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Science & Technology

USSR: Science & Technology Policy

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New Organization to Promote Science and Technical Work by Youth

18140142 Moscow KOMSOMOLSKAYA PRAVDA in Russian 6 Dec 87. p 1

[Article by V. Barabash, Secretary, Central Committee Ukrainian Komsomol: "Time to Think and Act"]

[Text] *The VLKSM [Komsomol] Central Committee Plenum opens tomorrow. It will discuss the participation of Komsomol members and young people in accelerating scientific-technical progress.*

Until recently our attempts and requests for young people to actively participate in accelerating scientific-technical progress were not supported by real possibilities for organizing this matter correctly. The 20th VLKSM Congress approved and maintained a new course — a start was made to set up a unified public-state NTTM [Scientific-technical creativity for youth] system. This system obtained reliable organizational, legal and financial support.

What is a unified NTTM system, and how does it differ from an ordinary noisy campaign which, to be frank about it, has been a fault of the Komsomol in recent years?

With the NTTM's creation a new public-state mechanism for youth initiative will begin to operate in the country. We came to it by a quite thorny path. Much labor, energy and time was spent by Komsomol committees on various types of coordination, requests for resources, implementing measures. This openly smelled of dilettantism. Many of the really talented initiatives of young people found no real use. Councils of young scientists and specialists stewed in their own juices; periodic charity was received by circles and sections. Unorthodox approaches to young peoples' inventions and suggestions gathered dust on the shelves of BRIZ [offices for rationalization and invention] and reputable scientific offices. Efforts by ministries, departments and public organizations were fragmented and uncoordinated. There was no continuity in forms and methods of scientific creativity for various categories of young people.

The formation of an NTTM system in the republic began when we decided to learn what should be given priority and what to reject. This was considerably helped by "Inventions and Rationalization - 90", developed and approved by the Ukrainian SSR Council of Ministers, the Ukrainian Trade Union Council, the LSKMU Central Committee and the Ukrainian SSR Academy of Sciences. Its main goal is to create a 9 billion ruble rationalization fund for the economy in the 12th Five-Year Plan.

Our structure for a unified NTTM system has, for the most part, been completed. However, there are still difficulties.

Even though they were at the finish line to the development of technical creativity, the NTTM coordination councils faced the dilemma of where to direct resources and efforts. The documents state that targets for NTTM development be included as individual lines in plans for the economic and social development of the appropriate levels. On the basis of these plans there should be closely linked financing, credits, cadre and material support, without which a system simply cannot develop.

It appears that the All-Union Coordination Council should be the first basis for organization. It would also be advisable to include questions of NTTM planning in USSR Gosplan methodological documents.

State instruments should operate in the system. So far this has not happened. The Komsomol, as the initiator cannot solve all questions itself. The NTTM system may remain only a public system. However, it previously was such... Today, as never before, what is needed are not arbitrary decisions, but economically based actions, taking into account, in varying degrees, the interests of public production and the individual. Perhaps it would be sufficient to combine these principles of independent technical creativity into what would be, in our opinion, one of the most important strategic objects for applying efforts and resources — a unified public-state NTTM system. Clubs for independent technical creativity should be an integral component of the NTTM system.

I am far from calling for any special role for the Komsomol, making it the organizer of everything. In our opinion, authoritative organs such as VOIR, NTO [Scientific-technical societies] and trade unions should not only work with us but should also view the NTTM system as their vital concern. Many public and state organizations obligated to work on this were initially fragmented.

Take, for example, a main and promising "trump card" such as the creation of urban and rayon funds for young people's scientific-technical creativity. Unfortunately, there are not now any very impressive examples of their formations or, most importantly, their effective use.

The situation is even worse with regards to the creation of working apparatuses for coordinating councils. The situation is simply tragicomic. They rack their brains about where to set limits on staff and wages funds. Authoritative instructions saying "find them" fly around and are boomeranged back as "give us". The initiator, the Komsomol, remains the work horse in any case. The All-Union Coordinating Council should bring the needed clarity to this question.

An obvious first need is the purely formal question of developing and introducing accounting and report forms for the NTTM system. These are now lacking.

I especially want to say something about the NTTM centers on cost accounting, enterprises which have no analogues in our country's history. They aroused great interest among young people. A multitude of groups showing initiative appeared among Komsomol workers and young scientists and engineers engaged in setting up such centers. We planned to open several NTTM centers. Could it be doubted that we would succeed? There are now already 12 in the republic.

The main conclusion to be drawn from their brief operation is that the NTTM centers, intermediates linking enterprises and organizations needing scientific and technical achievements to young specialists, inventors and innovators, have established their right to exist. They have definite advantages: the supra-sectoral and all encompassing character of their work and their freedom to maneuver. Today NTTM centers in the republic have signed and are implementing more than 250 economic contracts totaling 3 million rubles. According to the most cautious calculations, by the year's end this indicator should double. We place special importance upon signing contracts for implementing oblast and regional programs for the current five-year plan. During 1987-1988 targeted programs at the Odessa center alone will total 700,000 rubles. One can already talk about their sizable economic return. Preliminary analysis shows that the cost of work fulfilled by NTTM centers is 2-3 fold lower than for sectoral NII and KB, while the time required is several fold less.

They are gradually winning authority and prestige among economic managers and the creativity of young people is increasing. A comparison is indicative. During the 2 years since the approval of the temporary Statute on creative young people's collectives about 130 such collectives have been set up, while just during the 3 months work of the NTTM Centers twice as many young peoples collectives have been organized.

Yes, the NTTM centers will be developed. They are appearing even at industrial giants and at scientific-production institutions. The country's first center operating with the rights of a subdivision will be within the framework of an intersector scientific-technical complex, The Institute for Electric Welding imeni Paton. The next one will be set up at the agro-industrial complex for Kiev Oblast.

However, at the present stage, they can attain the highest point in their development only after the creation of a republic association of NTTM centers. It is just such a unit which we intend to set up, on an experimental basis, in our republic.

But this should not be understood as an organization with a bureaucratic apparatus! All regional centers will retain complete management and economic autonomy. Why then is an association needed? By creating more new centers we are only adding their efforts. However, we now need a form of management which would

multiply them. How? The association should have backlogs of orders and lists of work performers on a republic wide scale. For example, specialist in Odessa or Kiev would work on a them which is of interest to enterprises in Dnepropetrovsk. This will assure the most complete, high quality and rapid solution to problems. In addition, there will be a backlog of finished developments in a powerful computer. This will reduce work costs and eliminate the need to reinvent the wheel. This is how we see future science for young people in the republic.

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Amendments to Charter of USSR Academy of Sciences

18140126 Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 10, Oct 87 pp 33-43

[Article by Doctor of Juridical Sciences V.A. Rassudovskiy, scientific secretary of the Commission for the Preparation of Suggestions on Amendments to the Charter of the USSR Academy of Sciences, under the rubric "The Organization and Efficiency of Scientific Research": "On the Charter of the USSR Academy of Sciences"]

[Text] At the session of the General Assembly of the USSR Academy of Sciences in March 1987 a large number of amendments to the prevailing Charter of the USSR Academy of Sciences were adopted—more than ever were since its adoption in 1963. These changes and the discussion, which preceded them, at the meetings of the General Assembly and in the pages of the press¹ attracted much attention of the scientific community and raised in it a number of questions. In this article we will attempt to answer several of them.

The Charter of the USSR Academy of Sciences is the main legal document which specifies its status, organization, and forms of activity. And not by chance has particular importance been attached throughout the history of the academy to its charter. The members of the academy were ordered to study it carefully, a special procedure of reporting to the academy assembly on the fulfillment of the charter provisions also existed. The concluding Article 125 of the 1836 Charter stated: "So that everyone, in performing his duties exactly, could observe at the same time whether any omissions in the scientific or economic area have arisen, this charter has to be read both at the Conference and in the Committee of the Board during the first meeting of every year."² In other words, the academy constantly kept an eye on the exact fulfillment of all the articles of the academy charter.

The charter is called upon to directly regulate relations of an intra-academic nature: the structure of the academy, the procedure of election to the academy, the rights and duties of the members of the USSR Academy of Sciences, the organization of the management of academic

science, and so forth. At the same time it is connected with legislative acts, which establish the diverse relations of the academy with organs of state government, with various units of the national economic complex and the sociocultural sphere, and with foreign organizations. The charter norms on the goals, tasks, and functions of the academy reflect the legislative statutes in the area of science and the use of scientific achievements and, therefore, react to some changes or others of these statutes.

Along with this the charter of the academy has the significance of a system-forming legal act—it constitutes the nucleus of the legal complex, which consists of charter norms and the statutes and charters, which accompany them. The charter of the academy in basic outline specifies the procedure of election to the academy, the tasks, functions, and powers of the departments, the Presidium of the USSR Academy of Sciences, and its sections, as well as the legal status of the scientific centers, affiliates, and scientific research institutes of the USSR Academy of Sciences. In the charter there are reference norms to the associated standard documents, which specify and develop the corresponding charter provisions. Among the standard legal acts, which are a part of the package of charter documents of the academy, are the Statute on Election to the USSR Academy of Sciences, the Statute on the Department, the charters of the regional departments of the academy, the Statute on the Section of the Presidium of the USSR Academy of Sciences, the Statute on the Scientific Center, the Statute on the Affiliate, and the Charter of the Scientific Research Institute of the USSR Academy of Sciences.

All the standard charter documents are approved in accordance with the representation of the Presidium of the USSR Academy of Sciences by the General Assembly, here the Charter of the USSR Academy of Sciences has the highest legal rank: it is approved and amendments are made to it in accordance with the decision of the General Assembly, which has been adopted by not less than a two-thirds majority of the total number of full members of the USSR Academy of Sciences; associated charter documents are adopted in accordance with the decision of a simple majority of the academicians who are present at the assembly.

The now prevailing charter of the academy was adopted in 1963, when the process of the formation and development of the USSR Academy of Sciences as the highest scientific institution of the country, which is responsible for the management of its own, academic system of scientific institutions and for the coordination of scientific research throughout the country, for the most part had come to an end. A lengthy search for an adequate legal status of the academy, the forms of its contact with other state organs, and the principles of organization preceded this.

From the moment of its establishment the Academy of Sciences was always a state institution with an approved

budget and staff of employees, and, beginning with the 1724 plan of Peter the Great, all its regulations and charters (1747, 1803, and 1836) came from the highest state authorities.

During the first years of Soviet power, for nearly a 10-year period, the Russian Academy of Sciences was under the jurisdiction of the RSFSR People's Commissariat of Education and in its activity continued to base itself on the 1836 charter, in which only individual innovations had been included. After the formation of the Union of Soviet Socialist Republics the question of transforming the Academy of Sciences into an all-union institution arose. True, the RSFSR People's Commissariat of Education insisted that the Academy of Sciences would remain under its jurisdiction, but the academy itself considered subordination directly to the USSR Council of People's Commissars most acceptable. In a special memorandum of 20 February 1925, which was addressed to the Council of People's Commissars, the all-union nature of the work of the Academy of Sciences and its "quite exceptional position among all other scholarly and scientific institutions of the country" were emphasized. Moreover, as would now be said, the extra-departmental nature of its activity is opposed to the narrow departmental position of the People's Commissariat of Education. "And this position," it is stated further in the memorandum, "it has retained unchanged for 200 years even during the most reactionary periods of the czarist autocracy." The former Ministry of Public Education never had and could not have any direct influence on the Academy of Sciences, since the academy, as was stated at that time, was "under the special protection" of the highest authority in the country. The Ministry of Public Education was only an intermediary organ, which passed on all the statements of the Academy of Sciences for consideration by the organs of the highest authority, moreover, the relations of the academy with the latter in accordance with its charter were carried out directly through its president, vice president, and permanent secretary.³

The proclamation of the new status of the Academy of Sciences was timed to coincide with the jubilee celebrations on the occasion of its 200th anniversary. The basic legislative act, which also specifies to this day the legal basis of its activity, was the decree of the Central Executive Committee and the USSR Council of People's Commissars of 27 July 1925, in which it was stated: "1. To recognize the Russian Academy of Sciences as the highest all-union institution, which is attached to the USSR Council of People's Commissars and operates on the basis of the charter, which has been approved by the latter. 2. To confer on the designated academy the title 'Academy of Sciences of the Union of Soviet Socialist Republics'."⁴ The academy was transferred from the jurisdiction of the People's Commissariat of Education to the USSR Council of People's Commissars, while a special department of scientific institutions was formed within the Administration of Affairs of the Council of People's Commissars.

On 18 June 1927 the USSR Council of People's Commissars approved the Charter of the USSR Academy of Sciences.⁵ The development of basic research as the basis for applied developments in the most important areas of the national economy and culture was proclaimed as its main task. In principle the subsequent charters of the academy, which were adopted in 1930 and 1935, also advanced the same tasks.

The appearance of three academic charters over a comparatively short historical interval in itself requires explanation. Of course, the broadening of its functions, the complication of the tasks, and the increase of the amount of scientific and scientific organizational activity were set down and reflected each time in the new academy charters. But there were also reasons of a specifically legal nature for such a change. Thus, the 1930 charter was approved by the Presidium of the USSR Central Executive Committee in connection with the transfer of the Academy of Sciences to the jurisdiction of the Committee for the Management of Scientific and Educational Institutions of the USSR Central Executive Committee;⁶ the 1935 charter was approved by the government in connection with the fact that the Academy of Sciences was transferred again to the jurisdiction of the USSR Council of People's Commissars.

In 1956 the formulation of the draft of a new charter, which envisaged the broadening of the functions and powers of the academy in the area of the planning of scientific research, the coordination of the activity of scientific institutions, and the organization of scientific work, was begun. The draft of the charter, which was prepared by the academy, was submitted for approval to the USSR Council of Ministers, while it delegated its powers to the USSR Academy of Sciences, having granted it the right to approve itself the draft of the new charter. The charter was approved by the General Assembly of the academy and was put into effect on 31 March 1959. Subsequently, in connection with the decree of the CPSU Central Committee and the USSR Council of Ministers of 11 April 1963 "On Measures on the Improvement of the Activity of the USSR Academy of Sciences and the Academies of Sciences of the Union Republics," it was necessary to draft a new charter, which was also approved on the instructions of the USSR Council of Ministers by the General Assembly of the USSR Academy of Sciences on 1 July 1963. This charter with the corresponding amendments is also in effect at present.

The prevailing charter of the academy reflected the realities of "large-scale science" and the peculiarities of the organization of research in the age of the scientific and technical revolution. The constant increase of the scale of scientific research work had the result that the academy developed into a branched system of scientific institutions with an ever increasing pilot production base. The number of full members and corresponding members of the USSR Academy of Sciences increased significantly and new departments were established,

which in turn brought about the formation of the sections of the Presidium of the USSR Academy of Sciences for groups of fields of sciences. The correlation of the functions and powers among the various units of the academic system: the scientific research institute—the department—the section of the Presidium—the Presidium—the General Assembly of the USSR Academy of Sciences, was specified and set down in the charter provisions. In this chain the institute is the basic unit of scientific research activity, and its relations with superior organs of the academic system of management are based not on rigid administrative subordination, but on coordination, self-management, and collectivity. The Presidium of the USSR Academy of Sciences is also an organ of management of a special kind: in the forms and methods of work and in the structure of the staff it does not have analogs among other organs of state management. The staff of the Presidium of the USSR Academy of Sciences objectively cannot act by the methods, which are characteristic of ministries and departments, it should function within the relations, which are characteristic of the Academy of Sciences and were developed by it during practical work. The structure of the staff and its functions and powers are subordinate to the main task—to ensure the development of basic research. This task is unique and differs radically from the tasks of ministries and departments, therefore, management at the academy is also carried out in a special way—collectively, on the basis of the principles of appointment by election and scientific democratism. The lengthy practical experience of organizing academic science, which is reflected in the charter provisions, attests to this. The president of the USSR Academy of Sciences manages the academy not in accordance with the principle of one-man management, but on behalf of the Presidium as an organ of collective management. In their activity the academicians secretaries of the departments rely on the organs of collective management—the bureaus of the departments.

Thus, the USSR Academy of Sciences—the highest scientific institution of the country—is a state institution, but an institution which has a broad degree of self-management and a special nature of formation. The management of academic affairs within broad limits is granted to the very members of the academy. Its legal connection with the government is reflected in the wording of Article 12 of the Law on the USSR Council of Ministers, which, as is indicated there, "directs the activity of the USSR Academy of Sciences."⁸

The broad autonomy, which was granted to the Academy of Sciences, was also reflected in the prevailing procedure of the approval and change of its charter and in the delegation (transfer) of the corresponding rights, which belong by law to the USSR Council of Ministers, to the General Assembly of the USSR Academy of Sciences. Owing to this the academy acquired the opportunity upon the representation of its Presidium to make the necessary changes in the charter in the same manner in which the very text of the 1963 charter was approved,

that is, in accordance with a decision adopted by not less than a two-thirds majority of the total number of full members. During the period since 1963 the General Assembly has repeatedly made amendments to the charter—in 1964, 1966, 1968, 1970, 1975, 1977, 1979, 1981, 1983, 1984, and, finally, during the current year of 1987.

This responsible work required the corresponding organizational forms and special regulation. On 28 November 1978 the Presidium of the USSR Academy of Sciences organized a commission for the preparation for consideration at the meetings of the Presidium of proposals on amendments to the charter. The proposals, which have been received both from the Presidium and from the members of the academy, are usually considered in the commission before each annual General Assembly. The commission turns its recommendations over to the Presidium of the USSR Academy of Sciences. The proposals, which have been supported by the Presidium, are submitted for the consideration of the General Assembly and are put to a vote, while the chairman of the commission reports to the General Assembly on those which were not supported by the Presidium. If as a result of subsequent discussion some suggestion, which was not supported by the Presidium, all the same meets the approval of the majority of full members of the academy, who are present at the assembly, it is again turned over to the commission for the preparation of the text of the corresponding amendment to the charter and is submitted to the next General Assembly for a vote and final decision.

Such a procedure of the periodic updating of the academy charter should not create the notion of it as a document which needs all but annual adjustments. On the contrary, the proper combination of the stability of the charter, which has been in effect now for a quarter century, with the possibility of making in it the necessary corrections on the basis of the needs of practice has been achieved.

The academy charter recorded in good time the necessary changes in the activity of the academy. Thus, after the adoption of the 1963 charter it was supplemented by a section on the scientific centers of the USSR Academy of Sciences, the tasks of the academy and the terms of office of its elected organs and managers were specified, a new periodicity of election to the USSR Academy of Sciences was introduced, a secret ballot when nominating candidate members of the Academy of Sciences at institutions and organizations was established, the conditions of membership in the academy were brought in line with the Law on USSR Citizenship, and so forth. The inclusion in the charter of a new article (Article 74) with detailed wording on the scientific methods supervision of the activity of sectorial (departmental) institutes that conduct basic research was also important.

But the most serious changes of the charter provisions are connected with the important measures on the restructuring of the USSR Academy of Sciences in light

of the decisions of the 27th CPSU Congress. After the session of the General Assembly of the USSR Academy of Sciences of 16-17 October 1986 a review of the basic provisions of the entire set of charter documents was made. At the annual General Assembly on 12 March 1987 the Statute on the Department of the USSR Academy of Sciences, the Statute on the Section of the Presidium of the USSR Academy of Sciences, and the Temporary Charter of the Scientific Research Institute of the USSR Academy of Sciences were approved, while changes were also made in the Charter of the USSR Academy of Sciences and in the Statute on Election to the USSR Academy of Sciences.⁹

The charter provisions were revised in the following directions: the increase of the role of departments and the reorganization of institutes; the formation of regional departments; the improvement of the procedure of election to the USSR Academy of Sciences; organizational questions.

Let us examine these directions in greater detail. During the period after the approval of the 1963 charter the centralized system of management, in case of which the role of the functional subdivisions of the official staff of the Presidium of the USSR Academy of Sciences increased, while the role of the departments of the USSR Academy of Sciences decreased, continued to be strengthened at the academy. It should be noted that at one time the centralized management of science was a correct thing: the composition of the Academy of Sciences was not so large, and from the center it was possible in time to support what was new and to aim development in the necessary direction. But now the situation is different: in the USSR Academy of Sciences alone there are 250 institutes, there are nearly as many academic organizations of union republics, higher educational institutions, and so forth. It is impossible to manage in a centralized manner the very enormous potential of basic science. That is precisely why there arose in the Presidium of the Academy of Sciences the idea of decentralization, but decentralization without the loss of the global management of science on the part of the Presidium: it needs to focus attention on questions of the structure of management and on the coordination of intersectorial and interdepartmental problems. Thus, the specialized departments settle all questions on the management of science, which are connected with their competence, while the highest unit—the Presidium—is responsible for the coordination of scientific research and the prospects of the development of science in the country.¹⁰

In the new version of Article 50 of the charter it is stressed that the department of the USSR Academy of Sciences is the basic scientific and scientific organizational center, which is responsible for the development of basic research in the corresponding field of science in the country, for the state of research at the scientific institutions of the department, for the obtaining of

scientific results, which are at the level of world achievements or surpass them, for the formulation of suggestions on the acceleration of scientific and technical progress and the socioeconomic and spiritual development of society, and for the efficiency of international cooperation. The competence of the General Assembly of the department, which in conformity with Article 51 of the charter specifies the basic directions and settles fundamental questions of the development and planning of the corresponding field of science and the introduction of the results of scientific research in practice and specifies the tasks and basic directions of coordinating activity in accordance with the specialization of the department, including institutions of the USSR Academy of Sciences and the academies of sciences of the union republics, sectorial institutes, and higher educational institutions of the country, was broadened. The Statute on the Council for the Coordination of the Scientific Activity of the Department of the USSR Academy of Sciences was approved by Decree No 19 of the Presidium of the USSR Academy of Sciences of 13 January 1987. In stipulating the basic functions and powers of the General Assembly of the department, Article 51 of the charter contains the new provision that the General Assembly can also examine other questions which belong to the jurisdiction of the department of the USSR Academy of Sciences. As to the executive organ—the bureau of the department, in contrast to the former version of the charter Article 53 in the new version merely establishes that the functions and powers of the bureau of the department are specified by the Statute on the Department of the USSR Academy of Sciences. Such “relieving” of the charter is due to the fact that the Statute on the Department of the USSR Academy of Sciences now contains the detailed and comprehensive regulation of the competence of the bureau of the department (Paragraphs 17.1-17.24).

So that the departments would have the opportunity to perform their role, several powers, which previously belonged to the central staff of the Presidium of the USSR Academy of Sciences, were additionally transferred to them. The rights of the departments in the area of the scientific and scientific organizational supervision of institutes, the formation of the system of scientific institutions, and the establishment of flexible and mobile organizational structures at institutes, in the personnel and resource support of the activity of institutes, as well as in the sphere of international scientific relations were broadened. All this is substantially changing the status of the department of the USSR Academy of Sciences, which is now not only a union of members of the Academy of Sciences and an association of scientific institutions, but also a management organ with a set of powers, which ensure the supervision of science with respect to the attached field. Such a change of the status of the department required the organizational forms of its work to be defined more carefully, the powers of the academician secretary to be specified, and the official staff of the department to be strengthened. The charter (Article 52) envisages the introduction of the position of

deputy academician secretary for scientific organizational questions, who is appointed by the Presidium of the USSR Academy of Sciences upon the representation of the bureau of the department from among the members of the USSR Academy of Sciences or doctors of sciences and has the rights of a member of the bureau of the department. The scientific secretary of the department, who is appointed upon the representation of the academician secretary by the Presidium of the USSR Academy of Sciences, also belongs to the bureau of the department.

The change of the status of the departments of the USSR Academy of Sciences will require the significant improvement of the style and methods of work of the staff of the departments and its better interaction with the subdivisions of the staff of the Presidium of the USSR Academy of Sciences. In this connection it is worth emphasizing that the Presidium has performed much work on the reorganization of the central staff. In conformity with Article 49 of the charter the statutes on its structural subdivisions were updated. As a result the new status of the departments was strengthened organizationally and was coordinated with the structure and powers of the central staff of the Presidium of the USSR Academy of Sciences.

The reorganization of the structure and activity of academic scientific research institutes was another important element of restructuring. In the new version of Article 71 of the charter the scientific research institute is characterized as the basic unit of the scientific research activity of the academy. Just as before, the charter does not contain regulation of the activity of institutes, referring to a special standard document—the Charter of the Scientific Research Institute, which is approved by the General Assembly of the academy. The General Assembly by the decree of 12 March 1987 approved the Temporary Charter of the Scientific Research Institute of the USSR Academy of Sciences. The main direction of the changes, which were made in the charter of the institute, is the broadening of the independence of institutes and the increase of their responsibility for the scientific results on the basis of the creation of the conditions for the maximum realization of the creative possibilities of scientists. The rights of institutes in the settlement of questions of the structure and staffs and in the use of the wage fund and financial, material, and manpower resources were broadened. Along with stable structural subdivisions temporary collectives made up of staff members of the institute and specialists from outside can be established at the institute for the fulfillment of goal programs and projects, as well as for the fulfillment of individual assignments and orders. The institutes are now oriented toward the development of temporary collectives and toward the systematic influx of fresh creative forces. The rights of institutes in the area of the planning of scientific work have been specified with allowance made for the present tasks. The right to approve detailed annual plans of scientific research work, while systematically updating the themes, focusing

attention on basic and priority research, and halting in good time the work on themes of little urgency, has been attached to them. The possibilities of institutes in the formation of stimulation and development funds, in the disposal of material resources, and in the monitoring of the construction of facilities have been broadened. The rights of institutes in the area of international scientific relations have been broadened.

The charter of the institute, which was previously in effect, was approved by the General Assembly of the academy on 1 March 1972. The charter, which replaced it and was adopted on 12 March 1987, has the status of a temporary enforceable enactment. The point is that the legal status of academic institutes is based on the norms of the general statute on scientific research, design, planning and design, and technological organizations, which was approved on the instructions of the USSR Academy of Sciences by the decree of the USSR State Committee for Science and Technology of 13 November 1970.¹¹ This statute regulates the basic scientific activity and establishes the peculiarities of the use in the activity of scientific organizations of the norms of the Statute on the Socialist State Production Enterprise. This means that the Law on the State Enterprise (Association), the draft of which was submitted for national discussion,¹² is a legislative act which in many respects determines the status of scientific organizations, regardless of their departmental affiliation. In Article 24 of the named draft it is indicated that the peculiarities of the application of the law on the enterprise in individual sectors of the national economy and to individual types of enterprises are determined by the USSR Council of Ministers. Now, following the adoption of the new law on the enterprise, the legal acts, which are connected with the activity of all scientific organizations, including academic institutes, have to be updated. The temporary charter, which was adopted on 12 March 1987, recorded the intermediate stage of the organizational restructuring of institutes.

The modification of the temporary statute of the institute will proceed, for the most part, in two directions. First, the cost accounting principles in the activity of institutes will be developed. Of course, the principles of self-support [samookupayemost], self-financing, and full cost accounting can be used to a far from equal degree in the activity of all scientific organizations. It is clear that to a great extent they can be used at organizations of the sectorial type and especially where there is a developed production base. But in principle the status of all academic institutes can also include specific conditions of the use of cost accounting principles in their activity, however, without detriment to the fulfillment of the main task—the development of basic research. Second, the democratic principles of the management of scientific collectives have to be developed. In the temporary charter of the institute there are norms on the strengthening of such principles in management and on the combination of one-man management with the extensive participation of workers in management on the basis of glasnost, the development of criticism and self-criticism,

the consideration of public opinion, the provision of the most favorable conditions of creative scientific work, the holding of discussions, and the competition of scientific ideas and results. In conformity with the law the labor collective participates in the management of the institute through the general assembly and other organs. At the same time the future law on the enterprise will provide a legal basis for the development of new forms of production democracy. Here one should bear in mind that now elections of candidates for management positions are also held at the institutes of the academy: the directors of institutes are elected at the general assemblies of the departments of the USSR Academy of Sciences, the managers of structural scientific research subdivisions are elected to vacant positions on the basis of competition by the scientific councils of institutes. The new law on the enterprise will create the prerequisites for the further strengthening of the democratic principles in the management of institutes and the development of the self-management of labor collectives, glasnost, and collectivity and the settlement of a broader range of scientific and administrative questions. However, the forms of production democracy at enterprises cannot be carried over mechanically to scientific organizations.

Within the framework of the restructuring of the Academy of Sciences important steps in the area of regional science policy have been implemented: the Far Eastern and Ural Scientific Centers, which were established in 1969, have been transformed into regional departments of the USSR Academy of Sciences. Field meetings of the Presidium of the USSR Academy of Sciences, which examined the questions of the state and the prospects of development of science in the Far East and the Urals in light of the decisions of the 27th CPSU Congress, were held in Vladivostok in November 1986 and in Sverdlovsk in February 1987.¹³ Proposals on the establishment of new departments were formulated, and final decisions on this question were made by the General Assembly in the decree of 12 March 1987 "On the Establishment of the Far Eastern and Ural Departments of the USSR Academy of Sciences."

The legal principles of the activity of the regional departments are set forth in the new version of the charter. The norm on the departments of the academy, which have been organized in accordance with the regional attribute, is included in Article 7 of the charter and these departments are named: the Far Eastern, the Siberian, and the Ural departments. The members of the USSR Academy of Sciences, who are united by regional departments, at the same time are members of the departments in their specialty. The regional departments operate on the basis of their own charters, which are approved by the General Assembly and are an integral part of the Charter of the USSR Academy of Sciences. An essential peculiarity of the legal status of the regional departments is present: they operate on the basis of individual charters, while the departments for fields and directions of science operate on the basis of a statute that is common to all specialized departments. The affiliates operate on the basis of a

common statute, the scientific research institutes of the academy operate on the basis of a common charter. At the same time the possibility of the adoption by the Presidium of the USSR Academy of Sciences of an individual statute on each specialized department with allowance made for the specific peculiarities of their activity (Article 57 of the Charter), as well as an individual charter of the scientific research institute with allowance made for the specific peculiarities of its legal status (the note to the Temporary Charter of the Scientific Research Institute of the USSR Academy of Sciences) is now allowed.

In connection with the establishment of the regional departments Section VIII of the Charter, which specified the status of the Siberian Department of the USSR Academy of Sciences, in the new version has the title "Regional Departments of the USSR Academy of Sciences," and with respect to the text of this section the words "Siberian Department" have been replaced with "Regional Departments." Moreover, in Article 60 the addition is made that the regional department is financed through the RSFSR budget by a separate line. Such amendments show that the 30 years of experience of the Siberian Department made it possible to prepare a decision on the legal status of the regional departments on an analogous basis. It is clear that much work on the draft of the charters of the Far Eastern and Ural departments and the modification of the charter of the Siberian Department lie ahead, however, the basic fundamental questions of their common legal status are already set down in the academic charter.

Special conditions of the election of candidate members of the USSR Academy of Sciences for work at the regional departments are recorded in the new version of Article 25 of the Charter and Article 17 of the Statute on Election to the USSR Academy of Sciences. The elections are held at the general assemblies of the departments for the corresponding specialty for specially stipulated vacancies from among the people, who work in the given region or have been brought in by the regional department, and with allowance made for the recommendations of the regional department. At the same time the General Assembly adopted the decision that the people, who have been elected to specially allocated vacancies for regional departments, are obliged to work at the institutions of the regional department, with respect to which they have been elected, and commissioned the Presidium of the USSR Academy of Sciences to develop a procedure which ensures the unconditional fulfillment of this provision.

