pp 165-167

[Article by Raymo Pullat: "The 39th Session of the Council to Coordinate the Scientific Activities of the Union Republics' Academies of Sciences"]

[Text] The 39th session of the Council to Coordinate the Scientific Activities of the Union Republics' Academies of Sciences was held in Tallinn on June 8-10 1982. Our country's leading scientists, headed by the president of the USSR Academy of Sciences, A.P. Aleksandrov, who has been named Hero of Socialist Labor three times, gathered to participate in the session. In addition to A.P. Aleksandrov, those arriving for the session included: Academicians V.A. Kotel'nikov and P.N. Fedoseyev, who are vice presidents of the USSR Academy of Sciences, and Academicians V.A. Ambartsumyan, S.V. Vonsovskiy, I.A. Glebov, N.M. Zhavoronkov, B.E. Paton, M.A. Styrikovich, B.S. Sokolov, N.P. Fedorenko and N.M. Emanuel', who are members of the Presidium of the USSR Academy of Sciences. I.A. Rozanov, CPSU Central Committee sector chief, took part in the work of the 39th session of the Coordinating Council, as did presidents, vice presidents and chief scientific secretaries from the presidiums of the union republics' academies of sciences, and from the scientific centers and branches of the USSR Academy of Sciences.

On 7 June K.G. Vayno, member of the CPSU Central Committee and first secretary of the Estonian Communist Party Central Committee, received the president of the USSR Academy of Sciences, A.P. Aleksandrov, and the distinguished scientists from the USSR and ESSR Academies of Sciences who accompanied him. Participating in the conversation were Comrades I.G. Kebin, V.I. Klauson, A.I. Kudryavtsev, V.A. Kyao, R.E. Ristlaan, A.F. Ryuytel', A.B. I. Upsi, M.A. Pedak, Estonian Communist Party Central Committee department chief A.I. Aben, ESSR Academy of Sciences president K.K. Rebane and others. On this same day our guests became acquainted with an exhibition of books which was opened at the ESSR Academy of Sciences' Scientific Library. At a reception held that evening at the ESSR Academy of Sciences Presidium K.K. Rebane, president of the ESSR Academy of Sciences and corresponding member of the USSR Academy of Sciences, presented ESSR Academy of Sciences commemorative medals to the prominent figures of Soviet science.

The session opened on 8 June. The presidium included well-known scientific, party and state figures. The opening remarks were made by Academician A.P. Aleksandrov, president of the USSR Academy of Sciences and chairman of the Coordinating Council. He noted that at the present time problems of power engineering must be the focus of basic research and that Estonian scientists are making a large contribution to the resolution of these problems.

K.G. Vayno, first secretary of the Estonian Communist Party (CPE) Central Committee, welcomed the guests on behalf of the CPE Central Committee, the presidium of the republic's Supreme Soviet and its Council of Ministers and said that the meeting of scientific leaders from all the fraternal republic in the capital of Soviet Estonia in the 60th anniversary year of the multinational Homeland was a vivid example of the practical implementation of the Leninist national policy. The science of Soviet Estonia is developing within the context of numerous fruitful contacts, especially contacts with the USSR Academy of Sciences. K.G. Vayno went on to emphasized that the May Plenum of the CPSU Central Committee presented science with urgent tasks. The essence of the question is how to link science and production more closely. Goal-oriented program research provides the way for science to develop. Nine programs established at the ESSR Academy of Sciences are concentrating successfully the forces of scientists to introduce effective methods for extracting and processing shale in order to supply the country's Northwest with electric power, liquid fuel and chemical products; to utilize rationally Estonian phosphorites, which are a source of fertility and one of the means for the fulfillment of the Food Program; to develop new biologically active compounds for use in medicine, agriculture, etc. and to establish up-to-date rapid-functioning automatic equipment and microprocessor systems for the automation of production processes. K.G. Vayno took particular note in his speech of the generous and fruitful assistance which the USSR Academy of Sciences and the Council to Coordinate the Scientific Activities of the Union Republics has given to the ESSR Academy of Sciences over a period of many years. Having noted the general successes of our scientific institutions, K.G. Vayno went on to talk about several concrete problems as well. He expressed the hope that the scientists will take measures to resolve these problems, and he wished the 39th session success in its work.

Academician M.A. Styrikovich presented a paper "On the Tasks of the Republic Academies of Sciences, the Scientific Centers and the Branches of the USSR Academy of Sciences on the Development of Research in the Area of USSR Fuel and Energy Complexes and on Energy-Saving Technology." He took note of significant changes in the development of worldwide power engineering and economics in general, which are characterized by a sharp increase in oil prices, the growing economic benefit to be derived from replacing liquid fuel with various energy resources and the implementation of an energy conservation policy. The speaker reacted positively to the work of scientists from the ESSR Academy of Sciences and certain other scientific academies to optimize the fuel and energy complex. However, the coordination of research in the area of the fuel and energy complex and energy-saving technologies has a number of inadequacies and requires further improvements in its forms and methods.

The Coordinating Council made a decision to recommend the following to the union republics' academies of sciences: 1) implement scientific-research and experimental-design work in the area of the fuel and energy complex and energy-saving technologies; 2) develop republic and regional comprehensive programs and methods for long-range prognostication in the development of the fuel and energy complex with consideration for regional features and the availability of mineral raw materials and energy resources.

K.K. Rebane, president of the ESSR Academy of Sciences, presented a report which he had written in collaboration with I.P. Epik entitled "The Problem of the Comprehensive Utilization of Oil Shales (Using the Estonian SSR as an Example)." He noted that it is essential to have scientific and technical preparation for the establishment of a major new branch of the economy--the production of liquid fuels made from oil shales, bituminous sand and coal.

Academician P.N. Fedosyev, vice president of the USSR Academy of Sciences reported to those assembled on preparations being made by institutions of the USSR Academy of Sciences and the scientific academies in the union republics for the implementation of measures devoted to the 60th anniversary of the formation of the USSR.

Academician N.P. Fedorenko, secretary of the Economics Division of the USSR Academy of Sciences, talked about the achievements and inadequacies in the coordination of the country's economic research. It was noted that the ESSR Academy of Sciences has increased its work on the utilization of the republic's scientific potential in resolving economic problems. N.S. Pshirkov, deputy chairman of the Coordinating Council, presented a report on the fulfillment of the decisions made by the Council's 38th session.

The following took part in discussions: Academicians of the USSR Academy of Sciences B.Ye. Paton, I.A. Glebov, N.M. Emanuel' and S.V. Vonsovskiy; corresponding members of the USSR Academy of Sciences G.I. Gorbunov and A.A. Zhuchenko, Academician of the Ukrainian SSR Academy of Sciences I.I. Lukinov, Academician of the Uzbek SSR Academy of Sciences E.Yu. Yusupov, Academician of the Lithuanian SSR Academy of Sciences K.A. Meshkauskas, corresponding member of the Estonian SSR Academy of Sciences M.L. Bronshteyn, Professor A.A. Ots of Tallin Polytechnical Institute and V.P. Leyin, general director of the Slantsekhim Production Association.

In summing up the results of the session, the Council adopted a decision aimed at further development in the coordination of Soviet science and at increases in its creative potential. On 9 June the conference participants visited Tartu. They were received by I.Kh. Toome, first secretary of the Tartu Gorkom of the CPE Central Committee, and N.A. Preyman, chairman of the gorispolkom. The guests viewed the town hall.

President of the USSR Academy of Sciences A.P. Aleksandrov, Vice President V.A. Kotel'nikov and other guests visited the ESSR Academy of Sciences' Institute of Physics. They learned about the work of the sectors devoted to laser spectroscopy, instrument building, the physics of semiconductors, and the physics of ionic crystals, as well as the group on laser equipment. Officials of the USSR Academy of Sciences have rated the work of the physicists highly.

Some of the conference participants, including the eminent astrophysicists Academician V.A. Ambartsumyan and corresponding member of the USSR Academy of Sciences Ye.K. Kharadze, took great interest in learning about the Institute of Astrophysics and Atmospheric Physics of the ESSR Academy of Sciences. The guests visited the sectors on physics of the atmosphere and space studies, and they viewed the 1.5-meter telescope. A working meeting with their Estonian colleagues was held.

Academician A.P. Aleksandrov, president of the USSR Academy of Sciences, Academician P.N. Fedoseyev, vice president, R.E. Ristlaan, secretary of the CPE Central Committee, and I.Kh. Toome, first secretary of the Tartu Gorkom of the CPE, met with the collective of Tartu Sate University. Academician A.P. Aleksandrov and Academician P.N. Fedoseyev presented papers. The guests familiarized themselves with the collections of the Tartu State University Scientific Library.

On 10 June the eminent scientists from the USSR Academy of Sciences met with working people from Tallinn enterprises and employees of its scientific institutions. At the Institute of Geology Academician B.S. Sokolov presented a report "On Certain Tasks of Science in the Area of Stratigraphy." Academician M.A. Styrikovich held a meeting with the collective of Estonian Naval Steamship Company; the subject of his report was "Problems of World Energy and the World Fuel Market." Academician N.P. Fedorenko, held a conversation with the collective of the ESSR Academy of Sciences' Institute of Economics. Academician I.A. Glebov spoke at the Vol'ta Plant, and Academician V.A. Kotel'nikov spoke at the Punane RET /not further identified/.

Academician A.P. Aleksandrov, chairman of the Council and president of the USSR Academy of Sciences, and K.G. Vayno, first secretary of the CPE Central Committee, and others visited the exhibition "From Science to the Economy" which was opened in the main pavilion of the ESSR Exhibition of Economic Achievements. On the same day a visit was made to the Research-Demonstration Fishing Kolkhoz imeni S.M. Kirov was made by Academician A.P. Aleksandrov, president of the USSR Academy of Sciences, Academicians V.A. Kotel'nikov and P.N. Fedoseyev, who are vice presidents of the USSR Academy of Sciences, I.A. Rozanov, CPSU Central Committee sector head, and other guests accompanied by K.G. Vayno, first secretary of the CPE Central Committee, V.A. Kyao, secretary of the CPE Central Committee, and K.K. Rebane, president of the ESSR Academy of Sciences.

On the evening of 10 June the participants in the 39th session of the Coordinating Council visited the town hall and heard a concert of ancient music. They were received by Kh.V. Lumi, first deputy chairman of the Tallinn Gorispolkom.

The work of the 39th session of the Council to Coordinate the Scientific Activities of the Union Republics' Academies of Sciences was completed suc-

successfully. The results were summarized, and in accordance with the decisions of the 26th CPSU Congress, future directions were outlined for the development of Soviet science, and especially for research in the area of the USSR fuel and energy complex and energy-saving technologies. The session acquires particular meaning as a result of being held in the 60th anniversary year of the formation of the USSR, when our entire country is looking back at the road which has been traveled and is setting out new tasks which must be completed in the near as well as the distant future.

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MARCHUK ON TASKS FACING INVENTORS, INNOVATORS

Moscow TRUD in Russian 25 May 83 p 2

[Article by G. Marchuk, deputy chairman of the USSR Council of Ministers and chairman of the State Committee for Science and Technology [GKNT]: "Created, Tested, Introduced"]

[Text] There is one firm rule: equipping with leading technology ensures a high level in the development of the national economy, and consequently in raising the rate of growth of the national income. There is a more capacious definition for leading technology, for everything new and possessing the essential difference of solving a task technically. This definition consists of one word--invention, and we refer to creators of inventions as inventors. Today, when the Sixth All-Union Congress of the All-Union Society of Inventors and Innovators [VOIR] opens in Moscow, it is appropriate as never before to mention the great contribution being made by our inventors and rationalizers so that all sectors of the national economy would move faster to advanced positions of science and technology, so that the use of manual labor would be reduced, that all resources would be used rationally and that quality of production would rise.

During the 10th Five-Year Plan, 378,000 inventions and nearly 23 million rationalization proposals were worked out. The economic effect from their introduction amounted to more than R29 million--this is 1.5-fold more than in the preceding five-year plan. During the first 2 years of the current five-year plan, 7,000 new kinds of industrial products were mastered and their production was undertaken.

At the same time, and this of course will be described by delegates to the congress, the contribution by inventors and rationalizers to the development of scientific and technical progress could have been much greater. Suffice it to cite, for example, such a figure. So far only about 30 percent of all inventions made in a year are introduced into national economy. In this connection it would be expedient to dwell on some key problems in solving which our innovators could participate more actively.

Retooling of the national economy and converting it to an intensive path of development, place new responsible tasks before machine building. It is no mere chance that I am talking precisely about machine building. It must ensure conditions for rapid renewing of industrial equipment in all sectors of production and for substantial economizing of metal, fuel and energy, sharply reducing the use of manual and hard labor and improving the quality and expanding the variety of consumer goods.

These problems are not new. They were already discussed more than once. Much has been done to change the situation. At the same time, much more has to be done to accelerate scientific and technical progress. It is very important that inventors and rationalizers actively participate in this work. Skilled direction of the creative forces of innovators toward solving key problem may yield a great effect. Shops, sectors and introduction brigades operating on a voluntary service basis and creative laboratories are called upon to make a substantial additional contribution to solving the tasks in renewing our technical park and in intesifying production.

What specific priority tasks are facing innovators? We must raise efficiency in creation, production and utilization of machine building production. The entire chain is mean by this--from scientific research and developments to ensuring normal exploitation of machines and equipment.

Let us note certain negative tendencies here, which are of an objective character and are connected with the transition from extensive to intensive method of housekeeping. Specifically, the proportions in renewing the fixed production capital of the national economy and, above all, of the industry have been somewhat violated. At many machine building enterprises, especially of the Ministry of Heavy and Transport Machine Building [Mintyazhmash] and the Ministry of Power Machine Building [Minenergomash], a considerable quantity of heavy and special-design metalworking equipment has been in use for more than 30 years. At the same time, the basic part of amortization deductions is used not for renewing the fixed production capital but for capital repairs. As a result, several million people are currently engaged in capital repairs in industry alone.

Moreover, it must be stressed that the system of decentralized repairs which has formed in the country is conducted with serious deviations from the plant processing methods and already does not meet contemporary demands for the quality of repairs and expenditure of materials, diverts extensive labor resources and is not profitable for the national economy. It has been calculated that during the service life of an equipment unit, the expenditures for its capital repairs exceed its initial cost more than 1.5-fold, and the safe life of repaired equipment does not exceed one half of the safe life of new equipment. For example, after capital repairs of an internal combustion engine, the expenditure of oil increases 1.5-2 fold and the expenditure of fuel by 5-10 percent. At the same time, more than 40 percent of rolled stock, which is planned for the production of new products, is used annually in repairs of motor vehicles and tractors.

Hence follows the conclusion that the line outlined by by 26th CPSU Congress toward modernization of industrial enterprises and renewing fixed capital is a key direction in the development of scientific and technical progress today.

Thus, first of all, the question is about speediest reequipping of our technical park and reducing the periods for developing and introducing new technology. Unfortunately, it must be noted, that there are still many unsolved problems here.

Here are only two specific examples. A discovery--a nondeterioration effect during fricion, a so-called selective transfer--was registered more than 15 years ago. The question is about principally new kinds of lubricants. On the basis of this discovery more than 100 technical solutions were developed which were recognized as inventions. The new lubricants make it possible to increase the service life of machine friction units fivefold, lessen their weight and size and reduce the expenditure of lubricants twofold. However, the Ministry of the Petroleum Refining and Petrochemical Industry [Minneftekhimprom] did not adopt energetic measures aimed at mass introduction of the new method, which held out a billion ruble saving.

Another extremely valuable work--a gamut of new highly productive automatic continuous operation broaching machine tools for machining components of intricate shape. The development is protected by 26 patents. The inventions are patented in leading capitalist countries. One such machine tool replaces an automatic line of several milling and broaching machines. Its compactness and high degree of automation make multimachine servicing possible. The first experimental and industrial batch of these machine tools was produced as early as 1976. In operation they made it possible to increase labor productivity 5-9 fold. However, despite corresponding directive decisions, the Ministry of the Machine Tool and Tool Building Industry [Minstankoprom] has been unable to master their mass series production.

At the same time, the equipment which is in series production has suffered numerous shortcomings in some instances. In basic indexes: specific metal and energy content, productivity, reliability and durability--many of our machines are still lagging behind foreign analogs. This leads to considerable losses of material, fuel, energy and labor resources in the national economy. "This is why it is so important today," stresses CPSU Central Committee General Secretary Yu. V. Andropov in an article carried in the journal KOMMUNIST, "to accelerate in every possible way the rate of scientific and technical progress and to use its achievements more actively, first of all, at those sectors where labor expenditures are especially great."

The USSR State Committee for Science and Technology together with the USSR Gosplan, the USSR Gossnab and the USSR State Committee for Standards [Gosstandard] and with participation of interested ministries and departments conducted an appraisal of the technical level of machines and equipment during the 1979-80 period. As a result of inspecting nearly 20,000 denominations of machine building production, it was established that nearly one-third of it must be modernized or removed from production and replaced with more improved output. The basic causes reducing the technical level of machine building production are usually unsatisfactory provision of production with modern industrial equipment and long periods in designing and mastering new goods in production as well as limited use in designs of progressive kinds of metal products and high-strenth materials.

Many types of machines, such as road-building machines, have lower unit power compared with the best foreign analogs, and consequently lower productivity and lesser engine life. An important problem is the output of equipment especially adapted to the north and for southern regions of the country.

Agricultural machine building requires special attention. A special resolution of the CPSU Central Committee and the USSR Council of Ministers was recently adopted on this question. It is necessary to devote maximum attention to this most important sector. Here is a simple example. Let us take a tractor for instance. A good machine increases our national wealth, and the other way round, a poor machine reduces our economy's efficiency. Hundreds of thousands if not millions of such machines are produced. Therefore, poor technical solutions in mass produced agricultural machines is one of the most lagging positions in the field of struggle for efficiency of new equipment.

Many types of domestically produced instruments yield to the best foreign models in precision, automation of measuring processes and processing their results and in equipping with additional servicing devices.

At the same time, our country's scientists and engineers have developed a large number of first-rate instruments and equipment, which are based on original ideas. But these instruments are available in single specimens, and their series production has not been organized. Here the decision is left to the Ministry of Instruments Making, Automation Equipment and Control System [Minpribor].

Far from all problems have been listed here in whose solution the country's inventors and rationalizers could actively participate. Of course, the basic work must be conducted by technical services of sectors and enterprises. But much can also be done by innovators. Leading technical solutions, directed search in eliminating the weakest spots and participation in eliminating unproductive manual labor. This work, by this I do not mean ideas by the process of introducing innovations itself, is not simple. Therefore, industrial executives, trade union committees and councils of the All-Union Society of Inventors and Innovators are called upon to render concrete, businesslike assistance to innovators. There is no doubt that members of the All-Union Society of Inventors and Innovators will continue making a worthy contribution to further development of scientific and technical progress, to solving tasks advanced by the 26th CPSU Congress.

Figures and Facts

One hundred three thousand primary organizations of the All-Union Society of Inventors and Innovators unite nearly 13 million people in their ranks.

Sixty percent of rationalizers and inventors are workers.

Twenty-five thousand public design bureaus, nearly 10,000 public patent bureaus and 11,500 councils of innovators are operating in the country under the supervision of organizations of the All-Union Society of Inventors and Innovators.