Considerable space in the charter is assigned to the procedure of electing members of the USSR Academy of Sciences (Articles 21-31). The established election procedure is a result of lengthy and complex development. In this direction there were many difficulties, various decisions were made, but to this day the system of academic elections often gives rise to critical opinions. The election procedure, which is specified in the charter,

originates from the sound and strictly regulated ratio of the powers of the General Assembly, the Presidium, and the departments of the USSR Academy of Sciences in the decision of election matters. Any redistribution of powers will inevitably upset the established balance and thereby will affect the interests of the corresponding units of the academic system. The Presidium of the USSR Academy of Sciences, in conformity with Article 21 of the Charter, has extensive powers to settle promptly questions which are connected with the organization and holding of elections, relying in this case on the suggestions of the departments. In this connection, in the spirit of the general policy of increasing the role of the departments, the addition concerning the fact that prior to the regular elections the bureaus of the specialized departments and the presidiums of the regional departments prepare suggestions on the breakdown by specialties of the vacancies allocated to them and submit their suggestions for the decision of the Presidium of the USSR Academy of Sciences, was inserted in Article 2 of the Statute on Election to the USSR Academy of Sciences. Moreover, it was established that the expert commissions of the departments either are elected at the general assemblies of the departments or upon the representation of the bureaus of the departments are appointed by the Presidium of the USSR Academy of Sciences. The question of which procedure of approving the expert commissions is to be used, is settled by the department itself. And, finally, a radical addition was inserted in Article 16 of the Statute on Election. It is well known that previously the Presidium allotted to those departments, in which a larger number of candidates than there were vacancies received the necessary number of votes, additional places by means of vacancies, which were not filled as a result of the elections in other departments. Now this practice has been halted, and if as a result of the elections in the departments vacancies in the announced specialties turned out not to be filled, the unused vacancies remain unfilled until the next election to the USSR Academy of Sciences.

Among the amendments made to the charter many concern organizational questions.

The quorum (competence) of the meetings of the General Assembly of the academy and the general assemblies and bureaus of the departments was specified (Article 40 of the Charter, Paragraphs 11 and 18 of the Statute on the Department). The suggestions of Academician V.L. Ginzburg were adopted: in Article 40 it was recorded that all personnel questions are settled by the General Assembly of the Academy of Sciences by secret ballot; an addition was inserted in Article 42—henceforth the Presidium of the USSR Academy of Sciences during each reelection of it will submit to the General Assembly a report on its activity during the past 5-year period.

The decision was made to free the General Assembly from confirming the appointment of directors of scientific research institutes, who are elected by the departments of the USSR Academy of Sciences. Now the

directors of institutes will be approved by decrees of the Presidium of the USSR Academy of Sciences (Articles 37 and 44 of the Charter). In turn the Presidium was freed from confirming the deputy directors of institutes and the composition of the editorial boards of journals of the Academy of Sciences—they will be approved by decisions of the bureaus of the departments (Paragraph 17.11 of the Statute on the Department).

Previously difficulties arose with the procedure of adopting decisions on the change of the charter at the General Assembly of the academy. Usually the votes "against" and "abstained" were recorded at the meeting, and by subtracting them from the total number of those who registered their attendance at the assembly the number of votes "for" was determined. If this number was less than two-thirds of the total number of full members of the academy, the change of the charter was rejected. It is clear that given such a procedure of rejection comparatively few votes were sufficient, while the attitude of all the full members of the Academy of Sciences to the proposed amendments was not identified. Such a procedure aroused serious doubts.¹⁴ On the suggestion of the commission, the Presidium of the USSR Academy of Sciences established the following procedure of voting on amendments at the General Assembly in conformity with Article 78 of the Charter: the amendment is put to the vote of the academicians present at the meeting of the General Assembly; when during the voting the number of votes "for" is less than two-thirds of the total number of academicians, while the number of votes "against" and "abstained" is less than one-third, the amendments are sent to the academicians, who were absent at the assembly, for voting by questionnaire. Let us note that at the meeting of 12 March 1987 the General Assembly unanimously approved all the proposed amendments to the charter, but with respect to the amendment to Article 37 on the approval of directors of institutes the decision was made to conduct a roll call. As a result of the subsequent voting (those present at the meeting answered the roll call, while the text of the amendment was sent to those who were absent for voting by questionnaire) the amendment to Article 37 of the Charter was adopted.

The updating of the charter provisions during the restructuring, which is being carried out at the Academy of Sciences, has not yet been fully completed. The charters of the regional departments have to be drafted; in connection with the forecast development of scientific centers of the academy the need has arisen for the preparation of a general Statute on the Scientific Center of the USSR Academy of Sciences, which is envisaged by Article 67 of the Charter; the work on the final text of the Charter of the Scientific Research Institute of the USSR Academy of Sciences will be continued.

Moreover, new suggestions on charter questions are being received by the commission, opinions on this account are also being voiced in the statements of members of the USSR Academy of Sciences at the

General Assembly of the academy and at the assemblies of the departments. There are suggestions which require careful study. The need has arisen to specify in the charter the procedure of election and the periodicity of the election of foreign members of the academy and to specify their status.

The questions, which are connected with the Charter of the USSR Academy of Sciences, are of priority importance for its activity. The Charter and the standard legal documents, which accompany it, are in force under the real and changing conditions of academic life. Therefore, both the constant observation of the completeness and meaningfulness of the wordings of charter provisions and their conformity to real conditions and the monitoring of the observance of the charter by all institutions and officials of the academy are necessary.

Obviously, it is necessary to study more thoroughly the experience of the organization of academic science in foreign socialist countries. In this connection it would be worth discussing the question of preparing a reference information publication—a collection of the charters of the academies of sciences of the socialist countries with comments and an introductory survey. It would be worth uniting in this work the efforts of the Institute of Economics of the World Socialist System, the Institute of History of Natural Science and Technology, the Institute of State and Law, as well as the Institute of Scientific Information on the Social Sciences of the USSR Academy of Sciences.

And in conclusion I would like to support the opinion of Academician V.L. Ginzburg on the desirability of the systematic discussion on the pages of *Vestnik Akademii Nauk SSSR* of questions connected with the Charter of the USSR Academy of Sciences.

Footnotes

1. V.L. Ginzburg, "On Several Changes of the Charter of the USSR Academy of Sciences and the Procedure of Making Additions to It," *Vestnik Akademii Nauk SSSR*, No 11, 1986, pp 38-45. Also see *Vestnik Akademii Nauk SSSR*, No 1, 1987, pp 45-46.
2. "Ustav Akademii nauk SSSR" [The Charters of the USSR Academy of Sciences], Moscow, Nauka, 1975, p 116.
3. "Organizatsiya nauki v pervyye gody Sovetskoy vlasti (1917-1925). Sbornik dokumentov" [The Organization of Science During the First Years of Soviet Power (1917-1925). A Collection of Documents], Leningrad, Nauka, 1968, pp 199-203.
4. *Sobraniye Zakonov SSSR*, No 48, 1925, Article 351.
5. *Sobraniye Zakonov SSSR*, No 35, 1927, Article 367.
6. *Sobraniye Zakonov SSSR*, No 30, 1930, Article 335.

7. *Sobraniye Zakonov SSSR*, No 59, 1935, Article 484.

8. *Vedomosti Verkhovnogo Soveta SSSR*, No 28, 1978, Article 436.

9. "On the Approval of the Temporary Charter of the Scientific Research Institute of the USSR Academy of Sciences, the Statute on the Department of the USSR Academy of Sciences, and the Statute on the Section of the Presidium of the USSR Academy of Sciences and on the Amendments to the Charter of the USSR Academy of Sciences. Report of Vice President of the USSR Academy of Sciences Academician V.A. Kotelnikov," *Vestnik Akademii Nauk SSSR*, No 7, 1987, pp 78-82.

10. G.I. Marchuk, The Restructuring of the Scientific Activity of Academic Institutes in Light of the Decisions of the 27th CPSU Congress," *Vestnik Akademii Nauk SSSR*, No 1, 1987, p 7.

11. See *Ekonomicheskaya Gazeta*, No 52, 1970.

12. *Pravda*, 8 February 1987.

13. "On the Organization of the Far Eastern Department of the USSR Academy of Sciences," *Vestnik Akademii Nauk SSSR*, No 7, 1987, pp 94-101; "On the Organization of the Ural Department of the USSR Academy of Sciences," *Vestnik Akademii Nauk SSSR*, No 7, 1987, pp 102-119.

14. *Vestnik Akademii Nauk SSSR*, No 11, 1986, pp 38-40.

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Decree on Management of S&T Progress in RSFSR

18140128 Moscow *SOBRANIYE POSTANOVLENIY PRAVITELSTVA RSFSR in Russian No 17, 1987*
pp 369-383

[Decree No 360 of the RSFSR Council of Ministers of 31 August 1987]

[Text] 120. On Measures on the Fulfillment of Decree No 817 of the CPSU Central Committee and the USSR Council of Ministers of 17 July 1987 "On the Increase of the Role of the USSR State Committee for Science and Technology in the Management of Scientific and Technical Progress in the Country"

The CPSU Central Committee and the USSR Council of Ministers in Decree No 817 of 17 July 1987 (*Sobraniye Postanovleniy Pravitelstva SSSR*, No 34, 1987, Article 116) noted that the implementation of the strategic policy of the acceleration of the socioeconomic development of Soviet society, the assurance of the attainment

by the country of leading scientific and technical levels, and the increase of the well-being of the people, which was approved by the 27th party congress, requires the implementation of major steps on the increase of the pace of scientific and technical progress and the carrying out of the thorough restructuring of the system of management of the development of science and technology.

A powerful scientific and technical potential, which is making it possible to solve many difficult national economic problems, has been established in the country. At the same time the efficiency of its use is still obviously inadequate. As was noted at the June (1987) CPSU Central Committee Plenum, scientific and technical progress in the country has slowed down. In a number of most important directions a lag has been allowed, the leading development of science and technology with allowance made for the scientific and technical revolution, which is taking place in the world, is not being ensured. Cases, when even the most advanced technical ideas do not find practical implementation, continue to occur. Often while having our own developments, which ensure a high technical level and competitive ability of Soviet equipment and technology on the world market, foreign technical solutions are unjustifiably borrowed.

The basic cause of such a situation consists in the fact that scientific and technical progress has not been made a fundamental part of all economic processes.

In the decree it is noted that the USSR State Committee for Science and Technology is not performing purposeful, persistent work on the formation jointly with other organs of state management of an effective economic mechanism, which ensures the stimulation of academic, VUZ, and sectorial science, the strengthening of the interaction of science with production, and the constant acceleration of the pace of scientific and technical progress. The USSR State Planning Committee, the USSR State Committee for Science and Technology, and other central economic departments in their practical activity are not pursuing a policy of the increase of the production of science-intensive products. The scientific forecasts of the USSR Academy of Sciences do not substantiate thoroughly enough the influence of scientific and technical progress on the development of the national economy.

As a result of this the plans of economic and social development do not fully rely on the extensive use of scientific and technical achievements and do not have the proper influence on the development of new directions of scientific and technical progress.

The acceleration of scientific and technical progress thus far has not become the main task of ministries, departments, associations, and enterprises. The development of the sectors of the national economy and many associations, enterprises, and scientific research, planning and design, and technological organizations is poorly coordinated with the strategic goals of scientific and technical

progress. Many main institutes, having taken a monopoly position in sectors, are preventing the introduction of developments, which were completed at academic institutions and higher educational institutions and at other sectorial institutes, and often hinder the use of the proposals of inventors.

The questions of the strengthening of the material and pilot experimental base of science and of the development of scientific instrument making and the entire system of the service of scientific and technical activity are being settled extremely slowly. An efficient system of the gathering, analysis, generalization, and use of information on the achievements and the trends of development of domestic and foreign science and technology has not been set up.

The creative activity of workers is being used inadequately in the management of scientific and technical progress. Inventing and efficiency activity is not being coordinated with the vital tasks of the increase of the technical level and efficiency of production and the quality of the output being produced. Many important inventions are not receiving timely reflection in the plans of economic and social development and are not being implemented.

The possibilities of international scientific and technical cooperation are being used poorly. A creative, innovative approach, which ensures the dynamic development of cooperation with organizations and enterprises of the socialist countries in the area of science and technology, is lacking in the work on the implementation of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000.

The restructuring of the management of the national economy in many respects depends on the efficient management of scientific and technical progress. At the same time, it is indicated in the decree, the USSR State Committee for Science and Technology is slowly reorganizing its activity in conformity with the new requirements. The settlement of current questions, frequently ones of a narrow sectorial nature, which do not govern the statewide strategy of scientific and technical development, predominates in its work. The unjustifiably great attention to the day-to-day regulation of the course of the fulfillment of an excessively increased number of scientific and technical programs does not enable the committee to concentrate efforts on the key questions of the formulation and practical implementation of a unified state science and technology policy, the making of an analytical evaluation of the development of science and technology, the solution of important intersectorial scientific and technical problems, and the coordination of the activity of sectors in the development of a strategy of technical development. Serious shortcomings exist in the training of scientists, as well as in the manpower supply of the USSR State Committee for Science and Technology.

For the purposes of the acceleration of the economic and social development of the republic on the basis of the increase of the pace of scientific and technical progress, the efficient use of the scientific and technical potential, and the strengthening of the integration of science with production and in execution of Decree No 817 of the CPSU Central Committee and the USSR Council of Ministers of 17 July 1987 the RSFSR Council of Ministers resolves:

1. RSFSR ministries and departments, the councils of ministers of autonomous republics, kray soviet executive committees, oblast soviet executive committees, the Moscow and Leningrad city soviet executive committees, the Far Eastern, Siberian, and Ural departments of the USSR Academy of Sciences, the All-Russian Department of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin, the Siberian Department of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin, the Department of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin for the Nonchernozem Zone of the RSFSR, and the Siberian Department of the USSR Academy of Medical Sciences are to regard as the main thing in their activity the steadfast implementation of the strategy of the party on the acceleration of the socioeconomic development of the country on the basis of the efficient use of the possibilities of the scientific and technical revolution.

To devote foremost attention to the development of the priority directions of scientific and technical progress, the solution of major scientific and technical problems, the organization of the development of fundamentally new equipment, technology, and materials, the carrying out of the monitoring of the scientific and technical level of sectors and the conformity of production to the best world achievements, and to the increase of the efficiency of the activity of scientific research, planning and design, and technological organizations.

The RSFSR State Planning Committee jointly with republic economic organs, RSFSR ministries and departments, the Far Eastern, Siberian, and Ural departments of the USSR Academy of Sciences, the All-Russian Department of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin, the Siberian Department of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin, the Department of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin for the Nonchernozem Zone of the RSFSR, and the Siberian Department of the USSR Academy of Medical Sciences is to concentrate its activity on the development and the constant improvement of such an economic mechanism, which would make it possible to ensure the steady increase of the technical level of social production and the strengthening and efficient use of the scientific and technical potential under the conditions of the broadening of the independence of associations, enterprises, and organizations and their work on the

basis of the principles of full cost accounting and self-financing, to carry out scientific and technical forecasting systematically, and to ensure the concentration of resources of academic, VUZ, and sectorial science in the priority directions of scientific and technical progress and the extension of scientific and technical cooperation with the CEMA member countries.

To increase the responsibility of RSFSR ministries and departments for the development of scientific and technical progress in the republic.

2. To regard the Comprehensive Program of Scientific and Technical Progress of the RSFSR for 20 Years as the most important preplanning document and the basis for long-range and 5-year planning in full conformity with the economic strategy of the CPSU.

The RSFSR State Planning Committee, the RSFSR State Committee for Construction Affairs, the RSFSR State Agroindustrial Committee, the RSFSR Ministry of Higher and Secondary Specialized Education, and the Far Eastern, Siberian, and Ural departments of the USSR Academy of Sciences with the enlistment of interested RSFSR ministries and departments, the councils of ministers of autonomous republics, kray soviet executive committees, oblast soviet executive committees, the Moscow and Leningrad city soviet executive committees and their scientific research organizations, the All-Russian Department of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin, the Siberian Department of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin, the Department of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin for the Nonchernozem Zone of the RSFSR, and the Siberian Department of the USSR Academy of Medical Sciences, as well as with the participation of scientific institutions of the USSR Academy of Sciences, which are located on the territory of the RSFSR, are to implement measures on the radical improvement of the formulation of the Comprehensive Program of Scientific and Technical Progress of the RSFSR for 20 Years and to increase the scientific soundness of the most promising directions of the acceleration of scientific and technical progress and the socioeconomic development of the republic and of the technical and economic evaluations of the most important achievements of domestic and world science and technology and the conclusions and suggestions on their use in the national economy, which are contained in it, envisaging here several versions, ways, and means of the accomplishment of the posed tasks. When formulating the Comprehensive Program to ensure the more precise specification of the recommendations for the next 5-year period.

The work on the Comprehensive Program should be carried out constantly, it is necessary to revise and update it every 5 years. The Comprehensive Program of

Scientific and Technical Progress of the RSFSR for 20 Years is submitted to the RSFSR Council of Ministers no later than 3 years before the start of the next five-year plan.

3. RSFSR ministries and departments, the councils of ministers of autonomous republics, kray soviet executive committees, oblast soviet executive committees, and the Moscow and Leningrad city soviet executive committees, for the purposes of the increase of the scientific soundness of the plans of economic and social development and the more complete consideration in them of the latest achievements of science and technology for the assurance of radical changes in the structure and technical level of production and the increase of its efficiency on the basis of the Comprehensive Program of Scientific and Technical Progress of the RSFSR for 20 Years are to submit to the RSFSR State Planning Committee specific materials for suggestions for the RSFSR on the Concept and the Basic Directions of USSR Economic and Social Development for 15 Years in the manner and on the dates, which are established by the RSFSR State Planning Committee.

4. The RSFSR State Planning Committee, the RSFSR State Committee for Construction Affairs, and the RSFSR State Agroindustrial Committee jointly with the Far Eastern, Siberian, and Ural departments of the USSR Academy of Sciences, the All-Russian Department of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin, the Siberian Department of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin, the Department of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin for the Nonchernozem Zone of the RSFSR, the Siberian Department of the USSR Academy of Medical Sciences, and RSFSR ministries and departments:

a) are to take part:

—in the work of the USSR State Committee for Science and Technology on the assurance of the choice and substantiation of the priority directions of scientific and technical progress.

The CPSU Central Committee and the USSR Council of Ministers made the USSR State Committee for Science and Technology responsible for the timely and efficient development of the work in the priority directions of scientific and technical progress and for the leading development of domestic science and technology in these directions as compared with the world level;

—in the formulation by the USSR State Committee for Science and Technology, the USSR State Planning Committee, and the USSR Academy of Sciences of state scientific and technical goal programs of an intersectorial nature, which envisage the development of fundamentally new equipment, technology, and materials and

the solution of important scientific and technical problems, which are of revolutionizing importance for the development of the economy and the attainment by domestic production of the highest world level.

The CPSU Central Committee and the USSR Council of Ministers established that the list of state scientific and technical goal programs is specified during the drawing up of the draft of the Concept of USSR Economic and Social Development. These programs are used during the preparation of drafts of the Basic Directions of USSR Economic and Social Development and five-year plans and in the formulation by the USSR State Planning Committee, ministries and departments, and the councils of ministers of union republics of control figures and state orders;

b) are to formulate and submit to the RSFSR Council of Ministers republic scientific and technical goal programs of an intersectorial nature.

The list of republic scientific and technical goal programs is to be specified during the formulation of proposals for the RSFSR on the draft of the Concept of USSR Economic and Social Development. These programs are to be used during the preparation of proposals for the RSFSR on the drafts of the Basic Directions of USSR Economic and Social Development and the five-year plans and during the formulation of control figures and state orders.

5. To notify that the CPSU Central Committee and the USSR Council of Ministers by Decree No 817 of 17 July 1987 assigned to the USSR State Committee for Science and Technology the supervision of interbranch scientific technical complexes (MNTK's) and obliged it to ensure the priority development of the scientific and technical directions, which are attached to interbranch scientific technical complexes, and to monitor the conformity of the level of their research and development to the highest world achievements and the long-range trends of development of science and technology.

The RSFSR Ministry of Health and the Siberian Department of the USSR Academy of Sciences jointly with the USSR State Committee for Science and Technology are to ensure the radical improvement of the activity of the Mikrokhirurgiya glaza and Katalizator interbranch scientific technical complexes. Jointly with the RSFSR State Planning Committee to actively participate in the formulation by the USSR State Planning Committee of special-purpose assignments on the development of these complexes as independent objects in the corresponding sections of the state plans of USSR economic and social development, as well as on the extensive use in the national economy of the results of their developments. To submit as needed the corresponding suggestions to the RSFSR Council of Ministers.

6. To notify that the CPSU Central Committee and the USSR Council of Ministers by Decree No 817 of 17 July 1987 acknowledged as the most important task of the USSR State Committee for Science and Technology the work on the implementation of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000 and the elaboration of measures on its development.

The USSR State Committee for Science and Technology bears responsibility for the organization of the work on the fulfillment for the country as a whole of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries, organizes and coordinates the scientific research and development, which are being conducted by ministries, departments, and organizations of the USSR on the problems and assignments of this program jointly with the corresponding organizations of the CEMA member countries; makes decisions on the assurance of the fulfillment of the obligations of the Soviet Side; jointly with the USSR State Planning Committee formulates special sections of the state plans of USSR economic and social development for the accomplishment of the assignments that are envisaged by the program.

7. For the purposes of the timely assimilation of the production of fundamentally new types of equipment, technology, and materials, which were developed in conformity with state scientific and technical goal programs, the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000, and republic scientific and technical goal programs, as well as the implementation in the national economy of the republic of the most important developments of interbranch scientific technical complexes, republic engineering and technical centers, and academic and VUZ science and important inventions the RSFSR State Planning Committee is to carry out with the participation of the Far Eastern, Siberian, and Ural departments of the USSR Academy of Sciences, the RSFSR Ministry of Higher and Secondary Specialized Education, RSFSR ministries and departments, the councils of ministers of autonomous republics, kray soviet executive committees, oblast soviet executive committees, and the Moscow and Leningrad city soviet executive committees the formulation of state orders on the development of science and technology and the pilot experimental bases of republic engineering and technical centers, as well as organizations and enterprises, which are fulfilling republic scientific and technical goal programs, and to include them in the drafts of the state plans of RSFSR economic and social development and to monitor their fulfillment.

The CPSU Central Committee and the USSR Council of Ministers commissioned the USSR State Committee for Science and Technology to carry out the systematic analysis of the state and the effective monitoring of the development of the pilot experimental base and scientific instrument making in the country.

8. The RSFSR State Planning Committee jointly with the RSFSR Ministry of Higher and Secondary Specialized Education and RSFSR ministries and departments is to draft in accordance with established procedure long-range and annual plans of the training and distribution of scientific personnel with allowance made for the development of the latest directions of science and technology.

The CPSU Central Committee and the USSR Council of Ministers:

—obliged the USSR State Committee for Science and Technology jointly with the USSR Ministry of Higher and Secondary Specialized Education to ensure the supervision of the work of USSR ministries and departments on the organization of the training of candidates and doctors of sciences with allowance made for the development of the latest directions of science and technology; to draft in accordance with established procedure long-range and annual plans of the training and distribution of scientific personnel;

—assigned to the USSR State Committee for Science and Technology the monitoring of the activity of the Higher Certification Commission attached to the USSR Council of Ministers.

9. To notify that the CPSU Central Committee and the USSR Council of Ministers by Decree No 817 of 17 July 1987:

—commissioned the USSR State Committee for Science and Technology to carry out periodically the comprehensive analysis of the scientific and technical level of the sectors of the national economy and the monitoring of the conformity of production to the best world achievements and the effectiveness of the use of the sectorial scientific and technical potential and its interrelations with academic and VUZ science;

—established that the USSR State Committee for Science and Technology carries out the random expert evaluation of the most important types of products and base technologies, as well as the technological section of the plans for the construction, expansion, modernization, and retooling of the most important enterprises.

RSFSR ministries and departments, the councils of ministers of autonomous republics, kray soviet executive committees, oblast soviet executive committees, and the Moscow and Leningrad city soviet executive committees on the basis of the analysis and evaluations of the USSR State Committee for Science and Technology are to organize the formulation and implementation of measures on the increase of the technical level of production and the output being produced and on the elimination of the shortcomings in this work.

10. To regard as one of the most important tasks of RSFSR ministries and departments, the councils of ministers of autonomous republics, kray soviet executive committees, oblast soviet executive committees, and the Moscow and Leningrad city soviet executive committees the assurance of the highly efficient activity of subordinate scientific research, planning and design, and technological organizations, as well as the plant sector of science.

The CPSU Central Committee and the USSR Council of Ministers:

—commissioned the USSR State Committee for Science and Technology to make periodically state checks of the indicated organizations and to provide a principled evaluation of the efficiency of their activity and the evaluation toward the development of the priority directions of scientific and technical progress and toward the development of fundamentally new technologies and equipment of new generations for the timely replacement of operating base technologies and the updating of the output being produced, the provision of these organizations with scientific instruments and automation equipment, and their pilot and experimental base. To send the materials of the checks to permanent organs of the USSR Council of Ministers, the corresponding USSR ministries and departments, and the councils of ministers of union republics. In necessary cases to make suggestions on the change of the type of work of institutions of science and scientific service and on the elimination of organizations, the activity of which is inefficient or is not urgent;

—established that the USSR State Committee for Science and Technology considers the suggestions of USSR ministries and departments and the councils of ministers of union republics on the establishment of new scientific research, planning and design, and technological organizations and checks the scientific, technical, and economic soundness of these suggestions. The establishment of such organizations, regardless of their departmental subordination, should be carried out only for the highly efficient solution of the problems that face the national economy.

RSFSR ministries and departments, the councils of ministers of autonomous republics, kray soviet executive committees, oblast soviet executive committees, and the Moscow and Leningrad city soviet executive committees are to submit in accordance with established procedure suggestions on the establishment of the indicated organizations with the corresponding scientific, technical, and economic substantiation.

11. To notify that the CPSU Central Committee and the USSR Council of Ministers by Decree No 817 of 17 July 1987 for the purposes of the increase of the efficiency of the scientific and technical potential of the country, the assurance of the radical increase of the technical level of the sectors of the national economy, and the attainment

of leading levels of scientific and technical progress deemed it necessary with allowance made for the provisions of the USSR Law on the State Enterprise (Association) to restructure the system of management of scientific and technical progress, bearing in mind the changeover to economic methods, which stimulate the increase of the interest of associations, enterprises, and scientific research, planning and design, and technological organizations in the increase of the technical level of production and the quality of the output being produced and in the shortening of the time of the development and assimilation of the production of new equipment, technology, and materials.

To proceed from the fact that the creation of conditions, under which each collective will be most receptive to innovations and will be vitally interested in the use of the achievements of science and technology, is the most important task of restructuring. To use extensively competitive, contractual principles in the scientific and technical sphere, including basic research, for the purposes of preventing a monopoly of individual main organizations in the directions of work, which have been attached to them.

Assigned to the USSR State Committee for Science and Technology the formulation jointly with the USSR State Planning Committee and USSR ministries and departments and with the extensive enlistment of the scientific and technical community of steps on the improvement of the economic mechanism of management and the forms of the integration of academic, VUZ, and sectorial science and production, which are aimed at the increase of the efficiency of the work of institutions of science and scientific service and the speeding up of the introduction of scientific and technical achievements in practice, as well as the systematic analysis of the practical effectiveness of this mechanism.

Commissioned this work to be performed in the following directions:

a) the utmost development of the principles of cost accounting in the interrelations between scientific research, planning and design, and technological organizations and enterprises with the use of contract prices and the increase of the mutual economic responsibility of these organizations and enterprises for the scientific and technical level, efficiency, and quality of the results of research and development and for the timely development and assimilation in production of new equipment, technology, and materials.

To envisage for associations, enterprises, and scientific organizations the introduction of economic benefits and the increase of their responsibility in case of the implementation of important comprehensive measures on the development and assimilation of fundamentally new equipment and technology and in case of the fulfillment of the assignments of scientific and technical programs, which are of the greatest statewide importance;

b) the gradual changeover of scientific research, planning and design, and technological organizations and scientific production associations to full cost accounting and self-financing with the use of the standardized method of the distribution of the profit (income);

c) the development and the increase of the efficiency of the activity of interbranch scientific technical complexes, engineering centers, scientific production associations, temporary scientific collectives, and other advanced forms of the integration of academic, VUZ, and sectorial science and production;

d) the improvement of the planning of scientific and technical progress at all levels, with allowance made for the following principles:

—academic science is obliged to ensure with the participation of VUZ science the utmost development of basic research in the most important directions of the social, natural, and technical sciences as the basis of the steady movement of the country along the path of progress;

—VUZ science along with the assurance of the high quality of the training of specialists for the national economy and the conducting jointly with academic science of basic research should develop with the participation of sectorial and plant science basic and applied research and experimental design work for the solution of sectorial and intersectorial scientific and technical problems (including in accordance with orders of associations and enterprises);

—sectorial and plant science should bear responsibility for the high technical level of production and the output being produced and the constant improvement, updating, and supply of associations and enterprises with advanced base technologies, as well as should ensure jointly with academic and VUZ science the timely comprehensive preparation for radical changes of means of production, which make it possible to increase labor productivity cardinally;

—to concentrate national economic planning on the implementation of the most important directions of science and technology, including the assignments of state scientific and technical goal programs, the unified plans of interbranch scientific technical complexes, and the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000, as well as on the solution of individual statewide problems, which are of revolutionizing importance for the development of social production.

The RSFSR State Planning Committee jointly with RSFSR ministries and departments, the councils of ministers of autonomous republics, kray soviet executive committees, oblast soviet executive committees, the Moscow and Leningrad city soviet executive committees, the Far Eastern, Siberian, and Ural departments of

the USSR Academy of Sciences, the All-Russian Department of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin, the Siberian Department of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin, the Department of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin for the Nonchernozem Zone of the RSFSR, and the Siberian Department of the USSR Academy of Medical Sciences within a 2-month period is to prepare proposals on the development of a system of the management of scientific and technical progress in the RSFSR and to submit them to the Commission of the Presidium of the RSFSR Council of Ministers for the Improvement of Management, Planning, and the Economic Mechanism for consideration and subsequent submitting to the RSFSR Council of Ministers.

12. To notify that the CPSU Central Committee and the USSR Council of Ministers by Decree No 817 of 17 July 1987:

—deemed it necessary under the conditions of the changeover of associations, enterprises, and scientific research, planning and design, and technological organizations to full cost accounting and self-financing to revise substantially the procedure of the financing of scientific research and experimental design work. The changeover from the financing of the maintenance of organizations to the special-purpose financing of specific scientific research and planning and design operations in accordance with contracts with clients, which are interested in these operations, should be the basis for this. The assets of associations, enterprises, and organizations, the assets of the centralized funds and reserves of ministries and departments, as well as budget allocations and credits of banks are the sources of financing of such operations;

—stipulated that there are financed from budget assets the operations: on the most important promising theoretical research in the field of the social, natural, and technical sciences; on intersectorial scientific and technical problems, which are of statewide importance; on the development of fundamentally new equipment and technology, which revolutionize social production;

—established that the USSR State Committee for Science and Technology submits to the USSR Council of Ministers for approval suggestions on the distribution among national economic complexes and directions of the development of science and technology of the allocations for science and scientific service, which are envisaged by the USSR state budget;

—obliged the USSR State Committee for Science and Technology to carry out the strict monitoring of the efficient use of the state budget assets, which are allocated for the development of science. Established that the USSR State Committee for Science and Technology

along with USSR ministries and departments and the councils of ministers of union republics bears responsibility for the efficient use of these assets.