Nine hundred thousand innovators studied in 1982 in various schools of young rationalizer and universities of technical creativity.

Fifty-four thousand rubles in savings were given on an average to the country by every invention that was introduced and nearly R2,000 by every rationalization proposal.

9817
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ANALYSIS OF PUBLISHED WORK ESSENTIAL FOR PLANNING OF SCIENTIFIC RESEARCH

Moscow PRAVDA in Russian 6 May 83 p 3

[Article by S. Kara-Murza, senior scientific associate at the USSR Academy of Sciences Institute of History of Natural Sciences and Engineering: "What Will Be Topical Tomorrow? The Scientific Potential Must Be Used Effectively"]

[Text] Insuring the development of a solid front of scientific research in the country does not at all mean the simple, even distribution of efforts in all directions. Of course, the first thing is to concentrate them on the most important sectors but at the same time maintain at least small cells of research in other directions. Science is dynamic, and tomorrow, problems that yesterday still seemed to hold little promise can move to the fore. By having the germ of scientific potential it is possible to develop it rapidly to a productive state. Here is a textbook example of this. In 1936 the Leningrad Physicotechnical Institute was criticized because it was conducting work on nuclear physics that "held no practical promise." The atomic problem had for several years been growing both for foreign and for Soviet science. It would not be possible to solve it quickly if the country did not have at its disposal highly qualified scientists of the appropriate disciplines.

But how is it possible to catch that moment when what yesterday seemed unimportant becomes urgent? Given the present scales of the scientific quest and the rates at which "priorities" change, the intuition and experience of specialists are no longer adequate for clarifying today's position at the leading edge of science and its comparison with research being conducted here in the country. A constant inflow of information useful for planning is essential. The foundation for this is being laid by the work of Soviet philosophers and epistemologists. In principle, the necessary technical facilities have also been developed for analyzing the enormous amounts of scientific information published by researchers worldwide.

Soviet and U.S. information specialists have developed methods for detecting within the mass of published work in the world the "clusters" of most important work that give direction to and define the nature of research in specific fields of knowledge. Machine analysis of the worldwide mass of published work (about 4 million articles each year) makes it possible to compile a "map" of the fields and directions in present-day science. It reflects not the subjective opinion of experts (who for many reasons do not always notice new directions just being born) but the actual status of research efforts.

If today we analyze these maps for previous decades it must with regret be stated that at that time some of the ripe and major directions were not noticed in good time or assessed by some of our experts. Thus, the radioimmunoassay method served as the basis for a whole range of research fields being rapidly developed during the Seventies. It opened up extensive opportunities for the diagnosis (including before the appearance of symptoms) of many diseases and endocrine disorders.

Radioimmunoassay was developed 20 years ago but it is only in recent years, after its developer received a Nobel Prize, that the method began to be used extensively in research and practical work in our country. And it is scarcely possible to make reference to objective conditions, namely the lack of instruments and reagents. The main components for assimilating the method here were available: the "Radiopreparat" test production facility at the Uzbek SSR Academy of Sciences Institute of Nuclear Physics organized in just one year the production of a standard set of materials for determination of the insulin level in the diagnosis of diabetes. Evidently the main reason was that the scientific establishments failed to evaluate in good time the promising nature of the method and the scientific directions built on its basis and were not the "stormy petrels" for the planning organs and the corresponding production facilities.

New methods like this often become the "embryos" of entire scientific directions. Lack of attention to their assimilation is not only a lagging at a given time on a given sector of research and the lowering of scientists' labor productivity. It is also a brake on the development of a progressive direction in the production cell of scientific potential.

The need has repeatedly been noted for the accelerated development of the technical base of our science. There is no doubt that the lack of up-to-date instruments lowers research efficiency everywhere. But is it merely a matter of shortages? For even if there are major delays, sometimes methods are still developed that do not require complicated equipment. Sharp differences in the utilization of new equipment are observed between individual detachments of researchers that have about the same opportunities for acquiring instruments. Finally, the intensity with which up-to-date instruments are used is frequently not great.

Thus, for all their importance, shortages of instruments cannot hide the fact that the introduction of new "research technology" is determined by a whole set of factors that remain unaltered even when the provision of material-technical backup is generous. Technological advances that take the scientific and technical revolution into the sphere of research set qualitatively new problems for the management of science. The variety of methods used grows and their interdisciplinary "transfer" accelerates.

Under these conditions the habit of traditional methods of observing the progress of "scientific techniwues" hampers foresight about the scales of their use and the value of new methods. The losses from this are especially obvious when a scientific method not only engenders a whole range of directions in research and alters the appearance of whole fields of science, but is also transferred without further development into practice (as occurred with the radioimmunoassay technique). It is not easy to notice in good time and correctly assess a method that has only just appeared. As with recognizing the growing direction of research, the complexity stems from the very nature of the way in which new concepts in science are perceived. What is needed is an "early warning" service, a special kind of patrol. Without this it is difficult to use the advantages of the planned system in the important matter of renewing the methodological and technical equipment for research.

The methods for analyzing scientific information developed by scientific epistemology are helping in tracing the dynamics in the spread of new methods in world science even in their earliest stages, and to detect which of them possess the greatest potential. Who should conduct this kind of analysis? The scientific establishments, of course, primarily the academic establishments. But in my opinion these duties cannot be fully decentralized because the system of institutes is built according to fields of knowledge, while methods often "fall" somewhere between them. Within the system of science management it is necessary to have a subdivision responsible for the analysis and prediction of the methodological facilities for science and an interdisciplinary base for coordinating this work.

It seems that the time has definitely come to discuss the question of setting up, say, within the USSR Academy of Sciences or the State Committee for Science and Technology, a cell to coordinate the preparation of analytical information. If it is combined with the methods used to compile the "maps of science" we shall obtain an instrument for "taking inventory" of the research being conducted in the country and comparing it with the status of world science.

By altering the scale of the map and increasing the resolution of information analysis we shall see the actual picture of the state of affairs in the individual fields of knowledge in graphic form, namely the clusters of key work. Having then compared this with work published in Soviet publications of the appropriate discipline, it will be possible to judge in which fields our scientists are the leaders and in which, perhaps, they are lagging. Both kinds of collectives exist in science in any country; the picture is dynamic. For rational planning it is useful to know the actual position of all our laboratories and not only the acknowledged leaders.

If it is applied to individual laboratories or to entire scientific research institutes, this kind of analysis would be an efficient "diagnostic" tool. It will show that in given fields of knowledge we not only have cases of lagging behind world science, but also in general that research is not being conducted in important directions. Thus, criticism of the work of the Scientific Research Institute of Potato Growing has already appeared in the press: it has developed varieties that are not as good as varieties that have been around for a long time. In fact, developing a new variety of a plant which has already been cultivated for hundreds of years is possible only by relying on the achievements of plant physiology, botany, virology, genetics and a number of other disciplines. But if we take the block of work published by the staff of the Scientific Research Institute of Potato Growing, then it can be seen that they have not been making use of the information from these disciplines and have lost their cognitive links with many sectors not only in world but also in Soviet fundamental science.

Use of the "map of science" and regular assessment of the leading research in the country requires from those working in science management a certain psychological readjustment and the assimilation of unusual concepts and skills. Obviously the use of results from empirical scientific epistemology as an element in the management process will also be new. In essence it is a matter of introducing new methods in the practice of research management practice. In any sphere the assimilation of something new is a complicated process. In this regard, the sphere of science is no exception. But difficulties can be overcome. Delay in resolving these problems will be much more costly.

9642
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SCIENTIFIC, TECHNICAL PROGRESS MUST BE ACCELERATED

Moscow PRAVDA in Russian 28 May 83 p 1

[Editorial: "Scientists for the Five-Year Plan"]

[Text] The intensification of social production is the main source for the economy's dynamic growth. At the CPSU Central Committee November (1982) Plenum comrade Yu.V. Andropov noted that "... reserves must be sought in the acceleration of scientific and technical progress and the extensive and rapid introduction of the achievements of science and technology and leading experience in production." Our party is orienting the collectives of scientists on doing everything necessary, in cooperation with the producers, to organically combine the achievements of the scientific and technical revolution with the advantages of the socialist economic system.

Soviet science possesses great creative potential. Its basis is the fundamental research that defines the propsects and basically new pathways of scientific and technical progress and opens up broad horizons in the study of nature and society. The possibilities for such research are growing. The "Astron" astrophysics observatory has been added to the "Salyut-7" orbital laboratory. The sector scientific research and design organizations are making a substantial contribution to the development of progressive technological processes and materials, and models of machines and instruments. Powerful scientific-production associations and technological centers are appearing that are capable of handling the entire cycle from the birth of a scientific idea to its practical embodiment.

Our scientists are increasing their contribution to accelerating the rates of scientific and technical progress. Last year alone, 3,500 models of new types of machines, equipment, apparatus and instruments and means of automation were developed. In the first 2 years of the current five-year plan the use in the national economy of proposals from inventors and rationalizers netted R13.9 billion of savings. And in the third, core year of the present five-year plan the scientists have set themselves high targets. They are participating actively in the implementation of the USSR Food Program and helping to make our economy more economic. For example, the scientific collectives of Moscow have pledged themselves to obtain R2.7 billion from the marketing of research results. Together with the producers, scientists in Leningrad have taken it upon themselves to developed and start up the production ahead of schedule of 500 new articles; in the Ukraine they have pledged to save the labor of 600,000 people in the national economy.

One of the most crucial sectors of the quest is implementation of the state scientific and technical programs for the five-year plan. To cope with them in good time and in full measure means to insure by 1985 about R16 billion of savings together with millions of tons of ferrous metals and tens of millions of tons of fuel in conventional units, and to make about 3 million people redundant for other work. The course of the realization of the programs is constantly held in view by the party and soviet organs, the minstries and administrations, and the leaders of the scientific and design establishments and enterprises and their party organizations. It is important to strive for a situation in which they are fulfilled at a high level, in accordance with precise schedules. It is this kind of approach that culminated in success during the construction of the 750-kilovolt power transmission line connecting the Chernobyl nuclear power station with Vinnitsa; it was commissioned one year ahead of schedule. During the first quarter of this year the enterprises and organizations of 21 ministries and administrations have coped with their program tasks.

However, the implementation of tasks is not going as it should everywhere. During the first 2 years of the five-year plan only 82 of the 127 programs providing for test installations and major industrial projects were handed over for exploitation, and in the USSR Ministry of Agriculture and the USSR Gossnab, not one of the 10 projects was ready on time. This year, the Ministry of the Petroleum Industry has failed to fulfill 6 out of 15, and the USSR Ministry of the Fish Industry and the USSR Ministry of Chemical and Petroleum Machine Building have each failed to fulfill five. The quarterly plan for the introduction of new equipment has been substantially underfulfilled by the USSR Ministry of Power and Electrification, the USSR Ministry of Petroleum Refining and Petrochemical Industry and a number of other sectors.

What is the reason for these failures? According to figures from the USSR State Committee for Science and Technology, in more than 40 percent of cases they are the result of untimely and inadequate supplies of material and financial resources and production capacities and limits on capital investments and contract work. One disruption in five is explained by delays in the formulation by ministries and administrations of the tasks for the executor organizations or by the fact that tasks have not even been included in the plan.

During the 11th Five-Year Plan, in accordance with the programs about 1,000 projects have to be commissioned. The ministries and administrations participating in the realization of these tasks must without delay outline and implement effective measures to insure their fulfillment in full measure and exactly on schedule.

Acceleration in the rates of scientific and technical progress depends primarily on the successes of scientific research and planning and design establishments and their well-organized joint work with the enterprises. Day after day the scientific collectives and the communist scientists must concern themselves with the maximum possible utilization of each person's potential. Up to now, far from everything needed is being done for this. Trivial work is often included in thematic plans. A considerable proportion of the sector institutes are engaged primarily in insignificant improvementsin equipment already being produced, and insufficient attention is being given to the development of ideas promising radical changes in a given technical field. According to scientists' figures, the proportion of research themes in the machine building institutes has dropped to one-third over the past 10 years. The institutes are not always able to withstand the "storm of economic contracts" and so a number of them are overwhelmed by a flow of insignificant orders. The ministries and administrations and the party committees must strengthen leadership in the scientific research and planning and design organizations and enhance the responsibility of their leaders for the topicality of themes, the scientific-economic level of work and the fulfillment of plans and tasks.

Socialist competition is a reliable lever of party influence over the acceleration of technical progress. It should be organized in such a way that scientific potential is used to the full and the creative initiative of scientific personnel stimulated. Fulfilling the decisions of the 26th CPSU Congress, scientists are reinforcing their ties with production and they are filled with a resolve to achieve new accomplishments for the honor of Soviet science and the good of the motherland.

9642
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NEW SYSTEM OF INCENTIVES FOR SCIENTIFIC PERSONNEL ANALYZED

Minsk PROMYSHLENNOST' BELORUSSII in Russian No 3, Mar 83 pp 30-32

/Article by A. Osipenko, chief of the Planning-Production Department of the Head Technological Bureau for Specialized Planning and Design of the Soyuzfermmash All-Union Production Association: "They Have Earned But Not Received"/

/Text/ The decree of the CPSU Central Committee and the USSR Council of Ministers concerning improvements in the economic mechanism stipulated a number of measures to further accelerate scientific and technical progress and to expand the output of highly effective production. These measures included transferring scientific-research, design, planning-design and technological organizations to a new system for stimulating the development, production and application of new equipment.

The goal of the new system is to establish a direct relation between the size of the economic incentive fund created at scientific-technical organizations or at enterprises and the amount of economic benefit obtained by the economy from the utilization of the scientific and technical innovations.

Machine building for animal husbandry and fodder production was one of the first sectors to shift to the new system of incentives. During this process the following task was set: substantially reduce the "research, development, initial production" cycle and increase the output of highly effective equipment by increasing the material interest of employees at scientific-technical organizations and enterprises in the end results of their labor.

What has the first experiment in the use of this system shown? It turns out that, contrary to expectations, the economic incentive funds at scientific-technical organizations have grown insignificantly, and at certain scientific-research institutes and design bureaus which operate on an independent balance, they have even shrunk.

The allotments which organizations receive from profits formed at enterprises as a result of actual reductions in production costs following the introduction of new equipment have amounted to only 8.6 percent of the total amount of the funds, while allotments from supplementary profits, actually obtained by enterprises through incentive increases in wholesale prises for new, highly-effective output and for products with the State Quality Seal amounted to 23.2 percent. And, after all, it was stipulated that these would be the main sources of fund formation. At the same time allotments arising from means included in the estimated cost of scientific-research and experimental-design work which were intended to be supplementary sources amounted to the following: 12.2 percent from guaranteed economic effect, 23.8 percent from work without economic effect, 12 percent as a form of an advance on results from work on the formulation of items for production, 4.6 percent from orders placed by enterprises and organizations of other ministries, 9.4 percent from the centralized bonus fund of the ministry and 6.2 percent from other sources.

Thus, the proportion of basic sources amounts to a total of 31.8 percent. But why did it come out this way? In order to answer this question it is essential to examine the entire process by which the economic incentive funds are formed.

Let us begin with the fact that as of today the sector uses the new system for planning the scientific-research, experimental-design and technological work (using customer orders) at only the two first links in the chain "research, development, initial production." This means that the introduction of the new equipment into mass production is taking place essentially in the old way, that is slowly. And this is why allotments of the necessary size are not being made to the economic incentive funds of the scientific-research organizations.

I will cite one such example. In 1979 the Head Technological Bureau for Specialized Planning and Design of the Soyuzfermmash All-Union Production Association (HTBSPD) developed a design and followed the established procedure in making a decision regarding the production arrangement for an attachment to carry pulverized fodder (PIM-40) on the base of the mass-produced organic fertilizer spreader (PRT-10). The rural workers have particular need for this attachement when the fodder is being harvested. Utilization of this attachment was expected to yield quite a high economic effect. According to calculations, this was supposed to amount to 348 rubles per unit.

However, in 1979 the necessary capacities to produce the attachments did not exist. For this reason production of the first 100 PIM-40 units was entrusted to the HTBSPD, which has its own experimental production unit, and to the Bobruysksel'mash Plant. The wholesale price was set at 970 rubles. An incentive increase in the amount of 45 rubles was established for effectiveness; it was to be in effect for one year. In accordance with the established protocol, 20 rubles of this increase went into the HTBSPD economic incentive fund. A simple calculation shows that the above-plan profits which the manufacturing plant received from the sale of the PIM-40 resulted in an allotment to the design-technological bureau of a total of 2,000 rubles (mass production of the attachment began only last year when the period during which the incentive increase was in effect had already ended).

One more typical example. The sector has developed this procedure: after new equipment is developed, it is included in the plan for the assimilation of new industrial products, the so-called first industrial series which (depending on the complexity of the product's design and its technological effectiveness) does not exceed 10-20 units. They are manufactured at an experimental production unit of the organizations which developed them or at the experimental shops of mass-production plants. Experience shows that mass production of these items begins a year or two and sometimes even longer after the production of the first industrial batch. As a result, this note appears in the reports: "production of the new machine has been started," although in fact it is being produced in inconsequential numbers.

At the same time the existing system for the determination of prices stipulates that if the appropriate organs approve a decision regarding the formulation of an item for production, then a permanent wholesale price must be approved as well, regardless of the number of the pieces of equipment which are being produced. However, an increase for effectiveness may be established for a period of one year, or for two years if the item is particularly complex. It is not difficult to guess that a majority of enterprise and association officials are reluctant to shift their production capacities to the manufacture of new products, especially when there is demand for the mass-production. And this is not surprising: after all, the output of new equipment does not become firmly established with a position on the products list. In this way the large-scale production of the equipment is, as a rule, delayed. And the economic incentive funds to stimulate researchers and developers are set up so that they are directly dependent on the quantity of equipment produced. Nor should it be forgotten in this regard that at the present time the main indicator for judging the work of institutes and design bureaus of industrial ministries is the economic benefit derived from the introduction of the new equipment, and it it practically impossible to obtain this benefit in the necessary amounts. And even in those cases where the enterprise has already introduced a new design, it is not interested in sharing the amount put into the bonus fund with the design organizations, or in determining their share of the benefit derived from the measure which has been introduced. And it is for precisely this reason that arguments arise between the manufacturer and the designer; these disputes frequently go to departmental arbitration for resolution.

The regulation regarding the procedure for the formation of economic incentive funds at scientific and technical organizations also stipulates the issuing of an advance, which is determined by taking into account the size of the expected effect for new or up-dated machines which, it has been decided, will be put into production. In accordance with industry instructions, the amount of the advance is included in the estimated cost of the final stage of the design process. The proportion of these allotments in the designers' incentive funds usually varies from 10 to 17 percent, and sometimes it is even more significant.

For example, in 1982 the total for the advances which our bureau received for projects being completed amounted to about 70,000 rubles of the total amount of planned incomings for the material incentive funds. This total must be taken into account during the final calculation of the size of the payments made into the bureau's economic incentive fund from the above-plan profits, which are obtained by enterprises when they produce items with the incentive increase for effectiveness. As a result, the designers find themselves in an extremely difficult position because the output of a small number of new items in the form of first industrial series does not always provide for sufficient payments to make up for the advance. However, in this case the enterprise does not bear the economic costs: the targets for fund-formation indicators were fulfilled.