13. RSFSR ministries and departments, the councils of ministers of autonomous republics, kray soviet executive committees, oblast soviet executive committees, and the Moscow and Leningrad city soviet executive committees are to take part in the formulation and implementation by the USSR State Committee for Science and Technology of steps on the improvement of the organization of the state system of scientific and technical information and the increase of its effectiveness, which intend to ensure:

—the extensive development of work on the analysis and evaluation of information, the development and use of data banks, and the prompt supply of organs of management, scientific organizations, associations, and enterprises with reliable specific domestic and foreign information. The analytical information for various levels of management in its content should be submitted in such a form, so that it would be possible to make the necessary decisions on its basis;

—the comprehensive solution of the problems of the development of the state system of scientific and technical information on the basis of the extensive use of advanced information processing hardware and information technology;

—the rapid development of the centralized and territorial systems of the processing of all types of scientific and technical literature and documentation and the quick delivery of the necessary information and documents to interested associations, enterprises, and organizations;

—the improvement of the planning of information activity, the expansion of economic methods of the stimulation of the labor of workers of scientific and technical information services, and the increase of the quality of the information product on the basis of the introduction of cost accounting.

The CPSU Central Committee and the USSR Council of Ministers:

—assigned to the USSR State Committee for Science and Technology the general procedural supervision and the monitoring of the work of scientific and technical information organs, regardless of their departmental affiliation;

—established that the decisions of the USSR State Committee for Science and Technology on questions of the joint use of the network of automated systems of scientific and technical information and the intersectorial distribution of information resources are mandatory for ministries and departments, as well as for all-union, central, sectorial, republic, and intersectorial territorial information organs.

14. To notify that the CPSU Central Committee and the USSR Council of Ministers by Decree No 817 of 17 July 1987:

a) obliged the USSR State Committee for Science and Technology:

—to improve the organization of the work on the systematic analysis of the trends and the level of development of scientific and technical progress abroad. To increase constantly the effectiveness of international relations for the purposes of the speeding up of the solution of the most important problems of scientific and technical progress in the country and the implementation of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000, carrying out this activity in close contact with the State Foreign Economic Commission of the USSR Council of Ministers;

—to increase the efficiency of the work on the coordination and monitoring of the activity of USSR ministries and departments, the USSR Academy of Sciences, and the councils of ministers of union republics in the area of scientific and technical cooperation with foreign countries and the study and use in the national economy of the achievements and advanced know-how of world science and technology;

b) established that the USSR State Committee for Science and Technology supervises the work on the sale of Soviet licenses abroad, as well as on the purchase of foreign licenses and models of new equipment by means of centralized currency allocations, which are earmarked for these purposes, carries out the monitoring of the efficient use of foreign licenses and models of new equipment in the national economy, and reports annually to the USSR Council of Ministers on the progress of this work.

RSFSR ministries and departments, the councils of ministers of autonomous republics, kray soviet executive committees, oblast soviet executive committees, the Moscow and Leningrad city soviet executive committees, the Far Eastern, Siberian, and Ural departments of the USSR Academy of Sciences, the All-Russian Department of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin, the Siberian Department of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin, the Department of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin for the Nonchernozem Zone of the RSFSR, and the Siberian Department of the USSR Academy of Medical Sciences are to devote particular attention to the broadening of scientific and technical cooperation with socialist countries for the joint solution of the most important national economic problems, to the organization of such cooperation on the basis of long-term mutually advantageous

contracts and agreements, to the development of international scientific and technical cooperation and direct ties between enterprises and organizations, and to the establishment of joint enterprises and scientific collectives.

15. To notify that the CPSU Central Committee and the USSR Council of Ministers by Decree No 817 of 17 July 1987:

—assigned to the USSR State Committee for Science and Technology the supervision of the work on the development of invention and efficiency promotion in the country;

—established that the activity of the USSR State Committee for Science and Technology should be aimed at the utmost development of the creative scientific and technical work of workers, the increase of the responsibility of ministries and departments for the extensive practical use of inventions, and the assurance of the monitoring of the introduction and large-scale use in production of inventions that are of the greatest national economic importance.

RSFSR ministries and departments, the councils of ministers of autonomous republics, kray soviet executive committees, oblast soviet executive committees, and the Moscow and Leningrad city soviet executive committees are to regard the development of invention and efficiency promotion as one of the most important sections of the work on the acceleration of scientific and technical progress. To enhance substantially the role of efficiency promotion and invention in the matter of increasing the efficiency of social production and to radically reorganize the work in this area.

16. To notify that the CPSU Central Committee and the USSR Council of Ministers by Decree No 817 of 17 July 1987 commissioned the USSR State Committee for Science and Technology to take an active part in the formulation and implementation by the councils of ministers of union republics of measures on the acceleration of scientific and technical progress, the pursuit of a unified science and technology policy, and the concentration of resources of republic organizations on the main directions of science and technology.

The RSFSR Council of Ministers expresses confidence that the implementation of the outlined measures will contribute to the restructuring of the work on the acceleration of scientific and technical progress and will make it possible to make new gains in the development of the national economy of the RSFSR.

[Signed] Chairman of the RSFSR Council of Ministers
V. Vorotnikov

Administrator of Affairs of the RSFSR Council of Ministers
I. Zarubin

Moscow, 31 August 1987. No 360.

7807

Better Planning, Organization, Management of Sectorial Science

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[Article by Candidate of Economic Sciences M. Volo-brinskiy under the rubric "Scientific and Technical Progress": "The Improvement of the Economic Mechanism and the Organizational Forms of the Management of Sectorial Sciences"; first paragraph is *Planovoye Khozyaystvo* introduction]

[Text] At present sectorial scientific research organizations are not aimed at the implementation of scientific and technical achievements. There should be established as a basic 5-year assignment for scientific organizations of the sector the plan of the increase of the technical and economic level of products and production in the national economy or sector from the introduction of their own developments. Reorient the activity of the staff of ministries toward the solution of the strategic problems of scientific and technical progress. Ensure the community of economic interests of scientific research organizations and industrial enterprises. The establishment of engineering centers and temporary collectives will make it possible to accelerate scientific and technical progress significantly.

The tasks on the increase of the efficiency of social production, which were posed by the 27th CPSU Congress and the subsequent CPSU Central Committee Plenums, require radical restructuring in the work of sectorial scientific research organizations. The latter should guarantee such a quality of scientific and technical developments, which will make it possible to increase by 2000 the technical and economic level of products and production and to attain leading levels. In this connection the mobilization of organizational and economic reserves by the improvement of the economic mechanism and the reform of the structure of the scientific potential and the organizational forms of management appears as the most important direction in the matter of intensifying sectorial science.

The experience of the work of sectorial scientific research organizations during the 10th and 11th Five-Year Plans showed that the existing mechanism of the management of scientific and technical progress for the present does not conform to the strategy of intensification. Today their activity is inadequately oriented toward the retooling of social production, the search for fundamentally new highly efficient solutions, their competitive ability on the world market, and the extensive duplication of completed scientific research developments in the national economy. "The basic cause of such a situation is," it was noted at the 7th Session, 11th

Convocation, of the USSR Supreme Soviet, "that scientific and technical progress has not been made a fundamental part of all economic processes."¹

At present sectorial scientific research organizations are not aimed economically at the implementation of scientific and technical achievements. In the management of scientific and technical progress there is no feedback between the objective requirements of the economic development of social production and the tasks, which have been set for sectorial science for the fulfillment of these requirements. This is due to the inefficiency of the system of the planning of scientific and technical progress in the sector, particularly the planning of the work of scientific research organizations.

Scientific research organizations act as the carriers and vehicles of scientific and technical progress in the sector, while industrial enterprises act as the objects of its application. The more strict interconnection of the systems of the planning, stimulation, and evaluation of the activity of enterprises and scientific research organizations, which are working jointly on the tasks of the retooling of production and the updating of the products list, is necessary under the conditions of the acceleration of scientific and technical progress and the increase of its influence on the economy. Their joint activity in the area of intensification should be evaluated (planned and stimulated) in accordance with the indicators of the increase of the technical and economic level of products and production. Scientific and technical progress influences precisely through these indicators the growth of the volumes and the increase of product quality and production efficiency. But they, of course, should characterize generally the efficiency of the use of resources and the consumer properties of products.

The question arises: Is it legitimate to evaluate the activity of scientific organizations of the sector in accordance with the indicators of the development of industrial production? For the extensive dissemination of scientific and technical achievements it is necessary. Without having such a gauge of the end results of the activity of scientific research organizations, the economic mechanism of their management leads mainly to the accumulation of the scientific and technical potential, without ensuring the qualitative increase of the technical and economic level of production.

The accepted procedure of formulating the five-year and annual plans of scientific research and experimental design work of institutes and scientific production associations is also conducive to this. Now, in essence, there is no organizational economic mechanism of the objective selection of the composition and structure of themes (basic, technical, and economic research, scientific and technical development, the duplication of the introduction of previously completed highly efficient developments), which is necessary for the planned development of the corresponding sector. The tasks of the choice of scientific problems and the planning of the deadlines,

resources, and end results of work (the technical characteristics of a product and the technologies of obtaining them) for the most part are accomplished in scientific research subdivisions. The management of an organization as a whole usually considers only questions of the allocation by superior organizations (the all-union industrial association, the ministry) of various types of resources. But the suggestions "from below" do not always coincide with the goals of the development of the sector. At the same time the traditional system of planning is resistant to the attempts to suggest "from above" the themes of research or specific solutions, if they do not conform to the scientific or other interests of the leading specialists and the informal leaders of scientific collectives. The inadequate level of the scientific, technical, and economic forecasting of research and development (on which long-range planning depends), planning to accommodate the existing personnel and structure of work, and the prevalence of current questions have the result that the management of the scientific organization and the ministry, which approves the supply orders, does not always have the opportunity to submit counter arguments to the performers for the substantial change of the thematic plan which has been proposed "from below." As a result, the adopted plan (it includes the number and deadlines of the themes being fulfilled, the amount of expenditures on scientific research work and experimental design work, and the anticipated economic impact from the introduction of developments) does not properly reflect the characteristics of scientific and technical progress of the sector. It is clear that such a procedure of planning is at variance with the posed tasks of the rapid and harmonious development of the sectors of the national economy.

In the planning and evaluation of scientific and technical progress in the sector one must not direct attention only to the indicator of economic efficiency, since scientific and technical progress is a multiparametric process and cannot be described by just one indicator. Consequently, the evaluation of the contribution of scientific production associations and other scientific organizations to scientific and technical progress of the sector only in accordance with the profit and the fulfillment of the most important state assignments is unacceptable.

In the matter of choosing the composition and number of planned indicators for scientific organizations one should not shift from one extreme to the other: there were many indicators, now for the assurance of independence it is recommended to reduce their number to an abstract minimum. For any system, in our opinion, it is necessary to establish such a composition of the planned and evaluation indicators, which would reflect sufficiently completely the achievement of the goals set for it. Thus, the goal of the scientific production association consists not only in the output of high-quality and highly efficient products and the derivation as a result of this of a profit (this is the means of achieving the goal!), but also in the mandatory assurance of scientific and technical

progress at enterprises and associations of the sector and the national economy by the organization of the large-scale introduction of highly efficient scientific and technical developments.

The present strategy of the development of the national economy requires the singling out in the sectorial five-year plans of the section "The Increase of Industrial Production by Intensification and the Introduction of New Equipment." Drafted and balanced with respect to the needs of related subsectors and sectors of social production, the existing and predicted scientific and technical potential, the state of the industrial base, and the resources being allocated, they should reflect the changes of the basic indicators of the technical and economic level of production and products during the five-year plan with a breakdown by years. These plans should be delivered to enterprises and scientific production associations first as control figures and the most important state assignments on the development and introduction of new equipment. After the conclusion among them of economic contracts for the development and introduction of new equipment (and among enterprises of related sectors for the delivery of new equipment) the control figures should be specified in the directive plan indicators.

Thus, there should be established as the basic 5-year assignment for scientific organizations of the sector the plan of the increase of the technical and economic level of products and production in the national economy or sector from the introduction of their own developments.

The proposed procedure of planning in combination with other elements of the economic mechanism (stimulation, the evaluation of activity, and so on) and the intensification and broadening of the work on the long-range planning of scientific research work will ensure the directed choice of the most promising themes within the scientific organization (which have been approved by the client enterprises) for the achievement of the planned results in the next 2 years (by the introduction of previously completed jobs) and in the future, when new jobs will be completed. Such a system of planning obliges scientific organizations to approach quite strictly the themes proposed by superior organizations. Moreover, it makes it possible after the inclusion in the thematic plan of the most promising themes of national economic and sectorial importance to approve the plan only by the director of the scientific research institute, design bureau, or scientific production association. And in this case there appears for the manager of the scientific organization a mechanism of the management of the formulation of annual thematic plans for the achievement of the economic changes in industrial production from the results of its activity, which have been planned for the institute (scientific production association) for the five-year plan.

The changes of the technical and economic level of industrial production and products should also become

objective criteria of the evaluation of the personal contribution of the staff members of the scientific organization to the development of the sector during their certification and the establishment of salaries in conformity with the new system of the remuneration of the labor of scientists.

The composition of the indicators, which are established by directive, for scientific research organizations and individual sectors (subsectors) of industry will be different and will be determined by their peculiarities and, what is the main thing, by the most important characteristics of scientific and technical progress both in these sectors and in the sectors that are the consumers of the product. And here we are approaching another aspect of the planning of scientific and technical progress. It is a question of the overcoming of departmentalism and the evaluation of the results of the intensification of production only within enterprises and organizations of one sector, since its final product in its parameters should ensure the intensification of production for the consumer.

Thus, the proposed approach in the planning of scientific and technical progress in the sector implies:

—for scientific research institutes and scientific production associations—the five-year and annual thematic plans should be drafted so that their fulfillment would ensure the changes of the technical and economic levels of production and products, which have been planned for the consumer;

—for the sector as a whole—the plans of industrial production and new equipment will be linked by the community of the posed task: to ensure the achievement in the sector and the national economy of the planned changes of specific characteristics of scientific and technical progress.

What should the composition and structure of the indicators of the plan of the scientific organization be? Let us examine this question on the basis of the example of the scientific production association of the paint and varnish industry. Its five-year plan, in our opinion, should include five groups of indicators, among which are indicators which specify:

—the influence of its own introduced developments on the increase of the technical and economic levels of production and products in the paint and varnish industry and the national economy, including the increase in the subsector of: the proportion of products of the highest quality category (in the volume of output that is subject to certification) and products of an advanced assortment (in the total production volume); labor productivity (the conditional release of personnel); the decrease of the cost of paint and varnish products (the increase of the profit); the economic impact from the introduction of developments in the national economy;

—the results of the scientific, technical, and production activity of the association, including the volume of commodity production (scientific, technical, and production) in value terms² and the production of the basic products list in physical terms, including the state assignments for the development, assimilation, and introduction of new equipment and technology and the assignments on the annual updating of the production engineering products of the scientific production association, as well as the profit;

—the quality of commodity production: the proportion of developments with the level "B" and "C" in the volume of scientific and technical production of the association, which is subject to evaluation according to the levels, and the proportion of production of the highest quality category, which is produced on its own production capacities;

—the limited resources of the scientific production association: the allocated limits of material and technical resources with respect to the consolidated products list and of state centralized capital investments and construction and installation work, as well as the base wage fund of the association, including for nonindustrial personnel;

—the economic standards.

Thus, according to the examined structure of the five-year plan of the scientific production association its first section reflects the goals of the activity of the association, the second and third—the tasks which it is necessary to accomplish for the achievement of the goals, the fourth—the necessary resources, and the fifth—the restrictions and economic regulators of activity. Taking into account that the indicators of the first section are of a strategic nature, as well as that the economic standards should be formulated for the five-year plan, the annual plan will include only the second, third, and fourth sections.

In connection with the forthcoming reform of the structures of management of sectorial ministries the question of the optimum centralization of the management of scientific and technical progress is becoming especially urgent. Under the conditions of the present scale of industrial production and the need to ensure a qualitatively new level of the increase of its efficiency on the basis of the introduction of the achievements of scientific and technical progress sectorial organs of management no longer can accomplish these tasks without a fundamental change of their functions. In our opinion, their basic tasks should be:

—the analysis of the scientific and technical potential of the sector, the determination of the most advanced directions of scientific and technical progress, and the organization of the formulation and implementation of comprehensive goal programs of an intersectorial and sectorial nature;

—the preparation for all subsectors of long-range plans of the increase of the technical and economic level of the development of industrial production and products by the introduction of new equipment, which are balanced on the national economic and sectorial levels;

—the establishment (with allowance made for the peculiarities of the development of individual subsectors) of economic regulators, which ensure the economic receptivity of all the units of the sector for the fulfillment of the plans;

—the distribution of centralized reserves and the most scarce means of production (equipment, automation equipment, robotic aids, and others) among subsectors for the implementation of the plans of development.

The reorientation of the activity of the staff of ministries toward the accomplishment of the strategic tasks of scientific and technical progress and the change of the system of planning in this area will make it possible to actually change over to the comprehensive planning of the "science-production" cycle within the sector.

One of the most important causes of the low efficiency of the management of scientific and technical progress at the level of the sector is the existing system of the stimulation of personnel of scientific research organizations. It is oriented toward the obtaining of an economic impact from the isolated introduction of developments, and not toward specific changes in the technical and economic level of products and production in the sector. Therefore, a large portion of the developments (80 percent), which are regarded as introduced, are being used at only one enterprise.

The indicator of economic efficiency, which at present is a generalizing one in the evaluation of the work of a scientific organization, does not reveal all the aspects of its activity and is not binding in the choice of themes, which are aimed at the increase of product quality and labor productivity and the decrease of material, energy, and labor expenditures. For example, at the State Research and Planning Institute of the Paint and Varnish Industry for a number of years the bulk of research, which was included in the thematic plan, was connected with the development of new formulas of paints and varnishes. In most cases it concluded with the production of a test run at one enterprise. Such a means in the obtaining of bonuses, of course, is easier to implement than the development of fundamentally new technologies, which require the retooling of plants of the sector. Therefore, themes, which often are of an opportunistic nature, but have a large estimated economic impact, got into the thematic plans of work of the institute. As a result an unjustifiably large number of brands of paints and varnishes were developed. As a rule, they were inferior in their properties to foreign analogs, often differed in practically no way from those previously produced, and did not have raw material and technological support.

The payment of bonuses for isolated introduction, and not for the achieved technical and economic level of production is also responsible for another negative consequence. Often new highly efficient items due to the lack of interest of developers in the extensive introduction of completed works have a very short "life cycle." Thus, FL-62 enamel for the coating of the interior surfaces of petroleum storage tanks was developed about 10 years ago. The Lida Paint and Varnish Plant produced a small batch, which was introduced at the Bashkir Petroleum Production Association and yielded an economic impact of about 450,000 rubles, having increased by 2.5-fold the durability of storage tanks. The 8-year use of this coating at the association confirmed its great efficiency. However, the mass production of the enamel was not begun at a single plant of the sector, although the need for it is great. The reason is the lack of economic interest of the institute, enterprises, and the superior all-union industrial association.

In conformity with the stated concept of the planning of the activity of sectorial scientific organizations it also seems advisable to organize the system of stimulation on the basis of these principles. In our opinion, the standards of the formation of economic stimulation funds should be established for them with allowance made for not only the amount of the profit, but also the values of the increases of the indicators of the technical and economic level of production and products, which were obtained as a result of the introduction of developments at enterprises of the sector and in the national economy.

For the purpose of stimulating the completion of the highly efficient development of new equipment (technology) it is necessary that the standard of profitability, which is established for determining the contract price for the commodity production of the scientific organization, first of all the scientific production association, would depend on the scientific and technical level of the developments (B, C), which ended with pilot industrial introduction and confirmed their potential suitability for extensive duplication in industry.

As a whole a precise connection is established between the indicators that influence the amount of the standards of the formation of economic stimulation funds: the high scientific and technical level of developments should ensure the high technical and economic level of production and products in one's own sector, which, in turn, will provide the conditions for the increase of production efficiency for the consumer. It seems that given such a system of the stimulation of the personnel of scientific organizations the interests of society and the personal interests of developers will be in agreement and the need for the restriction of stimulation will disappear, since every ruble of bonuses will be backed by a real increase of the efficiency of social production.

The effectiveness of the work of scientific research organizations under the conditions of the use of the proposed system of the planning, stimulation, and evaluation of activity in many respects will be determined by

the effectiveness of the economic mechanism of the management of scientific and technical progress of industrial enterprises and production associations. At present the latter, as is known, are not ensuring the strict coordination of the long-range plans of production and the plans of the introduction of new equipment.

For the acceleration of the introduction of scientific and technical achievements it is necessary to ensure the community of the economic interests of scientific research organizations and industrial enterprises. For this purpose it seems efficient to specify for enterprises for the five-year plan estimated indicators of the increase of the technical and economic level of production and products and with allowance made for this increase to approve the five-year and annual plans of production. At the same time for enterprises and scientific research organizations it is necessary to establish indicators, which are common in content and influence the standard of the formation of the material incentive fund for the introduction of new equipment.

The coordination of the economic organizational conditions of the activity of scientific organizations and industrial enterprises in the area of the development and introduction of scientific and technical achievements will determine their mutual interests and will make it possible to establish a system of financial relations on the basis of direct economic contracts.

As a whole the presented concept of the economic mechanism of the management of scientific and technical progress in the sector is aimed at the achievement of the community of economic interests of all its units and the assurance of its substantial acceleration in industrial production.

Another important reserve of the intensification of sectorial science is the structural reform of the scientific potential. It is dictated by the fact that the necessity of the extensive dissemination of advanced scientific and technical achievements for the accomplishment in the shortest possible time of the retooling of operating enterprises is a distinctive feature of the present. The practice of conducting research and development, which exists at scientific research institutes and scientific production associations, is oriented, as was noted above, primarily toward isolated introduction.

Even in case of the introduction of a development at just one enterprise the most skilled and highly paid specialists, who are responsible for the fulfillment of the theme, are forced to spend up to 30-40 percent of the time allotted for it on preliminary organizational work, the conducting of correspondence and conferences at all levels, and the adjustment of the technology of series production. Consequently, the scientific potential is

used inefficiently and, hence, such a practice is fundamentally unacceptable for the quick and extensive introduction of the latest achievements. Moreover, specialists of a different type are needed for such activity (for the chemical industry, as a rule, process engineers).

In case of the broadening of the front of work on introduction the maintenance of the formed organization of its performance can lead to the decrease of the quality of scientific research. Therefore, at the majority of sectorial scientific technical complexes it is necessary to change the organization of work on the basis of the functional division of the labor of subdivisions with respect to development and extensive introduction and their close cooperation with respect to the planned end result.

In essence, it is a question of the concentration in scientific research subdivisions of the efforts of the most skilled scientists, who are capable of generating ideas, for the solution of the most important problems of scientific and technical progress in the sector. Their goal is a high level of scientific and technical developments, which is capable of ensuring a substantial increase of the technical and economic level of products and production after the extensive introduction of developments. For this they perform research on the development of a scientific and technical reserve; carry out scientific and technical development on new equipment (equipment, materials, technology, means of mechanization and automation, and others), which concludes with interdepartmental tests of prototypes and test runs and recommendations on the scale of use of this equipment; carry out scientific supervision (and in individual cases direct participation) in the introduction of new equipment in series production at plants of the sector and in user sectors.

On the other hand, the concentration of specialists at an engineering center of a scientific research institute (scientific production association) for the performance of work on the assurance of the large-scale introduction at enterprises of the sector of completed scientific and technical developments by their attachment to the specific conditions of individual objects and on the provision of practical assistance to the user sectors in the quick introduction of new items (technological processes) and their proper use for the purpose of intensifying production is necessary.

Positive experience in the organization at large scientific centers of specialized subdivisions for the introduction of scientific and technical achievements in industry exists abroad and in our country. For example, a subdivision of this type exists at the Leningrad Plastopolimer Scientific Production Association, which is known for the great efficiency of its work. In recent years engineering centers of institutions of the Ukrainian SSR Academy of Sciences, which have demonstrated the advisability of the organizational restructuring of work in the

"research-introduction in production" cycle, have been established in accordance with the experience of the Institute of Electric Welding imeni Ye.O. Paton.

Under the conditions of operating scientific research institutes and scientific production associations the engineering center can have the status of a division or department, while its internal structure (sectors, laboratories) is determined by the scale of individual directions of work. Here the introducing subdivisions should be formed mainly by the redistribution of internal resources. Their activity should be based exclusively on economic contractual relations with industrial enterprises.

For the purpose of shortening the time of introduction the engineering centers are obliged to take part in commercial and acceptance tests and on the basis of their results to submit their suggestions on the modification of new equipment and the technical specifications. It would probably be advisable to carry out by the forces of engineering centers in accordance with the orders of enterprises of their own sector relatively small-scale planning and design development on the modernization of individual sections and production lines.

Just the development of highly efficient new equipment and even its series production are insufficient for the support of the processes of the intensification of production, it is also necessary to ensure its proper use by the consumer. Thus, according to the available data, the improper use of paints and varnishes at enterprises of user sectors leads as a whole for the national economy to the loss of up to 25 percent of the annual production volume of this sector. Therefore, there should be assigned to engineering centers the tasks on: the study and generalization in the process of the testing of new equipment and its introduction of the technical and economic requirements of consumers with allowance made for the prospects of scientific and technical progress; the provision of consultations and procedural assistance to consumers in the most effective application of new equipment and the broadening of the areas of its use; the drawing up in individual cases of planning and design documentation on the attachment of new equipment to the production lines of the user enterprises; the organization and conducting of a test of prototypes of new equipment at the users; the development of graphic propaganda and the carrying out of the promotion of scientific and technical achievements for the purpose of using the latter in the national economy.

The effectiveness of the functioning of the proposed form of the division of labor in many respects will depend on the establishment of organizational and economic community between scientific research subdivisions and the engineering center. Thus, it is necessary to envisage the economic stimulation of scientific research subdivisions for the introduction of their developments at enterprises. But it is not ruled out that here additional research may be needed at a specific enterprise. And

then the lack of economic and organizational community will lead to the unjustified increase of the time of introduction. The cooperation of subdivisions will be necessary, when the development being carried out envisages the testing of a new material at enterprises of other sectors, the development of new equipment and a new technological process in operating pilot production (the scientific production association), and introduction at a number of plants of the sector. Thus, the cooperation of scientific research and introducing subdivisions should be of a versatile, flexible nature and should be governed by the peculiarities of the object and the ultimate goals of the task being worked on.

Experience shows that under the conditions of the chemical industry the effectiveness of the introduction of new equipment is often artificially overstated, since the latter "undoes only one bottleneck" in the chain of interconnected technological processes of the obtaining of the final product. In such cases the performance of a set of operations on the retooling of production, which ensures the increase of its technical level (labor productivity, product quality, the decrease of expenditures of material and energy resources, and so on), is economically justified. On the other hand, the use of new equipment, as a rule, also requires changes in the organization of labor and management. With allowance made for the long-range tasks drafts of comprehensive plans of retooling and the improvement of the organization of labor and management of individual works and even enterprises should be used more.

The great diversity of the works being introduced at specific plants presumes the extensive organization of temporary collectives made up of specialists of various scientific research subdivisions (subdivisions of the development and technology of materials, equipment and technological subdivisions, subdivisions for mechanization, automation, technical rate setting, the rate setting and organization of labor, management, and others), personnel of the engineering center, as well as specialists of the industrial enterprise, for which the plan is being drafted.

Temporary collectives and engineering centers can be established everywhere. These organizational forms are making it possible to speed up significantly scientific and technical progress in industry.

Footnotes

1. *Pravda*, 30 June 1987.

2. It is established by estimate with respect to the base year and the annual growth rate of commodity production, which is approved for the five-year plan.

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Growing Role of Scientific and Economic Society Described

Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 4, Apr 87 pp 75-83

[Article by Academician T.S. Khachaturov: "Economic Development and the Scientific and Economic Society"]

[Text] In the beginning of 1982, the Scientific and Economic Society was formed within the framework of the All-Union Council of Scientific and Technical Societies, which in a few years was transformed into a mass organization of the economic community. Today, among the 11,000 of its primary organizations there work more than half a million economists, engineering and technical specialists, workers and staff members of planning, financial and statistical institutions and organs of material and technical supply, VUZ's, tekhnikums, scientific-research institutes and other organizations and enterprises of the national economy.

The society is responsible for promoting in every possible way the development of economic science and practice and supporting the initiative of members of the economic community aimed at improving the economic mechanism, growth of production efficiency and comprehensive use of manpower and material reserves. It widely disseminates the achievements of economic science, economic knowledge and advanced experience, striving to have all participants of the production process possess economic knowledge.

The specific character itself of the Scientific and Economic Society opens up unique possibilities for wide-scale interaction of economic theory and economic practice and overcoming of various departmental barriers. The fact is that it like other scientific and technical societies unites representatives of science, production, organs of economic management and staff members of the USSR Academy of Sciences, higher school, various sectors of the national economy and departments.

The Scientific and Economic Society strives to ensure close cooperation of scientists and production people for solving the tasks of restructuring the Soviet economy set by the Communist party, acceleration of the economic and social development of the country, scientific and technical progress and utilization of the tremendous reserves existing in the national economy. The society is in a position to solve its own problems, uniting for participation in measures being conducted by them, on the one hand, scientist economists working in scientific sections and brought in from planning, financial, statistical and other organs and from scientific institutes and higher educational institutions and, on the other, economists from agriculture, construction, transport and other fields.

The Scientific and Economic Society is carrying out several important work assignments at the location of the country's important enterprises. Thus, jointly with

the KamAZ Plant, the effectiveness of firm repair of motor vehicles was studied in Brezhnev and jointly with the Kovdor Mining Concentration Combine ways of improving price formation for comprehensive utilization of raw materials and on the basis of the experience of the Krasnyy Proletariy Plant in Moscow problems of planning, development and introduction of new equipment and so forth. Some work assignments were performed by the society jointly with higher educational institutions such as Moscow and Leningrad universities and with scientific-research institutes, for example, the Institute of Economics of the USSR Academy of Sciences, the Institute of Economy of the World Socialist System of the USSR Academy of Sciences and economic academic institutes of Novosibirsk, Vladivostok, Kiev, Tbilisi, Tashkent and other scientific centers of the country.

The work of the numerous primary organizations of the Scientific and Economic Society is supervised by its Central Board and also by republic, oblast and city governing bodies. The sections of the governing bodies are organized on the problem principle.

Thus in the course of the work of the scientific section on national-economic planning, questions were broadly discussed on improvement of national-economic plans, their proportionality and balance, coordination of sectoral and regional planning and other topical problems. The job of the scientific section on finance and credit is to boost the effectiveness of these important economic levers, to promote the implementation of the party's policy on strengthening the initiative and independence of associations and enterprises and increasing their responsibility for results of their work. This section jointly with the section on management of the economy and others can do much to help strengthen and disseminate the new forms of economic relationships of the state and enterprises and associations and their transition to self-support and self-financing for the purpose of fuller utilization of their resources. The section on prices and price formation has been assigned development of proposals on the most important questions of improving price structure, which should serve as an active tool of planning supervision of the national economy and at the same time stimulate the initiative of collectives and provide enterprises with the possibility of self-financing. The work of the material-supply section should promote better use of material resources and the struggle against unjustifiable accumulation of reserves of resources and their wasteful expenditure. The section on economics of labor and manpower resources resolves various problems connected with boosting the stimulating role of wages, improving labor organization and eliminating worktime losses. The section on economics of scientific and technical progress is working on questions of effectiveness of retooling production. The theoretical developments conducted within the framework of the section

on political economy of socialism are significant. Major tasks also face the other sections: organization of management of the economy, disposition of productive forces, accounting and analysis of economic activity, effectiveness of capital investment, economics of use of nature [prirodopolzovaniya], economics of branches of culture, economics of agroindustrial complexes, economics of transport and the section for work with young specialists.

All these sections, operating under the Central Governing Board of the society and organized as needed in republic, kray, oblast and other local governing bodies, convoke all-union and republic conferences, scientific seminars, symposiums, meetings and schools where prominent specialists—scientists and practical workers—exchange opinions on important questions of our economy and methods of solving specific problems and work out coordinated carefully thought out proposals. Frequently, such meetings are preceded by a thorough working out of a specific economic problem.

On the basis of the results of such elaborations and discussions, proposals are prepared for directive organs, the USSR Gosplan and ministries. Pertinent decisions are made on the basis of many such decisions. Thus, on the basis of the results of the economic experiment at the KamAZ, proposals were sent to USSR Gosplan and the USSR Ministry of Automotive Industry. On the basis of proposals of the Scientific and Economic Society on improving ore use of the Kovdor deposit, the USSR State Committee for Prices introduced additional payments for simultaneously extracted components and the USSR Ministry of Ferrous Metallurgy established stable normative formations of economic stimulation funds. Measures were adopted for improving the ore utilization of the Kostomuksha deposit, especially the polyporphyrates. USSR Gosplan has supported proposals of the All-Union Council of Scientific and Technical Societies and the Scientific and Economic Society on measures for increasing effectiveness of use of raw and other material resources in the national economy.

The Section of Political Economy of Socialism actively participated in the preparation of a number of proposals for a new edition of the CPSU Program and other pregress documents. It was possible only recently to increase manifold the list of proposals adopted by the Scientific and Economic Society.

A major place in the work of the Scientific and Economic Society is occupied by questions of the economics of scientific and technical progress. In 1985 alone, conferences, meetings and symposiums in Tbilisi, Shaulay, Gomel, Kiev, Yerevan, Tashkent, Brezhnev and Moscow dealt with these problems. Special attention is devoted to problems of growth of the electric power-worker ratio used in calculation of a worked man-hour and the introduction of microprocessors and other automated equipment.

From the economist's point of view, the new equipment justifies itself only when it provides growth of production volume with reduction of current expenditures on a product unit. It is possible to achieve this either by increasing equipment capacity or by changing over to basically new equipment. In the latter case, an essential condition is the reduction of current expenditures on a product unit which would justify the increased capital investment in new equipment and secure a payback of this investment within the limits of a normative time period. Only if production grows faster than expenditures, that is, in the case of the "resource conservation" type of development, is it possible to speak of intensification. Determination of ways of technical improvement presupposes comprehensive economic calculations, economic validation of technical equipment planned for introduction and the selection of such equipment as would ensure a payback within the limits of normative time periods. All this could be abetted by studies conducted by the Scientific and Economic Society: economists are duty bound to assist in determining the efficiency of developed equipment and to provide proper economic measurement and comparison in order to optimize the use of this equipment and the priority of realizing developments.

Let us take as an example introduction of computer technology and information science. In the presence of a planned economic system, wide-scale computerization can be very effective, making it possible to significantly speed up and simplify adopted solutions at all levels and to ensure big economy not only of administrative but also of production costs. But these possibilities will themselves depend on whether the many measures relating to organization and management of the economy designated by the large-scale economic experiment are implemented. The question concerns improvement of the economic mechanism, accuracy of reporting data, greater responsibility of each association and enterprise for the timely fulfillment of the delivery plan in accordance with contracts without which no "computer" planning can ensure the uninterrupted operation of user enterprises and so forth. Only with fulfillment of these requirements can employment of the whole system of computer technology in management be effective. And measures for improvement of the economic mechanism, the planning system and cost accounting may be and must be put into practice first of all by economists and managers.

Another example is effectiveness of using robots. The number of produced industrial robots and manipulators has already exceeded 50,000 for us and in terms of this indicator we occupy one of the first places in the world. But solution of the question of use of such expensive automatic equipment as robots requires each time serious organizational measures and economic validation. Specifically, for effective introduction of robots, it is necessary for them to have the fullest possible load—basically around the clock. And this means that it is necessary to introduce pertinent changes into the shift

nature of the work of operators and adjusters. It is necessary to estimate what expenditures this will require, what benefit can be secured and how to use the initiative of the workers themselves in a transition to 3-shift work and on this basis to solve each time the question of scale of robot introduction. Here a major role is bound to be played by the Scientific and Economic Society's primary organizations. These problems among others were discussed at the conference in May 1986 on economic problems of scientific and technical progress.

Mechanization of manual labor is of tremendous importance to raising productivity of public labor—half of all expenditures on public labor apply to it. According to Basic Directions of USSR Economic and Social Development for 1986-1990 and for the Period to the Year 2000, it is planned to reduce the use of manual labor in the production sphere by 15-20 percent. In principle, it is quite possible to achieve a very high level of mechanization. But here also, the economic side of the matter is important. It is necessary to carefully take into consideration each time what the required mechanisms will cost, how production is organized there, where they are planned to be used and whether it is possible to provide them with an adequate load. Here it is very important to develop measures for the fullest possible use of mechanization equipment, and the Scientific and Economic Society's organizations are called upon to help solve this pressing question.

One more example—employment of new materials: composites, metal powders, multipolymers, fiber glass, superhard ceramics and others. Through the use of these new wear-resistant, durable and relatively inexpensive materials, it is possible to significantly reduce the need for ferrous and nonferrous metals. But it is necessary to determine how much all these materials will cost under this or that scale of production and what benefit can be secured from their use thanks to the reduced cost of these or those components or parts or extension of their service life. Only by comparing expenditures with effect is it possible in each concrete case to solve the question of employment of new materials. And here it is extremely important to organize locally the cooperation of engineers and scientists with economists.

Economic calculations and validations are also required for the determination of effective ways of intensification itself and the fullest possible use of fixed and working capital, manpower and natural resources. Intensification can contribute to the introduction of new machines and equipment and the fastest possible replacement of existing ones. Up to now, such replacement took place very slowly. The ratio to liquidated capital in the course of a year to the total cost of capital at the start of the year amounted in 1984 to a total of only 1.3 percent, including buildings and structures, 1.4 percent. It can be seen from these figures that complete replacement of all fixed capital would take 77 years and of machines and equipment 44 years. According to the plan for the 12th Five-Year Plan, fixed-capital renewal is to be speeded up 1.5- to twofold.

The average degree of equipment wear for the country amounted to 39 percent at the end of the 11th Five-Year Plan. The required capital repair and other complex repair of this equipment cost sometimes more than a new machine. It is found necessary to keep in repair shops up to one-third or more of the entire machine-tool park and a large number of workers. For the purpose of speeding up replacement of equipment, it is essential to significantly increase the production of machines: the production of machine building according to the 12th Five-Year Plan should have grown by 43 percent in 1990 compared to 1985. This is a difficult task. Even now machine building uses one-fourth of all capital investment in industry and will need to increase its share: during the 12th Five-Year Plan, capital investment in the machine-building complex is contemplated to be in an amount of 63 billion rubles. For the proper redistribution of investment and optimal use of released funds, most responsible economic measures are required. To help select them and implement them at the most diverse levels is still another important task of the Scientific and Economic Society's organizations.

Society faces major tasks in connection with the need of improving organization of labor and raising its productivity, ensuring a correspondence between the number of created work stations and the number of personnel, improving work conditions and eliminating downtime. Improvement of the wage system and enhancing its stimulating role and its influence on growth of productivity and the elimination of leveling or so-called "vyvodilovka" ["exclusion" (?)], all this is impossible without the active participation of the broad economic community. The Ukrainian republic's governing board of the Scientific and Economic Society is doing a great deal of important work along this direction within the framework of the Trud Program.

Under conditions of intensification, growth of labor productivity should be ahead of growth of equipment capacity or in any case not lag behind it. Only then will it be possible to speak of using all the possibilities, both technical and organizational, for growth of production created by the new equipment. In this connection, factor analysis is of great importance as it makes it possible to establish what was specifically responsible for raising labor productivity and efficiency—be it introduction of new equipment and technology, boosting of production quality or extension of its service life or economy of materials, fuel, raw materials and power, improvement of the use of secondary products and waste and elimination of losses. The society sets the task of conducting such factor analysis. This work has already been started at the Scientific-Research Institute of Labor of the USSR State Committee for Labor and Social Problems.

For raising labor productivity, major importance is attached to rational organization of production in the brigade, shop and enterprise, elimination of downtime because of untimely supply of materials and power and because of lack of coordination between various sectors

of the production process. In this matter, the use of economic methods of managing production can be of major importance. And here the economic community, specifically members of the Scientific and Economic Society, must play their role. Members of the Scientific and Economic Society working at related enterprises can provide considerable help to production in establishing ties between enterprises, improving planning and control over plan fulfillment and financing supply and sales throughout the entire production cycle.

Questions of raising labor productivity and the role of the economic community in the solution of this task were discussed at several meetings of the Scientific and Economic Society. In particular, a special conference was devoted to introduction of the collective contract. Conferences were also held on questions of improvement of wages and boosting their stimulating role. Much work is being done here by the scientific section of economics of labor and manpower resources, working in contact with the Scientific-Research Institute of Labor.

Intensification of production presupposes a rise in the effectiveness of expenditures, both capital investment and current expenditures on labor and materials. Of course, planning organs, which provide for their size and structure and also those on whom the actual course of construction and its results depend are first of all under obligation to ensure the effectiveness of capital investment. But both collectives of enterprises and the economic community can and must see to it that proposals for boosting effectiveness of capital investment are methodologically rightly based in conformity with existing norms in order that the most effective variants are selected on the basis of strict calculations so that construction proceeds normally in accordance with plans. If capital investment is allotted from the development fund on the proposal of an enterprise, it would be especially important to verify that that proposal has a comprehensive economic basis and is in accord with the general directions of investment policy. Dissipation of capital investment on a large number of facilities results in dragging out of construction and freezing of funds. It is necessary to decisively improve the quality of capital construction. The Scientific and Economic Society has concrete proposals for all these questions. They also touch upon concentration of capital investment for the most important facilities subject to completion in the planned period and growth of the share of investment in modernization and retooling with reduction of the share of new construction and planning of existing production and new construction as a single whole. Here a great deal may depend on the everyday work of the Scientific and Economic Society and on its members who must help in carrying out the requisite economic calculations and keep track of the course of construction.

The development of methods of determining effectiveness of new equipment is of great importance. A model method of determining the effectiveness of capital investment has been in existence now for 25 years. It has

been issued in three editions. It would seem that this tested method should be used in determining the effectiveness of new equipment. This has not been done and attempts are made to use other initial positions, as yet not tested in practice, as a basis. This is wrong.

The Scientific and Economic Society and the Scientific Council on Effectiveness of Capital Investment of the USSR Academy of Sciences have their own plan for a method of determining the effectiveness of new equipment. This plan, worked out according to an instruction of the Presidium of the USSR Academy of Sciences and approved by the Scientific Council of the Institute of Economics, was published in the journal VOPROSY EKONOMIKI (No 9, 1984) and received a positive rating from USSR Gosplan, USSR Srobybank and a number of other organizations. Their responses and comments were published in VOPROSY EKONOMIKI (No 6, 1985). One of the tasks of the Scientific and Economic Society is to work for the introduction of this method.

An important job of the Scientific and Economic Society is social analysis of fulfillment of the plan not only as to quantity but also as to quality of production. We know that when it comes to quantitative indicators plan fulfillment is carried out at the expense of lower quality of production since qualitative characteristics may not be and in general are not shown in plan indicators. The assistance of the economic community is all the more important in ensuring high production quality. A big role can also be played by members of the economic community in the solution of such an important task as all-out economy of resources, especially fuel and power, in economic validation of the selection of the most effective types of fuel and rational organization of their production, processing and utilization. The selection and validation of optimal directions of power conservation and provision of incentives from the economic point of view are not temporary measures but continuous work at the most diverse levels.

Major economy can also be attained with a more rational expenditure of ferrous and nonferrous metals. So far the main method of working metal in the country is cutting. About 6 million metal-cutting machine tools (a significant portion of them is in repair shops) produce in a year up to 20 million tons of waste of which about one-half consists of shavings. The fuller shifting to pressure working of ferrous metal on forging and pressing machines has made it possible to reduce waste significantly.

But for this it is necessary to increase the production of sheet metal in conformity with modern tendencies of development of metalworking. It is possible to reduce the need for iron ore and ferrous metal through reduction of the weight of machines, pipe and other types of metal products and to extend the service life of products by improving the quality of metal, protective coatings

and wider use of power metallurgy and finally through utilization of secondary raw materials which are still being inadequately collected.

Metal economy could come from ferrous metallurgy itself by developing well-known but still inadequately employed methods of production—continuous steel casting and oxygen-converter smelting. The introduction of modern production methods in metallurgy and metalworking also needs the support of economist members of the Scientific and Economic Society together with representatives of other scientific and technical societies. Economics measures of various kinds are likewise needed to stimulate the collection and use of scrap, nonferrous metals and replacement of nonferrous metals with synthetic materials.

Calculations show the great possibilities of economy of lumber and other construction materials. The experience of timber-industry combines of the Carpathian area shows that with appropriate management of work not a single chip, not a single branch and not a single one of the numerous types of products of timber management—mushrooms, medicinal plants, juices and so on should be lost. And here the work of the Scientific and Economic Society must contribute to the selection of optimal and most advantageous solutions.

Preservation of production output and getting it to the user are of tremendous importance to the rational organization of the entire production process. This applies particularly to agricultural products. Members of the Scientific and Economic Society devote attention to improving the movement of agricultural products from field to consumer. There is a need in particular for rationally locating warehouses so that a portion of the products could be stored with the producer and when needed shipped to consumers and for improving the conditions of storage of fertilizers, maintenance of tractors and other agricultural tools. The question of development of a modern storage base and of its most advantageous capacity while taking into account the cubic volume of materials requiring storage, the cost of the actual warehouses, the size of losses in the event of a shortage of space requires special study by economists. Calculations show that in many cases building of warehouses can be repaid in 1-3 years through preservation of readily perishable products. This is an important field of activity for economists and associations in the Scientific and Economic Society.

The question is particularly acute concerning buildings materials and production equipment. Today, because of low quality of building materials, cement, brick and metals, it is necessary to increase their expenditure. Thus, overexpenditure of cement is due to the fact that a large amount of cement of low grade—300 and 400—is produced and used. It is essential to increase the output of cement of the 500 and 600 grades. A great deal of

brick is damaged because of careless loading and unloading. Storage conditions of building materials are unsatisfactory. A system of economic incentives is needed that would promote a thrifty attitude toward building materials and reduction of their expenditures. A number of proposals on economy of lumber and other kinds of building materials were heard at one of the meetings of the Central Administrative Board of the Scientific and Economic Society and reported to the government and Gosplan. Similar questions were examined at other conferences held by the section on material and technical supply of the Scientific and Economic Society whose recommendations were likewise presented to the administration.

In determination of ways of restructuring public production on the basis of intensification, problems of protection of the environment become increasingly more acute. Here it is necessary to solve two questions: first, how to utilize most rationally existing natural resources so that they would suffice the country for as long a period of time as possible and, second, how to reduce pollution of the environment and to create the best possible conditions for man's existence. The solution of both questions depends to a significant degree on rationalization of the production process and the introduction of low-waste or waste-free production operations.

The solution of economic problems depends to a large degree on the successful operation of the economic mechanism and on improvement of management of the national economy and its planning. These problems cannot be solved solely "at the top" at a single center. The science of management and planning should be the property of all workers, first of all the immediate participants of production. Proper utilization of the interests of individual collectives and each participant of public production is becoming increasingly more important. It is necessary to be based on these interests in the name of further development and improvement of socialist production, activating in every possible way the operation of material and moral incentives. The work of the Scientific and Economic Society, its administrative boards, sections, primary organizations and each of its members must contribute to all this. It is necessary to use all possibilities of stimulating their creative activity. In addition to conferences and meetings, scientific research must be encouraged more, exhibits of the best work must be organized, competitions held and publication promoted of the best work in the press. An information bulletin of the Scientific and Economic Society has begun to be published, so far in a small printing.

The Scientific and Economic Society becoming a member of the All-Union Council of Scientific and Technical Societies makes it possible to jointly work out and solve important national-economic and technico-economic problems, for example, to seek out ways of reducing in every possible way the personal interest of enterprises in creating stores of materials, which negatively affects the balance in the national economy. The All-Union Council

of Scientific and Technical Societies together with the Scientific and Economic Council has worked out proposals on elimination of this defect, particularly by making periodic inventories of working capital and establishing penalties for unnecessary and harmful "accumulations."

All these are prerequisites so that the Scientific and Economic Society actively contributes to the solution of major problems of acceleration set before the Soviet people by the party.

In the solution of this problem facing society, major importance is attached to strengthening its ties with the country's scientific institutions, first of all the USSR Academy of Sciences and the academies of sciences of the union republics. Throughout the years of the society's existence, these ties have been developing and becoming stronger. In many cases, the society's scientific sections have been working in contact with the Institute of Economics of the USSR Academy of Sciences and the academies of sciences of union republics, the Commission for Study of Productive Forces and Natural Resources of the USSR Academy of Sciences and also with such organizations as the Council for the Study of Productive Forces attached to USSR Gosplan, as well as working in contact with the USSR Academy of Sciences. Academic organizations frequently submit proposals for joint holding of conferences and other measures with the Scientific and Economic Society. Thus, in April 1986 an impressive conference was held in Leningrad for discussion of a most pressing theme—ways of speeding up social and economic development of socialist society. It was convoked by the economic faculty of Leningrad State University together with the Leningrad administrative board of the Scientific and Economic Society and the Scientific Council of the USSR Academy of Sciences on "Economic Laws of Development of Socialism and Competition of the Two Systems." In October 1986, the Scientific and Economic Society jointly held with the Institute of Economics of the World Socialist System of the USSR Academy of Sciences and the Higher School of the Trade-Union Movement of the AUCCTU a conference on the problem of rational utilization of manpower resources under conditions of intensification of the socialist economy. Many such examples could be given, and it remains only to wish that the contacts of the society's organization both at the center and locally with institutions of the USSR Academy of Sciences and the academies of sciences of the union republics become stronger and develop.

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Introduction of Developments of Academic Material Science

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SSSR in Russian No 9, Sep 87 pp 43-47

[Article by Academician M.M. Shults and Doctor of Technical Sciences O.V. Mazurin under the rubric "The Organization and Efficiency of Scientific Research": "How to Speed Up the Introduction of Developments of

an Academic Institute"]

[Text] The quickest use by the national economy of the results of scientific research is one of the mandatory, obvious conditions of the rapid development of our industry, the sharp increase of the scientific and technical level of its output, and the assurance of competitive ability on world markets. So that this condition would be completely met, scientists of the USSR Academy of Sciences also have much to do.

Now at academic institutes work is being performed on the revision of themes and on the concentration of the efforts of collectives on the solution of important scientific problems that are promising for technical applications. This implies that in the next few years the volume of results of scientific research work, which are of specific practical importance, will increase substantially. And now many academic institutes have large reserves in the area of scientific developments that are intended for introduction. These developments are very different in their national economic importance, in the scale of potential application, and in the degree of readiness for immediate use. But as a whole during the decades, when the majority of scientists succeeded in introducing only a small portion of the results that are useful for practice, a substantial potential of the increase of the efficiency of the most diverse sectors of the national economy, which for the present has simply not been realized, was accumulated.

The preservation of such a situation seems simply intolerable. However, in the 2 years, which have passed since the April (1985) CPSU Central Committee Plenum, scientists of the Institute of Silicate Chemistry imeni I.V. Grebenshchikov of the USSR Academy of Sciences have not noticed that the attitude of ministries, departments, and individual industrial enterprises toward the problems of the introduction of scientific developments has improved.

The authors of the article, of course, realize that at different research institutes the state of affairs with the transfer of scientific achievements to industry can be very different. And still, apparently, the situation at the Institute of Silicate Chemistry is quite typical at least for academic material science institutes, since our developments are being introduced (or are not being introduced) at many tens of enterprises of the most different ministries and departments.

There are no doubts that the steps, which are now being taken by the party and government, in the end will change radically the attitude of industry itself toward the scientific and technical achievements of academic institutes. But scientists of the academy cannot wait quietly for this time. In this area means of stimulating the participation of academic institutes in the solution of a number of problems of introduction are examined.

On first approximation it is possible to divide the applied developments of any material science institute into two groups. Either it is possible to successfully introduce such a development independently, "autonomously," within just the given enterprise or for its successful assimilation at one (the main) enterprise it is necessary to organize in advance the production of new materials or items at some other enterprises, which often belong to a different ministry or department. Precisely this, the last case proves to be most difficult for introduction.

The main enterprise also can take an interest under present conditions in a development, if its use promises the increase of the quality, the increase of the technical level, the decrease of the production cost, the reduction of the labor intensity, and so on of a product that is already being produced. But if for this it is necessary that some other plant would begin the output of a new product, which is not planned for it by superior organs, such introduction becomes a nearly hopeless matter.

The results of numerous attempts at the organization of introductions of such a type convince us that under the conditions of the nearly universal "shortage of everything" and the excess of demand over supply the existing economic mechanism not only does not stimulate the output of a new product, but, on the contrary, forces both enterprises and ministries to resist this in every way. And here it is very important to understand that at first (until the production possibilities exceed if only by a little the existing demand for the product being produced) the more rights that are given to enterprises, the more successfully they will resist such innovations.

This is an objective reality of our present economy. We should soberly evaluate it and draw realistic conclusions. Perhaps it is clear that the introduction at large plants of materials and items, the needs for which even on the scale of the country are small—tons, or else kilograms of a material of a specific brand, thousands or hundreds of units of an item—takes place with the greatest difficulty in such a situation. There is usually no reason for a large enterprise to spend time on assimilating such a product: there are disproportionately many troubles, the danger of not fulfilling the plan of deliveries increases, while the profit even in case of the complete success of assimilation is minimal. At the same time the lack in the country of small-tonnage and small-series works, which could meet the existing need for numerous latest materials and items, hinders technical progress not at all less than the slow placement into operation of modern large-tonnage and large-series works. It seems that the most prompt steps on the elimination of such a situation must be taken.

One of the most obvious means of solving this problem is the utmost development of pilot plants attached to scientific research institutions, particularly academic institutes. But here it is necessary to meet a number of conditions. Only the total production volume in rubles,

without a products list, should be planned for such a plant, while the price of a new product during the first years of production should be established on a contractual basis, on the basis of its use value. In general the relations with the consumer here should be organized on the basis of direct contractual ties. It is natural that the scientists of the institute should be interested materially in the successful activity of the pilot plant.

Such a system will ensure the maneuverability of production and the conditions for the most rapid assimilation of a new product. The institute will also receive unquestionable advantages: the efficiency of the introduction of its practical developments will increase significantly. The results of the activity of academic institutes, which have their own pilot plants, convincingly confirm this. What is more, the possibility of a quick transition from a scientific idea to the production of materials and items, which the national economy needs, changes radically the attitude of scientists toward the formulation of the ultimate goals of their work. This ensures a real technical orientation of basic research much more effectively than any ardent appeals or threatening orders.

In our country there are many regions, in which the share of academic institutions, which have pilot plants, is significant. However, within the overwhelming majority of Moscow and Leningrad academic institutes such plants, unfortunately, are lacking. Their establishment will require large capital investments, the drastic expansion of the capacity of academic construction organizations, the enlistment of additional manpower resources, not to mention time: the making of the decision on construction, designing, inclusion in the plan, building, and assimilation—all this drags out for many years.

Thus, active steps must be taken immediately for the accelerated construction of pilot plants, but, inasmuch as at best they will begin to be put into operation during the second half of the next five-year plan, we are simultaneously obliged to see other solutions of the above-named problem, which, even though partial, on the other hand are capable of yielding an impact in the next few years and months.

At the Institute of Silicate Chemistry one of the versions of an efficient solution suggests itself. The overwhelming majority of staff members of the institute work one shift, while the rest of the time nearly all the equipment is idle. Meanwhile many materials and items, which it is possible without detriment to basic research to produce directly on the available equipment in case of its operation during a second and third shift, as well as on Saturdays and Sundays, have been developed here. In this way very many enterprises and research institutions of the most different ministries and departments would be provided with scarce products. It would be possible to perform this work mainly (and at the initial stage,

entirely) by the forces of the staff members of the institute on the condition that they are permitted to hold more than one job within the institute.

So that production activity of this sort would not do harm to the research work of the institute, it is necessary to single out organizationally within its structure a pilot production department (OPO). This department should operate on the basis of full cost accounting. Having the right to establish contract prices, the pilot production department, in case of a high national economic utility of its product, can derive a significant profit, a portion of which should be used for the acquisition of new equipment, while a portion should be used for the stimulation of both the producers and the developers of the corresponding materials.

The advantages from the extensive implementation of this proposal are obvious. By participating in the production of materials, which the national economy needs, researchers of the academic institutions will treat much more realistically the problems of the practical use of their scientific developments and will experience a taste for the meeting of the demands of practice. Among young scientists the opportunity will appear to increase the income of their family, by directly using their basic skills. This will increase the prestige of work at research institutions, which among young people is now decreasing. Thus, specific social problems will also be solved. And, of course, the national economy will be able to obtain, although in small quantities, urgently needed materials, moreover, the flexibility of the reaction of the producer to changes of the requirements of the client will be maximal. Indeed, who will ensure the required changes of the parameters of a material better and more rapidly than the developer who is interested in this?

It is necessary to specially emphasize that it is possible to organize such production literally a few months after the making of the corresponding decision, without requiring in so doing space, limits on labor, or money. Only permission for the use of a specific portion of the amounts, which have been received by the pilot production department from the sale of products, for the remuneration of the people holding more than one job is necessary.

Of course, the organization of the pilot production department may evoke in someone the aspiration to subordinate the interests of academic science to the interests of pilot production, which is flourishing near by. Here effective monitoring should be envisaged from the very start. In particular, both laboratories and individual staff members can participate in the work of the pilot production department only if the high level and intensity of their basic scientific activity do not arouse doubts of either the scientific council or the public organizations of the institute.

It is possible to devise many specific versions of the organization of the pilot production department. Probably, before making a decision on the extensive use of the proposed system, several of them should be checked in an experiment of a limited number of institutes. In Leningrad the Institute of Silicate Chemistry is most prepared for this: many of its developments completely meet the above-stipulated conditions and, moreover, already today have specific users who are guaranteeing payment for deliveries of the materials they need. These circumstances also served as the basis for the addressing by the Leningrad Oblast Committee of the CPSU of the request to the Presidium of the USSR Academy of Sciences to conduct the corresponding experiment on the basis of the Institute of Silicate Chemistry. The ideas of the experiment received support initially from Academician A.P. Aleksandrov, then from Academician G.I. Marchuk. A number of other executives of the USSR Academy of Sciences also had a positive attitude toward it. But many difficulties of an organizational nature remain. Several mandatory conditions of the experiment are in conflict both with the existing instructions and norms and with established practice. In this connection, in particular, the quite natural aspiration of the staff of the Presidium to introduce the new experiment in the already existing framework, for example, to replace the pilot production department with a temporary scientific and technical laboratory (VNTL), appeared.

Of course, the drawing up and approval in the appropriate instances of the statute on the pilot production department are not a simple matter. The organization of such departments will lead to a certain increase of the amount of work of several subdivisions of the Presidium of the USSR Academy of Sciences, which is connected with the planning (minimal, it must be hoped) and monitoring of their activity. But we are convinced that the needs of our common cause today do not leave us a choice.

At the Academy of Sciences there are no forms of the organization of introduction, which are if only remotely reminiscent of the system proposed here. The temporary scientific and technical laboratories, which are very fruitful in accomplishing specific scientific and technical tasks, also do not constitute an exception. Indeed, the goal of the temporary scientific and technical laboratory is to ensure the quickest carrying out of some specific development, the task of the pilot production department is to ensure the output of a product that had already been developed earlier (even 5-10 years before the organization of production). The temporary scientific and technical laboratory should serve only one ministry or department—the one which took part in its establishment. The pilot production department can supply with the same type of product an unlimited number of institutions of the most different departmental subordination. The organization of a new temporary scientific and technical laboratory is required for a new problem, but this procedure is very unwieldy and requires a large outlay of forces and time. The pilot

production department, if it has already been organized, in principle will be able to accept and fill a not previously planned small order literally within a month. This is extremely important for the assurance of genuine, and not paper technical progress.

I want to hope that in the immediate future the formal and psychological obstacles to the experimental organization of the pilot production department at the Institute of Silicate Chemistry and, perhaps, at several other academic institutions will be overcome. In case of the successful outcome of the experiment a basis will appear for the substantial increase in the near future of the contribution of academic institutes to the acceleration of the scientific and technical progress of the country.

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Preparation of Leningrad Sectorial Institutes for Cost Accounting

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[Article on *Leningradskaya Pravda* round table conducted by *Leningradskaya Pravda* correspondent V. Chichin: "The Last Days on the State Budget"; first six paragraphs are *Leningradskaya Pravda* introduction; last three paragraphs are *Leningradskaya Pravda* conclusion]

[Text] The decree of the CPSU Central Committee and the USSR Council of Ministers "On the Changeover of Scientific Organizations to Full Cost Accounting and Self-Financing" was published the other day. We will be frank: at many institutes the reaction to this news was akin to a "dumb show." That has its reasons.

Indeed, in recent times we have already been imbued with the idea that without an anti-expenditure mechanism there will not be any acceleration. But we realized it, so to speak, in general, on the scale of the country. And even after the matter with the changeover of enterprises to cost accounting was settled at the June CPSU Central Committee Plenum, at the majority of scientific research institutes they did not suspect that the last days were coming to their existence at the expense of the state budget. It is a matter not only of many years of habit. Hardly anyone imagined how it is possible to connect cost accounting with the specific nature of the scientific product.

Meanwhile back in June the basic principle of restructuring in science was formulated: the scientific product should have the status of a commodity. This is the foundation of the building of the cost accounting institute. First of all the sectorial institute. How will it differ from the existing one? When, by whom, and how is it to be built? What will cost accounting in science give the very creators of new equipment and society as a whole?

It is possible to multiply the questions, but for the present there are no unequivocal answers to many of them. Taking this into account, we also determined the composition of the participants in the round table. Among them are representatives of scientific research institutes, who back during the well-known Leningrad experiment took a step toward cost accounting. Now it is necessary to solve qualitatively new problems.

S.I. Aleksandrov, secretary of the party bureau of the All-Union Scientific Research Institute of Electric Welding Equipment, and M.G. Grebinnik, chief of the Department of Technical and Economic Substantiations of the All-Union Planning and Design Institute of the Technology of Electrical Equipment Production, speak about them. Today it is also necessary to look in a new way at the very problem "the economics of science"—Candidate of Economic Sciences A.B. Chubays of the Leningrad Institute of Engineering Economics and G.I. Rekord, senior scientific associate of the Leningrad Institute of Finance Economics, posed the question that way. The opinion of our guest, M. Vanchev, economic commentator of the newspaper *Otechestven Glas*, who for more than a year now has been writing about the problems of cost accounting in science—in Bulgaria they changed over to it 6 years ago—was of particular interest for the discussion participants.

Different, at times contradictory opinions were voiced. But the discussion participants were unanimous in one thing: in the life of sectorial institutes truly revolutionary changes are coming. Strictly speaking, they have already begun....

1. "The Import Plague" and Its Consequences

Correspondent: Before building, let us examine what is demolished. Specifically, why does the existing mechanism not suit us?

Chubays: Is "us" society or the institutes themselves? If it is society, it has long had the right to make a strict claim on sectorial science, and, I am sure, many scientific research institutes are incapable of paying it. For illustration: during the 11th Five-Year Plan the number of newly developed machines turned out to be...14 percent less than 10 years ago.