A similar picture is also observed with the formation of incentive funds on the basis of payments from profits, which are obtained from reductions in production costs as a result of the introdution of new equipment and technology. Again, it is only the enterprises which prove to be in the winner's position.

As is well known, projects which provide for a reduction in production costs and the corresponding payments to the fund of the scientific and technical organization are aimed mainly at improvements in technological processes and at the reduction of material- or labor-intensity. Usually these projects are fulfilled on the basis of economic contracts, which are concluded according to a planned procedure or at the initiative of enterprises. In this regard, the financing of expenditures to fulfill them is, in a majority of cases, provided from a single fund for the development of science and technology of the industrial ministry. This is why enterprises, when they conclude agreements, try to impose upon the party carrying out the work (a scientific or technical organization) the stipulation that the source of payments to the incentive funds should be means which are included in the estimated cost for carrying out the project instead of profits which will be obtained by this enterprise from the introduction of designs into production. This approach is not in the interests of the scientific and technical organizations because the amount of the payments is limited in this case.

It should also be said that when economic contracts are concluded between enterprises and scientific-technical organizations, the technical and economic documentation for designs is provided at an extremely low level, and in some cases it is not provided at all. This means that it is impossible to determine in advance the expected effectiveness of work of a given type and, consequently, the size of the payments for one of the main sources. Nor is it possible to determine in advance the proportions of the payments for the incentive funds for the enterprise and the organization. And it is precisely these amounts and introduction deadlines for innovations which must be stipulated in the contract between the body placing the order (the enterprise) and the body carrying it out (the scientific-technical organization).

In practice, calculating the effectiveness derived from designs which have been introduced is done only on the basis of actual data. And the payments are also determined using the size of the obtained effect as the basis, but only for the payments which go into the enterprises' fund. Even in those cases where the size of the payments for the first source are calculated in advance and written into contracts, the producers frequently do not inform the scientific-technical organization about the time periods for the actual introduction of the designs and their effectiveness; they refuse to transfer to the organization its share of these means.

All of the above speaks to the need for improvements in the system to stimulate work on new equipment. What specifically should be done first? In the first place, if a decision has been made to put into production up-dated or new models of equipment, which are more effective than those already being mass produced, and an enterprise delays in producing them, it is essential to strengthen the economic sanctions for the output of the old products. In this case it is advisable to establish a strictly fixed percentage discount to be taken not from the obtained profit but from the wholesale price of the obsolete item regardless of its actual profitability.

In the second place, those enterprises which determine the acceleration of scientific and technical progress in the national economy, should include as one of the basic fund-formation indicators (along with the growth of labor productivity, the proportion of output in the highest quality category, reduction of production costs, etc.) a target for the introduction of new equipment with an indicatior of time periods, volumes and planned effect to be derived from their introduction.

In the third place, it is essential to define by either a legislative or directive procedure the responsibility of enterprises for the correctness of their accounts with scientific and technical organizations in terms of the sources and amounts of the payments going into their economic incentive funds, as well as responsibility for scientific-research or planning and design work which has been fulfilled and applied. In this way the system for the formation of economic incentives to promote the creation, assimilation and introduction of new equipment will receive legal norms.

8543
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NEEDED IMPROVEMENTS IN VUZ RESEARCH DISCUSSED

Minsk PROMYSHLENNOST' BELORUSSII in Russian No 3, Mar 83 pp 60-61

/Article by S. Vermeyenko, junior scientific associate and A. Golovachev, chief of the Scientific-Research Problem Laboratory for the Scientific Organization of Labor of the Belorussian State Economic Institute imeni V.V. Kuybyshev: "A Squeaky Mechanism"/

/Text/ During the Tenth Five-Year Plan the effectiveness of scientific research in the BSSR Ministry of Higher Education grew more than 1.6-fold, but the absolute magnitude of the effect obtained continues to remain small. The completion periods for scientific research are frequently extended (sometimes without good reason), and the results often do not reach the stage of practical implementation.

Today we continue the conversation about raising the effectiveness of VUZ science.

Here is a curious fact: hardly a single project carried out on the basis of an economic contract (of the many thousands carried out in the republic's VUZ's) has been completed ahead of schedule. The explanation is quite simple: the existing system of incentives cannot compensate for the losses of wages which the researchers incur if contract work is completed ahead of schedule. And so they do not hurry.

The bonus for "contract subjects" has become virtually a guaranteed wage supplement. For example, nearly all the people who carried out projects at the Belorussian Polytechnical Institute (BPI) in 1980 received bonuses. And what were the results of their work? This, as they say, is a secondary matter. Frequently there is a period of 5-6 years between the start of an investigation on a contract subject and the application of the results. It is not surprising that during this time the "scientific product" becomes obsolete.

Here is another example. The staff members in a number of departments at the same BPI have quite a few patents for various technical solutions in the area of machine tool manufacturing. However, these solutions have not yet found practical application.

Thus, the planning of contract research carried out at VUZ's, while it touches on only the actual research process, leaves aside the main problem of obtaining the final result, which should, according to the logic of things, determine the size of the remuneration.

Contracts regarding scientific-technical cooperation (CSTC) are the most common form of a link with production within the BSSR Ministry of Higher Education. In accordance with the CSTC's, the labor of the people working on the projects is not rewarded during the research process. In addition, both sides have the right to abrogate the contract at any moment, without risking material sanctions. The lack of material interest on the part of the people carrying out the work (and sometimes on the part of the people placing the order for the work) results from the poor material-technical provision for the research and the lack of effective monitoring of its progress. The contracts do not always stipulate measures for the introduction of the research results: out of the large number of CSTC's, one can count with ease the number of results which have actually been applied.

Nonetheless, within just the five-year period the number of contracts concluded by certain VUZ's in the republic has increased 2- or 3-fold. What is happening is that in many case a CSTC is functioning as a stage in the research, a stage which precedes the conclusion of an economic contract. Within the BSSR Ministry of Higher Education system it is the economic contract which has become the most common. For example, during the last 10 years the volume of economic contract scientific-research work in the republic's VUZ's grew by more than 4.7-fold and by the end of the five-year period it had reached 87.4 percent of the ministry's total scientific research. The volume of resources which have been used is growing as a result of an increase in the number of contracts which have been concluded (40 percent) as well as a result of an increase in the volme of financing for individual projects (60 percent).

The mechanism for directing research on contract subjects needs further improvement. This concerns first of all the methods for selecting subject matter, facilities, optimal amounts of work and time periods for the conduct of the research. Despite the fact that during the 10th Five-Year Plan the number of economic contract projects carried out on the most important subjects, increased nearly 3.5-fold, the proportion of these projects amounts to less than half of the total number. In short, the majority of investigations resolve only specific, individual problems. As a rule, these projects are short-term, characterized by small volumes, and their results do not find application beyond the enterprises ordering the work.

The results are much greater when the research is carried out within the framework of an academic-scientific-production association (ASPA). The Belorussian Technological Institute imeni S.M. Kirov, for example, has accumulated substantial experience in this kind of work. Here the effectiveness of expenditures for research carried out within the framework of an ASPA were 4-fold higher at the end of the last five-year plan than the ministry average. Let us compare another indicator. For the BSSR

Ministry of Higher Education as a whole inventions are utilized only from every second economic agreement, any topic investigated within the framework of an ASPA gives rise to one or two patent applications.

In recent years a comparatively new form of interaction between VUZ science and production has grown more and more common: the agreement to transfer scientific-technical achievements to other enterprises and organizations. This agreement usually stipulates that assistance will be given in making use of the borrowed experience. The economic effectiveness of one ruble spent in this case is higher than with a traditional economic contract. Unfortunately, at present the agreements to transfer scientific-technical achievements are "not what count" in research by VUZ scientists--their effect does not reach even three percent of the total volume of scientific-research work.

In short, the mechanism which guides the interaction between VUZ science and production is squeaky and need further improvements. Here three basic directions can be seen: an increased role for the republic's Ministry of Higher Education to play in directing science; an increased role for the scientific-resarch sectors of VUZ's and improvements in the methods for stimulating scientific research and the application of the results.

The first way presumes the establishment of a self-financing scientific association (probably on the basis of the administration of science and the administration of cost-accounting enterprises and organizations of the BSSR Ministry of Higher Education), endowed with the right to conclude contracts to conduct scientific research. For experience one does not need to go far--the USSR Ministry of Higher Education has already established this kind of association. What can this give to the republic's VUZ scientists?

In the first place, they will receive the opportunity to choose as their "customers" (and consequently, the objects of investigation) major enterprises, organizations and sectors of the industry, which, in turn, will make it possible to work on timely subject matter which has significance for a given sector as well as related sectors. There will also be opportunities to carry out comprehensive investigations planned for 5-10 years. Under these conditions wider use can be made of goal-oriented program methods of planning. In addition, basic research carried out by the VUZ will be related to the essential needs of production collectives.

In the second place, it will be easer to establish centralized funds for scientific research, scientific and technical development, material incentives, socio-cultural measures and housing construction in a cost-accounting scientific association. This will make it possible to carry out goal-oriented financing of comprehensive programs, to improve their material and technical basis and to significantly increase the effectiveness of incentives.

It would be logical to establish this relationship: if the results obtained (parameters, characteristics) are worse than those defined by the plan target, then the size of the incentive payment is reduced, and if they are better, the bonus is increased. It would then be simpler to develop a range of bonuses, which takes into account not only the effect obtained but also the time period for the application of the research results.

Finally, the time has come to increase the effectiveness of the scientific research sectors at VUZ's. At present this subdivision has become essentially an office, which is concerned only with current questions, and at the best combines the scientific plans of individual departments into a single list. At the same time such questions as the study of scientific directions and the potential of various departments remain on the aside, as do questions such as the pre-planning development of subjects, goal-oriented program planning, the scientifically grounded evaluation of research work and the development of effective methods for applying results to the national economy.

8543
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SCIENTIFIC-TECHNICAL INFORMATION USED TO COORDINATE S&T PROGRAMS

Tashkent EKONOMIKA I ZHIZN' in Russian No 2, Feb 83 pp 29-31

[Article by M. Muminov, director of UzNIINTI (Uzbek SSR Gosplan Scientific-Technical Information and Technical-Economic Research Institute), and G. Vaynshteyn, laboratory chief: "The Accompaniment of Scientific-Technical Programs"]

[Text] The progress of science and technology and introduction of their achievements into the national economy is one of the important factors of our country's economic and social development. As a rule, the chief tasks for accelerating the rates of scientific-technical progress bear an intersectorial and interregional character. A problem that can be cited as an example is the creation and assimilation of highly productive engineering processes and equipment for the production of metal powders, powder alloys of refractory compounds and, on their basis, new materials, coatings and articles needed in practically all sectors of the national economy. The very same can be said of the creation and use of effective chemical and biological means for protecting plants and animals against pests, diseases and weeds which are safe for man and the environment. The creation and broad use in the national economy of semiconductor power technology is an example of a solution to an intersectorial problem.

The resolution of intersectorial and interregional problems required certain transformations in existing forms of planning, management and organization stemming from the CPSU Central Committee and USSR Council of Ministers Decree "On an Improvement in Planning and Reinforcement of the Action of the Economic Mechanism on an Improvement of Production Effectiveness and Work Quality." There was expanded application of the system program method, the result of which was the development and inclusion in plans of the 11th Five-Year Plan of 41 special-purpose comprehensive scientific-technical programs and 129 programs to resolve very important scientific-technical problems, with the basic return from them envisaged in the following five-year plan. These programs contain an entire set of measures needed for achieving the end goals: scientific research, development and planning work, the manufacture and testing of experimental models, and construction of experimental industrial units and industrial installations with subsequent development of production and creation of additional capacities. Concrete assignments, dates and estimated cost of the work were projected. Responsible ministries and coperforming ministries were envisaged. The assignments indicated sources of financing and end results expressed in a general indicator--annual economic effect based on 1985 or 1990. And so the backbone of a program of scientific-technical progress was created for the first time in our country and supported with all material-technical resources in a state five-year plan.

It is not without interest to note that scientific-technical programs envisage the creation of over 4,000 models of new equipment and engineering processes, of which some 60 percent is planned for output already in this five-year plan. The annual economic effect from realization of the planned program in 1985 should comprise some 16.5 billion rubles.

These programs are very elaborate and of great scope. They tie together the spheres of activity of many union ministries and departments, the USSR Academy of Sciences, republic academies, and union-republic and republic ministries and departments.

For this reason the disruption of even one small assignment may lead to disruption of the program as a whole. To keep this from occurring there has to be a mechanism for management and supervision over the organization of work under the programs. The USSR TsSU [Central Statistical Administration] periodically informs the USSR Council of Ministers, the USSR State Committee for Science and Technology and USSR Gosplan about the status of fulfillment of stages and assignments of scientific-technical programs. Councils under the leading ministries, headed by the ministers, their deputies and very prominent scientists, coordinate work under separate programs, ensure observation over the technical level of innovations being created, and exercise coordination among performing organizations. All this is the so-called mechanism of vertical tracking of the fulfillment of program stages and assignments. But the territorial separation of performing organizations requires creation of a "horizontal"-regional tracking. To this end the USSR State Committee for Science and Technology decided to use the far-flung system of scientific-technical information.

The Uzbek SSR Gosplan Scientific-Technical Information and Technical-Economic Research Institute (UzNIINTI) was given responsibility for accompanying--tracking--realization of the comprehensive special-purpose programs and programs for resolving the most important scientific-technical problems by performing organizations located on the territory of the Uzbek SSR. There are over 100 such organizations. Program tracking, i.e., monitoring the fulfillment of stages and assignments on time, is carried on in close coordination with party, management and planning entities of the republic. This makes it possible, where necessary, to include other organizations in program fulfillment so as to make fuller use of the entire scientific-technical potential.

UzNIINTI began the tracking and priority information support to scientific-technical programs last year. Responsible departments were determined, a card file of performing organizations was developed and dates for checking the realization of various programs were projected.

We checked over 50 organizations carrying out scientific-technical programs on republic territory and identified those which had not begun fulfilling the assignments of scientific-technical programs which had been made their responsibility. Reasons for a lag were uncovered and measures were suggested for remedying them. There basically were three reasons: Assignments were not provided to individual organizations of a ministry and department on time; some performing organizations did not receive the entire programs, but only the designation of a project, which gives no idea about the place of the assignment in the overall plan of program fulfillment or ties with other projects; a lack of financing, cadres or material-technical resources. In the first two instances UzNIINTI specialists helped clarify all matters and in the third instance, in conformity with recommendations of USSR Gosplan and the USSR GKNT [State Committee for Science and Technology], the organizations which had not begun realization of scientific-technical program assignments were told to think about redistributing financing and scientific personnel and reorienting them to study those problems at which the scientific-technical programs were aiming.

One of UzNIINTI's most important tasks is the priority, primary, information support to comprehensive special-purpose programs and programs for resolving scientific-technical programs being realized on the territory of the Uzbek SSR.

To this end UzNIINTI departments began studying the information needs of collectives executing the programs and compiling a special card file on this basis. Based on the information needs identified, the institute's sectorial departments drew up a comprehensive long-range plan for preparation and publication of survey information designed for the period 1981-1985. During the five-year plan it was planned to prepare over 150 analytical surveys on the topics of scientific-technical programs. Some 30 such surveys were published in 1982 and over 30 are to be published this year. They systematized and scientifically generalized information about the status and development trends of appropriate fields of science and technology. In analyzing this information the survey authors suggest their own forecasts for development of a given field. This survey-analytical information is intended chiefly for the heads of various management levels as well as leading engineering-technical workers of industrial enterprises and organizations.

The subject matter of scientific-technical programs is included in the list of topics on which information service of republic party, management and planning entities is carried on in the system of selective information distribution (IRI), which is one of the most effective forms of information support. In this mode UzNIINTI specialists analyze, select and send subscribers of IRI the title and brief abstract of materials coming to the institute's information reference fund. Subscribers to the IRI system can if necessary request the primary source after familiarizing themselves with the current awareness notification.

Our institute set up priority library services for topics of scientific-technical programs. Exhibits are held of new arrivals connected with these topics. The corresponding literature is presented first of all. A note "for information support of scientific-technical programs" is made on the order blanks for this purpose. If the requested materials are lacking in the institute's information reference fund, UzNIINTI will request them from other libraries of the unified republic information reference fund or in all-union sectorial entities of scientific-technical information.

Prioritizing is provided in satisfying one-time requests for subject matter of scientific-technical programs. In the "question-answer" mode extracted information is provided of a factographic future (technical characteristics of articles, technical descriptions, technical-economic indicators and so on) and an address nature (addresses of enterprises or organizations, location of normative-technical documents and so on), as well as copies of primary and secondary documents (catalogues, articles, information sheets, specifications and so on).

We also can provide qualified assistance in obtaining patent information and conducting patent research at the facility of the republic patent documentation fund. Organizations which are executing programs are provided with primary operational access to the current world flow of patent documentation on the basis of data of the International Center for Patent Documentation. Each week organizations which conclude an agreement with UzNIINTI are provided with bibliographic information obtained from this center about published patent documents (applications, inventor's certificates, patents) and then if necessary, with copies of primary patent documents.

UzNIINTI takes an active part in arranging scientific-technical conferences, seminars, interplant schools of foremost experience and thematic exhibits, and in preparing radio and television broadcasts and announcements for publication in the press.

The tracking and broad information support of scientific-technical programs today is one of the leading directions in UzNIINTI's work. We hope that our work will help those who take a direct part in realizing these programs to cope successfully with the tasks assigned them.

6904
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WAYS TO SPEED UP PRACTICAL APPLICATION OF RESEARCH RESULTS DISCUSSED

Moscow EKONOMICHESKIYE NAUKI in Russian No 5, May 83 pp 25-29

/Article by I. Sigov, professor and doctor of economic sciences, Leningrad: "The Content of and Ways to Accelerate the Practical Application of Scientific Achievements"/

/Text/ As was noted at the 26th CPSU Congress, the conditions under which the country's economy will develop in the 80's require ever more persistently the acceleration of scientific and technical progress. In this regard, a most acute and decisive issue today involves the practical application of scientific discoveries and inventions. In theoretical studies and in practical work ever increasing amounts of attention are being devoted to the problem of applying results. However it is still viewed mainly with regard to implementation within the material production sphere of the achievements of technical and natural sciences. At the same time the task of putting into practice the results obtained from research in the social sciences, and especially in economics, is becoming no less important. "Science," the CPSU Central Committee Report to the 26th party congress emphasized, "must be a 'disturber of the peace,' by showing which sectors have given in to stagnation and delays and where the present level of knowledge makes it possible to move ahead faster and more successfully. Consideration should be given to the question of how this work can be turned into an integral part of the management mechanism."[1] This situation has a direct relation to the economic sciences, which are called upon to provide the methodological basis for improvements in the economic mechanism of society. At the same time the scientific-research institutes themselves, and especially those which are part of the system of the USSR State Committees (Gosplan, Gosstroy, Gossnab, Goskomtrud and others) act with ever greater frequency as direct units in the system for the management of society's economic and social development, units which are engaged in the preparation of initial materials for the adoption of management decisions.

The urgency of this problem requires in-depth theoretical treatment of the questions concerning the essence, spheres, forms and evaluations of the practical application of the achievements of economic sciences, as well the determination of concrete ways to accelerate this process.