Now this year the state has allocated 30 billion rubles for the maintenance of scientific research institutes and design bureaus. Into what will they turn? Somewhere they will yield a profit, but at some institutes you will not return 50 kopecks per spent ruble. Meanwhile this will have little effect on the well-being of the latter: in essence, regardless of the efficiency they will all the same get "their due."

It has reached the point where in sectorial science a real "import plague" has begun. It turned out that today it is far easier to purchase an innovation abroad (the money is not one's own, but state money) and to reproduce it

under our conditions than to seek oneself original solutions. Being practically independent of clients, developers nearly always display indifference to the fate of their creations and to their competitive ability. I believe that the roots of such a phenomenon as unwarranted leveling in the remuneration of labor also come from there, from a placid existence.

Grebinnik: I dare say that I would not agree with you. Neither a peaceful life nor unwarranted leveling exists, for example, at our institute.

Chubays: So, does the existing mechanism suit your collective?

Grebinnik: No, it does not, but for other reasons. I will cite a few figures. During the past 5 years the staff of the institute has been reduced by 200, the efficiency of work has increased by 30 percent, and at last the wage of people has been increased appreciably—by 65 percent. Rather good statistics, are they not? But imagine that we get from the client nearly 70 percent of our profit from the introduction of developments through...arbitration.

It is a paradox. During the experiment, it would seem, they accustomed people in subdivisions to count every kopeck and to be managers, but immediately beyond the doors this "insular" cost accounting no longer interests anyone. Because the entire mechanism in science is based on another principle: we have become accustomed to paying not for the work of specific people, but the organization, at which they work.

Aleksandrov: Excessive regulation in work also does not suit us. They accuse us of the fact that we poorly influence technical policy in the sector. But are we alone really to blame for the fact that we have actually become like the "lawyers' offices" attached to ministries? Whoever pays, orders the music. We receive money through the ministry, try to reject it in the fulfillment of various assignments and commissions, which are far from science....

Correspondent: Is there a guarantee that under the new conditions the situation will change?

Rekord: In principle the new status of the scientific product should provide it. Once it has become a commodity, it is necessary to pay for it in all instances. Not one assignment should be accepted without the conclusion of a contract and without payment. Precisely the contract will become the basic document, which governs the relations of scientific research institutes with the outside world—the ministry included.

Vanchev: But miracles do not happen. Until exactly as many people remain in ministries as are required for new tasks, until then "superfluous" officials will seek superfluous work for themselves and others. You know, we

already have such experience. It has been possible to resolve much about what you are now speaking, but thus far we have not eliminated the close tutelage of ministries.

Chubays: No one is arguing: it is necessary to change the relations of the institute and the headquarters of the sector. And in the decree this is spoken about. For example, the fact that for the most part the influence of the ministry will find expression in the distribution of state orders, that is, assignments that are especially important for the national economy. But in any case their proportion should hardly exceed the share of contractual work with client enterprises. Precisely the latter will determine the well-being of the scientific research institute. As of 1 January both partners will appear in a new capacity. How their interrelations will be organized is the main question.

2. A Model After a Pattern

Correspondent: As is known, two versions of cost accounting in science are envisaged by the decree. Both aim the collective and each staff member at the achievement of the maximum economic results. In both cases the development fund of the institute, the fund for sociocultural measures, and the incentive fund will be formed from the profit. But all the same there are two models. How do they differ and to which one is preference to be given?

Grebinnik: We began to study this question first of all. We submitted it to a group of economists and to the general verdict of the collective. It is turning out as follows. In the first version the wage fund is formed by the deduction of a specific percent from the total profit of the institute. The ministry establishes the percent. The second means is perhaps more fundamental. If the institute makes settlements on all the payments envisaged by cost accounting (including the deductions to the state budget), the remaining money goes into the wage fund, more precisely, into the fund for the remuneration of labor. We gave preference to the first model.

Aleksandrov: We also sent the same kind of proposal to the ministry.

Chubays: If that is straightforward, you, Mikhail Gerasimovich, have really taken me aback. For some reason I was certain that the All-Union Planning and Design Institute of the Technology of Electrical Equipment Production would take up the second model without fail—you have such good economists.

Grebinnik: Frankness for frankness: personally I stood up precisely for the second version. It was rejected only because we do not know how our expenditures will look under the new conditions. Will the prices for scientific equipment increase, how much will we now pay for the building of stands or laboratory facilities?... Here it is like a mine layer—make one mistake and that is it.

Vanchev: Listen, in any version, after all, poor work should be punished. Of course, I do not want that precisely your institute would suffer a fiasco, but would society really not gain if there were 1 or 10 fewer incompetent institutes?

Rekord: It also seems to me that it is a matter not only of models. It is impossible to assert that salt is bad, while sugar is good. What is there to argue about, if the right of choice is officially given. But whatever it is like, if an institute has nothing to offer clients, it will all the same go bankrupt. Precisely the lack of clients, it is stated in the decree, will be the decisive argument for the elimination of a scientific research institute that is a failure.

They will shut it, of course, not all at once. Initially they will "treat" it: they will give credit, will reduce the wage of management or replace it altogether, will seek clients in other spheres....

Correspondent: It turns out as follows: no matter what question you touch upon, you will surely face as a result the interrelations with the client. But are there other sources of existence of an institute under cost accounting?

Aleksandrov: There are. We can get credit at the bank. With time, we will hope, our own assets, which it will be possible to use for not only social, but also production needs, will also appear. For example, for a client some idea of ours is still not quite ripe, but if we sense that it is promising, we will develop it with our own assets. We may also get our own currency, of course, if we make our way through with our developments to the foreign market.

Vanchev: I would like to ask Mikhail Gerasimovich whether his institute sells anything abroad?

Grebinnik: No, unfortunately.

Vanchev: But how do you intend to appear on the world market? At several of our institutes they had hoped that this would happen by itself, only because they had changed over to cost accounting. It turned out the other way round. They began to pursue the number of contracts and clients and got buried in minor themes, they forgot about the future.

Chubays: Indeed, we now also have heated debates over this question. Let us listen to what experienced workers will say.

Grebinnik: We studied it at our place. We came to the following conclusion: we will be able to live a year or two on the available "bank of ideas," but not longer. Therefore, we have already set up two brigades made up of the most skilled specialists, which will work exclusively for the future. Suppose they do not yield a real impact—other subdivisions will compensate. But it is at least naive to live under cost accounting only for today.

3. How Are Prices to Be Controlled?

Rekord: In my opinion, we have been trying all the time to evade a question which lies on the surface—the mechanism of pricing. I know that it has not yet been debugged, but nevertheless.... Pardon the pessimism, but I believe that first of all sectorial scientific research institutes will increase the prices for their scientific product. Or am I mistaken?

Aleksandrov: In principle the question is being posed as follows: prices are established in accordance with a mutual understanding of the parties. If a client wants to have your equipment, let it calculate whether it is worth spending the money. In turn, we should also be none the worse off—the institute has the right to count on approximately 30 percent of the profit from the introduction of a development.

Vanchev: But if an enterprise does not want to pay your price, where will it pay less? In your country, I was told, the main institutes also retain a monopoly in their sectors. Hence, competition, if it will exist, will be very small. How is one to knock down the price?

Rekord: Perhaps, joint enterprises of the scientific type will have their say. It will also be necessary to seek application for their developments. How is there not competition?

Vanchev: You are passing off what is desired as what is real. Your correspondent and I were at the first Soviet-Bulgarian enterprise in Plovdiv. Let him say what he thinks about such competition.

Correspondent: I am afraid that our guest is right. There are so many problems there that for the present it is difficult to say when these enterprises will gain strength. At least today it is not worth overestimating their role on the "market" of scientific products.

Chubays: And one must not. First, the institutes themselves are now obliged to review their expenditures on development. Second, do not regard clients as more stupid than yourself, they count money no worse.

Grebinnik: Everything is so. But do you want to know at what price we concluded the first 15 contracts for next year? Absolutely all cost the clients more. These are not strong-willed decisions—they are substantiated by calculations and confirmed by documents. But a fact remains a fact: previously we charged, let us suppose, 8,000 rubles for a similar development, this time we charge 19,000. Why? One has to count now every kopeck, otherwise it may turn out that there will be nothing to form the wage fund from.

Aleksandrov: Add that we also are liable for the same amount. If through our fault a development does not suit the client, we will return everything from our own pocket. But if they took it, hence, it is advantageous.

Correspondent: Well, is this advantageous to me and to those who have nothing to do with either the institute or the enterprise?

Grebinnik: Hardly to you....

Rekord: And how! The enterprise will automatically inflate the price for its items, their clients in turn will not be slow to do this as well, while you and I will see in the price books at the store into what everything will develop.

Chubays: You are piling it on in vain. The client enterprises under the conditions of cost accounting will be able to place developers on solid ground. All the same it is not the old times, when they got more than half of the assets for new equipment from the state treasury.

Rekord: I do not share your optimism. It is better, while it is not too late, to think about how, first, to get the mechanism of base prices going and, second, to establish effective contact between pricing organs and us, the consumers. For even the comrades from the State Committee for Prices do not rule out the possibility of the establishment of public control over prices within economic regions.

4. Readiness Is No 1

Correspondent: A little more than 2 months remain to the engagement of the mechanism of cost accounting. How will this time be used? What have you already begun to do in order to prepare better for work under the new conditions?

Aleksandrov: Something has already been done. A headquarters for the preparation of the changeover of the institute to cost accounting is in operation, a plan of priority measures has been drafted. Of course, there are very many problems. It is necessary to organize economic education in laboratories and departments, to make calculations of the new standards, to draft a new charter of the enterprise, and so forth. Next year, having gained the first experience, we intend to carry out the reorganization of the structure of the institute.

Grebinnik: The basic load during the remaining time will fall by itself to us, economists. It would not be a bad idea for both the executives of institutes and party organizations to take this circumstance into account—their assistance and support are needed now as never before. Unfortunately, one has to complain again of the stand of the ministry—thus far it has not delivered to the institute the basic indicators, in accordance with which we will work starting on 1 January. Here, too, you have to guess....

Vanchev: But how many of them do you have now?

Grebinnik: In all 8 institutewide ones, while in the department up to 16.

Vanchev: Is that not a great deal? For example, our institutes now manage with just four: the profit, currency receipts, the net income, and the real output.

Grebinnik: Perhaps, they will also leave us just as many—for the present it is unclear.

Correspondent: During the preparation for cost accounting one of the first questions will probably be the question of the wage of staff members of institutes. Theoretically, as I understand, it has been settled....

Chubays: Yes, the restrictions existing today (when the amount of the salary increment should not exceed 50 percent of the salary) as of 1 January should no longer be in effect, for they contradict the Law on the Enterprise. Thus, the increments in principle can be any ones—everything depends on the profit of the institute and the real contribution of the specific person.

Correspondent: How will this contribution be determined?

Rekord: Quite simply. If the labor of a person is standardized, in accordance with the standards of labor intensity. If it is a question of creative labor, by the decision of the collective.

Grebinnik: In this connection I would speak well of our experiment. By means of it we have significantly improved both the system of the stimulation of labor and the forms of its organization. The psychology of people has also begun to change. Now, for example, it is not necessary to convince anyone that if the subdivision yields a profit of less than 3 rubles per ruble of expenditures, it is necessary to eliminate it. You also have to test in this way the reliability of the units, when you change over to cost accounting. It cannot be helped.

Chubays: We always underestimated the role of economic thinking and relied mainly on slogans and appeals. I do not mean that now everyone should understand instructions and standards better than planners or economists, but everyone is obliged to become a manager. In order to see behind any development both one's own interest and our common interest, so that immediate successes would not give reassurance and risky steps would not be frightening.

It seems to me that you and I are now as if changing from a tricycle to a bicycle. There is less stability, there are more chances of getting bumps, but how the speed increases!

Thus, as of 1 January tens of Leningrad institutes jointly with their sectors are changing over to cost accounting. Now the organizational stage is under way, applied problems are being solved. Along with the drafting of new standard documents a campaign for the conclusion of economic contracts for next year, which is special in the life of the institutes, is being conducted. Alas, in

places the thematic plan is being formulated in the old way, without being connected with the wage fund. If this is not taken into account, it is also possible to be left without means of existence.

Many economic and organizational questions have to be settled in the remaining time. But, perhaps, the most important task is to create in collectives high labor spirits and to fascinate people with the idea of cost accounting. At each institute there are many lucid minds, it is merely necessary that they would sense that precisely their time has come.

Sectorial science is at a turning point. It is in reality also switching literally from one type of transportation to another, picking up speed and sacrificing a serene existence. It is a difficult, painful process. But you will hardly catch up otherwise with the chariot of scientific and technical progress.

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Problems in Organization of Biological Research
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[Article by Candidate of Biological Sciences V.V. Grechko, responsible secretary of the journal *Molekul-yarnaya Biologiya*, under the rubric "The Theme of the Day": "How Is Scientific Research to Be Organized?"]

[Text] The obvious lag of several sections of our science and, in particular, molecular biology and biotechnology behind Western science makes it incumbent to analyze over and over again the causes of what has happened and to seek cardinal solutions, which would help us if not to return the leading position in biology, as was the case 50-60 years ago, then if only to become firmly established in a worthy position as compared with Japan, the United States, the FRG, England, and France. And this is a question not of prestige, but of vital necessity.

Several reasons, which checked the development of biological science in our country, are clear. This is the devastating activity of Lysenko and his minions, this is the war and dislocation, which diverted assets for the rebuilding of the country. But there is another reason, which is less conspicuous, but just as destructive in its consequences—this is the overorganization of science, the dominance in it of the principle of administration by decree, and the libertarian methods of its management. Judging from the materials of the press of this year (the statement of G.I. Marchuk and V.A. Legasov in *Moskovskiye Novosti*, the article of V.N. Shubkin in *Znamya*, the article of B. Kurashvili and A. Obolonskiy in *Literaturnaya Gazeta*, and many others), the bureaucratization of science is the basic cause of the stagnation which has now appeared especially pointedly.

On the Lack of Freedom of Creative Scientific Work

It would seem that the necessity of freedom in creative scientific work, as, incidentally, in any other creative work, is obvious. It would seem that it is also obvious that it is impossible to determine in advance the result of creative work! No. All the same they oblige scientists to give reports, to predict the results (not only what they will be, but also whether they will be able to be used immediately in practice), and to plan a type of human activity, which in principle cannot be planned—scientific research, scientific thought. There are no exaggerations in this: all scientists draft plans for the year, the five-year plan, or else a longer period. There are the columns: "What it is planned to do" and "What results it is proposed to obtain." The former of them, in essence, makes rough sense and is entirely reasonable, especially if it would be possible to specify it in the course of work. But the latter ties the former closely to the future report, which you simply would not call a total formality, since the failure to fulfill the plan is a major shortcoming and God forbid that one would write—"the plan was not fulfilled, because not at all the results, which were expected, appeared." It would not enter anyone's head to do such a thing. Therefore, everyone has learned to draft plans so that already done work would be included in them or the possibility of nonfulfillment would be stipulated.

The plans—tens of thousands of pages for the academy—are adopted formally, are stamped formally, and often, not read and not quoted by anyone except the compilers, are buried forever in the annals of the academy. An entirely independent paper life of science exists, and a staff of people, who support this life, exists. Science is paying its tribute to the witchcraft of bureaucracy in the country.

But this is still a comparatively inoffensive tribute. The real administrative pressure on science from above has a much more burdensome effect. We will not speak here about the sources of the origin of administration by mere decree. I want merely to note that they are concealed, in essence, in the same ground which brought about Lysenkoism as an embodiment of the libertarian principle in science. The tragedy of those years was more dreadful, because flagrant ignoramuses implemented this principle, because it took many fine lives, and because it broke the contact of the times in science. The tragedy of our days—I will not be afraid of this word—lies in the fact that now entirely educated people, who speak the language of modern science and, at the same time, reverently believe that science in a flash will come to a halt without their appeals, without their administrative instructions, and without a "boost" on their part, are stubbornly following this principle.

What is the tragedy here, people may ask. For the opinion of respected, erudite people and the injection of capital stimulate the development of one area or another. That is true. But, unfortunately, even the most

skilled administrator can set the wrong direction—for example, because, by “estranging” himself from direct scientific work (at any rate, in experimental science), he directs his attention to the directions and problems, which are already being elaborated abroad and which he often knows better than the works of fellow countrymen. Such an orientation is acceptable only in those instances, when it is necessary to assimilate already discovered phenomena, as was the case, for example, during the work on the atomic project, on the technology of microprocessors, and on the biotechnological synthesis of hormones and other biologically active substances. In basic science such an orientation signifies “following in the wake,” which dooms one to perpetual lagging, which has now also occurred with molecular biology in our country.

Moreover, the administrator from science, unfortunately, does not confine himself to advice and the suggestion of directions which are desirable for development. He embodies his ideas in practice, by launching new research programs, regulating supply, and promoting his own ideas about the means of development of science from all the platforms accessible to him. And the higher his position is, the more unquestionable his opinions are—this effect appears equally in all spheres of life.

And, finally, an administrative style helps on as managers those who see in the pursuit of science only a means of advancing up the job ladder and who are capable of switching over headlong to the “necessary” directions, without considering either their own skill or the desire and potentials of their associates. As a result, a situation, which is paradoxical in essence and is regrettably known to all of us and in case of which the meaning of the concept “scientific leader” is split in two, arose. There are informal leaders, who are the center of attraction for colleagues in their own field. These are genuine leaders, but they far from always hold administrative posts. And there are formal leaders, who know how to “conform,” to represent, to write reports and socialist obligations, and to edit and often also to sign the articles and books of their associates. If they were to disappear at one fine moment, this would not affect science in any way whatsoever, because their contribution in it is next to nothing. The existing division of actual and formal leadership has become one of the basic obstacles in the way of the rapid development of science in our country.

The Consequences

One of the results of the administrative supervision of science is the investment of much capital in unpromising, even special problems, which at the given moment seem most important to someone; and, on the contrary, inattention to works which hold the possibility of a breakthrough into new fields of knowledge.

Here is one of the examples. About 20 years ago studies of the primary structure of proteins and nucleic acids were begun in our country. Considerable capital was invested in them, an appeal was made to involve newer and newer forces in them. Laboratories were organized, work of good quality was done, state prizes were received, and dissertations were defended. Well, what is the result? In the world about 400 protein structures have now been decoded, of them 3 are ours. Of the 100 transfer RNA's a handful have also been read by us.

Why so few? Because the method that we used proved to be inefficient. It is oriented toward the direct reading of sequences of proteins and RNA's and toward labor-consuming and prolonged work. While in the 1970's genetic engineering proposed new possibilities of reading a sequence not directly, but through the structure of DNA. This method of reading proved to be much more rapid and more economical and by means of it they began to read the texts of proteins and RNA's literally one after the other.

But we had already been focused on the first method. Inertia took its toll. Hence, too, the result. Meanwhile in our country all the prerequisites existed not only to assimilate and run after, but also to develop ourselves the same indirect method of reading the texts of DNA. We already had works, which had been completed at a high world level and which directly led to this method. But they, unfortunately, remained in the shadow. Our ideas were taken up abroad, the method was developed—but, alas, not by us.

This incident shows how great the responsibility is, which falls on the managers of science, when they rigidly specify its course at their own discretion.

Another consequence of such management of science is the orientation of those entering it and, what is more, more mature scientists toward fashionable directions (fashion most often originates abroad) and, hence, also toward the obvious secondary nature of our science. Individual research and studies away from fashion not only are not supported, but are often considered second rate and secondary. This is fundamentally incorrect! History gives a large number of confirmations of this, and not only from distant times (Mendel, Curie), but also from our times (Barbara McClintock).

The thesis “people do not do science alone” is prospering. And already now a portion of the young people are quickly grasping what is of use and are joining up with scientists, who are successful at the given moment, and the directions being developed by them, yet not because the ideas, which could enrich this direction, grip them, but because this means leads most quickly to elementary personal well-being (to a dissertation, at the least).

But would it not be better if a young scientist made plans of his career in terms of his own abilities and possibilities to generate an independent scientific idea? Would it

really not be better to give him an opportunity after practical training in a recognized group to advance his own program boldly and quickly and to obtain for it a subsidy that does not depend on anyone? Then precisely this would become a stimulus for the scholar entering science, but not a dissertation as such.

During the 1960's, when in our country the era of molecular biology began, all capable young scientists received "carte blanche" in science and quickly attained a high world level. This was the service of Academicians V.A. Engelgardt, M.M. Shemyakin, A.P. Aleksandrov, I.M. Frank, and A.N. Belozerskiy, who displayed adequate breadth and understanding of the moment, in order to afford specific people full freedom, and supported them in a powerful way. But very soon the process of the active advancement of young people began to skid. Why?

The Laboratory: History and Problems

During those years the laboratory system was made the basis for the organization of new institutes. It was formed "from the top down" by the director with a view toward young scientists who had proven their worth. They attracted to molecular biology specialists from biochemistry, physiology, and the chemistry and physics of organic compounds. However, the laboratory structure ossified quite rapidly. It was not designed for the rapid advancement of subsequent generations of young people. And this is understandable. The structure of the institute is not elastic, it is impossible to provide all capable scientists with their own laboratories. Therefore, new laboratories emerged subsequently both rarely and with difficulty. And the grounds for this were, as a rule, extraordinary: either (alas!) the death of a manager (in practice they do not retire on a pension at academic institutes) or the reorganization of a laboratory, the carrying away from it of a portion of the associates is a very painful process.

Thus, there is the time lag of the laboratory system, on the one hand, and the rapid growth of molecular biology, on the other. This discrepancy also became, so it seems to me, the cause of the "decay" of many laboratories and institutes.

The point is not only that veterans age and become less productive. The point is mainly that in the depths of existing laboratories, the expansion or division which is impossible, conflicts and tensions inevitably arise. They are due, as a rule, to the dissatisfaction of associates with their leader—even in those instances, when formal and informal leadership are combined in one person.

At times scientists outgrow their manager. At times they are disappointed with him. Or they simply cannot interest him with their ideas. Such clashes are natural—the

aspiration for independence is incorporated in the character of the scientist, it should also lead to contradictions. And we, who are well grounded in theory, practically always prove to be incapable of accepting this dialectics in life. The rare manager is sufficiently patient and generous to give freedom to a capable person, without expecting from this advantages for himself. Most often resistance arises, if only because the manager is entangled by the networks of the plan, of the rejection of the fulfillment of which they can always accuse him. Administrative games begin, the mechanism of the actual dependence of the scientist on the manager (at any rate, up to the moment of defense or up to the completion of the term of practical studies) begins to operate. But if the manager is worried about the preservation of his formal leadership and if he fattens several subordinates with foreign business trips and promotions out of turn to the detriment of others, then everyone will get out of the mood for science.

The author is not retailing any stale news, this picture is familiar to everyone who deals with scientific activity, they have grown accustomed to this, practically everyone has experienced something of the sort. It remains to be asked whether it is really not obvious that there is no other solution except to eliminate in scientific dealings the administrative power of one person over another.

I remember how our associates, who found themselves for the first time in foreign laboratories, were staggered most of all by the lack of any overbearing barriers between the most prominent scientists and beginning students and by the fact that the associates simply call the Nobel Prize winner "Joe" and that he himself works at a laboratory table. That a prominent scientist might not have a single permanent associate, but tens of specialists, who want to associate a little with him or to do a little work together with him, come flying to him from throughout the world. It turned out that for the obtaining of significant results it is not at all mandatory to have an enormous laboratory. And the very word "laboratory" can have a different meaning: not a self-sufficient administrative unit, but an association of free scientists around an informal leader.

What It Is Possible to Suggest

We will not idealize the system of the organization of science in other countries, there they have their own shortcomings and costs. But it must be admitted that precisely such a system guaranteed, for example, American molecular biology in just a few years an explosion, about which for the present it remains for us only to dream. Not for nothing did I "forget" to mention the fact that science in the United States is supported by enormous one-time subsidies—state and private, and the fact that the level of production of the purest reagents, enzymes, cell cultures, laboratory equipment, and instruments is extremely high; the fact that any discovery, which can serve practice, is taken up instantaneously by scientific production firms (according to our custom,

sectorial institutes or scientific production associations); that the firms themselves pay for and maintain within their own walls departments of basic science, without restricting them in any way and without directing them. I did not mention all of this because not only and not so much this high technical level, it seems to me, ensured the rapid development of science, but precisely the efficient method of the identification and rapid stimulation of capable, independent people.

Our science has also received millions in subsidies from the state, including foreign currency; the main institutes and the main laboratories of these institutes are equipped in the same way as the best laboratories abroad. However, these injections are distributed most often among institutes and themes, and not with a view toward specific talented and rapidly growing scientists.

In the United States any scientific associate—regardless of rank, position, age, and regalia—can propose and substantiate his own program of research and request the allocation of assets for its fulfillment over a number of years. The Expert Commission of a state or private fund, which also carries out financial control, makes the decision. The possibility of the flourishing of formal leaders is reduced to a minimum; the scientist is spared of the need to obey instructions and to perform work that does not interest him; the problem of the psychological compatibility of the leader and his associates disappears.

Is this system applicable in our country? Apparently, it is not or at least not immediately, although it is necessary, in my opinion, to strive for it.

Now steps are being taken in the direction of this, the American—let us call it that—system: the Academy of Sciences is promoting a new model of scientific association—the temporary scientific collective (VNK) which can be formed on both an intra-institute and an inter-institute basis. According to this model, any associate can suggest a theme, interest others in it, and set up a group, having received the opportunity to leave the laboratory for a time and having retained in so doing his former position. According to the idea, this is a means to grant independence to young scientists.

But if this fine initiative is left exclusively to the mercy of the director, nothing worthwhile will come of it. The groups, which are organized from above, will become simply another means of stimulation or punishment, a means of administrative influence. And the conflict situations in laboratories, which emerge in this case, simply will not stimulate young people to participate in a temporary scientific collective. There is one solution—to launch the initiative from below.

The decision on the formation of a temporary collective should be made by the Scientific Council or, what is better, by the interinstitute Expert Council. The decision of the council should be mandatory for the director, who

as a member of the Scientific Council can participate in the discussion and defend his own point of view on the advisability of forming a temporary scientific collective.

And, of course, it is very important that those who wish to form a temporary collective would be firmly confident that their wage and place of work will be retained for them regardless of whether or not they accept their program and whether or not the head of the laboratory approves of their actions.

Looking at this formula—the temporary collective—more broadly, it is possible, in principle, to evaluate any present laboratory as a temporary collective, the composition and the themes of work of which will be determined by the free choice of the associates of the institute.

Who Will Decide?

The advisability of granting creative freedom to one aspirant or another should probably be evaluated by the Scientific Council of the institute. The opportunity to decide openly what the scientific themes of an institute are to be should be included in its immediate duties. Without fail with the enlistment of outside experts, especially in those instances, when it is necessary to evaluate the technological and economic advisability of the results of applied work.

In general changes are necessary in the work of many Scientific Councils, which now often reduces to the approval of plans and themes of dissertations and to other organizational questions, which have been prepared by the board of directors. It would, of course, make sense to elect the Scientific Council at the general assembly of the scientific associates of the institute and to systematically renew its composition from among the associates, who are working actively and are authoritative in the collective. And, of course, there should be turned over to the Scientific Councils, if it is possible to return them to the state of scientific activity, the function of the distribution of assets (except for the wage), which are released by the Academy of Sciences or are requested from it. Without the transfer—and the sooner, the better—to the Scientific Council of the right to finance new groups all good wishes about legitimizing the status of the temporary scientific collective will just remain wishes, since neither the director himself (in whose hands the assets and, hence, real power are) nor his deputies and their service are interested in changing the structure of the institute.

The organization of temporary collectives would have little effect on the present heads of laboratories, who combine in their person informal and formal leadership, so that one does not have to fear complete confusion and disorder. The flow of scientific associates from such laboratories will hardly be great, but it will also be useful for everyone. Both those, who sense in themselves the strength for independent work, and managers, who can rid themselves of a person, who has become disobedient,

and from the stressful situations connected with this. Genuine scientists—the heads of laboratories—will always have the opportunity to reinforce their circle with young people, since they have the centripetal force which is characteristic of any informal leader.

What Will the Director Do?

If the director is a prominent scientist, his role as a strategist of science and the founder of a school, by force of intellect, which forms a scientific direction and consolidates a collective, is enormous and fruitful. In reality, precisely such scientists should also head academic institutes.

But if the authority of the director is not that great or it simply does not exist, the broadening of the rights of the Scientific Council will help to guard the collective against the libertarian ways of the manager. However, one does not have to worry that the director will have nothing to do. For example, the task of organizing the material supply of applied and contractual operations and much, much more will be left to him.

And the Last Thing

What is it necessary to do so that molecular biology would spurt ahead? It is possible to expect the quickest return from those scientific associates who are now 25-35 years old. And, hence, it is already now necessary to give precisely them without fail the maximum freedom and the possibility of risk taking and unplanned research. The laboratory system is resisting this, therefore, in many cases one should apparently reject it. But other organizational problems are also checking the development of our science. Yes, precisely organizational ones, since the scientific and intellectual potential of molecular biology in our country is very great and is competitive on the world market.

For example, the excessive centralization of supply, due to which not less than 1.5 years separate an order and the receipt of the necessary reagent or equipment, makes the work of an ordinary associate extremely difficult. As a consequence, millions of rubles are frozen, since the need for the order often has time to disappear, while the stocks being created by someone spoil and become obsolete.

It is necessary to discuss openly this and many, many other problems and to suggest solutions. Unfortunately, the rank and file armies of scientists, as is the custom in the army, are silent, although the questions, which were touched upon in this article, concern everyone and are being discussed with interest "on the stairs." It is possible to understand people—recertification is ahead, but the certification commission is appointed by the director....

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Marchuk on Development, Restructuring of Science

18140084 Moscow *EKONOMICHESKAYA GAZETA* in Russian No 46, Nov 87 pp 20-21

[Article by President of the USSR Academy of Sciences G.I. Marchuk: "Soviet Science Is the Breakthrough to the Future"]

[Text] "I would especially like to stress the increasing importance of intellectual labor, the interaction of science, technology, and society, the humanistic, moral, and ethical orientation of science and scientific and technical progress. We are for all the achievements of science and technology being placed at the service of man and not leading to disturbances of the ecological environment." (M.S. Gorbachev)

The anniversary of Great October is bringing back to mind the glorious path, which has been covered by our country during the past 7 decades, and is prompting us to reevaluate the imposing changes that have occurred during this time.

October 1917 was also a noteworthy milestone in the development of domestic science.

In tsarist Russia the scientific forces were small, while the state allocations for scientific purposes were negligible. The initiatives of even prominent scientists for the most part did not receive support on the part of the government.

The victory of the socialist revolution in Russia changed radically the attitude toward science and afforded previously unprecedented opportunities for the conducting of research. An exceptional role in the building of socialism was assigned to science. Only the cooperation of representatives of science and workers, Vladimir Ilich Lenin stressed, will be capable of eliminating the entire yoke of poverty, diseases, and filth.

The Concern and Support of the State

Immediately after the revolution the Soviet state took upon itself all the worries about the development of science and the organization and supply of scientific institutions. The utmost support was given to prominent scientists, the conditions they needed for work were created. During the difficult times of the civil war and foreign military intervention, economic dislocation and famine the Soviet Government financed scientific research and the establishment of new institutes and universities, enlisting the most prominent Russian scientists in this work.