The essence of practical application [in italics]. The concept of the practical application of scientific achievements has not yet received comprehensive treatment in our literature. Usually we understand the expression "introducing into practice" as meaning the practical realization of scientific results. In this regard, however, it is not always clear what kind of practice and exactly which scientific results are the subject of discussion because science has various functions in society. The function of science cannot be reduced to just the effect on material production, to participation in the creation of new equipment and technological processes. At the same time the importance of this function under conditions of ever greater transformation of production into an area for the technological application of science must not be minimized.

In evaluating the role of science and its place in society at the present stage it is essential to keep in mind at the very least three aspects: 1) the production of material benefits and services; 2) the sphere of education, which provides for the development of the individual as a person and as the main producing force; 3) the sphere of management of various processes in the functioning and development of society. Finally, we must not fail to see the role of scientific knowledge in the development of science itself as one of the spheres in the production of spiritual benefits.

A description of the place of science in society, and a delineation of its functions into "external" (aimed at production, education, management) and "internal" (aimed at the development of science itself) makes it possible to clarify the relations between the concepts of "science" and "practice," as well as the role of practical application as the implementation of scientific results in practice (beyond the boundaries of science) and in science itself.

The progress of society is characterized by the growing influence of science on all spheres of public life, including the development of material production. The division of scientific labor itself is frequently viewed as a stage in the strengthening of the links between science and production, as are the relatively clear differentiation between "pure" (fundamental) and applied research and the singling out from the latter of specific types of activities--planning and experimental design work--and of new types of scientific organizations--planning and planning-technological institutes, design bureaus, experimental enterprises, etc. From this the conclusions is drawn that at the present time we view with increasing clarity the outline of the processes, which can be characterized as the further qualitative development and intensification of the scientific division of labor--the introduction of the results of scientific research into social practice.[2] With this formulation of the question, application (or "introduction") is viewed essentially as a definite stage in the division of labor--the development of a special "application" (or "introductory") sphere. It is not difficult to note that in this case the idea of "application" (or "introduction") is limited only by utilization of scientific achievements in the sphere of material production. In addition, we must not lose sight of the fact that application can take place and does take place at all stages of scientific research, and not only at the final stage, when there is the question of implementing results at the production unit. The characterization of application (introduction) as only a special sphere of scientific activity, which is located at the junction between scientific-technical innovations and their industrial assimilation, can lead to a restrictive interpretation of the concept of application (introduction), especially with regard to the area of the social sciences.

To provide a more comprehensive description of the essence of the practical introduction of scientific achievements it is fruitful to consider this process as a definite area in the relations between the producers of scientific output in all of its forms and its consumers in all spheres of human activity. In this regard there arise problems of the particular organization and regulation of relations between producers and consumers of scientific output, the establishment of their rights and obligations and the determination of forms for the participation and interest of both sides in the practical application of scientific output.

With regard to scientific-research organizations of a technical type the problem is already at the stage of practical resolution: at the present time they are being shifted to a cost-accounting system for the organization of work to create, develop and introduce new equipment on the basis of orders (contracts). This system creates conditions for the bilateral accounting and monitoring of the application of projects which have been carried out. With regard to scientific research in the area of the social sciences, and especially economics, the question of establishing a system for the practical application of the results is acquiring ever greater timeliness.

The spheres and forms of application /in italics/ A more successful organization of work to implement the achievements of economic sciences in practice requires a clear demarcation of the spheres and forms for their application. Under the spheres of application /in italics/ it is possible to include: a) science itself as a sphere of spiritual activity whose development presupposes more and more new data which expand people's ideas about the world which surrounds them; b) the sphere of education and indoctrination which requires systematic, continuous training and the updating of educational curricula and programs, academic-methodological materials, which generalize the scientific knowledge and experience accumulated in various areas; c) the sphere of management, in which ever greater use is made of the materials and recommendations which are prepared by scholars in the social sciences and which represent the results of scientific investigations; d) the production sphere, in which use may be found for the results not only of natural and technical sciences, but also results from the social sciences (for example, the formulation of a social order for the development of scientific-technical progress in the direction of changes in the content as well as the conditions of people's labor, daily life and leisure).

Along with the spheres of application one should differentiate the forms for the application of scientific research results in the area of the economic sciences. It seems to us that these can include: a) scientific publications which contain new theses and conclusions in the respective areas of the sciences; b) the publication of textbooks and other academic materials; c) participation in the preparation of various types of management decisions (decrees by directive organs, methodological recommendations for the development of the country and the regions, as well as normative documents, etc.); e) the implementation of specific projects in the area of production, labor and management organization for various production nuclei of the national economy.

Evaluation of application /in italics/. The evaluation of the practical application of achievements in the economic sciences has great theoretical and practical significance with regard to their various spheres and forms. The question consists primarily of who can and should carry out this kind of evaluation. It is obvious that there cannot be just one single answer.

The evaluation of newly published scientific results constitutes one of the most current problems. The very fact that scientific research results have been published by no means provides evidence that these results are new and significant. In this regard care in selecting those scientific works which are published becomes of ever greater significance. At the same time it is essential to create a system to review them, a system which includes a mandatory expert evaluation of the content and significance of new scientific results, and which is similar to the one currently used to judge doctoral and candidate dissertations.

Textbooks and other educational aids, as well as the development of educational curricula and programs, constitute a most important form for putting scientific output into practice. In our opinion, objectivity in the evaluation of this form of application can be significantly increased by introducing a system of competitions for all educational literature which is planned for publication.

The task of evaluating the practical application of the achievements of economic sciences in the sphere of managing society's development is extremely complex. In this sphere application is frequently evaluated on the basis of scientific reports and notes about reports which are sent to party, soviet, trade union and economic organs; these reports and notes, as a rule, are for the purpose of improving various aspects of the life of society. However, these materials frquently are so general and at the same time so one-sided in nature that they cannot be used directly as the specific content of any management decisions. Not the least cause of this situation is the lack of direct contacts between the producers and consumers of scientific output, the poor participation by the consumers in the placing of an order, or the preparation and discussion of materials of this kind.

The evaluation of application in this sphere which is carried out on the basis of the degree to which the proposals contained in the report notes are implemented through various management decisions is more objective. In this connection it is worth paying attention to the formulation of the question concerning the quality of the management decisions themselves, the final criteria for which are the practical results achieved on the basis of those decisions.

Finally, careful study has not been given to the issue of evaluating the results of scientific-economic investigations directly in the production sphere. In this case the discussion concerns to a significant degree the realization of the potential of the economic sciences with regard to scientific and technical progress; it also concerns their role in the determination of the "order" placed by society for the development of scientific-technical progress and in the socio-economic appraisal of the scientific-technical innovations which are being developed, from the viewpoint of their economic effectiveness, as well as from the viewpoint of their influence on the content and conditions of labor, daily life, leisure, the environment, etc.

Ways to accelerate the practical application of the achievements of the economic sciences /in italics/. Acceleration of the application (introduction) process depends on a number of factors, especially on the quality of the research itself, and on the degree to which it is "ready" for introduction into practice. And in turn, the quality of research depends largely on the level of its organization.

At present it is becoming more and more obvious that the quality of research which is being conducted and the opportunity of bringing it to practical application in the sphere of management and production depends largely on providing a comprehensive investigation of the object or phenomenon under study. For example, an investigation of the socio-economic development of the country's major cities, which is being conducted by the USSR Academy of Sciences Institute of Social and Economic Problems, very quickly showed that it was necessary to include specialists of the most diverse kinds: economists, philosophers, demographers, geographers, historians, and others. The All-Union Scientific Conference on "The Socialist City as an Object of Research and Management," which was held in Leningrad in October 1981, adopted recommendations which emphasized the importance of ensuring an inter-disciplinary comprehensive approach to research on cities, as well as increasing the practical orientation of these studies toward improvements in the management of city development. And in turn, it is difficult when working to ensure that studies are comprehensive in nature to overestimate the significance of the following: coordinated plans, attempts to improve the quality of the work involved in the studies, a clear determination of the rights and obligations of the basic personnel performing the work and their co-workers, and consolidation of the role of head organizations in evaluating the fulfillment of plan targets by organizations which are working along with them.

For improving the quality of research there is no less significance in the establishment of a system to supply these studies with all types of social-economic information, including statistical, sociological, scientific-bibliographic and documentary information. Moreover, in raising research effectiveness decisive significance is to be found in the creation of a statistical data base for carrying out problem-oriented investigations, as well as in the establishment of a system for obtaining these data from central and local statistical organs, as well as a procedure for storing and utilizing this information.

The establishment of extended direct connections between the developers of scientific output and its consumers has great significance for the acceleration of the application process. An example of this can be seen in the joint work by the USSR Academy of Sciences' Institute of Social-Economic Problems and the Main Architectural Planning Administration of the Leningrad Gorispolkom in the application of mathematical methods and computers to the practice of city planning for the development of Leningrad. The work has been carried out over a period of many years, and its methods are being improved constantly on the basis of an analysis of actual experience.

A definite inadequacy in the existing system for the application of results from studies in the economic sciences lies in the fact that the application work usually ends when one particular organization receives an appropriate act or when there is an evaluation of the potential effect to be derived from the possible application at all organizations of the same type. In this regard it is advisable to develop an information system about projects which have actually been carried out and about the organizations where the project results have been applied in order to make wider use of results obtained throughout the country.

The fundamental resolution of the problem of accelerating the practical application of achievements in economic sciences may require a significant restructuring of the existing system for planning scientific research and the compilation of coordinated plans, as well as the early establishment of the rights and obligations of the people responsible for carrying out the work, as well as those working with them, and the organizations placing the orders for the work. In order to achieve a resolution of this kind it is also essential to increase the material and moral incentives for those participating in scientific activities for the purpose of increasing their interest in the final results of those activities.

FOOTNOTES

1. "Materialy XXVI s"yezda KPSS" /Materials of the 26th CPSU Congress/, Moscow, 1981, p 43.

2. See L.S. Glyazer, "Science and Production: Stages in the Formation of of the System," EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA, No 11, 1979, pp 24-27.

8543
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IMPROVEMENTS IN DISSEMINATION OF PRODUCTION EXPERIENCE PROPOSED

Moscow EKONOMICHESKIYE NAUKI in Russian No 5, May 83 pp 29-32

/Article by A. Gorelykh, docent and candidate of economic sciences, Ternopol': "Advanced Production Experience and Scientific-Technical Information"/

/Text/ The opportunity for the practical repetition of the best experience is one of the most important principles in the organization of socialist competition put forward by V.I. Lenin. The discovery of the best work methods represents an important stage in the achievement of the goal of socialist competition--the general advancement of the economy and the comprehensive development of the individual. According to V.I. Lenin's ideas, when the results of socialist competition are summed up, the best collectives and individual workers are determined, and as a rule, they are the ones who have the most advanced experience of production. This experience becomes available to all those who compete, and it enables them to raise themselves to the level of the best within a period of time. Because this process is continuous, it ensures constant progress in production. According to some estimates, utilization of the best experience requires only one-fifth to one-seventh of the expenditure for labor in comparison with independent development of the same work.[1] But there is not only the matter here of the economic effect but also the social effect, which is obtained when the newest achivements in the improvement of working conditions, in the upgrading of skills and the development of employee initiatives are disseminated.

The state system of scientific and technical information has a very important role to play in disseminating the best experience. In the Ukrainian SSR alone the annual economic effect derived from the introduction of advanced production experience is at the present time, according to available calculations, approaching 1.3 billion rubles; this factor results in a 1.2-1.4 percent increase in labor productivity in a year, i.e., this factor accounts for approximately 20 percent of the increase in labor productivity.[2] However, the existing situation with regard to the dissemination of the best experience can by no means be considered satisfactory: there are great unutilized reserves; the work is poorly set up at many enterprises and associations. As a result, socialist competition does not come to its logical end: a significant portion of the best experience is not utilized.

The USSR is the first country in the world to provide scientific and technical information through a single state system (SSSTI), which has developed at an especially rapid rate in the past decade. No capitalist country has a national system for scientific and technical information. The SSSTI includes 10 all-Union and 86 central sector organs of information, it has nearly 400 regional organs, and 15,000 scientific-technical information organs at enterprises, organizations and other institutions. The establishment and further development of this system has been advisable and essential. The constantly increasing flow of scientific and technical information results in the growth of expenditures for this information throughout the world. Statistics confirm that the number of scientific publications in the world is doubling every 5-8 years, and the number of scientific and technical journals is doubling every 15 years; the amount of time which a specialist needs to review information about all the new developments in his own field of knowledge is now approaching one-third to one-half of the working day. In the opinion of Academician A.I. Berg, "in relation to the national income, the volume of information must increase by a factor of two and even more rapidly."[3] This means that for a two percent increase in the national income it is essential to ensure an initial increase in information amounting to a minimum of four percent. It can be assumed that approximately the same ratio is maintained between the growth of economic effectiveness from the application of the best experience and the scientific-technical information which provides for this growth. Further, the information materials must meet the following requirements: they must be reliable, brief, complete, new, clear, timely, useful, communicatively effective and purposeful.

The SSSTI which has been created in the USSR has attained some well-known achievements in the work to meet these requirements, as in all of its activities. But there are also many inadequacies here. The main ones, which were discovered in an analysis of the work of the central sectorial, territorial and primary organs of scientific and technical information, are these: there are frequent delays in getting information to the consumer, or the information is received in incomplete form or in excessively large amounts; there are frequent instances of work duplication by various scientific-technical information organs which do not work in a well-coordinated manner; many scientific-technical information organs are not good at discovering, studying or publicizing the experience of the best enterprises, outstanding workers or production innovators.

For example, at the production association of the Ternopol' Combine Plant imeni 26th CPSU Congress (TCP), where scientific-technical information work is carried out on a relatively high level, the plant was successful in selecting for its own needs only 73 units of information materials (informational letters and lists, express information etc.) out of 5,074 units which were received during 1981. Almost 93 percent of the information turned out to be either not relevant to the association or not new or merely a duplication of something else. In this case there is frequent work duplication by the L'vov Scientific Technical Information Center and the sector center for scientific-technical information of the Central Scientific Research Institute of Information and Technical-Economic Research on Tractor and Agricultural Machine Building (TsNIITEI traktorse'mash).

As for the discovery and dissemination of the best experience, let us take as an example the Ukrgazprom All-Union Industrial Association, one of the best associations of the USSR Gas Industry with regard to the utilization level for the best production experience, scientific-technical information projects, efficiency improvement and inventions. According to data from the 1980 investigation which we conducted, the people here made use of 3,869 efficiency proposals and 90 inventions; however, the technical community was informed of only 43 of these, about those which had been reported in the industry's collection entitled "The Petroleum and Gas Industry" and in informational leaflets for the exchange of information throughout the industry. In addition, 22 inventions were described in the annual collection of the best efficiency proposals of the all-Union Production Associations which are distributed mainly within a department. Articles (113) published in information publications and presented at exhibition displays (30) duplicate to a significant degree the above mentioned best efficiency proposals and inventions. Moreover, some structural subdivisions of the All-Union Production Association did not send any information at all about outstanding experience to scientific-technical information centers. Thus, in the final analysis it turns out that according to our investigation, only about two-three percent of the technical innovations which are the objects of outstanding experience have information published about them. It is understandable that this leads to a repetition of the work put into solving these problems.

Of course, it is necessary to take into account the fact that not all of the technical innovations are objects of outstanding experience with broad significance; some of them are effective only under the specific conditions of a given enterprise or shop. Nonetheless, the proportion of objects of the best experience is quite high. A selective analysis established that they amount to 85-90 percent (in terms of annual economic effect) of the efficiency suggestions, but only six percent of inventions.[4] (As a rule, the majority of inventions are utilized in scientific and planning work.)

There are several reasons for the emergence of the above-mentioned inadequacies in the work of the scientific-technical information system.

Firstly, the number and skills of scientific-technical information employees are inadequate, especially in the primary units of the system (at enterprises and associations), and this makes it physically impossible to provide in sufficient measure for the "ascending flow" of information, as well as to refine according to requirements of purpose and time the information of the "descending flow." At enterprises and associations the scientific-information system operates mainly on a volunteer basis.

At the Ukrgazprom Association, for example, 0.06 percent of the industrial-production personnel are concerned with scientific-technical information as part of their duties, and fewer than 0.01 percent do not do other work as well. Of course, under these conditions one cannot talk about any kind of specialization according to types of activity. In accordance with the recommendations of the USSR State Committee on Science and Technology,[5] the number of information employees at industrial enterprises should comprise 1-2 percent of the total number of engineering-technical workers, i.e., in the Ukrgazprom Association they should number approximately four times more than at present.

In addition, the existing staff of scientific-technical information employees does not possess specialized training to work in the area of information science and the organization of information activities; consequently they cannot carry out these activities in a qualified manner. Plans for training and upgrading the qualifications of scientific-technical information personnel through the Institute for Upgrading the Qualifications of Information Workers (IPKIR) are not fulfilled as a rule. In the association under consideration by us only one engineer was trained by the IPKIR in the entire Tenth Five-Year Plan. Attracting the technical community to work in the area of scientific-technical information in place of staff employees does not provide the necessary effect.

In addition to adequate staffing provisions, the scientific-technical information service needs technical means, especially up-to-date duplicating equipment and special materials. Scientific-technical libraries with staff employees are also necessary; many enterprises and associations do not have these at present. At the present time opportunities for the scientific-technical information service of enterprises are extremely limited, as a result of which outside requests for technical documentation on advanced experience are far from satisfactorily fulfilled, and frequently they go unanswered.

Secondly, another reason for the imperfect operation of the information services is to be found in the lack of generally accepted regulation or a legal foundation for resolving questions concerning the collection and dissemination of information about innovations,their production application (what kind of information to collect, where to send it, in what form, by when and who has the responsibility for it), the determination of economic effectiveness and material incentives, i.e., regulations or procedures similar to those which exist in the efficiency and invention service. It is thought that the time has come for similar regulations in the area of scientific and technical information: local systems for material incentives, which have been established at certain enterprises and which have resulted in a significant upswing in the work of searching for and applying innovative practices, confirm the soundness of this judgement.

For example, the above mentioned TCP Production Association has had in operation since 1975 regulations which were developed by analogy with those operating in the efficiency and invention serivce to encourage employees who demonstrated initiative in the utilization of the best experience, borrowed from the scientific-technical information materials. Bonuses are given for investigating and contributing to the production application of innovations. The total amount of the reward depends on the annual economic effectiveness obtained from the introduction of the innovations and is calculated in the following amounts.

Yearly Savings, in rubles	Reward
Up to 100	10
From 100 to 500	2 % +15
From 500 to 1,000	2 % +20
From 1,000 to 3,000	2 % +25
From 3,000 to 5,000	2 % +30
Above 5,000	150

For the introduction of measures which do not yield savings, but which provide some other kind of positive effect (an improvement in working conditions, safety equipment, etc.), a reward in the amount of 10 rubles has been established. In addition to the general scale, the regulations contain a scale for the distribution of a reward (in percentage terms) among the employees of various shops or departments, if their work was joint. The reward is paid from the production cost savings and from means stipulated by the estimate of expenditures for scientific-technical information. The introduction of the regulations has contributed in significant measure to the upswing in the work to utilize the best experience. In 1981 a total of 1,252 rubles was paid out in rewards.