During the first years of Soviet power A.F. Ioffe organized the Physical Technical Institute, D.S. Rozhdestvenskiy—the Optics Institute, N.Ye. Zhukovskiy and

S.A. Chaplygin—the Central Institute of Aerohydrodynamics (TsAGI), K.A. Krug—the All-Union Electrical Engineering Institute, and N.I. Vavilov—the Institute of Plant Growing. There were also established: the Physics and Mathematics Institute, the Chemistry Institute imeni Karpov, the Institute of Applied Chemistry, and a number of others. In 1918 the Socialist Academy of Social Sciences (which subsequently was transformed into the Communist Academy) began working, a year later the Ukrainian Academy of Sciences did. The training of scientists was expanded, state organs, which deal directly with questions of science, appeared. Thus, immediately after October in our country the state organization of science was carried out for the first time in the world.

The party attached great importance to the enlistment of the most competent scientists in the solution of vitally important problems for the country. In "The Draft of a Plan of Scientific and Technical Work," which was written by V.I. Lenin in the spring of 1918, there was envisaged the commissioning of the Academy of Sciences "...to form a number of commissions made up of specialists for the quickest possible drafting of a plan of the reorganization of industry and the economic development of Russia." Lenin's plan of the State Commission for the Electrification of Russia, in the drafting of which many scientists participated, was the first national economic plan and at the same time a plan of scientific research work. G.M. Krzhizhanovskiy, I.G. Aleksandrov, B.Ye. Vedeneyev, A.V. Vinter, G.O. Graftio, and others formulated in theory and practice a program of electrification of the national economy, the development of power systems, the complete use of energy resources, and the designing, construction, and operation of powerful electric power plants.

In response to the confidence and concern of the party and state Soviet science starting with the first days began to make its significant contribution to the building of socialism in the country. Already during the years of the civil war Academician P.P. Lazarev began the extensive study of the Kursk Magnetic Anomaly, which concluded with the discovery of enormous reserves of iron ores. Academician I.M. Gubkin, a prominent petroleum scientist, headed the prospecting of petroleum deposits in Ukhtinskiy Rayon. Under the supervision of Academician A.Ye. Fersman enormous deposits of apatites and ores of rare metals were discovered on the Kola Peninsula. The comprehensive study of the Kara-Bogaz-Gol Bay, and subsequently the Karakumy Desert, the regions of Central Asia, the Apsheron Peninsula, the Urals, and other regions, which was begun in 1920, made it possible to discover the most abundant reserves of chemical and metallurgical raw materials and fuel. Scientists took an active part in the development of the Kuznetsk and Karaganda coal basins and in the establishment of coal and metallurgical bases in the eastern part of the country. As a result of their efforts abundant deposits of petroleum were discovered between the Volga and the Urals.

The research in the area of radio engineering made it possible already in the early 1920's to set up powerful broadcasting radio stations.

The carrying out of the industrialization of the country from the first steps relied on the achievements of science and technology. I.P. Bardin, A.A. Baykov, N.T. Gudtsov, and M.A. Pavlov created the foundations of the theory of metallurgical processes and developed methods of the designing of mechanized metallurgical plants and powerful blast furnace and other units and means of the intensification of technological processes.

The works of V.P. Goryachkin (the theory, design, and construction of agricultural machinery), Ye.A. Chudakov (the theory of the motor vehicle), and Ye.O. Paton (electric welding) played a prominent role in the development of Soviet machine building. The ideas of L.I. Mandelshtam, N.D. Papaleksi, and other researchers laid the foundation for the development of modern radioelectronics.

The discoveries of domestic scientists in the area of mechanics, especially in aerohydrodynamics, made it possible to lay the theoretical foundations of modern aeronautics, rocketry, and shipbuilding. The successes in the area of physics, first of all in optics, radiophysics, and solid-state physics, contributed to the formation of radioelectronics, instrument making, and the optics industry. In the middle of the 1930's the synthetic rubber industry was established.

The achievements of Soviet scientists in basic and applied research and their dedicated labor during the terrible war years contributed to the victory of the Soviet people in the Great Patriotic War and to the postwar restoration and reconstruction of the national economy.

The scientific potential, which was created in our country, made it possible in the shortest possible time to solve the most difficult scientific and technical problems: the mastering of nuclear energy, the going into space, and the development of computers and, on their basis, automated control systems. In the tense international situation, which formed after World War II, and under the conditions of the "Cold War," which was imposed by aggressive imperialist circles, the talent of Soviet scientists made it possible to develop a reliable nuclear missile shield, which guaranteed the security of our homeland and the other socialist countries.

While strengthening the defensive capability of the country, domestic science sought means of the peaceful use of these achievements of human genius. Back in 1954 the first nuclear electric power plant in the world was put into operation in our country, while in 1957 the first atomic ice breaker went into the water. Precisely Soviet scientists advanced the ideas of accomplishing controlled thermonuclear fusion and were the first to launch experimental research on this problem.

Our country became the pioneer of the development of space. The launch in 1957 of the first artificial earth satellite marked the beginning of the space age of mankind. Soviet citizen Yuriy Alekseyevich Gagarin also became the first cosmonaut of the planet.

The use of nuclear power and the development of rocket and space technology, modern aeronautics, and electronic computer technology required basic research to be rapidly launched in a large number of scientific directions, different technologies to be assimilated, and new sectors of industry to be established. Under these conditions during the postwar decades steps were taken on the further increase of the scientific and technical potential of the country: the Siberian Department of the USSR Academy of Sciences, and then both the Ural and Far Eastern scientific centers were formed. The number of scientists in the country at present has reached 1.5 million.

In recent decades fundamentally new hardware, technologies, and materials, which advanced practice needs, have been developed on the basis of much basic research of Soviet scientists. Here it is necessary to name synthetic diamonds and other superhard materials, semiconductor power converters, various types of lasers, single crystals, medicinal preparations, and microbiological fodder protein made from petroleum hydrocarbons.

Soviet science now holds leading positions in a number of directions of mathematics, theoretical physics, optics and radiophysics, solid-state physics, and astronomy. The successes in space research, in research on the problem of controlled thermonuclear fusion, in laser technology, in elementoorganic chemistry, in the development of light alloys and magnetic materials, in several directions of physical chemical biology, and in a number of other fields are indisputable.

However, the level and scale of research in such important directions as several sections of experimental physics, microelectronics, the technology of obtaining pure substances, computer technology and robotics, nuclear and laser engineering, physical chemical biology and genetics, immunology and medicine cannot satisfy us.

The present degree of the implementation of the achievements of science in practice also cannot satisfy us. The scientific and technical potential, which has been created in the country, for the present is not being used efficiently enough. This dictated the need for the radical restructuring of all spheres of science—basic, sectorial, and VUZ. In particular, it was deemed expedient to change scientific organizations over to full cost accounting and self-financing.

At the Turning Point

The present restructuring, which is innovative and revolutionary in its essence, and the modernization of all aspects of the life of society are preserving at the same

time historic continuity with respect to Great October. Therefore, the 70th anniversary of the October Revolution is entering the life of Soviet society not only as a great historical date, but also as a powerful stimulus of new achievements.

The restructuring of the activity of the USSR Academy of Sciences, in particular, is called upon to achieve the intensification of the development of science, the sharp increase of the pace and effectiveness of research, and the strengthening of the integration of science and production. The restructuring at the Academy of Sciences is being carried out in four basic directions.

The first of them is the improvement of the long-range planning of scientific research and the practical implementation of the achievements of science. The USSR Academy of Sciences has prepared forecasting reports on the priority, most promising scientific directions. Research programs of academic and sectorial institutes and higher educational institutions for the period to 2000 have been formulated on their basis. The goal of achieving the world level in each of these directions is posed in the programs.

For the improvement of the practical implementation of the works of scientists it is planned to develop the pilot production base of scientific institutions and to increase the integration of science with production in the form of interbranch scientific technical complexes and temporary scientific and technical collectives and laboratories.

The second direction of restructuring is the improvement of the management of science. At the USSR Academy of Sciences they have eliminated the excessive centralization of management and have broadened the powers and rights of departments and institutes. In particular, the powers with respect to the approval of the basic directions of basic research, the organization and coordination of work, the implementation of personnel policy, the determination of the needs and the distribution among scientific institutions of staff, financial, publishing, material, and technical resources, as well as in the area of international cooperation in their own scientific specialization have been delegated to the departments. The attainment of the world level and its maintenance and leading are now becoming the main criterion of the work of the departments.

Another important aspect of this direction of restructuring is the substantial reorganization of the structure and activity of institutes—the basic unit of academic science. Their changeover to the new methods of work is especially significant. The basis here is the creation of flexible organizational forms in the structure of institutes and the increase of their independence and scientific responsibility. This will make it possible, on the one hand, to effectively strengthen scientific schools and, on the other, to ensure the influx of talented young people. A flexible dynamic structure of institutes will make it

possible to develop new directions of science without an increase of personnel, to react quickly to new demands, and to accomplish more easily integration with other organizations.

The third direction of restructuring is the radical improvement of the coordination of research in the system of academic, sectorial, and VUZ science. The functions of the basic coordinating organ of the USSR Academy of Sciences—the Council for Coordination—in whose sphere of activity there now are not only the academies of sciences of the union republics, but also sectorial academies and higher educational institutions, are being broadened significantly. It is also planned to specify more clearly the directions of specialization of each academy of the union republics.

And, finally, the fourth direction of restructuring at the USSR Academy of Sciences is the improvement of personnel policy. It includes first of all the intensive updating of the staff of scientific institutions, the promotion of creative scientists, and their election by democratic means to all positions at scientific research institutes with allowance made for the opinion of the labor collectives. This will guarantee the harmonious combination of the experience of scientists of the older generation with the creative energy of scientific youth, the objective evaluation of the results of scientific activity, and the corresponding stimulation of personnel. The change of personnel policy in science is called upon to increase the efficiency of the labor of scientists.

The consistent pursuit of the policy of the 27th party congress of accelerating the socioeconomic development of the country required the radical restructuring of all our science. In the recently adopted decree of the CPSU Central Committee and the USSR Council of Ministers "On the Changeover of Scientific Organizations to Full Cost Accounting and Self-Financing" the principles and goals of this restructuring were specified. Of course, the Academy of Sciences cannot change over entirely to self-financing. A large portion of its expenditures will be met by the budget. But here, too, instead of the financing of institutes the special-purpose financing of problems is coming to the forefront. The task has been posed to speed up drastically the development of fundamentally new equipment, technology, and materials, which revolutionize production and make it possible to ensure the highest world level and competitive ability of the product being developed.

The restructuring in progress of Soviet science will enable it to make an even more significant contribution to world scientific and technical progress.

Changes in Production, S&T Development Fund
18140085 Moscow EKONOMICHESKAYA GAZETA in Russian No 40, Oct 87 p 17

[Article by Doctor of Economic Sciences A. Sidorovich under the rubric "The New Economic Mechanism": "The Fund for the Development of Production, Science, and Technology"]

[Text] The fund for the development of production, science, and technology is playing an exceptionally important role in the changeover of the enterprise to its own sources of reproduction. The point is that the stable effective management of enterprises and associations is possible only on the basis of the constant technical modernization of production in conformity with the achievements of the scientific and technical revolution. Without the establishment of an effective mechanism of the formation and use of the fund for the development of production, science, and technology and without the overcoming of the formed stereotypes to its formation such management is inconceivable.

The New Role of the Fund

The singling out of the production development fund during the 1965 reform reflected the objective necessity of giving enterprises and associations their own cost accounting resources for the improvement of production, and first of all fixed production capital. The procedure of the formation and use of this fund, which was adopted during those years, remained, in essence, unchanged up to the present. Individual changes did not alter either the bases of the formation and use of the production development fund or its role in the improvement of the production system and in the introduction of new equipment and technology at enterprises. Without ensuring even the simple reproduction of fixed capital, it was, in point of fact, only a fund for partial improvements of production.

This role was predetermined by the size of the production development fund. In industry, for example, in recent years its amount has not exceeded 1.2 percent of the value of the fixed production capital. This not only is significantly less than the amount of capital investments, which are being channeled into the modernization and retooling of production, but also is nearly a fourth less than the volume of the retirement of fixed production capital in this sector. With allowance made for the fact that a significant portion of the assets of the production development fund was not used for the needs of the technical updating of production due to the lack of supply of material resources, the influence of the production development fund on the systematic technical improvement of production was obviously inadequate.

In conformity with the Law on the State Enterprise (Association) the formation of the fund for the development of production, science, and technology signifies not only the expansion of the sources of the improvement of

reproduction at enterprises by the transfer of all amortization to the fund or simply the changeover to the financing at the expensive enterprises of the expenditures on the introduction of scientific and technical progress. The essence of the changes of the role of the fund under the conditions of full cost account and self-financing consists in the fact that it for the first time is being transformed from a fund for the partial improvement of production into a fund, by means of which the simple and expanded reproduction of the material and technical base of enterprises in conformity with the requirements of the scientific and technical revolution and the solution of the problems of updating the output being produced should be completely ensured.

Under the conditions of self-financing enterprises are receiving for the first time the opportunity owing to the transfer of all the amortization for renovation and the deductions from the profit to actually earn financial assets for their own reproduction. The change of the reproduction function is thereby one of the basic units in the transformation of cost accounting from incomplete to full cost accounting. Owing to the new procedure of formation enterprises and associations are actually becoming responsible for the results of their own activity, since they should independently earn assets for the continuous improvement of their production potential in the future and on this basis ensure the growth of the profit or the cost accounting income.

The Limits and Standards of Formation

The new reproduction role of the fund requires the further improvement of the procedure of its formation and use, the elimination of a number of inconsistencies in this procedure, and a fundamentally new approach to the formation of the standard base of deductions for the fund.

The reproduction function of the development fund presumes that its limits should be broadened extensively. This broadening should be achieved not only by means of the amortization for renovation, but also by increasing the deductions from the profit in accordance with stable long-term standards. At first glance it seems that the transfer of all amortization makes it possible to solve the problems of the technical improvement of production. Thus, if in 1986 all the amortization for renovation were transferred to the fund, its amount would exceed by more than threefold the sum of the presently available assets of the production development fund of industry. However, from the standpoint of the prospects of the continuous technical updating of enterprises and their responsibility for retooling and modernization by means of their own assets this amount of the development fund will prove to be inadequate. The point is that under the conditions of the present stage of scientific and technical progress the amount of amortization for renovation cannot in principle ensure the technical updating of production. New equipment under the conditions of scientific and technical progress, while

being less expensive per unit of effective impact, increases absolutely in price in connection with the fact that new models of it have a significantly higher efficiency. Thereby in the process of updating the material and technical base of enterprises by means of the replacement of equipment, retooling, and modernization the simple and expanded reproduction of fixed capital is inseparably united.

Technical progress requires that the share of the profit, which is channeled into the development fund, would increase significantly. This requirement should find reflection in the increase of the standard of the formation of the fund due to deductions from the profit. Calculations show that whereas for enterprises of the food industry at present this standard comes to 2 percent, in case of the changeover to self-financing it should come to not less than 10 percent. If we take into account the increase of the prices for new equipment, the deductions from the profit for the fund for the development of production, science, and technology should increase even more.

The transformation of the development fund into an effective factor of the continuous updating of production requires the decisive overcoming under the conditions of self-financing of the formed stereotypes in the approach to the standards of the formation of the fund. Their essence, first, consists in the fact that the need for assets of the fund is calculated on the basis of a 5-year or even a 1-year period. Given such an approach the necessity of the coincidence of the need for assets of the fund during the 5-year period and the amount of assets, which are transferred to it, is incorporated by ministries in the calculation of the standards of the formation of the fund for the development of production, science, and technology. Meanwhile the cycle of the reproduction of fixed capital does not fit within a 5-year period. It is already for this reason that the standards of the deduction for the development fund should be of a long-term nature. Enterprises should accumulate assets for the updating of their own production system during the time of its service. As a consequence it is advisable to calculate the standards of the formation of the fund for the development of production, science, and technology, which are stable for a 5-year period, on the basis of the need for assets for the retooling and modernization of enterprises during the entire cycle of the reproduction of fixed capital. In our opinion, the assets of the fund should systematically exceed the amount of the need of enterprises during each period up to the moment of retooling and modernization. The accumulation of considerable assets in the development fund should be the rule of full cost accounting and self-financing. The existing practice of the fluctuation of the standards of deductions for the fund by enterprises in case of the changeover to the conditions of self-financing (which was justly criticized on the pages of *Ekonomicheskaya Gazeta*, No 9) shows that, as a rule, the aspiration to limit the amount of the development fund to the assets for updating within 5-year periods, that is, without regard for the long-term need for assets of the fund, is behind this.

Numerous facts testify that the indicated shortcoming of the formation of the standard base of the development fund has become widespread. Thus, at the Vladimir Avtopribor Association the systematic decrease of the amount of the fund by years of the five-year plan from 12 million rubles in 1987 to 7.2 rubles in 1990 was planned. This decrease is occurring mainly due to the amortization which is left at the disposal of the enterprise. This procedure undermines the basis of self-financing—the need for enterprises themselves to earn assets for their own reproduction in the future. In our opinion, Article 22 of the Model Statute on the Procedure of the Formation and Use of the Fund for the Development of Production, Science, and Technology by Production Associations and Enterprises, Which Are Working Under the New Conditions of Full Cost Accounting and Self-Financing, which specifies that the assets of the fund can be accumulated for the implementation of necessary measures in subsequent periods, should be revised. This formula came over from the previous conditions of management. The provision: enterprises should accumulate assets for the purposes of their own reproduction, should be clearly recorded in this article. This revision would conform to the sense of the Law on the State Enterprise (Association).

Second, the approach set down in the Model Statute, in accordance with which ministries can differentiate the standards of the development fund by subordinate enterprises subject to the degree of wear of fixed capital, requires critical interpretation. It seems that this provision is at variance with the fact that enterprises themselves should earn assets over the entire cycle of the reproduction of fixed capital. From the standpoint of the possibility of earning these assets enterprises should be placed under equal conditions. For the differentiation of the standards subject to the degree of wear of fixed capital contradicts the essence of the long-term approach to the accumulation by the basic production units of their own sources of self-financing. As to the differentiation of the deductions to the fund, it should be connected mainly with the formation of the centralized fund for the development of production, science, and technology subject to the possibilities of enterprises to carry out independently the planning and financing of retooling at a modern level. This means that the standards of deductions for the centralized fund for small enterprises can be higher than for large enterprises, which are capable of carrying out retooling at a high technical level at their own expense.

The Stimulating Role

Self-financing requires the increase of the stimulating role of the entire system of funds of the enterprise, including the development fund. Here the peculiarities of the performance by this fund of a stimulating function as compared with other funds should be taken into account. Whereas the material incentive fund and fund for social development directly and immediately affect the material interest of the members of labor collectives,

the development fund does so indirectly, after the results of the improvement of the material and technical base are materialized in the increase of the profit or cost accounting income. A contradiction also exists between the development fund and other economic stimulation funds during each given period. The transfers of the profit to the production development fund directly limit the possibilities of increasing the expenditures on material incentives and social development.

The question arises: Are possibilities of stimulating labor collectives for the intensification of the updating of production and first of all fixed production capital included in the fund itself? In case of the former procedure of the formation of the production development fund, as well as in case of the system of the formation of the development fund, which exists today, one should give a negative response to this question. For the procedure of its formation under present conditions is not connected with the mechanism of the intensive reproduction of fixed capital. What is more, it even comes into conflict with the need for the rapid technical updating of production. The prevailing Statute on the Procedure of the Planning, Crediting, and Use of Amortization Deductions in the National Economy proceeds from the fact that amortization is credited over the entire service life of fixed capital. This inevitably has the result that the use of obsolete equipment under the conditions of self-financing can be profitable for enterprises, since it leads to the increase of the internal assets of the enterprise in the fund for the development of production, science, and technology, without requiring expenditures on capital replacement.

For the transformation of the development fund into an effective factor of the economic stimulation of the replacement of fixed capital within the period which is dictated by scientific and technical progress, in our opinion, one should closely link the procedure of the formation and use of amortization and the process of the formation of the fund so that the use of obsolete equipment would directly affect the amount of assets of the fund.

For this purpose it seems expedient to put an end to the practice of crediting amortization for renovation after the lapse of the standard service life of fixed capital. Often this suggestion arouses the fears that its implementation can lead to an increase of the interest of enterprises in the use of obsolete equipment, since the production cost will automatically decrease and the profit will automatically increase. But under the conditions of self-financing this fear can be relieved, since through the mechanism of the standardized distribution of the profit a significantly smaller share of the assets will be transferred to the enterprise than by the direct deduction of amortization for the development fund. A procedure of increasing the deductions to the budget from the profit by the amount of the income, which is derived by

enterprises as a consequence of ceasing the crediting of amortization from fixed capital, which has served the standard service life, can also be introduced.

At the same time the procedure of writing off the value of incompletely amortized fixed capital should also be changed. For the purpose of optimizing the service life of fixed capital these amounts should be attributed not to the overall results of the economic activity of enterprises, as is done at present, but to the fund for the development of production, science, and technology. Thereby both the use of obsolete equipment and the underutilization of fixed capital will directly affect the internal cost accounting assets of enterprises and will stimulate the efficient use of fixed production capital.

Self-financing is raising in a new way the question of the possibilities of using the methods of accelerated depreciation at enterprises and associations. Since the fixed capital for the updating of the material and technical base is concentrated in one fund, enterprises and associations should have the opportunity to manage flexibly the procedure of forming this fund under the conditions of intensive reproduction and the updating of products.

7807

Greater Autonomy in Medical Industry, Health Care Urged

18140088 Moscow SOTSIALISTICHESKAYA
INDUSTRIYA in Russian 4 Oct 87 p 2

[Interview with Academician of the USSR Academy of Medical Sciences Yuriy Mikhaylovich Lopukhin by Ye. Razin: "It is Profitable for Them. But Is It for Us?"]

[Text] [Answer] Today the successes of medicine depend directly on technical equipment. It more than any other sector has the right to lay claim to the active assistance of science. Therefore, I would place the problem of the use of the results of research and development in first place. In contrast to many colleagues I do not see the need for the question of putting a new instrument or preparation into series production to be settled without fail at the level of the State Planning Committee. If there is an "okay" on the part of the Ministry of Health, everything else should depend on our Soviet industrialist—the director of a factory, plant, association. Until they are vitally interested in our developments, until the economic well-being of enterprises is connected with them, no commands "from above" will solve the problem.

Take, for example, our Scientific Research Institute of Physical Chemical Medicine. In recent years we have succeeded in developing and testing fundamentally new methods of the screening diagnosis of cholesterol. It is easy to appreciate the significance of this development: cholesterol is a scourge of the cardiovascular system, one of the causes of atherosclerosis, strokes, and infarctions. Today more than half of all people die from atherosclerosis—the obstruction of vessels and their premature

deterioration. Our method is quick and bloodless, it makes it possible to make a preliminary diagnosis painlessly, on the basis of a skin test.

Directly for the treatment of atherosclerosis we developed enterosorbents and phospholipid preparations, devised instruments for electrochemical oxidation and preparations for rendering microbes harmless, and "designed" special chains of protein molecules, which activate the immunity of our body. But what have we succeeded in introducing? Only one preparation—T-aktivin, which restores the activity of cells of the immune system. And here the particular attention to the problem of AIDS helped.

[Question] Yuriy Mikhaylovich, could you roughly estimate what source of the derivation of a profit the director of an enterprise would discover for himself, having undertaken the production of our preparations?

[Answer] There is nothing here to roughly estimate: it is a question of millions of dollars. American and Japanese firms are offering us considerable compensation, if we would transfer to them the same set of diagnostic tests for cholesterol. I am certain that the amount named by them is only some percent of the future revenues. Why should foreign firms, and not ours, derive them?

Why is there no interest in important developments on the part of our Soviet entrepreneurs? For a long time we have not been able to find an enterprise which would undertake the production of the same phospholipid preparations, which would free the country from export purchases of expensive "lipostabil" or "essential." The managers of pharmacological works have one response to our proposals: "We have our own plans."

It is well known to what this leads. We simply cannot assimilate the production of enterosorbents which remove cholesterol from the intestine. The Japanese also led us in the assimilation of the production of immunosorbents, which selectively eliminate undesirable lipids from the blood plasma of patients with a severe form of atherosclerosis. Now Japan is the supplier of these unique preparations to Europe. We, some of their discoverers, remained aloof. Worse than that, we cannot set up production at home.

[Question] Is the main reason perhaps that your preparations are insufficiently ready for commercial assimilation? The policy of the establishment of integrated organizations—with their own engineering, technological, and production—is probably visible not by chance in the plan of the restructuring of health care. Their advantages are clearly seen from the example of the Mikrokhirurgiya glaza Interbranch Scientific Technical Complex.

[Answer] It is not worth going to extremes. Far from every scientist is capable of organizing such a complex. And especially of combining its management with scientific activity, as Professor Fedorov is doing. And interbranch scientific technical complexes are not needed in all directions of medical science.

For example, it is hardly advisable to establish on the basis of our small institute a scientific production association or interbranch scientific technical complex. In such associations there is always the risk of turning science into an appendage of production, which can adversely affect first of all basic research. But without them there cannot be either breakthroughs or even big steps forward.

In our sector researchers in principle also do not need that much—if only there were reagents and modern equipment. While for the changeover to introduction there are enough scientific production laboratories, which are capable of quickly producing test batches of preparations. The preparation and organization of mass production, in my opinion, should be carried out outside the scientific research institute—at the enterprises themselves. All the same we understand worse than production workers the subtleties of industrial technology and its implementation. If the managers of enterprises were interested in a profit from our preparations, they would do everything themselves. Moreover, quickly and at a high level.

[Question] You insist so on the economic interest of enterprises, as if your well-being also depends on it....

[Answer] But of course! In case of normal cost accounting relations between science and industry a portion of the profit, including in currency, should be deducted in favor of the scientific research institute. By means of it we could if not solve, then if only alleviate the urgency of the problem which is checking the development of all medical science. It is a question of the hardware supply of our laboratories.

Its lack or low level is one of the main causes of inflated staffs, long research periods, and poor results. For example, only 3,200 scientists work at the U.S. National Institute of Health, which is equivalent to our Academy of Medical Sciences. And nevertheless of the 77 Nobel Prizes, which have been awarded for discoveries in biology and medicine, 58 belong to them, while scientists of West European countries have the other 19. How did the Americans achieve such superiority? Do they think better? Not only that. For the most part, by the quality of equipment and the most efficient organization of work.

Today, for example, in order to find means of combating the plague that has taken mankind by surprise—AIDS—it is necessary to organize without delay the production of advanced equipment with a computer, which makes it possible to study the structure of viral protein antigens and their active centers. The complete automation of

scientific and laboratory research is as necessary as air at scientific research institutes, hospitals, and polyclinics. Unfortunately, we have lost contact with our medical industry and the opportunity to influence it. As a result, today it is producing instruments and equipment, as a rule, of a low quality, without microprocessors and computers. If the scientists of our leading institutes have been able to discover something worthwhile, they are obliged for this in the majority of cases to foreign equipment. I will state frankly that this dependence is of arch danger for us.

I believe that, having separated at one time the medical industry from the USSR Ministry of Health, we made a mistake. Although it also "absorbed" the Main Administration of the Microbiological Industry, it is moving farther and farther away from the needs of medical science. Worse than that, it lost the ability to meet the demands of researchers, owing to which they have been forced to turn for assistance to other sectors. Here we are again faced with the questions of the organization of planning and management. In my opinion, scientists themselves should settle these questions.

During a recent trip to the United States I had occasion to acquaint myself in earnest with the so-called system of grants. In free translation a "grant" is a commercial "gift" of scientists to some industrialist. In order to obtain it, the industrialist finances the research activity of a scientist or an entire collective. But one should not think that, in investing considerable money, he is acting without thinking or by relying on the prestige of the given group of researchers. In order to reduce the risk to a minimum, the entrepreneur turns to the appropriate expert council, the work of which is exceptionally competent and strictly secret. In the United States great importance is attached to these expert councils: they, as they say, at the start, upon presentation reject up to 60 percent of the applications for developments.

Our Higher Certification Commission essentially does something similar. But its expert councils engage in the evaluation of what has already been done. In other words, they take up the matter when forces, money, and resources have already been spent. And probably in the same 60 percent of the cases it is unjustified. It seems that it is also time for us to turn expert work upside down.

In my opinion, that section of the plan of the restructuring of health care, in which it is a question of increasing the role of the expert commission, requires interpretation. From among the leading scientists of the Academy of Medical Sciences together with scientists of other academies an expert council for the preliminary evaluation of applications for basic research should be set up. While councils for the evaluation of applications for applied development should be set up at institutes. Scientists, inventors, and retirees could perform the role of authors of applications: for the expert commission the main thing is the promise of the idea. Given such an

organization of the matter the Ministry of Health in the area of the management of science could rely to a significant extent on the work of the expert councils. Of course, state goal program planning of research on the basis of the study of the statistics of diseases should also be retained.

[Question] Yuriy Mikhaylovich, we began the conversation with the economics of medicine, but have now proceeded to the principles of the management and planning of scientific research. Is there a connection between these concepts?

[Answer] A most direct one. For example, the superficial attitude toward questions of the financing of basic research greatly worries me. Today, for example, the basic hopes for the cure of cancer and hereditary diseases are connected with the synthesis of immunotoxins and genetic therapy. Immunotoxins are capable of selectively and accurately destroying cancer cells. The correction of the genetic apparatus of the embryonic cells of man, in the opinion of scientists, will become the key to the elimination of hereditary defects. In order to realize these ideas in methods of treatment, it is necessary to step up by several fold research in the area of molecular genetics, molecular biology, cytology, and immunology. In the United States, for example, more than a fourth of the total scientific budget is being spent on similar work as the basis of modern biotechnology.

And this is not the only one of the problems, which requires a fundamentally new approach. We like to parade the concern about health and hang where it is necessary and not necessary the warning signs "Do not stand under the boom!" But the aspiration to evade responsibility makes our system of preventive treatment similar to labor safety practices. We hang the sign "Keep your hands away from the circular saw," but it is necessary simply to shield it with a protective housing—and that is all there is to it. Here, for example, I brought back from the business trip to the United States dietary eggs, in which the cholesterol has been completely removed. Patients with atherosclerosis can eat them without the risk of aggravating the disease. Tell me, is such a product really not equivalent to entire mountains of medicine? But here, too, we are giving in to the inertia of our industrialists. While the Ministry of Health should raise the question of food industry workers producing similar products.

Of course, all these measures require money and resources. But it is already time to learn to compare the expenditures and losses, the verbal conclusions and the real gain. The demand of medical personnel to increase the cost of a hospital bed, for example, horrifies many people. Now its price is practically the same as that of a bed in a dormitory. This means that there will be neither automated equipment, effective preparations, nor much more in our hospitals. And, hence, the recovery time of patients will also be excessively long. In the United States the cost of a bed is ten- to fifteen fold (!) higher

than in our country. But then they release new mothers in a day, those who have undergone an appendectomy—in 2 days, and after a heart transplant—in 3 days. In our opinion, it is unnatural. But in practice these data testify to the high level and effectiveness of medical assistance. How can one not ponder here the imaginary and real saving?

Our health care has embarked on the path of great changes. So far we have achieved only the understanding that first place among socially significant problems belongs to it. Before we proceed from this understanding to practical steps, I would like to recall how more than 10 years ago they restructured the system of the training of personnel for health care in England. When the House of Lords submitted the bill to the queen, she put forth the condition that she would sign it only when everything best from the achievements of world medicine had been taken into account in it. I believe that we should also adopt this principle.

7807

Development of Science in Electrical Equipment Industry

18140096 Moscow MOSKOVSKAYA PRAVDA in
Russian 22 Oct 87 p 2

[Article by Doctor of Technical Sciences Ye. Orlov, chief of the Main Technical Administration of the Ministry of the Electrical Equipment Industry, under the rubric "The New Mechanism of Management. The Practice of Introduction": "Saving Into a Loss. How Is Sectorial Science to Be Developed?"]