Thirdly, there is no guarantee that information which comes into the scientific technical information system and which finds a consumer will, however, be introduced into production. Many enterprises, even some machine building enterprises, do not have an experimental base, specialized workshops or sectors where models or prototypes based on efficiency suggestions taken from the scientific-technical information could be made, and consequently it is difficult for these enterprises to manufacture new products. Thus the final stage in the utilization of the best experience sometimes becomes the most complex. For example, at the Krivoy Rog Kommunist Mining Equipment Plant 24 innovations selected by the scientific-technical information service with regard to the plant's needs, were not included in the 1981 plan by a single subdivision of the plant, because it has no experimental base, nor are there any incentives which would make other subdivisions undertake this work.

All three of the above-named reasons for the inadequacies in the scientific-technical information work have a common origin. The problems of disseminating the best experience have much in common with the general problems of scientific-technical progress and result, as Academician V. Trapeznikov notes, from an underestimation of the value of new technology and an incorrect determination of its place in the general "scale of values."[6]

The structure and organization of the SSSTI are constantly being improved. The links between individual units of the system are being improved, and attempts are being made to overcome the departmental separation of sector organs of scientific-technical information, which is the main cause of duplication in informational work. Particular hopes are being placed on automated scientific-technical information systems, which started to be established in the 70's and which now number more than 50 in the USSR. The mechanization of information search and processing on the basis of the computer is one of the main ways to reduce the demand for information workers, and to speed up the dissemination of information, as well as improve its quality. The volume of services and the number of subscribers for selective disseminatinn of information is increasing, and this also increases significantly the quality of the information services for collective and individual consumers.

It should be emphasized that the problems touched upon in this article can be fully resolved only with a comprehensive approach to the utilization of the best production experience. For example, it is hardly advisable to increase the number of employees in the scientific-technical information service, without taking measures to increase the capital-labor ratio of the service. And in turn, improving and strengthening the scientific-technical information service will yield only an insignificant effect, if the technical innovations borrowed from scientific-technical information are not produced by anyone in any place. The ministries and agencies must show concern for that problem in particular.

It is essential to note as well that the problems of disseminating the best production experience have arisen as a result of the structure and practice of economic management which has developed, and as a result of the developmental and economic features of the USSR. Hence many of these problems are inter-sectorial, and they appear in one degree or another at every enterprise and at every organization.

FOOTNOTES

1. See, for example, V.N. Goncharov, "The Economic Effectiveness of the Best Production Experience at Industrial Enterprises" in the collection Puti povysheniya effecktivnosti vnedreniya peredovogo proizvodstvennogo opyta v narodnom khozyaystve USSR v svete resheniy XXV s"yezda KPSS" /Ways to Increase the Effectiveness of the Application of the Best Production Experience in the Ukrainian SSR in the Light of the 25th CPSU Congress/, Voroshilovgrad, 1978, vyp 2, p 47.

2. See B.N. Serednenko, "Rasprostraneniye peredovogo opyta na predpriyatiyax USSR" /Dissemination of the Best Experience at Ukrainian SSR Enterprises/ Kiev, 1977, pp 17-18.

3. Cited according to O.I. Bobkov and Ye.Ye. Sokolov, "Izucheniye i vnedreniye peredovogo proizvodstvennogo opyta" /The Study and Application of the Best Production Experience/, Moscow, 1975, p 48.

4. See B.N.Serednenko, "Ukaz. soch." pp 11-12.

5. See: "Tipovyye polozheniya ob organakh nachno-tekhnicheskoy informatsii" "Standard Regulations Concerning the Organs of Scientific-Technical Information," Moscow, 1978.

6. See: V. Trapeznikov. "Incentives for Progress," PRAVDA, 20 March 1980.

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COST ACCOUNTING AND ORGANIZATIONAL STRUCTURE OF PRODUCTION UNITS DISCUSSED

Moscow EKONOMICHESKIYE NAUKI in Russian No 5, May 83 pp 32-36

/Article by V. Tarasov, deputy director of an auto-assembly plant for economic questions, city of Zainsk, Tatar ASSR: "The Organizational Structure and the Cost Accounting of the Primary Production Unit"/

/Text/ At the present time, when the country is being shifted to an intensive path of development, it is especially important to determine the principles for the construction of effective organizational forms for the management of production. When working to achieve this task there are, in our view, two basic elements in the economic mechanism of the primary production units which must be used as a foundation: the organizational structure and the internal system of cost accounting. The question of finding the best management forms comes forward, in our viewpoint, as a question primarily of the relation and interdependence of the two named elements in the process of functioning by the economic mechanism.

And how does the problem under consideration look in practice? If, for example, responsibility for the observance of planned expenditures for production output is put upon the production unit, this requires the establishment of the appropriate organizational conditions: services capable of exerting an influence on the level of the respective elements of expenses must be introduced into that unit. On the other hand, it is obvious that if all functions for the management and servicing of production are carried out in a centralized manner--at the level of the enterprise's management apparatus--the unit cannot be given complete responsibility for the state of the cost-accounting economic indicators of its operation. In this case, which is more correct--to "tune" the economic management to the organizational forms or vice versa? This or a similar question arises in one form or another at all evels of management in the national economy, and it arise most acutely in the primary production unit. Hence we draw the conclusion that the problem of the relations between the organizational structure and the internal cost-accounting is the most important one for the establishment of effective management. The resolution of this problem is possible only on a firm, politico-economic basis, i.e., on the basis of study devoted to the relations among people in the process of material production.

Where to begin? The answer is indisputable: with the interaction between workers as participants in certain labor processes, i.e. with the very lowest stratum of relations,[1] the stratum which develops in the process of producing material goods. Here there are processes of direct, technological interaction among people taking place; they manage the means of labor and thus, specifically, form the processes of the concentration, specialization, combination and cooperation in production. The relations which we are now talking about can be called technical.[2] Their influence on the organizational structure of production units can be traced without difficulty. For example, at enterprises which are being built today, the equipment being installed is so complex that it can be repaired and serviced only at a centralized repair shop. Its sectors must be specialized according to types of equipment (specialized installation, aerial push conveyors) or by systems (electronic, electric, hydraulic, and others). It is obvious that by themselves technical relations in the primary production unit, if they are isolated from the entire system of relations as a scientific abstraction, virtually do not depend on relations of property in the means of production. This was shown convincingly by N. Mal'tsev, in particular.[3]

Let us continue. As an analysis of the existing structure for the management apparatus of domestic and foreign enterprises shows, they are dependent on a completely defined set of activities for the management of production, a set which must be carried out to ensure the production process, regardless of the form of property. Here we are dealing with those types of management activities, which can be included under the technology of management (technical preparation of production, the operational management of production, material-technical supply, the selection and training of personnel, etc.). It seems to us that K. Marx was proceeding from the existence of this kind of function when he wrote that "any directly public or joint labor, which is carried out on a comparatively large scale, needs management to a greater or lesser degree."[4] And there is reason to cite in this connection the following, more definite pronouncement by K. Marx: "As the labor of a capitalist (the labor of management--V.T.) is determined by the process of production not only because this process is capitalistic, consequently this labor itself does not disappear with capital; inasmuch as it is not limited to such a function as the exploitations of someone else's labor, consequently it is determined by a form of labor such as public labor, by the combination and the cooperation of many for the achievement of a common result; this labor is as completely independent of capital as this form itself is independent of it once it has thrown off the capitalist shell."[5] There are no grounds for thinking that this labor, which does not disappear with capital and is completely independent of it for some reason ceases to exist under socialism. And if managerial labor is retained, then, it is natural that those relations which develop within it also exist.

The forms of rule, as K. Marx noted, depend on the forms of production.[6] To the degree that management relations which depend directly on the degree of technical improvements in production and the opportunities which follow from this for the cooperation and combination of labor are singled out from the entire system of relations existing in production and abstracted, it is correct to talk about a special group of relations which arise among people in the process of material production. These relations can be called organizational relations or relations of "pure" management.

As an analysis of the functioning of the primary production units shows, the technical and organizational relations are closely related; moreover, the former serve as the basis for the latter; they determine their essence and nature. In this regard we will cite one example. In the sphere of technical relations, public labor expenditures are increasing significantly; they take the form of fixed capital as a result of the fact that parts for machines and equipment are becoming substantially more complex and much higher quality materials are used to manufacture them. These changes inevitably are reflected in the relations of the production organization sphere; they require the centralization of functions for scientific-technical development work and the establishment of a single fund for the development of production.

The close interconnection of these two groups of relations between the participants of public production (including, of course, socialist production) make it possible, as we understand it, to consider them in an overall manner under the heading of organizational-technical relations. As a separate subsystem they possess two distinguishing features. On the one hand, they are larger than any others and depend on the technological interaction of the elements of production forces, and on the other hand, they are comparatively few or do not depend at all on relations of property in the means of production, i.e., on the socio-economic relations, which are a special subject of political-economic study.

At the same time there is no doubt that the latter group of relations exerts a definite influence both on the technical structure of production and to a greater degree on its organization. In this regard we will point out that the primary production unit is the site of management activities which are common to both capitalism and socialism, but it is also the site of management activities which are characteristic only of capitalist enterprises (for example, efforts to maximize the intensification of labor and the organization of advertising) or only of socialist enterprises (for example, the organization of socialist competition). In this way, the singling out of the complex of organizational-technical relations does not mean any downgrading of the role of socio-economic relations; the discussion conerns only intelligent consideration for both.

It seems that a realistic, practical study by political economy of that circle of relations which is its subject requires continuous dependence on the discovery of processes and trends in the development of organizational-technical relations. Otherwise it is impossible to reflect that content of which production relations are a form, i.e., the process of the forward development and interaction of the elements of production forces.

In an analogous manner, it is clear that a division should be made within the relations of economic management which, in the primary production unit, find expression in the systems for the organization and remuneration of workers' labor, as well as systems for the planning and monitoring of cost-accounting indicators, material labor incentives, etc. Let us take note, for example, of the brigade forms of labor organization and the development of the bonus-time payment system for the remuneration of workers; at the present time these are becoming more and more common. These are changes of a socio-economic nature. But they do not take place of their own accord; they are produced primarily by the increasing complexity and "conveyorization" of the tools of labor, and by the increasing specialization of production at enterprises which apply modern technology to the manufacturing of goods.

If we try to generalize what has been said above, there emerges the following model for the inter-relations which develop in the primary production unit among the elements of the production forces. The "lowest" stratum is the technological interaction of employees and the tools of labor, and the next stratum lies in the processes of specialization, concentration, cooperation and the combination processes of production. Somewhat "higher" is management, which in any case must exist to provide for the production process.

It goes without saying that when constructing this model of the hierarchy of relations we do not have in mind emphasizing only one-sided (from the top down) influence of the respective strata on each other. Because they interact in a manner similar to the relation between form and content, the upper strata inevitably exert a reverse influence on the lower strata. However, continuing our analogy, top-priority attention should be directed toward the fact that form always remains secondary to content, and with regard to the process of public production the latter always form the productive forces of society.[7]

In the light of what has been set out above it seems possible to reveal the general theoretical basis for the organizational structure and internal cost accounting, their relationship and interaction in the process by which the economic mechanism of the primary production links functions.

It is obvious that from the positions of production management science the technical relations in the primary production units find expression in the links and relations which determine the production structure. The latter reflects the division of labor in the actual production process and in this way it characterizes the activities (labor) of the workers at the enterprise. As for the organizational relations, they are manifested, in particular, in the structure of the management apparatus. Thus, the organizational structure of the primary production unit reflects objectively the resulting unity of the complex of technical and organizational relations, which always exists under conditions of dominance by any given relations of property in the means of production and which depends on these relations. The organizational structure is an element of the economic mechanism which can be developed relatively independently.[8]

The situation is more complex with cost accounting. We shall look first at the viewpoints which exist today in the economic literature with regard to the essence of cost accounting, both as an economic category in general and as cost accounting within a production unit in particular. Given all the diversity of views on this problem, it is possible, we think, to define quite clearly three fundamental positions. According to the first of these, planned relations constitute the essential basis of cost accounting as a specific category of the communist method of production. The essence of the second position is that commodity-money relations lie at the basis of cost accounting as a phenomenon specifically characteristics of socialism alone. Adherents of the third position think that planned relations and commodity-money relations in their conflicting interdependence lie at the base of cost accounting.[9]

We consider the third of these positions to be the most well grounded. Without going deeply into the essence of this special question (that is not the purpose of the present article) we shall limit outselves to the following. In the first of these positions cost accounting relations are essentially reduced to planned relations, and cost accounting is reduced to a method for conducting an economic unit in a planned manner. If we talk in terms of form, then here the same economic phenomenon is described by various terms ("planned" and "cost accounting"); as for content, it completely negates the objective nature of the existence--at a definite stage in the development of a socialist economy--of commodity-money relations. It seems that there is no need to prove the practical (as well as the theoretical) groundlessness of this negation. The authors who adhere to the second of these positions relate cost accounting only to the cost categories. In the first place, with this approach, a socialist economy is described essentially as a market economy; in the second place, it is accepted that the effect of cost accounting as an economic method is limited only to a phase of socialism (but this idea seems far from axiomatic); in the third place, and this is the main point, it is fundamentally incorrect to emphasize the dominant role of commodity-money relations, and even more so if the discussion conerns the stage of developed socialism.

These weaknesses in the two viewpoints, we think, confirm even further the correctness in this question of those scholars who think that the concept of cost accounting reflects the entire complex of economic relations in a communist, public-economic structure the basis of which is provided by planned relations given the existence of commodity-money relations over some historical period. It is understood that at various stages in the development of our economy the influence and significance of these two dialectically opposite basic elements of production relations have been and will be different.[10]

In the light of what has been said above, the following conclusion can be drawn: the internal cost accounting of the primary production unit is an economic method of management, which is based on a synthesis of the developed relations of a planned nature and substantially weakened commodity-money relations, and as a system it possesses its own special features. The weakness of commodity-money relations here is determined objectively by the high level of collectivized production. Further, the higher the level of specialization, concentration and cooperation in basic production, the higher the degree of centralization in the management and auxiliary functions and thus the stronger the influence of the planned relations and vice versa. An analysis shows that, in the first place, the intra-production unit cost accounting is--with regard to the organizational structure--the dependent element of the economic mechanism, which must be "tuned" to it in a definite manner. In the second place, it is possible to utilize the experience of foreign enterprises when constructing it.

In general, the internal organizational-economic mechanism of the primary production units is developing according to the following extended system. The increasing complexity of the tools and objects of labor and improvement in their qualitative characteristics determine the development of the processes of specialization, concentration and cooperation in production, and this, in turn, leads to changes in the organizational structure. And this is an objective process, which should be taken into account in theory and in practice.

FOOTNOTES

1. K. Marx assumed the correctness of the structural articulation of this system of relations. See K. Marx, F. Engels, "Soch." /Works/, 2d edition, Vol 46, Part 1, p 46.

2. In the literature these relations are also given other names; however, this is not a matter of terminology. It is important that the very existence of these relations is generally recognized. The debate centers on whether they should be the object of the study of socialism's political economy or not. For this see, for example, N. Chormanov, "The Subject of Political Economy: the Gnosiological Aspect," EKONOMICHESKIYE NAUKI, No 2, 1980.

3. See N. Mal'tsev, "An Analysis of the Collectivization of Labor and Production," VOPROSY EKONOMIKI, No 12, 1973.

4. K. Marx,and F. Engels, "Soch.," 2d edition, Vol 23, p 342.

5. K. Marx and F. Engels, "Soch.," 2d edition, Vol 25, Part 1, pp 425-426.

6. See K. Marx and F. Engels, "Soch.," 2d edition, Vol 46, Part 1, p 24.

7. In the analysis of relations cited here the author has used to a significant measures the ideas and concepts of the apparatus which were developed by L.I. Abalkin. See, for example, L.I. Abalkin, "Dialektika sotsialisticheskoy ekonomiki" /Dialectics of the Socialist Economy/, Moscow, 1981.

8. A persuasive example is to be found in the experience of the Volga Automobile Plant. In the system of management, production and labor which operates effectively here the experience of the largest capitalist car-building firms is taken into account fully.

9. V.N. Tel'nov substantiated this viewpoint earlier and more accurately than others. As long ago as 1966 he wrote: "Under socialism, planned and commodity-money relations represent a single (contradictory) whole. While penetrating each other, they are modified into the category of "cost accounting" (khozraschet), forming its substance" (V.N. Tel'nov, "The Bases of Economic Theory and the Practice of Cost Accounting," Saratov, 1966, p 106. This position was confirmed by this author in

the article "A Systematic Approach to the Study of Cost Accounting," VOPROSY EKONOMIKI, No 12, 1979.

10. See N.Ya. Petrakov, "Khozyastvennaya reforma: plan i ekonomicheskaya samostoyatel'nost'" [Economic Reform: The Plan and Economic Independence], Moscow, 1971, pp 25-29; D.V. Valovoy and G.Ye. Lapshina, "Sotsialism i tovarnyye otnosheniya" [Socialism and Commodity Relations], Mosocw, 1972, 329; A.M. Rumyantsev, "O kategoriyakh i zakonakh politicheskoy ekonomii kommunisticheskoy formatsii" [Concerning the Categories and Laws of the Political Economy of the Communist Structure], Moscow, 1976, p 276.

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UNIFIED SCIENTIFIC-TECHNICAL POLICY DISCUSSED

Moscow EKONOMICHESKIYE NAUKI in Russian No 5, May 83 pp 88-90

[Article by Yu. Simonov, docent and candidate of economic sciences, Rostov-na Donu: "Concerning a Unified Scientific-Technical Policy for the Socialist State"]

[Text] In the process of the transition to a primarily intensive type of socialist reproduction, there is put forward the urgent task of increasing the effectiveness of management of scientific-technical progress, which serves as the material basis for intensification. "We have at our disposal," noted Comrade Yu.V. Andropov, in a speech at the November (1982) plenum of the CPSU Central Committee, "great reserves in the national economy... We must look for these reserves in the acceleration of scientific-technical progress, and in the broad and rapid production application of the achievements of science, technology and the best experience."[1]

The socialist state acts as a unified economic center, and in particular as a united scientific-technical center, one of whose most important functions is to develop and implement a unified scientific-technical policy. In the developed socialist society this policy serves as an ever more important component of economic policy, and at the same time it exerts a growing influence on all state policy. This is because the opportunities for achieving a complex of economic, social and defense goals which face our society are determined to a significant degree by the state of science and technology.

The problems of a unified scientific-technical policy are attracting the concentrated attention of specialists. However, up to the present many of these problems have not yet received a simple solution. The concept of a "unified scientific-technical policy" at times is interpreted to mean that everything can be reduced to the enumeration of the basic directions in the development of science and technology. In a number of cases the discussion concerns only a unified technical policy.[2] An orientation towards a single technical policy rather than towards a scientific-technical policy reduces the management of scientific-technical progress mainly to the management of the development and introduction of new technology.

A unified scientific-technical policy represents the concentrated expression of the activities of the socialist state; its purpose is to provide for the effective utilization of the material and personal factors of production which are concentrated in the sphere of science and technology in order to resolve the tasks facing society. A unified scientific-technical policy is closely linked to other aspects of the socialist state's economic policy (investment, agrarian, export policy, etc.). The USSR Food Program, which was approved by the May (1982) plenum of the CPSU Central Committee for the period up to 1990, in particular, aims at establishing a close link between agrarian policy and a unified scientific-technical policy. The implementation of the Food Program presupposes that agriculture will be re-equipped in the 80's in comparison with the 70's. Sharp increases have been specified for the production of all types of agricultural equipment, along with improvements in its quality. There is evidence of the exceptional urgency of this task in the fact that in 1980 only 1.5 percent of the new output of the Ministry of Agricultural Machine Building had the Seal of Quality, at a time when the figure was 25.8 percent for all the machine building ministries.

There is a close connection between a unified scientific-technical policy and the export policy of the socialist state. The export policy, as is well known, is more successful when the goods put onto the external market are more able to compete, and this, in turn, depends on scientific-technical policy and its implementation. In connection with foreign economic activities by the socialist state, a unified licensing policy is especially worthy of attention; such a policy is designed to ensure constant patent security and the patentability of items which have been developed, as well as timely patenting of inventions abroad and the sale of technical innovations.

The basis of a unified scientific-technical policy should lie with a scientifically grounded strategy, which presumes the development of a theoretical concept and doctrine, which would reflect the coordinated opinion of the leading scientific organizations, as well as the organs responsible for the management of scientific-technical progress with regard to the basic directions in the development of science and technology and their resource provisions for the coming 15-20 years. This model for development must take into account the need to resolve the main future socio-economic task--the establishment of the material-technical base of communism.

In the working out of the concepts of scientific-technical development a number of aspects should be taken consideration: the degree to which the development of science and technology are in line with the aim of forming the basic features for the material-technical foundation of communism; how the work of realizing these directions is backed up with resources, and particularly with raw materials; the degree to which the development of a national science and technology makes it possible to utilize the advantages of the international division and cooperation of labor; the degree to which the balanced development of science and technology in our country and in other socialist countries creates the conditions for stable economic growth throughout the worldwide socialist economy; and the possible socio-economic and ecological consequences of further development of the scientific-technical revolution.

The goal orientation of a unified scientific-technical policy reflects both its main goal, which is the creation of a new production-technological apparatus, and the need to resolve more concrete tasks with reference to their temporal, territorial and sectorial aspects. From this there arises the need to establish a certain coordination among the goals which face all of science and technology, as well as their individual branches in the current, middle- and long-range time frame.

In our view, when working out ideas for the development of science and technology, the starting point should be the opportunities presented by unforeseen situations (a worsening or improvement of the general international situation, the unfavorable influence of natural disasters), which bring with them the need for changes in the volumes of planned investments and their location. For this reasons ideas for the development of science and technology must come with several alternative versions, which take into account various combinations of conditions which influence their implementation. A particular role in the development of this conception should be given to an evaluation of the resources, in particular to the raw material resources. This kind of evaluatinn is possible on the basis of predictions with regard to individual types of raw materials, taking into account those changes which will take place in their production and utilization, as well as on the basis of the formulation of a comprehensive prognosis, which reflects the possible state of the raw material sources in our country and throughout the world. For example, when solving fuel and energy problems under president-day conditions the need for an orientation toward significantly broader utilization of coal is revealed.

The elaboration of a profoundly substantiated conception for the development of science and technology requires the joining together of the efforts of scientists of various disciplines, especially of those specializing in the area of economics and the science of knowledge. Success in this work depends largely on how well informed the people are who are engaged in it. The necessary information must include facts about the existing conceptions for the development of science and technology, especially in the highly developed industrial countries of the world, as well as materials of meetings, symposia and conferences at which the prospects for the development of science and technology are discussed.

When working out a unified scientific-technical policy one should be guided by certain principles. An attempt to define these principles has been made in certain works. For example, V.V. Kosolapov includes among them: being common to all the people, having a class nature and goal orientation, putting a priority on socio-political goals and tasks, looking to the long-range future, possessing a comprehensive, program oriented, optimal nature, quality of being constant, predictable, possessing historical continuity, an integrated nature, an international outlook, humanity and combining theory and practice.[3] While agreeing with this author, we suggest that it is essential to point out one more extremely important principle, the principle of "scientificness." The implementation of this principle requires clarification of the specific effects of the objective laws in the area of science and technology. There are still many unresolved questions here. For example, if we turn to the effect of the law of planned development, it can be noted that the spcific features of planning in science and its individual branches (academic, VUZ and sector science) have not been completely clarified; nor have the system of proportions in the development of science and technology or the methods to optimize it been defined. Although no-one doubts the obvious fact that the law of steady growth in labor productivity operates in the sphere of science and technology, there are no reliable methods for determining the productivity and intensity of scientists' and engineers' labor. There is much which is not clear in the effect of the law of distribution according to labor; in particular, it is not clear whether the current system for the remuneration of those who work in the area of science and technology meets the objective requirements of this law.

The implementation of a unified scientific-technical policy is possible if a set of various methods (economic, social, organizational, technical legal) are used by the socialist state and its organs to influence the labor collectives, which develop and apply the new technology. Here mention should be made first of the economic methods, which encompass a broad range of effects in the area of planning, economic stimulation and the financing of scientific-technical progress. The 12 July 1979 decree of the CPSU Central Committee and the USSR Council of Ministers sets out a number of new measures to increase the role of the plan for scientific-technical development as an important component of the national economic plan, and to strengthen the connection between the results of scientific-technical progress and the general results of the activities of enterprises and associations.

Further improvements in the system for planning scientific-technical progress require the development of a number of methodological documents such as those which set out methods for long-term prognostication in science and technology and methods for the development of comprehensive scientific-technical programs. It is essential that the achievements of scientific-technical progress be used as the basis for continuous renewal of the system of long-term norms in the area of production and the consumption of material, labor and financial resources; it is also essential to take into account and constantly adapt data from prognoses, and to increase the coordination of work in the area of predicting and determining scientific organizations, which would answer for the compilation of intra-sector and inter-sector prognoses. The plan for science and technology (at all of its levels) must be organizally linked to the material balances and the targets for production.

The implementation of the Comprehensive Program of Scientific-Technical Progress for 20 years requires changes in the subject matter planning of research and development. In the first place, it is advisable to define more precisely the subject matter plans of scientific organizations, taking into account those tasks which are established in the Comprehensive Program of Scientific-Technical Progress, as well as to stipulate the development of resource-saving technology, which provides for ever greater savings of human labor and increased effectiveness of fixed production capital. In the second place, it is essential to increase the significance of subjects which are oriented toward the resolution of fundamentally important problems that set the rate and quality of economic growth for an extended period of time. In this regard, it is necessary to increase the responsibility of the organs which formulate the plans of scientific-technical progress and monitor their fulfillment. "If we want to truly advance the work of introducing new equipment and new labor methods, it is necessary," emphasized Comrade Yu.V. Andropov, "for the central economic organs, the Academy of Sciences, the State Committee on Science and Technology, as well as the ministries not simply to propagandize them but to dsicover and eliminate specific difficulties which hinder scientific-technical progress."[4]

Utilization of the complex of social methods for the implementation of a unified scientific-technical policy should contribute to ensuring that the scientist's labor has high social status and that there is continuous reproduction of the structure of the scientific-technical intelligentsia (on the basis of age characteristics, occupations and specialties), which meets to the highest degree the requirements for the development of society.

Organizational methods include the determination of unified general principles in the selection and distribution of personnel, in the organization of labor and scientific institutions, and in the construction of organs for the management of science and technology.

The policy of intensifying scientific research gives rise to the need to implement a series of technical measures in the area of accelerated development of scientific instrument building, the experimental design basis of scientific-research institutes and planning and design organizations. It is essential to increase the appropriations made by the ministries for the establishment of experimental design production units. The construction of these facilities should be included among the most important projects. A system must be implemented for strict monitoring over the targeted utilization of the output of experimental production units. In our opinion, a long-term (15-20 year) program should be worked out for the development of the material-technical base of the research and design sphere; The State Committee on Science and Technology of the USSR Council of Ministers, USSR Gosstroy and the USSR Academy of Scineces should be entrusted with the work of compiling such a program in conjunction with the machine building ministries, which must participate on a mandatory basis.

The implementation of a unified scientific-technical policy gives rise to the need to work out a system for the legal regulation of scientific-technical progress, which must encompass the planning, material incentives and financing for the development of science and technology, as well as measures to protect nature from the harmful consequences of man's intrusion upon it.

Success in the implementation of scientific-technical policy depends largely on coordinating the activities of inter-sector management organs, and sector ministries and agencies, which have at their disposal great opportunities to use financial, material, and labor resources. With the shift to the goal-oriented program method in the management of research and design, the State Committee on Science and Technology and the State Committee on Inventions and Discoveries of the USSR Council of Ministers have a growing role to play. In our opinion, the State Committee on Discoveries and Inventions should be granted the right to impose upon guilty officials administrative warnings and fines for delaying the introduction of recommended inventions: and on its part there must be stricter monitoring over the statistical reporting by enterprises with regard to inventions and efficiency improvement (Form 4-Science-Technology), to ensure that information received from enterprises yields a fuller picture of the state of the collectives' creative technical work.

The development and implementation of a unified scientific-technical policy should help to make our economic mechanism react more flexibly to everything new which contributes to scientific-technical progress, and it must help scientific achievements to become embodied in public production more quickly.

FOOTNOTES

1. "Materialy Plenuma Tsentral'nogo Komiteta KPSS" /Materials of the Plenum of the CPSU Central Committee/, 22 November 1982, Moscow, 1982, p 10.

2. See G. Anisimov, "Unity of State Technical Policy," VOPROSY EKONOMIKI, No 3, p 111: S. Kheynman, "Technical Policy and the Development of the Tools of Labor," VOPROSY EKONOMIKI, No 6, 1975. It is true that in another article devoted to this problem S. Kheynman already talks about a unified scientific-technical policy (See S. Kheynman, "Economic Problems of Scientific-Technical Policy," PLANOVOYE KHOZYAYSTVO, No 9, 1979).

3. See: V.V. Kosolapov, "Nauchno-tekhnicheskaya politika obshchestva razvitogo sotsialisma" /The Scientific-Technical Policy of the Society of Developed Socialism/, Kiev, 1979, p 51.

4. "Materialy Plenuma Tsentral'nogo Komiteta KPSS" 22 November 22 1982 p 10.

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AZERBAIJAN PEOPLE'S CONTROL CONFERENCE ON ACADEMY OF SCIENCES WORK

Baku BAKINSKIY RABOCHIY in Russian 24 Apr 83 p 2

[Report by A. Eberlin: "In the Interests of Big Science"]

[Text] A large detachment of people's controllers is working within the system of the Azerbaijan SSR Academy of Sciences. More than 1,400 patrol members combined into 80 groups and 100 people's control posts are numbered in its scientific establishments and design and production subdivisions. Headed by the general academy head group of people's control, the patrol members are making their contribution to the resolution of tasks set by the party and government for the republic's main scientific center.

The patrol members have many useful matters to their credit, but there are still serious shortcomings in their work. This was the subject of a principled and exacting discussion at a conference of representatives of academy collectives at which an account was presented by the head group of people's control. The report was delivered by its deputy chairman N. Samedov, a section chief at the scientific-production association for space research.

It was noted that the patrol members of the academy have been striving to influence fulfillment of plans for scientific research and test and design work and the accelerated introduction of the results of scientific developments into the national economy, and have exercised control over observance of labor, planning and financial discipline and the use of material resources, laboratory and technical equipment, and working time in the establishments and enterprises. Systematic checks on these these matters have been conducted by the head group and the local groups, and the results of these checks have been examined at group meetings and been subjected to the judgement of the collectives. The most important proposals of the people's controllers have been discussed by the party committee and the academy presidium, and the necessary steps taken.

One of the most active people's control groups within the academy is the group at the Institute of Physics, which has been awarded a testimonial of the USSR Committee for People's Control. The group patrol members at the Institute of Petrochemical Processes, awarded a testimonial of the repulic committee for people's control, and the groups at the institutes of geology, geography, botany and problems of deep oil and gas deposits are carrying out persistent work.

However, a whole number of groups within the academy system are acting passively and have a conciliatory attitude toward violations and carry out their public duties only formally. To some extent these shortcomings are inherent also in the head people's control group, and for this reason its activity was subjected to searching criticism at the conference

The basic error of the patrol members is that they are sometimes focusing their efforts on petty, secondary matters and neglecting the main question. The new makeup of the head group must radically reexamine the work and restructure it in light of the tasks set for science by the CPSU Central Committee November (1982) Plenum and the instructions contained in the speeches of CPSU Central Committee general secretary comrade Yu.V. Andropov. The recent Azerbaijan Communist Party Central Committee plenum also focused people's controllers on this. The party requires from the scientific establishments that they accelerate the rates of scientific and technical progress, and it is the duty of the people's controllers to promote in every possible way the resolution of the set task.

In recent years a series of serious violations and abuses have been uncovered at some academy establishments. Instances of misappropriation of state funds have been found at the Institute of Cybernetics, and of violations of financial disciplines at the Institute of Chemistry of Additives. The republic committee of people's control recently uncovered the grossest violations of planning, accounting and financial-management discipline at the special design bureau for biological instrument building. The director N. Mekhtiyev along with his deputy T. Sadykhov and the chief engineer G. Yeremeyev, were dismissed and materials on writeups in accounts and financial abuses were passed to the procurator's office.

It is necessary to deal with this case in more detail. The leaders of the special design bureau, and in particular its director N. Mekhtiyev, created an unhealthy atmosphere and set out on the road of eyewash, writeups, and fraud against the state and science. The fulfillment of orders there from organizations of the academy itself was chronically disrupted while work on the side was being carried on extensively. Allegedly in the interests of production, a paint and varnish section was set up in the special design bureau where they engaged in the repair and respraying of private cars. And this is only a small part of the violations and abuses uncovered in the special design bureau. The special design bureau was checked regularly by the control and auditing department of the republic academy of sciences, but the checks were so formal and cursory that they made it possible for the smart dealers from science to avoid responsibility. This kind of situation raises doubts about the objectivity and principledness of the academy's control service.

It was rightly stated at the conference that as a rule cases of serious violations and abuses in academy establishments are revealed by the higher party organs and the people's control organs. But the local patrol members, who should have been the first to raise the alarm, assume a passive and conciliatory attitude. This kind of situation must be decisively dealt with.

At the conference, much attention was given to a question of paramount significance for many academy organizations, namely, the optimal utilization of equipment. It is known that the state spares no means to equip the scientific establishments with unique instruments and apparatus, expecting that the return will be high. However, checks conducted by people's controllers show that in many scientific organizations the proper concern is not being shown for this expensive equipment. Valuable equipment worth altogether hundreds of thousands of rubles has not been set up for a long time, and sometimes has simply been left standing in the open. True, of late, thanks to the efforts made by the academy leadership, the party committee and the people's controllers, the situation has changed somewhat and a significant part of equipment not used earlier has been set up, but we cannot be satisfied with that. People's control still has much to do to remove the question of attitudes toward equipment from the agenda. For this it is necessary to make a final end to the revelation of instances of similar mismanagement and to make checks effective and to be more exacting toward workers answerable for the storage and use of technical equipment.

The training of scientic personnel through the postgraduate system was discussed with great concern at the conference. Checks conducted in particular by the republic committee of people's control show that the level of personnel training does not match the necessary requirements. The following figures show this. From 1980 to 1982, of the 465 people completing their work as postgraduate students in various academy establishments, only 24 defended their dissertations at the proper time and only 87 offered defense of their own work. These indicators show the poor effectiveness of training for junior personnel and indicate that there are many serious lacunae in this present matter. In this connection, serious claims were laid against the head people's control group, which has failed to penetrate deeply the questions of postgraduate work and has not shown exactingness toward the postgraduates themselves and their scientific leaders.

Those speaking at the conference, including T. Dzhafarov, deputy director of the Institute of Physics, E. Kadyrova, chairmwoman of the people's control group at the Institute of History, U. Alekperov, director of the Institute of Botany, A. Namazov, deputy secretary of the academy Komsomol committee, T. Mustafayev, chairman of an association local committee, E. Khalilov, chairman of the people's control group at the Institute of Problems of Deep Oil and Gas Deposits, and G. Abdullayev, academy president, analyzed the work of the people's controllers and touched on a number of important matters that require the constant attention of the new makeup of the head group of patrol members. It was stressed that the academy collective expects from the people's controllers an intensification of the struggle to strengthen discipline and order and the strict observance of planning and financial discipline. The patrol members must act decisively against manifestations of mismanagement and waste and give more attention to questions of personnel selection and placement.

Those at the conference elected a new makeup for the head group of people's control for the Azerbaijan SSR Academy of Sciences.

Azerbaijan Communist Party Central Committee secretary G.A. Gasanov spoke at the conference.

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ECONOMIC, TECHNICAL DEVELOPMENT AND FUTURE OF SPECIAL ELECTROMETALLURGY REVIEWED

Moscow IZVESTIYA in Russian 27 May 83 p 2

[Article by academician B. Paton, Twice Hero of Socialist Labor, and B. Medovar, academician of the Ukrainian SSR Academy of Sciences: "Steel and Slag"]

[Text] In May 1958 the world's first electroslag smelting furnace was introduced at the Zaparozh'ye "Dneprospetsstal'" electrometallurgical plant imeni A.N. Kuz'min. It fabricated steel ingots weighing up to 0.7 tons.

Thus began the victorious march of a completely new metallurgical technology that made it possible to create very rapidly here in the country an entire subsector for the production of metal of particularly high quality, namely special electrometallurgy.

A very interesting physical phenomenon, discovered 10 years before the event described above at the Ukrainian SSR Academy of Sciences Institute of Electric Welding, forms the basis of electroslag smelting. Its essence is that when an electric current is passed through melted slag is becomes an efficient heat generator capable of melting any metal and many nonmetallic materials.

At first the discovery was used for welding purposes, and this same electroslag welding had already received an award at EXPO-58 in Brussels in the same year that electroslag smelting was born. The welders drew attention to the fact that metal in an electroslag welded union is as good as the quality of a metal that is rolled, forged or extruded. It turned out that this amazing feature was the result of the refining action of the liquid slag on the melted metal and the special conditions of its crystallization. Having recognized what has now become a trivial truth, the welders suggested that the new process be used to obtain steel ingots of particularly high quality.

Let us say straight off that in the sector institutes of ferrous metallurgy the welders' suggestion was greeted without any special enthusiasm. Moreover, attempts were made to substantiate the indifference to the new process and the new technology on a theoretical basis. We were shown that melting a metal in slag necessarily leads to intolerable contamination by slag inclusions.

The workers at the plants had a different attitutde toward the new process: they voted to construct new electroslag furnaces for it, and there was demand from consumers, who immediately accepted the outstanding quality of the new product. Here it must not be forgotten that in those days that were so difficult for the new technology, it was IZVESTIYA that came to its defense; even now many people remember the article "The Electroslag Crucible."

Over the quarter of a century that has elapsed since then the country has obtained millions of tons of superior electroslag metal in the form of plate and shaped rolled metal, tubes, forged pieces and, during the last decade, high quality castings. As a result it has been possible to substantially increase the durability and reliability of aviation jet engines, various types of power installations, heavy load-bearing mechanisms and roller bearings, including high temperature bearings.

It can be stated directly: many of the problems in the development of equipment would be simply impossible to resolve without electroslag technology. This major achievement of Soviet science and technology has received world recognition. Electroslag furnaces have been built under license in Japan, the United States, France, Sweden, Austria and other countries. The Soviet Union is firmly maintaining its leading positions in the theoretical and practical fields of electroslag technology.