[Text] In order to actually turn scientific and technical progress into the main factor of economic growth, as the decisions of the June CPSU Central Committee Plenum require, it is necessary to begin with the radical restructuring of sectorial science. Its enormous potential thus far has not been used efficiently enough, which is also emphasized in the recently adopted decree of the CPSU Central Committee and the USSR Council of Ministers "On the Changeover of Scientific Organizations to Full Cost Accounting and Self-Financing."

Indeed, can we be satisfied with the fact that the result of scientific and technical measures comes annually to only 3 percent of the increase of labor productivity in the national economy? Of course not! The reckoning should be not in fractions—it should be in orders of ten. For the country spends up to 25 billion rubles a year on sectorial science. And the headquarters of the sectors, which are unsatisfactorily playing the role of strategists and organizers of their own science, are not last of all to blame for the fact that the return is so small.

The electrical equipment industry, nearly the most science-intensive sector, which has at its disposal an army of 100,000 scientists from 123 scientific research institutes and design bureaus, is also not an exception.

However, as is known, a good manager is not the one, who has a lot, but the one, who skillfully disposes of what has been accumulated. But, it must be stated frankly, we have thus far not displayed the skill.

A little more than a third of the inventions get to industrial assimilation. Here the lion's share of them is introduced at only one enterprise. The expenditures on each model of new equipment, which has been developed in the sector, are increasing very rapidly. During the past two five-year plans they have increased by nearly twofold, which, alas, it is impossible to say about its quality. A check of the basic types of electrical engineering products, which was made by a special commission under the supervision of Academician N. Sheremetyevskiy, showed that only half correspond to the world technical level. As a result: the share of exports in the volume of items produced by the sector is extremely small.

Even yesterday we were satisfied with the fact that the national economy as a whole was supplied with electric motors, turbogenerators and hydraulic generators, transformers, and cables. But today the orientation toward the assurance of progress in the key sectors of industry and the extensive penetration of the world market require of electrical engineering science the development of fundamentally new items and technologies. For during the years, which remain until the end of the five-year plan, we have to bring the output of the most important types of products, which correspond to the world level, up to 97 percent. And, hence, already now all these products should be designed and tested.

I deliberately released an entire "range" of figures in order to show the level, the "base camp," from which we are forced to start our ascent. As you see, it is coming as a difficult one. Is our sectorial science ready for this?

It is difficult to give an unequivocal answer. Of course, in electrical engineering there are scientific schools with a world reputation and powerful institutes, which are conducting development in the priority directions of scientific and technical progress. But there are also quite a few other scientific research institutes, which have not yet gained the height that the times require. For example, the collectives of the All-Union Scientific Research Institute of Electroceramics, the Scientific Research Institute of Starter Batteries, and the Special Design Bureau of the Khotkovo Elektrozolit Production Association and several others have obviously lost a sense of the front line and are subsisting on minor "scientific odd jobs" and local improvements. As a result: the return of these institutions does not even cover the expenditures. What is forcing the staff members working at them—not at all people without talent and loafers—to do their job so formally and in an uninspired manner?

I believe that first of all it is the very state budget nature of the financing of science. The Unified Fund for the Development of Science and Technology (YeFRNT) is a

common fund and, hence, nobody's. That is how they often reasoned both at scientific research institutes, where new equipment was developed, and at plants, where they should have used it. But if one has to pay not from his own pocket, it is possible both to confirm the nonexistent efficiency and to maintain a staff of candidates of sciences on recommendations and methods alone. The lack of real financial responsibility for the end result of labor corrupts the collective. It becomes so accustomed to working without a return, that it even ceases to notice the fruitlessness of its own activity.

The system of self-financing and self-support [samookupayemost] should change the situation. Both for production and for science. Under the conditions, when one will have to pay for a scientific development, as for any other commodity, with hard-earned money, enterprises will no longer accept pseudoworks under a scientific guise. Weak scientific research institutes will simply wither.

However, there is no time to wait until the entire sector has changed over to cost accounting. We have decided already now to broaden in part the rights of enterprises with respect to the development and assimilation of new equipment. As of 1 January 1987, 49 percent of the entire amount of the unified fund for the development of science and technology was put at their disposal. Now enterprises can directly purchase from scientific research institutes (both of their own sector and of "others" sector) the developments they need. Another measure is the decrease up to the complete elimination of deductions from the profit to the ministerial fund for those enterprises, at which radical retooling and the mass introduction of new equipment are being carried out.

A most important experiment for the sector was begun this summer at the Kvant Scientific Production Association. Henceforth all the scientific production and social activity of the association will depend only on its own cost accounting revenue. Here the scientific production association acquired the right after the fulfillment of the most important state assignments to formulate independently themes of scientific developments on the basis of direct contracts with consumers. I believe that the Kvant Scientific Production Association will become precisely the organization, at the establishment of which the party is aiming us. For only large, independent associations are capable of accomplishing in the optimum manner the tasks of expanded reproduction and social development and of obtaining a real return from science. It is also important that the potential of such main organizations is becoming the basis of the overall increase of the technical level in the sector.

However, it is impossible to speak about the independence of enterprises, without having settled the question of the rights of the headquarters of the sector. We are often criticized, including on the pages of *Moskovskaya Pravda*, for petty tutelage and for the large number of planned indicators. But if you think it over, we are only adhering to discipline. The State Planning Committee,

the State Committee for Material and Technical Supply, the State Committee for Science and Technology, and other organizations send down to us hundreds of indicators and instructions. Of course, we are forced to read-dress them downward. Let us face it, up to now the formulation of plans has been carried out in these departments. While only the monitoring of the fulfillment of the assignments, moreover, often unbalanced ones, is left to the ministry. It is difficult to carry it out under the conditions of the reduction of the management staff without the substantial improvement of the technical supply of ministerial workers. After this is it worth being amazed at the appearance of entire organization-“snowdrops,” which are keeping under the cover of sectorial science, but are performing a portion of the administrative and office work of their own ministerial management?...

I want to believe that the new methods of management will enable everyone, as was stated at the June CPSU Central Committee Plenum, to do his own work. And instead of looking all the time under its own feet—solving day-to-day management problems, the headquarters of the sector will finally be able to look ahead and to assume the management of the future and scientific and technical progress. With what will one have to start?

First of all it is necessary to orient science not toward pursuit, but toward overtaking. For long years scientists and designers, when beginning the development of new equipment, “danced” from a series-produced foreign analog, thereby laying the foundation of our present lag. It is possible to change the situation, only by relying on a systems analysis of the trends in the development of science and technology, by having set specific goals for developers, and by having designated clear qualitative parameters.

Unfortunately, such tasks, as a rule, are not being posed. But the consequences of mistakes in the choice of the main directions of sectorial science are becoming more and more serious with each year. And the responsibility for this first of all rests with the headquarters of the sector.

Precisely the ministry should be the first to demand a high-quality forecast from all scientific subdivisions and to carry out the methods supervision of systems forecasting. Today a cardinal reform is taking place in the management of sectorial science. In all 33 basic priority directions of its development have been specified. Now scientific and technical centers (NTTs's), which are headed by general and main designers of the sector—the most prominent scientists and organizers of electrical engineering science—will implement science and technology policy in each of them, will draw up scientific and economic forecasts, and will determine the national economic needs. The ultimate goal of the scientific and technical centers, it is possible to say, is a single one: in the shortest time to bring their products up to the world level.

Not by chance will precisely the scientific and technical centers finance reserve development by means of centralized assets and make decisions on the halting of inefficient work. The scientific and technical centers have received the right to appeal directly to the State Planning Committee, the State Committee for Science and Technology, and other central departments.

Through the scientific and technical centers we will finally be able to obtain complete and objective information about new equipment and the trends of its development and sound forecasts. With their assistance the ministry should become in practice, as the June CPSU Central Committee Plenum required, the scientific, technical, and economic planning headquarters of the sector, which is responsible to the country for the technical level of its products.

It is unquestionable: the national economic saving, and nothing else, should determine the orientation of scientific research. However, the principle of “more profit with fewer expenditures,” by which people were guided for a long time in investment policy, when the talk turned to investments in science, led only to a negative result. Due to such a “saving” the scientific research institutes and design bureaus of the sector today have an extremely weak material base for research and tests and are incapable of developing laboratory equipment for themselves. The capital-labor ratio of scientists of the sector is at least an order of 10 less than that of colleagues from the leading foreign firms.

No, expenditures should be not minimal, but efficient. That is why a program of the radical increase of the capital-labor ratio of sectorial science during the 12th Five-Year Plan, which envisages the construction of pilot experimental bases, the replacement of obsolete test equipment, and the computerization of the processes of research and designing, was recently adopted in the ministry. In all nearly 900 million rubles have been allocated for these purposes.

The new conditions of management, for which the sector is preparing, I hope, will enable us to increase the allocations to science. But not everything depends directly on us. The USSR State Planning Committee, for example, established for the sector a standard for the formation of the unified fund for the development of science and technology at the end of the five-year plan, which is nearly 20 percent less than the present standard. It turns out that the reduction of the highest priority scientific research, which is directed and financed directly by the ministry, is being planned for us by 1990. With the best will in the world it is difficult to see a rational kernel in this decision of the State Planning Committee. For to economize today on science means to ruin ourselves tomorrow....

Academy of Sciences Election Problems Viewed
18140153a Moscow PRAVDA in Russian
7 Dec 87 Second Edition p 4

[Article by N. Ilinskaya: "On the Eve of the Event. Concerning a Vacancy"]

[Text] This had never happened before. As many as 250 new academicians and corresponding members were to ascend the scientific Olympus at the same time. On hearing the news, the hall of the USSR Academy of Sciences' general meeting came alive. President G. Marchuk continued:

"Considering there is such a large number of vacancies, it has been suggested that elections be held in three stages: in December this year and in two more stages next year. Are there any objections?"

There were no objections. The hall began to discuss the news with interest.

Why such a large number of vacancies, which can usually be counted in tens rather than hundreds? The whole point is that, according to the new procedure, when an academician reaches age 75, his position becomes vacant and has to be filled by a new, elected full member. The previous holder of the position does retain his rights as member of the academy. Another fundamental decision has also been taken: An age limit has been established for holders of administrative positions. Academicians and corresponding members in charge of institutes, departments, laboratories, and sectors are relieved of their administrative responsibilities on reaching age 70. Other leading personnel who do not have high academic titles relinquish their authority at 65.

What is the point of this cadre restructuring? The facts of recent years show that the rejuvenation of the academy is an urgent necessity. The number of doctors of sciences younger than 40, for example, has been halved in institutes in the last 10 years, and the number of academicians below age 50 has declined by a factor of 6. Rectification of these age anomalies is not an end in itself or the formal dogma of the academy's cadre policy. Young people do not bring only new scientific ideas. They also give the collective the dynamism, calculated risk, and bold decisionmaking that are now so essential. A harmonious combination of leading scientific personnel's experience and young researchers' energy is a guarantee of society's high productivity and stable scientific and technical culture. That is why academy establishments will accept young VUZ graduates and specialists who have completed postgraduate studies at 5 percent of their annual intake from now on.

All these cadre policy innovations were approved by the academy's general meeting. A total of 12 academicians have already relinquished their authority as directors and become counselors. But as far as elections to the academy are concerned, there are still a number of points that have to be clarified.

The academy leadership said in no uncertain terms at a meeting of the USSR Academy of Sciences party and economic aktiv in September:

"Scientists no older than 60 and corresponding members no older than 55 should be nominated as academicians..."

The nomination of candidates took place in October. They included a considerable number of scientists older than 60. Many scientific collectives had felt that the age limit on elections was in direct violation of the USSR Academy of Sciences Statute. What is more, some scientists believe that these restrictions will be detrimental to science. Debate and discussion in the academy are a normal phenomenon, but now some people would like to use this situation for their own ends. The whole point is that there are too many candidates for the vacancies, which means that as far as some people are concerned, "promotion" to the academy is a fight "for a place in the sun." All this has nothing to do with a meaningful contribution by any given candidate....

What is the academy? It is a scientific association of scientists, not a department or an institution. Some people have recently been inclined to regard the academy as a department affiliation that confers an eternal stamp of erudition on them. However, science is not the work of glib administrators with academic titles but of researchers who can be given the lofty title "stars." Capable people gravitate toward them as a rule. After initially putting the ideas of their leader into practice, with time they themselves become stars. An entire constellation now decks the horizon of science, as we have seen in the collectives of Academicians A. Ioffe, N. Vayilov, N. Semenov, I. Kurchatov, S. Korolev, P. Kapitsa, and M. Lavrentyev. We are witnessing a process of educating the generations and ensuring their continuity.

Psychologists claim that talent appears early, as a rule, only in artistic creativity and theoretical disciplines such as physics and mathematics. This is also reflected in the academy: Our youngest scientists elected before the age of 40 for their outstanding contribution to science are representatives of the natural sciences: S. Sobolev, N. Semenov, Ye. Velikhov, A. Skrinkiy, and R. Sagdeyev.

If there had been an age limit in elections, many eminent scientists of world renown would never have become full members of the academy. They include shipbuilder N. Isanin, chemist Ya. Kolotyrkin, philosopher B. Kedrov, physicist and Nobel Prize Laureate P. Cherenkov, aircraft designer A. Yakovlev, renowned selection expert V.

Remeslo, literary critic D. Likhachev, writer L. Leonov, metallurgist N. Ageyev, nuclear physicist N. Dollezhal, power engineer M. Styrikovich, and geneticist D. Belyayev.... And there are many, many others—almost one-third of all academicians are elected after age 60.

It is hard to imagine that major scientists could have been barred from the academy because of such a formality as "irregularity in section three of the questionnaire," as witty physicists now joke.

"Creativity recognizes no questionnaire-based boundaries; it is a state of mind and quality of intellect and character," Academician A. Isayev, chairman of the Krasnoyarsk Affiliate of the USSR Academy of Sciences, reasons. "I will use some examples that are close to me as a biologist. At age 63, geneticist A. Shulyndin cultivated a new cereal combining the qualities of wheat and rye: triticale. It is known as the 'grain of the future' all over the world. This scientist spent more than 20 years working toward his goal. Success and age arrived together. Surely this does not mean that the work of a devoted scientist does not merit the classification 'outstanding'? It is not a question of age but of a meaningful contribution by the person concerned. This must be the main criterion during the elections..."

We will ask another question: Why are elections to the academy arousing such a heightened interest among the scientific community? It is because being elected is not only a great honor, it leads to direct and indirect material benefits. There is another country in the world where scientists are paid for bearing this distinguished title. That country is Spain. But in most countries, a scientist is remunerated for his work rather than his title. Material incentives encourage tangible results regardless of the title and regalia of their author.

Does the eternal stamp of erudition not encourage some people to try to get into the academy by crooked means? Perhaps we should go a step further and not pay for the title? Just make an exception for counselors? Incidentally, many academicians have suggested this more than once before, but as yet their voices have remained unheard....

There is another problem which cannot be overlooked today. Unfortunately, the system of election by position has become established in academic life. Directors of institutes are frequently appointed with a view to giving them a clear run to the academy. Officials appointed to leading positions and then elected to the academy have introduced an alien bureaucratic style to science. Scientific prestige is sometimes replaced by authoritarian, bureaucratic administration, and scientific debate disappears.

Many scientists now question the justification for this massive intake of administrators by the academy in their letters to the editor and publicly from the rostrum. Is this not the reason why we hold the world record in terms of

the number of academicians and corresponding members per capita of the population, while the number of scientists who have made a breakthrough to new knowledge can be counted on the fingers of one hand?

It has reached the stage where vacancies have come to be blatantly used as a form of enticement. In this sense, Siberia and the Far East have developed into a forge of scientific knowledge. Doctors of sciences from Moscow come to the region to act as directors. Within 2-4 years, they almost automatically become corresponding members and return to the capital to calmly pick up new posts and privileges as members of the elect, avoiding their more scrupulous colleagues in their scientific career.

There can be no argument that those who invite a Moscow specialist to "fill a vacancy" sincerely want to benefit science and improve cadre training. It is not their fault that these are conflicting aims. That is why, as many scientists believe, amendments have to be made to the regulations governing elections for the Siberian, Far Eastern, and Urals Departments of the USSR Academy of Sciences: the introduction of a special provision that persons living and working in these regions may become candidate members of these departments.

Scientists also draw attention to another longstanding feature of the election system. Current electoral practice is often at variance with the results of scientists' work. There is no indication as to the scientific qualifications expected of a candidate. Should he have made some discoveries, written textbooks and monographs, have the appropriate scientific experience? Or should he be judged by position and whether he has made a name for himself by becoming familiar in newspaper and journal publications? It is interesting to see what lies behind the mound of publications of some candidates. They include once fashionable works such as "Economic Reasons for the Disappearance of the Individual Subsidiary Farm" and similar works of their time. Today their authors are equally eloquent in their contention that individual subsidiary farms, individual labor activity, and real economic accountability [khozraschet] are economically expedient. They sail with the tide. But where is science in all this?

"We obviously need independent expert commissions of reputable specialists which would reach their own conclusions on the quality of a scientific work and judge a candidate's real contribution on this rather than on the 'volume' of his publication," Academician N. Moiseyev believes. "The democratization of scientific life is necessary for development of science. The election of new members is not a formality but the supreme recognition of their scientific creativity. I believe that changes should be made to the electoral procedure. I am firmly convinced that full members should not be elected by academicians alone, as is the current practice. Is it democratic to bar corresponding members from voting? It would be in our general interest to hear their opinions."

It is gratifying that the USSR Academy of Sciences is seeking new approaches. There is no doubt that scientists will find the optimum solutions, and the academy will be replenished with people who will become the pride of Soviet science. Let us once again recall that major breakthroughs in knowledge only happen when the entire research organizations system assist the talented leader—the generator of new ideas.

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Velikhov on Organization, Financing of Science
18140083 Moscow *SOTSIALISTICHESKAYA*
INDUSTRIYA in Russian 1 Dec 87 pp 1-2

[Article by Vice President of the USSR Academy of Sciences Academician Ye. Velikhov: "Science to Move Science"; first paragraph is *Sotsialisticheskaya Industriya* introduction]

[Text] Never yet has the future of the country depended to such an extent on the successes of science. The strategy of acceleration, which was formulated by the party, relies on its conclusions, its discoveries are called upon to become the foundation of restructuring. Without science it is also impossible to eliminate the lags which have been allowed in the development of a number of sectors.

Facing the truth, it is necessary to admit that the attempts to catch up with someone are obviously doomed to failure. If it is a question of truly promising directions of science and technology, the rivals are sparing neither forces nor assets to move in them with increasing speed. There is one solution: to break through to the most advanced levels along unbeaten paths—by the rapid implementation of the fundamentally new ideas proposed by basic science.

The difficulty of this task lies in the fact that in modern science new promising directions of research, which require additional resources for development, are emerging almost daily. Where is one to get them? By the rejection of themes that have exhausted themselves? But considerable danger is concealed in such an approach. A graphic example is the work on high temperature superconductivity, which at one time was halted literally a step away from discovery.

Unfortunately, in basic science it is difficult to predict in which of the directions it will be possible to make a breakthrough. On the other hand, even the most developed of countries is incapable of supporting an intensive search along the entire front of research. Consequently, whether we like it or not, preference must be given to some ideas and directions. Of course, while trying to reduce the likelihood of a mistake to a minimum. From this standpoint, in particular, it is also necessary to

examine the decree "On the Changeover of Scientific Organizations to Full Cost Accounting and Self-Financing," which was adopted by the party and government.

One of the fundamental provisions of this document involves the changeover from the financing of scientific organizations to the financing of specific research and development. One would like to know whether it is possible to implement such an approach fearlessly in the sphere of basic research? The experience of a number of countries shows: yes, it is possible, if competitive principles are introduced in the process of the distribution of budget allocations.

It is possible to imagine such a procedure, when individual scientists, groups, or entire laboratories advance ideas, projects, and research programs. All these proposals go through an independent expert commission, the conclusions of which make it possible to select from them the most promising ones. The necessary assets are allocated for the implementation of these proposals. While their authors, if they wish, can act further as temporary collectives. It is important that they could dispose of the received money at their own discretion, without any restrictions.

In the United States, for example, by means of such a mechanism about \$1.5 billion are distributed annually for basic research. Here more than 50,000 scientists are participating in the evaluation of the advanced ideas and the obtained results. Precisely scientists, and not officials of some departments. In other words, evaluation has become an integral element of scientific activity, which requires the maximum responsibility and large expenditures of time. It is impossible to carry it out at odd moments or as a voluntary service. In the United States they understood long ago that both the successes of science and the development of economy depend on the reliability of expert evaluations. Therefore, here they spend on the making of an evaluation up to 10 percent of the assets allocated for basic research. It seems that we should also take such a path.

A special channel of financing is economic contracts with industry, enterprises, scientific research institutes, and design bureaus. I will not conceal it: many managers of academic collectives, to put in mildly, treat economic contracts coolly, alluding that they divert associates from basic research. But this is only half the truth. Until now the system of contra accounts was such that the clients, while using the results of such research, in fact were relieved of the duties to compensate if only in part for the expenditures on it. They reimbursed only the direct expenses—for the remuneration of labor, materials, equipment, and business trips.

Now the scientific product is equated with a commodity, which can be sold at contract prices. Owing to them additional assets for social needs and for the development of the production and laboratory base can appear

at the disposal of institutes. And, what is the main thing, for the conducting of additional basic research. It remains for ourselves to see to it that this mechanism would send strong roots into the academic soil. But for this it is necessary not only to lift the bans, which prevented money from being earned, but also to create the conditions for its realization.

When in the United States or any other capitalist country a group of scientists receives \$1 million for research, extensive opportunities automatically appear for it. It can hire the needed specialists on half salary, temporarily, or on contract, purchase the necessary equipment, rent premises, and pay for the services of an outside organization. In our country 1 million rubles, which have not only been earned, but have also been allocated, in themselves mean hardly anything. So that they would begin to work, it is necessary to obtain a limit of the number of staff, to submit many months in advance an order for materials and equipment, to get premises, and to force out and receive currency. For all this a large amount of efforts is spent and time is used.

It is time for our financiers to understand that for the jingling of a coin it is possible to purchase the right to try the aroma of pilaff, but not the pilaff itself. So that basic science could develop at a leading pace and quickly and confidently set out in the directions of a breakthrough, it needs freedom of maneuvering. In particular, it is necessary at the state level to legitimize such a procedure, which would make it possible to "back up" the available assets with everything necessary. For this it is necessary to give science specific privileges in matters of construction and material and technical supply, to lift the endless restrictions from the planning of labor and the wage, and to establish a coefficient of the free convertibility of the ruble into foreign currency. It is possible not to fear that these steps will somehow affect the national economy—in its total resources basic science accounts for tenths of a percent. But, while operating under the most favorable conditions, it is capable of increasing its efficiency substantially.

Strictly speaking, here we are approaching in earnest the question of the practical return of basic science and, hence, the means of implementing its results. World experience shows that, having invested 1 ruble in science, it is necessary to spend approximately 10 rubles on the engineering analysis of ideas. And then another 100 rubles on the setting up of production, the study of markets, and the organization of marketing and service. The basic horrors also seethe around this ratio of "1-10-100," developing into the notorious problem of introduction. Either our planning organs "forget" to make provision for the necessary "10" and "100." Or industry suddenly declares: "If we provide 100 rubles, why do we need your paltry ruble?" But it happens that the sector is willing to invest the same "10 rubles" in the checking of an idea. But there are both no where and no one to bring it up to a prototype, an operating model, or a semi-industrial technology.

The conclusion is forced upon one: a flexible economic mechanism should allow the existence of the most different organizational forms. So that it would be possible to adjust the most suitable one of them to the problem being solved, and not cram it into the Procrustean bed of the traditional structure. Various temporary formations, one of the versions of which is temporary scientific and technical laboratories, are becoming today an alternative to it.

The idea was simple: in order to speed up the practical use of the results of basic research, it was proposed to establish at the institutes, where they were obtained, temporary subdivisions for a term of 3 years. At them associates of the institute and specialists of industry should have worked as if during a second shift with additional pay within the range of 30-50 percent of the basic salary. In essence it was a question of the internal combining of jobs, which is well known from the example of the higher school, where teaching activity is combined with scientific activity.

During the past 6 years this form of the interaction of science and production has clearly shown its effectiveness. In particular, it makes it possible to speed up by 1.5- to 3-fold the implementation of scientific results. Taking this into account, last year and this year alone the Presidium of the USSR Academy of Sciences made the decision on the establishment of 43 temporary scientific and technical laboratories. Several of them have already succeeded in completing important developments.

For example, the temporary laboratory of the Institute of High Temperatures jointly with specialists of the Ministry of Ferrous Metallurgy developed large power technology complexes for two plants, the start-up of which should take place at the end of the year. At the Institute of Applied Mathematics a package of programs for the automation of the preparation of the production of turned parts was developed and turned over to the client. While the temporary laboratory of the Institute of Metal Physics of the Ural Department of the USSR Academy of Sciences developed equipment for the checking of magnetic layers when producing information-carrying media.

Of course, in light of the adopted decisions on the introduction of cost accounting in the sphere of science the status of temporary scientific and technical laboratories needs improvement. But the increased "demand" for this form of interaction both on the part of industry and from academic institutes testifies that it should also be developed further.

The next step in this direction is temporary scientific and technical collectives. In essence they are already intersectorial formations: groups of researchers and developers, while remaining in their own organizations, work in accordance with a common plan on the solution of a posed problem. For example, representatives of academic institutes and higher educational institutions,

sectorial scientific research institutes and enterprises belong to the well-known Start Temporary Collective, which was able in a short time to develop a number of multiprocessor supercomputers. The Shkola Temporary Collective—for the solution of the problems of the computerization of school instruction—was also formed with the participation of many departments.

Temporary scientific and technical collectives can be "incorporated" quite easily in the new conditions of management. Since they are set up for a short period of 3-5 years and then should be dissolved, the advantages of self-financing and self-support [samookupayemost] are inaccessible to them. Therefore, for them the most suitable channel of financing is the state order, a necessary condition of activity is priorities in supply, and the main requirement is that the order should be filled on time and at a high level.

With some allowance it is possible to regard temporary collectives as a kind of "transitional form" on the path to MNTK's—interbranch scientific technical complexes. The idea is the same—regardless of departmental affiliation to gather in a strike force the best forces, in order in the shortest possible time to attain the most advanced levels. The differences consist in the fact that interbranch scientific technical complexes bear responsibility for the development of entire scientific and technical directions and the time of their activity is practically unlimited. For industry the most "disagreeable" trait of the interbranch scientific technical complex consists in the fact that its developments are introduced by way of directive—through the State Planning Committee.

All this also gave rise to the difficulties, with which the formation of interbranch scientific technical complexes is connected. The basic ones of them are due to the fact that sectors want to retain control over the "100 rubles" which are needed for the launching of production. And thereby they break the solid chain which leads from basic research and applied development. In order to "register" interbranch scientific technical complexes under the new conditions of management, it is apparently necessary to give the main organizations the right to distribute among the partners the assets received from clients.

Among the named organizational forms, perhaps, only interbranch scientific technical complexes have the opportunity to attain the end result—series-produced output. But even in this case the authors of a development are often not allowed farther than the threshold of the sector, which inevitably affects the time and quality of introduction. It is here that a question arises: Why, strictly speaking, must the production of a promising innovation be turned over without fail to someone?

Throughout the world, and first of all in the United States, not large concerns, but thousands of small, what are known as "venture" enterprises are often the pioneers of technical progress. As a rule, they are established by the authors of promising ideas, who decide that they

themselves will carry out developments, will introduce them, will bring them up to a commodity product, and will sell them. This product, as a rule, is the only one for the firm and, consequently, determines its well-being. Therefore, the developers do not spare efforts in order to maintain it at a high level. Precisely such firms were the first to release personal computers and many other technical innovations for sale.

Perhaps, this is one of the few organizational forms of introduction, which have been freed from obstacles at the meeting points. But for the present we have neither similar small enterprises for the output of the latest products nor the conditions for their establishment. Moreover, the scientist, who has risked on his own to implement his own development, gets into an alien and hostile environment. He has no one to rely on and nowhere to wait for assistance. In Bulgaria, for example, there is a bank which issues credit for the establishment of small collectives. Moreover, even in foreign currency. A similar bank also exists in Hungary. In order to adopt this experience, we need, apparently, not only credits of banks, but also skillful people for the role of organizers. It is necessary to seek, train, and encourage them.

In turning to the experience of foreign colleagues, we are usually skeptical about their ability "to make money." And without reason. If we eliminate the question of personal enrichment, it will turn out that we especially lack this ability. First of all, when it is a question of the foreign market. In the past the attempts to come out on it frequently encountered resistance in our own ranks: "Why should we send our academic, pioneering development to some country, if our industry can implement it?" It is no secret that behind such "vigilance" there was often an apprehension: something of the sort, for which one will have to answer, may happen.

Such was the case, for example, with the gyrotrons which were developed in our country. At one time industry refused to go to the world market, although we had priority in knowledge. By this step we did not undermine the potential of our opponents—they themselves soon developed and began to produce these devices. But we lost the market. We also lost a source for obtaining currency. And, what is the main thing, we missed the opportunity to win the prestige, which presence on the market of high technology gives any country and its science.

Of course, we should always remember the interests of our country and the confrontation of the two world systems. Especially as reality constantly reminds us of this. On the one hand, we are receiving more and more often proposals from various firms on the establishment of joint enterprises. But, on the other, we continue to sense the aspiration of the American administration of isolate Soviet science. This is being done on a grand scale, with the allocation of substantial assets. It is all the more offensive that in this matter in our country our own mechanism of deceleration continues to operate.

It would seem that in the present situation we should, are simply obligated to use any opportunity that makes it possible to become familiar with the latest scientific information. But what is happening in reality? You visit an American university and find out that a minimum of 50 Chinese students are studying at it (and in all there are about 30,000 of them in the United States). You go to a scientific conference and see there the same Chinese, Japanese, Europeans, and representatives of developing countries. And not one young Soviet scientist.

What, do we not have opportunities for this? We do. For example, the Academy of Sciences back during the last century was among the founders of the Humboldt stipend. Owing to this we can send to prominent scientific centers of the FRG a nearly unlimited number of scientists. But we annually send at the outside five people. Why? Because several workers of our institutes do not have the desire to engage in this and to specially train people. But apprehension is present in abundance: Will one suddenly have to answer for someone?

It is time for us, at last, to admit that in the world there always were and will be some centers, at which the most advanced scientific thought beats. And only at them it is possible to obtain the supply of ideas, which can then suffice for many years. We also have such centers. It is necessary to use them for the training of both our specialists and guests from abroad. Direct contact has the amazing property that it at least doubles our knowledge.

It should not be thought that the settlement of the posed and many other questions depends only on central organs and the management of the Academy of Sciences and its departments. In essence initiative, boldness of thought, assertiveness, and the ability to surmount difficulties are required today of every scientist. And one need not doubt that there will be difficulties. Unfortunately, our economic science for the present is incapable of providing us with a theory of management under the conditions of restructuring and of giving clear recommendations on new organizational forms and approaches. Therefore, in many cases we will have to act by trial and error. But precisely act, and not idle our time away.

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Organization of Creative Scientific, Technical Work of Youth

18140081 Moscow KOMSOMOLSKAYA PRAVDA in Russian 17 Nov 87 p 1

[Interview with Deputy Chairman of the USSR Council of Ministers Boris Leontyevich Tolstykh, chairman of the All-Union Coordinating Council of Creative Scientific and Technical Work of Youth: "From Fakel to the Creative Scientific and Technical Work of Youth"; date, place, and occasion not given; first paragraph is *Komsomolskaya Pravda* introduction]

[Text] Deputy Chairman of the USSR Council of Ministers B.L. Tolstykh, chairman of the All-Union Coordinating Council of Creative Scientific and Technical Work of Youth, answers the questions of *Komsomolskaya Pravda*.