Like all ferrous metallurgy, the further development of electroslag smelting envisages production intensification, that is, first and foremost not quantitative growth but further improvement in the quality of the metal. Here it is essential to emphasize that in recent years a general upswing in the technology and equipment for steel smelting production and the appearance of a powerful arsenal of facilities for the so-called furnaceless processing of steel are typical.

What we have in mind is the so-called hopper metallurgy: the steel smelting unit is used only to obtain a kind of semifinished product which is brought up to the required specification not in the furnace but in a hopper or special container with its own reaction vessel. Bringing the metal up to specification is done with the aid of a vacuum, blowing gases across the melt, and with powders and gas-and-powder mixtures. As a result of this kind of processing it is now possible to obtain any amount of high quality steel with a very low sulfur and oxygen content and small amounts of nonmetallic inclusions and harmful impurities, which previously could be obtained only by electroslag smelting and the other smelting processes that make up special electrometallurgy.

It would seem that with the development of furnaceless steel processing the role and significance of smelting processes in special electrometallurgy, and primarily electroslag smelting, would decrease. This is not so. And this is very simply explained: modern steel making really makes it possible to obtain millions of tons of the so-called superior pure liquid steel. But in order to obtain high quality rolled products or castings it is still necessary to insure appropriate conditions for the solidification of the liquid steel into the form of ingots or castings.

Meanwhile, the laws of crystallization for liquid metal (discovered a century ago by the great compatriot D.K. Chernov) are such that in the air alone even a high degree of purity in steel does not prevent the occurrence of chemical and structural inhomogeneity in the ingot. But homogeneity is precisely what today's consumer must have, both chemical and physical. Without it it is impossible to insure the specified characteristics of an article, whether it be a roller bearing or the hull of an oceangoing ship.

One definite advance was at one time continuous steel casting; in contrast to an ingot, which is poured in a cast ingot mold of large cross section, a continuous-cast billet is considerably more homogeneous in terms both of chemical composition and structure. However, now this is not enough.

A quarter of a century ago, in the period when special electrometallurgy was being established, it was still not possible to produce pure steel on industrial scales. Electroslag smelting attracted metallurgists and machine toolmakers, and later construction people using metal, and it still does today, primarily because of its homogeneity and the stability of its properties and its good reproducibility melt after melt, ingot after ingot, with virtually complete elimination of spoilage.

All these advantages of the electroslag metal are seen to an even greater degree if the pure steel is resmelted, that is, the metal is subjected to furnaceless processing. This is the reason why in the foreseeable future resmelt processes will remain acutely necessary for the national economy.

But no matter how good special electrometallurgy is, it is relatively expensive, because any additional conversion requires additional expenditures. On the scale of the national economy the saving from the replacement of metal obtained by regular methods compared with that from electroslag methods is extremely great. Depending on the brand and specificiation of the steel or alloy, it ranges from several hundred to several thousand rubles for each ton. However, the total volume of output in special electrometallurgy cannot be more than a few percent of the amount of steel smelted each year in the country. It is thus even more important to learn how to use this truly precious metal more economically.

It is well known that our country firmly occupies a leading place in the world in the smelting of cast iron and steel and the production of steel rolled products. But it is impossible to increase unchecked the scales of metallurgical production, including output from special electrometallurgy, that is to go along the road of extensive development in this very important sector of the national economy.

The party has proclaimed a course toward the intensification of our entire economy, and this means in the country's ferrous metallurgy. This also applies in full to special electrometallurgy and hence to electroslag smelting. Now the main attention should be focused on the maximum utilization of existing production capacities and the uncovering and extensive utilization of all potential opportunities in progressive technology.

Since we were the pioneers in the development and industrial assimilation of electroslag smelting, in contrast to those who started out later on the road to develop electroslag technology we should be in at least as good a position. The fact is that at many of our plants, the electroslag furnaces in operation are of an age that is quite serious for metallurgical units, namely 15, 20 years and more. The time has come to seriously tackle reconstruction and renewal and the replacement of old and obsolete equipment in electroslag shops and sections.

It has been calculated that even a relatively easy measure to implement such as increasing the electrical capacity of electroslag installations (replacing less powerful furnace transformers with more powerful ones) can provide a tangible addition in the production of electroslag metal. It is possible and essential to increase the output of suitable metal through reducing losses in the form of bottom and head shearings. No major capital investments are required for this. Given the desire and persistence of workers at metallurgical plants and support from plants in the electrotechnical and machine toolmaking plants, the saving derived from renewal can be quite large.

Unfortunately, it must be said that we have formed a unique kind of gap, let us state it frankly, a marked lack of accord, between the level of theoretical developments in the field of electroslag technology and the actual technical level at a number of enterprises in ferrous metallurgy and machine toolmaking. Under actual conditions at some plants, the quality of electroslag metal leaves something to be desired. We must recall yet again the trival truth that the quality of resmelted metal depends directly on the purity and homogeneity of the initial metal. Meanwhile, we often encounter cases where they see the resmelting process as a means of correcting the spoiled metal from main production.

Savings in the production of metal must not be confined only to the shops of special metallurgy. It is possible and necessary to achieve reductions in the prime costs of electroslag metal at the manufacturing plants. For this, in particular, it is necessary to accelerate the assimilation of cheaper flux slags that do not contain components that are either in short supply or expensive. Cast consumable electrodes (obtained from continuous casting machines) must replace rolled and ductile electrodes more boldly. The repeat use of worked slags is essential.

Then it is possible and essential to strive for the thrifty, economically efficient use of metal at consumer plants. Unfortunately, as is known, for a number of years now the coefficient of metal use in metalworking and machine toolmaking has not increased; it remains at about 0.7.

Alas, this also applies to special metal from which tailings are mixed with tailings from regular metal. As a result, it loses its consumer qualities.

Meanwhile the latest developments in the field of electroslag technology itself make it possible to utilize metalworking tailings--various kinds of shavings and even chips--simply and and quite reliably. We have in mind primarily efficient new processes such as electroslag chill casting and centrifugal electroslag casting.

Recently developed at the Institute of Electric Welding, with the support of the Kiev party gorkom they have already been disseminated at a number of machine toolmaking enterprises in the Ukrainian capital. It is hardly necessary to describe these technologies; today they are accessible to a wide range of specialists; it remains for us only to express the wish that the sector institutes follow the example of the VPKTIstroydormash [expansion unknown] (located in Kiev) and seriously address the assimilation of the new processes.

At one time the newspaper IZVESTIYA wrote a great deal about electroslag smelting, which is now used extensively in virtually all the subsectors of machine toolmaking. Today we should recall the promising applications of the electroslag process such as surfacing, heating, and additional feeding for ingots and castings.

There is no doubt that electroslag technology will be faithfully serving the cause of the scientific and technical revolution and the upsurge in our metallurgy, macine toolmaking and industrial construction for many years.

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PRINCIPLES, IDEAS, GOALS OF NOVOSIBIRSK INSTITUTE OF NUCLEAR PHYSICS EXAMINED

Moscow IZVESTIYA in Russian 22, 23 May 83

[Article by IZVESTIYA special correspondent B. Konovalov: "The Talent of a Collective"]

[22 May 83 p 2]

[Text] Novosibirsk--They say that talent is like a giraffe: once you see it you never confuse it again. There are few talented people. There are even fewer talented collectives. And it is important to know how these collectives come into being and how they live, and what helps them to remain talented over many years.

I first visited the USSR Academy of Sciences Siberian Branch Institute of Nuclear Physics, which is the subject of today's discussion, 20 years ago when I was preparing a reportage on a basically new direction in the development of installations for studying the microworld--colliding-beam accelerators. At that time experiments worldwide were conducted using the same scheme: "projectiles" accelerated in the accelerators to enormous velocities and the bombardment of fixed targets. And research on the consequences of these "catastrophes" gave the physicists information on the smallest "building blocks" of the physical world. But in Novosibirsk they were working on an accelerator in which the "target" rushed to meet the "projectiles." When I got to know about this accelerator, memories about the skeptical statements of venerable scientists from other scientific centers kept surfacing. Yes, they agreed, the idea was alluring. The higher the energy at collision the greater the information that could be obtained. But here these collisions would not take place because it is very difficult to make the moving "target" solid. The opposing particles would go right past it, like neighboring galaxies, with virtually no contact with one another. And still they succeeded in making the colliding-beam accelerator work, and physics experiments are being conducted.

I recall that I was puzzled that this accelerator, in contrast to all the others, was set not horizontal but vertical. I thought that this was also the latest word in accelerator equipment and I tried to find out about it from the institute director, academician A.M. Budker: what are the advantages of the vertical accelerator?

Andrey Mikhaylovich looked at me searchingly for a moment, and then he answered with a smile: "To be honest, none at all. It is simply that we began to develop it when our collective was still a laboratory at the Institute of Atomic Energy imeni I.V. Kurchatov; it was very tight there and so we set the accelerator 'on its bottom.'"

This witty solution charmed me. Behind its simplicity there was a lack of inhibition, an ability to reject the generally accepted, to overcome what had been sanctified by tradition and authority. I sensed that this institute would easily go up, sideways or anywhere it pleased, but would boldly face all difficulties and not shrink from them but achieve the goals that it set.

Now this accelerator is shown to guests as a museum piece. Over the past 25 years five colliding-beam accelerators have been developed in Novosibirsk. Two of them, first-class, fully operational installations, have set records in their "weight category," to use a sports term. At one time work on the development of colliding-beam accelerators was marked by a Lenin Prize. Now this direction has become the head echelon of physics as it storms the secrets of the microworld. Two rings, set as a pair in the shape of a figure eight, the first Novosibirsk accelerator had a total size of one meter. Now, the acceleration rings for the colliding-beam accelerators are little short of tens of kilometers. Experiments on colliding-beam accelerators are providing significant new information in elementary particle physics. And throughout the world they honor the memory of Soviet academician Budker primarily as a pioneer of this direction in accelerator technology.

Search and survey research at the boundary of the unknown is often set up on the principle of the start of a magic fairytale: off you go somewhere into the unknown to bring back I don't know what.... For Budker, his principle lay in this methodology: do not go where everyone else is going, go your own way. He thought that it is essential to be the leader, the trailblazer. If you stick in a rut you overtake no one. But if you work on your own original idea, even if you do not possess great technical facilities, at some time or other you can move away from where the stronger competitors are and obtain good scientific results.

He always had plenty of brilliant ideas. But most of them were fantastic or extraordinarily difficult to put into practice. And then a pure theoretician decided on a very bold step; first he headed a laboratory and then an entire institute so as to give his ideas life. Igor Vasil'yevich Kurchatov became the "holy father" of the Novosibirsk Institute of Nuclear Physics, making the main principle of its existence the search for nonstandard ways of development.

In our country, in thermonuclear research the Institute of Nuclear Physics leads in the direction of the so-called "open trap." The first of these was thought up by Budker. In shape, its magnetic field resembled two bottles with bases. The "stoppers" for the more powerful field plugged the hot plasma in the "throats" of this magnetic bottle. Thanks to their simplicity and cheapness compared with other installations, these kinds of traps appeared in laboratories throughout the world engaged in thermonuclear research and they played a major role in the development of plasma physics. Now they are developing installations of more refined designs for the magnetic "stoppers" and increasing their number. If they can effectively contain the hot plasma in the dense state required for the thermonuclear reaction these installations will be preferred over other present claimants to the role of the reactors in the electric power stations of the future. They are simpler, of better technology, and cheaper. Three different installations of this type are now being assembled and tested at the Institute of Nuclear Physics. At the same time work is going ahead with all dispatch on the construction of a building for them. Soon, the question "to be or not to be?" will be resolved in the thermonuclear housing: will the open traps remain only installations for physics research or will they become the basis of thermonuclear energy on our planet?

It is interesting that over the 25 years of its existence the range of subjects dealt with at the Institute of Nuclear Physics has not changed. As before, it covers the physics of elementary particles and the development of accelerators for experiments in this field, thermonuclear research and applied work. The proportions of these mainline directions in the institute's total efforts have remained the same at 50, 25 and 25 percent respectively. Although, of course, the internal content of each of them has changed substantially.

Applied research, for example, passed on from the cradle stage long ago and is bringing the institute as least as much glory as its fundamental research. The Institute of Nuclear Physics was one of the first in the country to develop industrial charged particle accelerators for use in the national economy. Seven types of accelerator have now been developed, operating even from normal power supplies at 220 volts and generating powerful beams of electrons at various energies. These accelerators have become the basis for the development of an entire range of radiation technologies in chemistry and electrical engineering and are used for dealing with insects in grain, cutting metals and applying coatings to metals, and purifying sewage.

Radiation imparts new properties to materials; it raises their strength and resistance to cold and heat and their durability in impact load. There have been occasions when the use of radiation technology has turned out to be much more economically effective than all development costs, when the price of an accelerator has been recouped literally in only a few months. The institute has already supplied the national economy and foreign countries with dozens of accelerators. In one industry alone--electrotechnics--14 flow lines have been set up on the basis of Novosibirsk accelerators for the production of power line and cable sheathings. The saving achieved through the startup of higher quality output using them has totaled more than R100 million.

Even the colliding-beam accelerators on which fundamental research is done have gradually at the same time started to serve for secondary and applied purposes. Beams of charged particles spiraled in a magnetic field generate the so-called synchrotron radiation, which is truly invaluable for many directions in science and technology. Depending on the energy of the accelerator, this radiation can cover an enormous range of the spectrum of electromagnetic waves, across the infrared, visible, ultraviolet and X-ray fields. And the intensity of the emission in all these fields is 10,000 to 100,000 times greater than in the traditional sources used (except for lasers).

The colossal brightness of the synchrotron "lamp" is making it possible, for example, to make movies of superfast processes lasting insignificant fractions of a second. Thanks to this it is possible to see all the stages in the contraction of muscle, the failure of a metal under load, the tiniest details of the processes of smelting and crystallization, the movement of blood in the tiniest vessels, and much, much else. For movie film, synchrotron radiation is a unique kind of "Aladdin's lamp" which at the desire of the researcher makes its possible to remove the veil from the secrets of many phenomena.

And for present-day electronics, which plays an enormous role in today's world, it has opened up a way out of an apparent impasse. The fact is that the main trend in the development of electronics is microminiaturization. But it turned out that light itself was acting as a brake on further progress in the process of microminiaturization. The moment comes when, during illumination of the mask with which the pictures of the circuit are transferred to the plate of the semiconductor, the lines begin, as it were, to merge. Their size is already comparable to the length of light waves and it rearranges the beam and affects its wave characteristics.

This means that radiation at a shorter wavelength must be used. But the X-ray lamps, even the best, are too weak, and so exposure time must be increased to several hours. The use of bright synchrotron radiation from which it is easy to separate out just a single X-ray beam, reduces the time needed for illumination to several seconds and opens up the way for X-ray lithography which makes it possible to "pack" electronic circuits into crystals of submicron size and make instruments, radio equipment and computers much smaller.

It is remarkable that while in no way interfering with the main experiments, it is possible to remove a whole sheaf of rays of synchrotron radiation from the accumulation rings of the accelerators. More than 80 very different scientific groups are now working on the Novosibirsk accelerators. Twelve of them are foreign. And for each one of these 80 groups there is a new direction in science and technology. And it is important here that not only are new paths in science and technology being laid, but that representatives of the most varied fields are gaining access to the standards of the present-day physics experiment and learning to use computer technology to set up research and process findings.

But no matter how important applied research may be, and no matter what advantages it may promise, the Institute of Nuclear Physics has not allowed itself to exceed the optimal quota from the viewpoint of the institute, namely one-fourth of the total effort. The Institute of Nuclear Physics cooperates willingly, passes on its developments to the sector institutes and helps to organize work on its own accelerators, but does not permit itself to be pulled to strongly into the storm of applied research. Right from the start it was intended that with time it would become a "financial locomotive" for fundamental research. This time has now come. In accordance with the budget for the Academy of Sciences Siberian Branch, the Institute of Nuclear Physics receives only one-seventh of the amount that it spends. The other sixth-sevenths are made up of cost-accounting work and special subsidies for research important for the country. Each year now for many years applied work has been giving the institute tens of millions of rubles, and, I repeat, only one-fourth of its efforts is for this. The other three-fourths go on fundamental research of purely scientific significance that is, as it were, work done ahead of time for future applied directions.

... Each accelerator or thermonuclear installation is a collective creation. And I deliberately do not distinguish between the creator and the first director of the institute, nor between any of the scientists, engineers and workers whose inspiration and labor give birth to the brilliant achievements of the Novosibirsk collective. Each of them has his own name and family name, but they also have a name for the entire collective, in which they rightly take pride: the Institute of Nuclear Physics.

[23 May 83 p 2]

[Text] The collective is characterized not only by what it does, but how it does it.

The Institute of Nuclear Physics designs and fabricates by its own efforts all its own industrial and experimental installations, including even the largest accelerators. In essence and in structure, the Institute of Nuclear Physics is, to use a widely term, a scientific-production association. In addition to the research laboratories, it also has design bureaus and experimental production facilities.

All the Institute of Nuclear Physics organizers have considered that under our conditions a major physics institute with no production facilities is like a man with one leg: it cannot move ahead confidently and quickly. But the production that is needed must itself be subordinate to the interests of science and the scientist. The academic institute is a creative organization and the central figure, and it is there that the creative scientist must be; and the design bureaus, production facilities and technical services, and the entire administrative apparatus, including the director himself, must be subordinate to its interests.

The institute's design section is not large: barely more than 100 people. But they are extremely well qualified and they design everything that the institute needs, from prosaic gates to the most complicated optical instruments. The section is split into ten thematic design bureaus and groups that are linked directly with specific laboratories. When a physicist thinks about an instrument, he works on the design problem together with the designer. In the formation of the design documentation, the number of signatures is deliberatley kept to the minimum. As a rule, the shop receives only a general idea of what the design bureau chief wants, and all the other blueprints are drawn by the author himself. But then his personal responsibility is sharply enhanced. The designer himself participates in assembly, and together with the physicist has an interest in making the article work immediately, without further work on it. The work of the designer has no formal criteria. At the institute they think that if they are introduced a person automatically starts to work for an indicator and may thus neglect the interests of the matter.

Much is now said and written about the need of associations for research institutes, design bureaus and plants. Indisputably, this can bring enormous advantage to production. But here there is silence about the fact that what science needs is not series production, but special design bureaus and plants ready to handle nonstandard articles.

"The special feature of our test plant," says N.A. Kuznetsov, chief of experimental production at the Institute of Nuclear Physics, "is that we do not have the right to say to the physicists 'we cannot do this or that.' This is fine for the physicists but bad for us, but nothing can be done about it because this is what the plant is for. Therefore, we have to be masters of everything: making machine tools, radiotechnics, electronics, optics, in short, everything required for the most complex modern physics installations. And we have only 2 or 3 weeks to reorganize from the production of one installation to another."

It is expedient to have the plant production subordinate to the interests of science. For example, the plan for June will be compiled in late May. And this is how it always is: the plan for the following month is drawn up at the end of the previous month! The flexibility is accomplished through the production of industrial accelerators and the portfolio of orders, which is always full. If the institute has a need to rapidly develop a new "scientific" accelerator or thermonuclear installation, then all the efforts of the design bureaus and production facilities can immediately be mobilized for the task. And if the scientific front is quiet for a while, then the plant calmly produces industrial accelerators.

If the test plant were not part of the institute but operated using the normal system, then there is no doubt that it would soon start to produce only series-produced industrial accelerators and rid itself of nonstandard scientific orders using all kinds of truths and nontruths. But now it does do it. Moreover, 10 percent of capacity in the experimental production facilities is given over for express orders! It may seem fantastic to the staffs of other scientific establishments, but it is a fact that express orders are completed within 2 or 3 days. And if a part essential for development or conducting an experiment is not complicated, it can be made within a day. And it is done for regular wages. The scientific council at the institute has established that if anyone dares to "push" his own orders for a bonus he will be dismissed from the institute. And everyone knows that the scientific council means what it says. It plays a special role here.

The Institute of Nuclear Physics has two foundations, the regular concrete foundation on which the walls of the institute stand, and a spiritual foundation that determines everything that is done within those walls. It is called "the roundtable." The meetings of the scientific council are held around this large, black plastic table.

On average the scientific councils of institutes meet about once a month. At the Institute of Nuclear Physics it meets every day. Precisely at 12 o'clock each day the members of the scientific council seat themselves at the round table and with a cup of coffee they discuss the cardinal problems of the institute's life or current affairs. Not only representatives of the director's office participate, but also the leaders of the party committees, the trade union council and the laboratories, along with the leading associates. In essence the "round table" is a collective form of institute management. Not a single important decision is made without the council, without discussion and debate. But when it is made, they carry it out from conviction, not as an order.

This does not contradict the official position of the academic institutions. It is said there that the scientific council meets at times established by the director. Right at the start of the institute's life, academician Budker decided that it should meet every day. He himself was the man who created during the process of these dealings the brilliant ideas that were often born during discussions using chalk on a blackboard. He naturally wanted this style also in the management of the institute. On the other hand, he considered that the institute was a family. And that here, all the boons and the difficulties, all the resources, should be shared frankly. In a good family, nothing is ever done in secret. And no offense is taken if one person gets a new suit today while someone else has to wait for tomorrow. And everyone in the family works to the best of his ability, but honestly.

Of course, they try to pick talented and capable people at the Institute of Nuclear Research. Here they know quite well that one first-class scientist is worth 10 second-class scientists. But they also understand that the sum of the talents of individuals still does not make up the collective talent. To make this happen it is necessary to make the entire nucleus of the scientific associate like-minded and try to get them to have common criteria and a unified understanding of what is good for the institute and what bad.

Responsibility, trust and scope for creative work: this is approach to the associates at the Institute of Nuclear Physics, most of whom were very young when the institute was formed. And people grow up quickly in this kind of atmosphere. The present director, A.N. Skrinskiy, came to the institute as a student on the fourth course. He became an academician at the age of 34. The "round table" nurtured academician S.T. Belyayev, director of the department of general and nuclear physics at the Institute of Atomic Energy imeni I.V. Kurchatov, academician R.Z. Sagdeyev, who is now the director of the USSR Academy of Sciences Institute of Space Research, academician Yu.Ye. Nesterikhin, who headed the USSR Academy of Sciences Siberian Branch Institute of Automation and Electrometry, and many other brilliant scientists. And new talent has taken their place at the "round table."

The Institute of Nuclear Physics is the largest in the Siberian Branch and one of the largest within the system of the USSR Academy of Sciences. And here, on the one hand, the common strong features of the Institute of Atomic Energy imeni I.V. Kurchatov, which brought the Institute of Nuclear Physics "into the world," and the Siberian Branch are most brilliantly distinguished:

educating first-class scientists and organically combining fundamental and applied research. On the other hand, the Institute of Nuclear Physics is distinguished by the monolithic character of its collective, such as is amazing for a scientific establishment. And it is precisely the "round table" that serves as the cement for this.

Academician Budker was the generator of many brilliant ides that even today still have a long life ahead of them. He left behind a very rich scientific legacy. But when his students and colleagues began to think about what kind of a memorial they could raise on Budker's grave, one that would best express the main thing that he had accomplished, they selcted the "round table." A copy of the round table at the institute was made in marble. One segment of it was removed; this is Budker's grave.

Within the institute you will not find a single office that does not have a portrait of Budker. Usually this portrait is of the latter period of his life when, after his heart attack, he grew a beard. The kind eyes of the sage look out from every portrait. And his soft smile, as if saying: well, are you living all right without me. You should be.

For the institute's inner life the "round table" has become akin to the invention of the wheel. Of course, it was more difficult to live without Budker. It was impossible to replace him. But thanks to the "round table" the institute managed to hold out, find strength, regroup and maintain its leading positions. What was formerly done in the external world by one Budker is now done by three, academician A.N. Skrinskiy, who took up the baton of directorship, and his two deputies for science, corresponding members of the USSR Academy of Sciences V.A. Sidorov and D.D. Ryutov. They do things differently, perhaps with greater expenditure of effort and energy, but they cope. The Institute of Nuclear Physics is moving confidently ahead in the stormy modern world thanks to the collective "captaincy."

Now, all together about 100 associates of the institute participate in the "round table" meetings. But, of course, not all on the same day. They have gradually been broken down into thematic subsections. On Mondays those engaged in work with elementary particles meet. Tuesday is the day for those working with the accelerators. Wednesday is the regular general institute meeting of the scientific council. Thursday is the day for those working on thermonuclear physics, and Friday is another general institute council meeting, but now administrative, with the leaders of all the technical services from the garage to bookkeeping, and all the laboratory chiefs, so as to resolve the problems that have cropped up during the week.

Each day has its own appearance at the "round table," its own range of questions, its own atmosphere. The thermonuclear people, for example, are more sedate and restrained. The accelerator people are younger, and the council is more cheerful, more unfettered. Although it must be admitted that humor and a good joke are valued every day. And this, better than anything else, generates a spirit of comradeship and brotherhood.

Whatever day it may be, at the round table at the Institute of Nuclear Physics you sense that you are present in a world scientific center. Someone is just back from a trip abroad, and reports must be presented on an international conference and there must be discussion of what rival colleagues are doing; and here, it is always noted that, no matter what the level of the institute, there is always one concern invisibly present--not to fall behind. At the Institute of Nuclear Physics they consider it important not only to work well but to try to be the leader in their field. Here they rightly think that whoever does not want to be first will not be; he will not even be tenth. Only leadership and work at the limits of the possible insures the institute's rapid development and respect in the scientific world.

At the Institute of Nuclear Physics they think that the institute should move ahead like a comet, leaving beihind a trail of scientific and practical results. And the "head" of the comet must necessarily be leading science. Therefore, in the institute's maturity, as in its youth, they try to travel by unfrequented roads. For example, they are working here on a project for a colliding-beam linear accelerator using electron and positron beams. This accelerator has made it possible to make a strong new breakthrough into the microcosm. It is a bold and daring project. Not everything in its accomplishment depends on the institute. And it will be a pity if history repeats itself with the idea of the accelerator operating with proton and antiproton beams which was put forward and worked out in detail in Novosibirsk but realized in Geneva by CERN, where this accelerator has now provided a whole range of major discoveries.

All who have worked at the Institute of Nuclear Physics for 20 years are given the gift of a clock by the institute. They are different from those being sold this year in the stores. But they all show the same thing--time. This is both a memory and a tireless, pulsating reminder. Times measures off what has been done. And they say to everyone: hurry on to do even more.

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BELORUSSIAN PHYSICISTS HONORED FOR DYNAMIC HOLOGRAPHY WORK

Minsk PROMYSHLENNOST' BELORUSSII in Russian No 3, Mar 83 pp 24-26

/Article by A. Afanas'yev and A. Ubranovich, candidates of physico-mathematical sciences: "New Discoveries"/

/Text/ The Belorussian scientists B.I. Stepanov, academician of the BSSR Academy of Sciences and director of the Academy's Institute of Physics, P. A. Apanasevich, deputy director and corresponding member of the BSSR Academy of Sciences, A.S. Rubanov, laboratory chief and doctor of physico-mathematical sciences, and Ye.V. Ivakin, candidate of physico-mathamatical sciences and senior scientific associate, were awarded the high title of laureates of the 1982 USSR State Prizes in the area of science for the cycle of works entitled "The Physical Bases of Dynamic Holography and New Methods for Transforming the Spatial Structure of Light Beams." The success of the Belorussian physicists is not accidental: they have participated actively in the formation of the new trends in laser physics, present-day optics and spectroscopy.

Holography did not find immediate application in scientific research. Three-dimensional representations of immobile objects arouse amazement but they can be seen only in exhibition halls.

In the late 70's a new scientific direction--dynamic holography--was formed at the junction of the sciences of holography and nonlinear optics. This new discipline made it possible to record objects moving and changing in time, and it became a powerful instrument for investigating physical processes taking place at a rapid rate. The experimental work carried out at the BSSR Academy of Sciences' Institute of Physics contributed to a significant degree to the development of this direction.

Lying at the basis of dynamic holography are nonlinear phenomena, which arise under the influence of light emission in the environment as a consequence of change in its optical parameters. The study of these phenomena has great scientific and applied significance and constitutes the subject of nonlinear optics--the optics of powerful light fields.

Research in this area has grown at an especially rapid rate since the creation of the first lasers. P.A. Apanasevich succeeded in discovering new patterns of change in the properties of substances under the effect of light. As a result of further theoretical work and experimental studies, B.I. Stepanov, A.S. Rubanov and Ye.V. Ivakin discovered in 1970 an effect previously unknown in optics--circulation of the wave front (CWF) of optical radiation. This discovery marked the beginning of a fundamentally new direction in laser physics--nonlinear adaptive optics, which has developed intensively in recent years.

The discovery of the CWF phenomenon has made it possible to resolve more successfully the complex problem of obtaining highly-directed powerful laser streams and the super-system for focussing them. These streams are essential for the directed transmission of light energy over large distances, for photolithography (the application of a very fine drawing or diagram on the surface of integral systems), and for the study of high temperature plasma in order to obtain a controllable thermonuclear reaction.

The traditional method for heating a target with nuclear fuel consists of the following: the radiation of a powerful laser is split into separate beams, which are amplified in special systems and subsequently reduced into component beams of still greater diameters. After they are focussed with special lenses the radiation is directed to the target and is absorbed by it, heating it to extremely high temperatures and initiating the first stage of a thermonuclear reaction. However, because a large number of optical elements are utilized, the radiation cannot be focussed precisely on the target: after focussing, the size of the light spot is approximately 10-fold greater than its diameter. Distortions of the wave front of the light beams directed within the optical system can be eliminated through the use of the CWF.

The systems which circulate the wave front have been called a CWF mirror. The simplest CWF phenomenon can be illustrated using the example of a light beam reflected from an ordinary mirror and a CWF mirror. For example, a person who looks into an ordinary mirror will see his own face, while a person who looks into a CWF mirror will see only his pupil. This is because the light scattered by other parts of the face will, when reflected from a CWF mirror, return to precisely those same parts and, consequently will not hit the person's eye. With one-time amplification, the divergence of the highly-directed light beam grows as a result of non-uniformities in the optical amplification system. Reflected from a CWF mirror, the beam which is being amplified circulates its own front. The reverse dispersion along the same trajectory eliminates distortions acquired during the direct passage, and this makes it possible to increase substantially the concentration of light energy on the target. This fundamental series of works by the Belorussian physicists has significantly enriched science.

The creative activities of Boris Ivanovich Stepanov, Hero of Socialist Labor, three-time winner of the USSR State Prize and winner of the BSSR State Prize, are purposeful and productive. He puts forward various theoretical ideas, conducts research intensively, engages in scientific-organizational activities, helps with the training and education of scientific personnel and performs a large amount of community work. About 30 years ago the young doctor of science science was invited to Minsk and since that time his activities have been directed to the development of physics in Belorussia. Under the leadership of Boris Ivanovich Stepanov our republic has established a school of physicists who are working successfullly in the area of modern optics and spectroscopy. The works of B.I. Stepanov and his students are well known both at home and abroad.

The breadth of his scientific interests, a deep understanding of the physics of the phenomena being studied and the high standards which he sets for himself also characterize Pavel Andreyevich Apansevich. These qualities have made it possible for him to attain significant scientific achievements, which have been acknowledged in the USSR and BSSR State Prizes. Aleksandr Sergeyevich Rubanov is also a representative of the Stepanov school. He possesses scientific intuition, a broad scientific outlook and excellent teaching ability. In 1976 A.S. Rubanov was awarded the high title of winner of the BSSR State Prize in the area of laser equipment. And while he is a highly-skilled specialist in this area, he defended his doctoral dissertation in a more recent and timely subject--dynamic holography.

A co-worker in his laboratory, Yevgeniy Vasil'yevich Ivakin, is a representative of the next generation of B.I. Stepanov's students. After graduating from the Higher Technical College imeni N.E. Bauman, he worked at a production unit and then enrolled in graduate studies at the BSSR Academy of Sciences' Institute of Physics. Diligence and persistence in scientific work have made it possible for Ye.V. Ivakin to become one of the founders of dynamic holography.

Research in the area of nonlinear adaptive optics is now in the stage of rapid development. Undoubtedly this research will make it possible to examine the physics of various phenomena from fundamentally new positions and it will find broad application in science and technology.

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REBANE DISCUSSES WORK OF ESTONIAN ACADEMY OF SCIENCES

Tallinn SOVETSKAYA ESTONIYA in Russian 17 Apr 83 p 3

[Interview with K. Rebane, president of the Estonian SSR Academy of Sciences, by A. Favorskaya: "Essential for Each Other"]

[Text] Along the road to the further development of our society's potential close interaction is required between science and practice, along with joint efforts by scientists in the different scientific centers. Correspondent A. Favorskaya talks about this with corresponding member of the USSR Academy of Sciences and president of the Estonian SSR Academy of Sciences, K. Rebane, using the development of research in our republic as an example.

[Question] Karl Karlovich, at the recent annual meeting of the ESSR Academy of Sciences there was a report on the broad range of research that is being conducted at the institutes. It was noted that more than 30 proposals by scientists have been recommended for introduction in practice, and last year 50 applications for inventions were made by academy establishments. How do these achievements relate to the comprehensive research programs?

[Answer] I would say that virtually all the worthwhile scientific and technical results in recent years have been obtained here within the framework of the programs. For example, the development of biotechnology, including the production of prostaglandin and pheromones, the development and fabrication of modern laser spectrometers, the results of research in the Baltic Sea, the development of software and the application of computer technology, including microprocessors, and much else. Here, the republic programs should be named, those such as the forecasting and planning of the ESSR's economic and social development, the comprehensive utilization of fuel shales, and the comprehensive use of phosphorites. Our work also has to do with the largest program in the country, namely the USSR energy program.

[Question] I would like to know about the contribution by our scientists to the development of the republicwide agrarian-industrial complex which literally only days ago was raised to legislative status.

[Answer] Well, the problems of the agrarian-industrial complex were being tackled by our scientists about 10 years ago: they were among the first to seek, along with the practical people, qualitatively new ways to improve work in agriculture and develop its links with industry. It should be said that our economists have been participating actively in the development of the scientific bases and recommendations for creating the agrarian-industrial associations as a new form of management, first at the rayon level and now at the republic level. In addition to the other problems, it is very important in this new system to reinforce the principles of economic accounting. There are many extremely urgent and topical questions here for the scientists to resolve. And it must be said that these are not only honorable but also extremely difficult tasks.

The academy of sciences is also working actively on problems such as the development of up-to-date, safe means for dealing with agricultural pests and resolving other technical and technological problems.

[Question] Practice shows that in science there should not be any "table of ranks." The research that today is considered secondary can become an important mainline in science. Notwithstanding, which work being done by republic scientists would you call key, the most important?

[Answer] Of course, it is very difficult to evaluate new scientific results; a correct evaluation is often made only after some years. But in my opinion, the long-lived achievements in science relate to, for example, the results being achieved by our astrophysicists on the large-scale structure of the universe--the concept that the universe has a cellular structure. This idea is now being well confirmed by astronomical observations. I would like to note that this cycle of work is being done here in very good cooperation with the theoretical physicists of the USSR Academy of Sciences headed by academician Ya.B. Zel'dovich. On the other hand, an important part of the observation material has been obtained in cooperation with astronomers in the United States and West Europe.

Of the achievements in physics I would note the cycle of work to study the superrapid processes of energy conversion in molecules and crystals. This is connected with yet another cycle of work, namely work on spectroscopy and the study of physical processes in the chlorophyll molecule and its analogues. The methods being used here by our physicists possess record accuracy and have made it possible to obtain a whole series of important new data. One example of the brilliant application of the possibilities of modern equipment and methods themself in fundamental research is provided by the work of the Institute of Chemical and Biological Physics. They are being used to solve important practical problems in today's very fine chemical and biochemical technology of significance also for agriculture and the Food Program.

The development by geologists of the bases for the comprehensive opening up of the mineral resources in the Rakvere phosphorite-bearing region is urgent. What is valuable in this present formulation of the problem is not only the recovery of phosphorites but also extraction taking into account the requirements for the comprehensive utilization of all the mineral riches and of environmental protection.

New developments have been made at the Institute of Economics, in particular in the field of the efficient operation of highway transportation in the republic and the optimization of mineral recovery taking into account the aggregate of economic consequences.

[Question] Is science in the republic experiencing any shortage of personnel, and is the level of training for researchers satisfactory?

[Answer] On the whole I think that the personnel of our academy are our greatest asset, our greatest capital. I would like to emphasize that we have dozens of young people at the various institutes, even postgraduate students and junior scientific associates, who are doing simply beautiful work and have fine published work in the central journals and in the foreign press. And I am confident that they will do even more for Soviet science.

[Question] It is known that money is invested advantageously in science. How is the material base of the ESSR Academy of Sciences now being strengthened?

[Answer] I personally an not a supporter of direct deductions into science as a whole by calculating how many rubles of return are gained from each ruble invested. The emergence of science into practice and the return to society from science constitute a very complex phenomenon and only part of this return can be calculated in rubles, and here, of course, it is absolutely essential. Perhaps, however, the most valuable part cannot be expressed in rubles. But I fully agree that the material-technical base is one decisive condition for the development of science. With regard to our academy, thanks to the great help from the republic and the USSR Academy of Sciences, and also from the State Committee for Science and Technology, our base is now much stronger than 10 years ago; and the main thing is that the possibilities for experimentation have grown beyond recognition. I think that today work done only at the all-union level makes sense, because this simultaneously means it is done at the level of world science. And where this does not happen and there is no hope of correcting the situation, we do not have the moral right to continue to spend funds.

[Question] What contacts with the scientific establishments in the other fraternal republics and in foreign countries do you regard as especially fruitful?

[Answer] If you were to ask where such links are needed today I would have difficulty in answering. In our country science is also strong because, say, the small academies like ours are working together with the major and leading centers of science and academies. So we say that our Institute of Physics together with the ESSR Academy of Sciences special design bureau and the special design bureau for computer equipment at our Institute of Cybernetics has developed a laser spectrometer, but in fact several dozens organizations throughout the country have actually participated. They include laboratories in Moscow, Novosibirsk, Kharkov, Leningrad and other centers. These links are especially important for new technological directions in science such as molecular biology, lasers, biotechnology, and computer technology. There we sense particularly what Soviet science needs. And we also need day-to-day links with those laboratories and production organizations that have initiated these directions in our country.

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