[Question] Boris Leontyevich, more than half a year has passed since the adoption of the documents which marked the beginning of the public-state system of the creative scientific and technical work of youth. What has happened in this time?

[Answer] As is known, the June CPSU Central Committee Plenum, which endorsed the draft of the Law on the State Enterprise (Association) and outlined the means of reorganizing the economic mechanism of the country, was held during the past half a year. Therefore, the documents, which regulate the system of the creative scientific and technical work of youth, also require revision. This work will be completed in the immediate future.

As a whole the public-state system of the creative scientific and technical work of youth should blend fundamentally with the new mechanism of management, for self-management, full cost accounting, and the decentralization of planning have been built into the basis of this system. Let us take, for example, the center of the creative scientific and technical work of youth—the main unit of the economic mechanism of the system. This is an intermediary organization. The center established direct contacts between enterprises, institutions, organizations, and the creative portion of the population. For this it forms on democratic principles creative collectives, which exist exactly in the number that is necessary for the matter. The relations between the creative collective and the center of the creative scientific and technical work of youth are specified by a turnkey contract. In turn the center of the creative scientific and technical work of youth concludes economic contracts with organizations and enterprises, operating, thus, on the principles of full cost accounting. Payment is made in accordance with the end results: if you do not fill the order, there will also be no revenues.

I believe that all this can serve in part as a prototype of a qualitatively new system of the management of scientific research and planning and design activity in the country.

[Question] That is, not on a bureaucratic basis, but on an economic basis? Incidentally, several of our readers fear precisely the bureaucratization of the new system—for them it reduces for the present to the demand to establish another council, a plant or rayon one.... What is one to reply to them?

[Answer] If you are afraid of wolves, do not go into the woods! Besides, for the present there are no grounds for such fears. The extradepartmental All-Union Coordinating Council of Creative Scientific and Technical Work of

Youth—the management organ of the entire system—was also established for that. But from Moscow, of course, it will not be possible to put a stop to all cases of bureaucracy in every rayon and city. That is precisely why local coordinating councils of creative scientific and technical work of youth, which constitute the basis of the entire system, and organs of its self-management should also be established. Self-management is also an alternative to bureaucracy.

[Question] There are letters, in which the present centers of the creative scientific and technical work of youth are compared with the regrettably well-known Novosibirsk Fakel. How legitimate is such a comparison?

[Answer] The basic principles of work of Fakel and the centers of the creative scientific and technical work of youth coincide. It is possible to say that these centers are direct heirs of Fakel. As to its regrettable fate, I am confident that it will not be repeated. The guarantees are the development of democracy and glasnost, economic reform, and the very situation in our country.

[Question] But to what is the need for the establishment of precisely a public-state system of the creative scientific and technical work of youth due?

[Answer] The public movement of creative scientific and technical work has existed in the country already for 2 decades. However, its real effectiveness for the present is not that great. The administrative bureaucratic methods of management, which prevailed for long years, led to a situation, in which creatively gifted individuals often need to spend their energy not on the development of a new thing, but of the overcoming of artificially creative obstacles of various kinds. This has an especially bad effect on young people.

The unified public-state system of the creative scientific and technical work of youth is a qualitatively new formation which was established for the first time in our country. Its goal is to ensure state support of the activity of the broad masses, first of all young people, having united for this all efforts and assets....

[Question] And...apparently, know-how? In 1984 our newspaper held on the suggestion of readers the first all-union exhibition and trade fair of student scientific and technical projects and developments. Last spring such a trade fair was held in accordance with an order of the petroleum industry workers in Nizhnevartovsk. The other day they reported from Western Siberia: of the 92 developments, which were sold at that time at the auction, 30 are already being actively introduced or have been introduced. Finally, on the eve of the 20th All-Union Komsomol Congress the Central Exhibition of the Creative Scientific and Technical Work of Youth also became an exhibition and trade fair. Boris Leontyevich, now, when the intermediary function has been

legalized in the form of centers of the creative scientific and technical work of youth, will the need for such auctions and trade fairs disappear?

[Answer] On the contrary! In my opinion, they should be held more extensively and more often. And now there is someone to hold them—this is the immediate affair of the councils and centers of the creative scientific and technical work of youth.

[Question] Among those who read this interview there will probably be not one young inventor, about whose problems we have written more than once: there is no space, there are no materials, there is no equipment, there is no client. Apparently, the system of the creative scientific and technical work of youth should also help such people. But many of them, we suspect, know almost nothing about it. How are they to act? With what are they to start? And from where will all this now come?

[Answer] One of the tasks of the system of the creative scientific and technical work of youth, which is being formed, also is to help such an inventor. The centers of the creative scientific and technical work of youth, which, having evaluated an idea and having contacts with enterprises and organization, offer this innovation to them for introduction, are affording them new opportunities. And not only the inventor himself, but a creative collective, which has been specially set up for this, will deal with introduction.

But do not be angry here: only truly valuable inventions—the natural selection—will go into operation!

Incidentally, the first experience of work of the centers of the creative scientific and technical work of youth—and there are already about 50 of them—showed that they can be used successfully in the interests of not only young people, but also all categories of workers.

Moreover, at present the centers of the creative scientific and technical work of youth are being established only under Komsomol committees, although other public and state organizations also have the right to establish them in accordance with established procedure. The time has also come, apparently, to begin this work.

So to the question: How are they to act?, I respond that councils and centers of the creative scientific and technical work of youth are to be established in their own city and rayon.

As to the question from where will all this come, here the "state" component of the system should play its role. One should not just think that all this is already lying about and waiting. Time is needed so that the system would begin to work in precisely that way.

[Question] What kind of time? Within what time should the system begin to work at full capacity? And what are the anticipated estimates of this "capacity"?

[Answer] You know what after all economic levers, and not administrative ones, will move the system. To plan this "from above" means once again schedules of allocations, "control figures," vast reporting, and "accounting." We know to what this can lead.... The creative scientific and technical work of youth is profitable. The more rapidly this idea becomes established in social consciousness, the more rapidly it will also be implemented.

For ourselves we imagine the future as follows. We plan to complete the organizational stage of the formation of the system in 1988. This, however, does not mean that during the period of formation the system is not operating: its "breaking in" is occurring, the economic organizational mechanism is being improved. Taking into account the large size of our country, according to our estimates, the system should reach full capacity in approximately 2.5-3 years.

What kind of capacity is this? On the condition of the formation of 2,000 centers of the creative scientific and technical work of youth, the national economic impact just from the introduction of developments may come to about 2.5 billion rubles a year. This is only an approximate lower estimate.

[Question] Today, when the foundation of the new system is being laid and the basic organizational questions are being settled, which of them, in your opinion, are most urgent?

[Answer] The main thing is to avoid a formal bureaucratic approach, which your readers have already recalled. And not without reason....

It turns out that many chairmen of the coordinating councils of the creative scientific and technical work of youth are inadequately investigating the essence of problems and do not realize their personal responsibility for the development of the system. At times they delegate this responsibility to people who do not have the necessary rights for this.

Considerable powers have been given to us. The USSR Council of Ministers, the All-Union Central Council of Trade Unions, and the All-Union Komsomol Central Committee by their joint decree specified that all ministries, departments, and public organizations are obliged to fulfill the decisions of the All-Union Coordinating Council of the Creative Scientific and Technical Work of Youth on questions that are within its competence. Moreover, the deputy chairmen of the councils of ministers of the union republics, the first deputy chairmen of the executive committees of the soviets of people's deputies, and, in rural areas, the chairmen of the rayon agroindustrial associations supervise the regional councils of the creative scientific and technical work of youth. All these are also guarantees against departmentalism. They should work.

As to Komsomol, I want to recall that its role in this matter is one of the main ones. While we will provide state support in its work. It is necessary to make every creative individual aware of what he can give society within the system of the creative scientific and technical work and what he can receive from society for his labor.

[Question] Would it perhaps make sense, without delaying, to illustrate both?

[Answer] The majority of centers of the creative scientific and technical work of youth, which exist today, have been operating a short time—3-4 months—and by 1 January they had completed and turned over to the client 94 developments worth 603,000 rubles. That is what kind of contribution there is for the present. But a trend is already being traced: the work is being completed with a better quality, more rapidly, by a smaller number, and less expensively than under "ordinary" conditions....

But we also expect from your readers the most unexpected and convincing specific examples of this. Today we need constant lively feedback (but, I will repeat, not massive reporting) like we need air. The connection is direct—from top to bottom.

[Question] Boris Leontyevich, would you agree to "look after" such a rubric in our newspaper?

[Answer] Why not?

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Independent Role of Scientific, Technical Societies in S&T Progress

18140070 Moscow NTR: PROBLEMY I RESHENIYA
in Russian No 20, 20 Oct-2 Nov 87 pp 4-5

[Interview with Professor Aleksandr Pavlovich Vladislavlev by An. Shakhov under the rubric "The Problem Close Up": "Professionals During Free Time"]

[Text] [Question] Recently, in publishing an article in *Pravda*, you stressed that the updated system of scientific and technical societies should, in particular, be "...a partner, a public expert, or an opponent of economic and state organs in the area of scientific and technical progress." What gave you, Aleksandr Pavlovich, such an idea?

[Answer] The difficulties with which the implementation of nontraditional scientific and technical solutions often is regrettably faced. Here is how this affects the initiatives of members and collectives of scientific and technical societies.

At the All-Union Scientific Research Planning Institute of Power Systems and Electric Power Networks they, for example, developed a new technology of the preparation of routes for electric power transmission lines through

large forests. It is envisaged to replace the clear cutting of trees with specially oriented cutting, during the installation of lines to use special interphase spacers, while for the installation of supports to use helicopters. The construction of the Kolskaya-Nikel pilot industrial 330-kilovolt overhead line of Kolenergo confirmed the design calculations and showed the possibility for the country as a whole to save annually more than 61,000 hectares of forests. Here is another example. At the Leningrad Forestry Engineering Academy imeni Kirov they developed a gas-producing unit, which is capable of converting wood scraps of small value, of which there is more than enough almost everywhere, into gaseous fuel. Experiments showed that it is 34-42 percent cheaper than imported coal. But, like a large number of similar enterprising plans of members of scientific and technical societies, both developments will simply not wait for their commercial application.

But here is an example of an entirely different sort. One of our temporary creative collectives developed a new technology of the felling and hauling of timber from hard to reach mountainous regions. It, in particular, made it possible to free the country from the importing of beechwood and to decrease the monetary expenses alone to at least a third. During 1985-1986 the economic impact from commercial use came to 1.2 million rubles. But this is merely an exception....

[Question] Since the times of the first five-year plans the formula, rather even the slogan, "Knowledge Is Strength" has become firmly established in our country. What has happened, why is there no longer enough strength, which is incorporated in new knowledge itself, for overcoming the distance "from the idea to the machine"?

[Answer] Of course, bureaucratization, departmentalism, the imperfection of the economic mechanism, and the obsolete forms of the management of scientific and technical progress played a certain role in this. In this sense one must not overestimate the importance of the June (1987) CPSU Central Committee Plenum, which formulated the strategy of the resolute overcoming of all these negative phenomena.

However, now, in my opinion, it is also necessary to ponder, if it is possible to express it this way, the intrascientific and intra-engineering factors of deceleration.

Obviously, here it what they are connected with. Under the conditions of the present scientific and technical revolution the pace of the updating of basic scientific knowledge has outstripped the change of scientific directions and the reorientation of schools. Comparatively recently, it is possible to say, in your and my memory, their cognitive potential was enough for not less than one generation of specialists. And the sectorial institutions, which emerged first of all on such a base, their subdivisions, the engineering services, which were nursed by

them, and the specialists, who work at all levels of management, up to a specific moment more or less adequately satisfied the needs of society.

But then the amount of scientific knowledge began to double first in 15, than already in 10 years, equipment began to become obsolete accordingly in 7 and even 5 years, while we as before speak about the long life of scientific directions and the stability of the aims of schools. The "institute framework," the skeleton first of all of the sectorial part of this system became, I would say, an "inflexible" one, which rejected "aliens," whose thinking broke out of the framework of stereotypes.

That is why for the resolute turn of the formed scientific and engineering structures to face progress, in my conviction, an external foothold, one that lies outside them, is also needed. I see it in the scientific and technical societies of the country. The task of scientific and technical societies is to create an atmosphere of competitiveness, the free struggle of ideas, and their real rivalry. To inject fresh blood of creativity into scientific and technical progress.

[Question] But will scientific and technical societies withstand competition? They do not have resources, equipment, or staffs....

[Answer] Well then, let us examine together the possibilities of public principles.

I hope you will agree that in the traditions of our community, and first and foremost the highly skilled community, its own initiatives have to be advanced. The task is to organize their interested and competent discussion and, of course, to aid the implementation of the best suggestions. Such, in my view, is the truly partnership role with respect to state institutes of the community in society, in which there should be more and more socialism and democracy and less and less...dependence on others.

This requires of scientific and technical societies the increase of the influence on the improvement of the conditions of creative work beyond them as well. Work, which increases the very prestige of engineers and other specialists, the reduction to naught of administration by mere decree, and the creation of an alternative to it.

For this we are capable of creating in scientific and technical societies conditions which enable authors to appeal to any council of the scientific and technical society. It is also easy to organize the registration of innovative suggestions, which legally guarantees the assignment of authorship. We are also entirely capable of establishing a specialized data bank and of setting up the depositing of the corresponding documentation or articles. And of revising even the procedure of the publication of a specific portion of them in publications of the scientific and technical societies.

While the creation, with the participation of the authors, of temporary problem formations for the most promising ideas is quite possible.

Of course, the most significant ideas, programs, and plans of temporary creative collectives (VTK's) need preliminary protection, which scientific and technical societies are capable of providing with the participation of both clients and independent experts.

[Question] Tell me, on what is your conviction that enterprising suggestions and developments, which are often rejected "from the threshold" outside scientific and technical societies, within societies will more easily acquire support and, having received it, will more easily be accepted in both the established official scientific engineering structures and the sectors of the national economy, based?

[Answer] My conviction is based if only on the fact that in our societies the USSR Academy of Sciences alone is represented by a fourth of its full members and a third of the corresponding members, by hundreds of doctors and thousands of candidates of sciences, by a large number of engineers and other leading specialists of the national economy....

[Question] But excuse me, these authoritative specialists are the same people, to whom under work conditions conservative prejudice with respect to innovations is by no means alien. They are from the same "institute framework," which at the beginning of our conversation you severely criticized so convincingly!

[Answer] Indeed, they are from there. But, first, they are of a different stamp than their colleagues. A different one by virtue of the fact that they have undertaken professional work on a public basis and have devoted their free time to it.

On the other hand, the same person at times behaves differently under work and nonwork conditions. Outside the official hierarchy, not bound by its aims and thematic and other plans, he, if it can be stated this way, "is not at all like his official self." It is safe to assert that the specialist, who is a member of a scientific and technical society, is receptive to a greater degree to nonstandard solutions and circumstances. He simply has greater readiness for alternative situations and a larger number of degrees of freedom.

[Question] Tell me, what advantages do the temporary creative collectives, which are already operating within scientific and technical societies, have?

[Answer] As the experience of their work, for example, in Kharkov or Saratov showed, they afford the specialist the opportunity to confirm himself in the most attractive manner for a creative person—by the realization of what has been contemplated. Under work conditions, and then not every time, the leaders (moreover, only the

formal leaders) of one project or another and their closest subordinates can take such a position. Thus, the status of the overwhelming majority is not that far from "blind execution."

The situation changes abruptly, when a collective is created for a specific task and is formed on the basis of the preferential consideration of the informal, essential qualities of each individual. Competence and professionalism go without saying. But first of all an innovative temperament, the originality of thinking, and the ability to focus it on the accomplishment of a task, in which a person has given voluntary consent to participate. Any high-class specialist regardless of his official and departmental affiliation can be brought into such an informal collective. Such is the real basis of the effectiveness of temporary creative collectives. Here, too, are the advantages for you of the lack by scientific and technical societies of stable manning tables for specialists.

As you see, informal public problem formations have quite sufficient chances to prove to be most competent, most efficient, and most competitive. Such experience of temporary creative collectives was recently endorsed by the All-Union Central Council of Trade Unions, which recommended its dissemination everywhere.

In temporary creative collectives it is easiest of all to create an atmosphere of intellectual comfort. And it is a matter not only of psychological compatibility, for which the fact that people come together for the same motive—to solve a problem that fascinates them—is conducive. Here there are no obstacles for the development in each person of the sense of indispensability, in other words, the same leadership in his own area of the program (or project) and, hence, responsibility for the effectiveness of his personal contribution to the collective efforts. Moreover, responsibility, which is not imposed administratively, but which is professed.

The management of collectives of this sort is also comparatively easier. It is based not on the official given "table of ranks." Its support is the efficient division of labor and powers and the sense of the real limits of one's own competence and one's own creative potentials, which are realized by each participant. The understanding of the fact that anyone bears a completely specific load, but beyond it already needs the support of others. On such a basis smooth work itself guarantees itself.

Having acquired a taste for it, a person can also join subsequently other problem formations of scientific and technical societies. One time as the performer of a specific task, another time as an expert, and at one time also as a leader. These changes are the best medicine against the stereotyping of thinking and against occupational aging. Against what K. Marx called "occupational cretinism." Such variability enriches the specialist by the change of roles and themes and by the diversity of lively contacts with a broadening group of colleagues. All this enriches free time and from it translates the precious

spirit of enthusiasm and the constant aspiration for the refreshing of knowledge and the results of one's own creative efforts to the official job.

[Question] It is easy to believe in the productivity of the work of such collectives. But then the experts and sectorial council of a scientific and technical society approved of some program or developed project. Now it can be fully implemented only by the forces of, let us assume, one, or else several sectors. But who will defend it at this "crossroad," which for the present lends itself least to introduction?

[Answer] The Presidium of the All-Union Council of Scientific and Technical Societies should take up the matter. We have outlets to the academic, sectorial, and government levels.

[Question] Certainly, the system proposed by you turns out to be very attractive for innovators and innovation. It is both intellectually comfortable and receptive to innovations. It risks becoming directly the most prestigious and attractive one. But will it not begin to "drain" the best personnel from the established scientific and engineering structures?

[Answer] Such a question exists. But the managers of permanent scientific and engineering collectives should organize the work of specialists in a manner that conforms to the spirit of the times. If they value a worker, they will have to create for him conditions that are most favorable for productive work.

[Question] Incidentally, what do you think, how much can the members of scientific and technical societies, who perform innovative research and development, earn?

[Answer] I believe as much as they earn. No, you are not, by all means, going to stop at that. Here unambiguous explanations are needed.

Whatever the people, who work in the formations of scientific and technical societies, incidentally, just as everywhere, do, with their own hands they create new use value. There is no fundamental difficulty in its evaluation. So this value is also subject to distribution.

But clear standards are needed for this. By means of them a certain share has to be channeled into the budget of the scientific and technical society, another share has to be allotted for covering the expenses of the temporary collective of developers itself, the remainder has to be channeled, with a single restriction, in accordance with the coefficient of labor participation, into the hands of each cop performer of the project.

Under such conditions they have only one chance to earn a lot: to implement a development of very great socio-economic value. But then any wage that conforms to it, given the mentioned restrictions, is above suspicion and, on the contrary, is respectable.

[Question] Well then, everything is clear, it would seem, with personnel, financial, and other questions. But what is one to do with material resources, equipment, and, for example, computer supply?

[Answer] Given the contractual relations of temporary collectives with enterprises and organizations, which, incidentally, are established by the councils of scientific and technical societies as legal entities, insurmountable difficulties with respect to this question, I believe, are not foreseen.

The client nearly every time can find monetary and material resources for a contractual theme (the result will make up for them). But computer time, equipment, all right, it is possible to book it for the hours of kinds of "third shifts." For the members of scientific and technical societies can work only during the hours of free time.

[Question] Here you noted that the result obtained by the client will make up for the consumed resources. But if one or another problem formation of a scientific and technical society itself will not obtain it, what then?

[Answer] It is easiest of all to reduce the degree of such a risk to a minimum, by establishing for especially critical themes two or several collectives which compete with each other. I will recall: all the best models of domestic equipment, for example, aviation equipment, on the eve of the last war were developed precisely on a competitive basis, incidentally, between the most celebrated design bureaus: those of Tupolev and Beriyev, Yakovlev and Lavochkin, Petlyakov, Ilyushin, and others.

Then it was shown to someone that a univariant nature of development is more economical, since it makes it possible to concentrate resources and assets in one direction, as it became fashionable to say, "not to disperse them on duplication."

Such a situation bureaucratized the choice of the best versions of the equipment being developed. It deprived the client-users of the opportunity on the basis of practical comparison and trial operation to make acceptable decisions for them. To this day they are also made at times in accordance with documents, at the predesign stage, under office conditions. By rejecting alternatives, the mass production of some one type of equipment is predetermined from the start.

Thus the conditions are created for the monopolization of the position of often not the most fruitful scientific schools and design organizations. And then they reject the best achievements of domestic science and engineering practice. Moreover, at times they also reject

them...abroad. A "classical" example of this level is the fact that the continuous casting of steel and oxygen-converter technology, which were developed for the first time precisely in our country, became widespread abroad, while domestic metallurgy for the most part simply remained at the obsolete "open hearth positions."

It is a different matter when they design, even on different principles and effects, several versions of new equipment. Here only one strategic restriction is needed: the minimum resource-output ratio, in case of which the functional possibilities needed by the user are achievable.

On such a basis five different designs, say, should also be developed by the forces of five different collectives. Having tested the prototypes under extreme conditions, two should be rejected. On the basis of the three remaining ones three trial runs should be produced. And in trial regular operation the single best version for the client should be chosen. It should also be turned over for mass production. Of course, the material "interest" of the winners should be completely satisfied.

Not only regular design bureaus and scientific research institutes and their experimental and sectorial plants, but also the temporary collectives of scientific and technical societies are entirely capable of taking part in such "competitive selection."

All these are also kinds of satellites of democratization. It should also appear in the struggle of various scientific and technical ideas. Not all of them can be developed and tested directly in the established scientific and technical structures and in operating production. Scientific and technical societies as a voluntary service are capable of developing for them an actively working testing ground with skilled evaluation that is independent of departments.

[Question] You have indicated an impressive prospect. However, it requires itself both careful design development and complex practice construction. How is all this to be done?

[Answer] For this we, obviously, will have to form, this time directly under the Presidium of the All-Union Council of Scientific and Technical Societies, a specialized temporary problem formation made up of the most competent representatives of various fields of knowledge, first of all sociology, psychology, heuristics, and economics.

On the basis of the legal basis, which is being modernized in the country, they have to draft an organizational plan. And to defend it once again in the Presidium of the All-Union Council of Scientific and Technical Societies, with the participation of independent experts. Thus we will succeed most rapidly in obtaining a streamlined method of the radical restructuring of the system of

scientific and technical societies. Of course, with allowance made for the opinions of the scientific and engineering community on the conception which you and I have now discussed. The forthcoming 7th All-Union Congress and the months remaining until it are the most suitable time for this.

[Question] Will the prospect revealed by you receive support among the members of the scientific and technical societies and in their organizations?

[Answer] It already is. The opinion of the necessity of establishing a creative union of the scientific and technical intelligentsia, worker and kolkhoz innovators, and enthusiasts of scientific and technical progress is being unanimously advanced at the conferences and congresses of scientific and technical societies, which are now being held, on the threshold of the 7th congress of our society. It is a question of the formation of a union of scientific and technical societies of the USSR, the doors of which should be opened wide to all associations of specialists of such a type, which operate in the sphere of science and technology. Their aspiration to be united in a single union is being felt very keenly. The USSR Philosophical Society, in particular, has displayed initiative on joining this union.

Precisely such a union will also be capable of being the basis of the public system of the management of scientific and technical program. Precisely this union will also become a powerful institution of genuine democratization in this area.

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Growing Role of Science in Industry under Socialism Traced

*Moscow EKONOMICHESKAYA GAZETA in Russian
No 41, Oct 87 p 10*

[Article by V. Kushlin, doctor of economic sciences: "Socialism and Scientific and Technical Progress"]

[Text] Socialism is the first society in the history of mankind to be built from the very beginning on a scientific foundation. The revolutionary outburst of the masses leading to October 1917 and the establishment of a qualitatively new social system on a significant portion of the earth was prepared by the creative and practical work of the party of communists and the great scientific discoveries of K. Marx, F. Engels and V.I. Lenin. From the first days of existence of the Soviet state, orientation towards science and the most advanced equipment became an inviolable rule of economic policy. In the Program of the Russian Communist Party (of Bolsheviks) adopted in 1919, it was emphasized that the party was striving for the "creation of the most favorable conditions of scientific work in its relation to boosting the country's productive forces."

That policy was determinedly developed and put into effect by the party. And to a large extent because of this, our country created in a historically short period of time a developed industrial base in all sectors of the national economy, withstood and came out victorious in a military testing without precedent and developed productive forces to the level of the most powerful countries of the world.

The accelerated development of science and technology is organically inherent in the socialist economy. Socialism and science are indivisible. It would be an error to attribute major defects at the junction of the '70s and '80s and the marked lag behind developed capitalist countries in a number of directions of scientific and technical progress to defects of the actual socialist system. They are the result of concrete forms of implementation of policy, the consequence of unfavorable subjective circumstances in guidance of the country and underestimation of the role of active development of socialist production relationships.

Of late, works have appeared in the press on a strong wave of criticism of defects in the recent past (and occupied rather offensive positions) in which the facts of the last seven decades are drawn up quite selectively and tendentiously. Their meaning boils down to a denial or ignoring of positive results in the past of development of productive forces stimulated by specific socialist social and economic relationships. According to the logic of these assertions, the result frequently is that in our socialist history, except for NEP, nothing worthy of today's consideration apparently has occurred. But, of course, we can in no way agree with this.

Accomplishment of the GOELRO plan; erection in the period of the early 5-year plans of an entire gamut of enterprises at the highest technical level for the period in record times according to today's standards of developed countries; setting up of perfectly new sectors of production for the country of complex equipment (aviation, motor-vehicle building, the tank industry, tractor building, atomic energy, construction of submarines, rocket building); accomplishment of a number of very important plans (for example, the plan of going into space) and much else are not in any way exceptions but law-conforming milestones in the history of the Land of the Soviets, evidence of the tremendous creative power of the socialist system. Could it be said that economists and social scientists have deeply and thoroughly studied the mechanism of implementing such measures? Apparently not. Yet this could provide much that is beneficial not only for the theory but also for the practice of today's restructuring of economic management.

Boosting the Payback of Science

The radical restructuring of the economic mechanism and management of the national economy carried out in the country in conformity with the directives of the June (1987) Plenum of the CPSU Central Committee is

bound to open up freedom of initiative and creativity of the masses and union of the most advanced scientific thought with the practical work of revolutionary transformation in production and life.

The level of development and effectiveness of scientific and technical progress (STP) depends on the interrelationship of three global factors: (1) the potential of science and the stock of ideas, discoveries and developments; (2) the structure and urgency of the needs of production and society; (3) the resource base of scientific and technical development.

An overemphasis on any one of these factors (for example, potentials of science, as happens most frequently) without an adequate accounting of other factors (real resource capabilities in a specific period and place as well as measures of actual need for the use of a new product) is a typical reason for an unsatisfactory rate of scientific and technical progress. The interaction of the mentioned factors should occur in such a way that the potential of the achievements of science constantly meshes with the structure of present and future needs of society and on this basis through comparative measurement with resource capabilities in a planned period a selection is made of the most necessary and effective programs and measures of scientific and technical progress.

The prevailing thesis that science today is greatly ahead of production, having accumulated an excess reserve of ideas and developments, is far from accurate. The point should probably not be made in principle that all scientific and technical developments are immediately and fully realized. There is no wastefulness in some "overproduction" of scientific developments. It does not run counter to the need of maximal raising of the performance of science. A surplus of ideas and proposals is vitally necessary in the final analysis for the creation of effective developments and innovations. Without their optimal surplus no basis will exist for selection of solutions and there will be no intensification of the economy. Furthermore, we know that expenditures on stages of research are at the very least one-tenth of subsequent outlays on the introduction of an innovation. The fact that "overproduction" of ideas even in the sense of outright economy of expenditures on scientific and technical progress is, as they say, a game which is worth the candle. But serious assessments of the present state of scientific research and technical developments in our country show that this sphere does not exceed the resources of production and in many respects lags behind the pressing and future needs of acceleration of social and economic development.

Work in the sphere of science in the USSR in the postwar period was characterized by a stable high rate of growth of investments of money in it. The relative share of resources allocated by the country increased significantly

(especially after 1960). In terms of size of expenditures on science vis-a-vis national income, the USSR in the '70s could already be compared to the United States.

The significant absolute and relative growth of the number of scientific workers and of investment in science occurring in the '60s and '70s did not result, however, in adequately raising its contribution to the national economy. The deterioration of the economic situation in the country and slowing down of growth of efficiency is connected with these and subsequent periods. As for changes in the quality of the work results of scientific and technical organizations, it especially cannot withstand criticism. Among the scientific-research institutes and design bureaus of 24 industrial ministries in the course of the last 10-12 years, on the average less than one-tenth of the share of all completed themes may be considered above the level of the best domestic and foreign developments. In addition, this indicator shows a tendency to becoming smaller. Only one-third of all introduced developments of these collectives relating to new equipment contained, for example, one invention.

Because of the need of sharply increasing the influence of science on raising the technical level and efficiency of production, the party is implementing at the present time a complex of measures on organically including work of scientific and technical organizations in the activities of associations and enterprises. The network of scientific-production associations is being expanded and many previously independent scientific organizations and design bureaus are being turned over to production associations and enterprises, while the experimental and production base of well-proved scientific-research institutes is being bolstered. Organizations of a new type—MNTK [international scientific and technical committees (?)], engineering centers and the like—are being created. In the recently enacted decree of the CPSU Central Committee and the USSR Council of Ministers "On Transfer of Scientific and Technical Organizations to Full Cost Accounting and Self-Financing,"¹ it is planned to change over in the immediate future from financing maintenance of scientific organizations to targeted financing of specific work on the basis of contracts with clients interested in this work.

The question of transferring scientific and technical organizations to a system of work meeting the requirements of the economic reform being implemented in the country naturally should not be resolved in one fell swoop. In each sector and organization, careful preparatory work is needed that would take into consideration the specific traits of spheres of activity and the character of the problems.

Commodities of a Special Kind

It would be simplistic to mechanically disseminate the principles of cost-accounting self-support to theoretical, basic science. Both world and domestic experience shows that the attraction of profitable developments in

this sphere inevitably leads to insignificant topics and could eventually bring on a lag lasting decades in the strategically important directions of scientific and technical progress.

At the USSR Academy of Sciences, which possesses the chief concentration of basic research in the country, the share of economic-contract topics in the total volume of work rose from 7 percent in the 9th Five-Year Plan (1971-1975) to 21 percent during 1981-1985. According to plan estimates for the current 5-year period, it should drop roughly to 14 percent, which, it must be assumed, is connected with attempts to bolster the role of academic scientific institutions in the creation of a stock of basic developments able to exert subsequently a revolutionary impact on the national economy. Therefore, in academic and even in VUZ scientific organizations, it would be useful to disseminate cost-accounting conditions clearly on only that portion of work which is directly connected to economic-contract topics.

It is important to carry out the planned expansion of product and money relationships in the operation of scientific institutions and in their relations with enterprises and organizations with an understanding of all the specific factors of this sphere. In evaluating scientific and technical products of scientific organizations as commodities, one must not take the route of mechanical analogies with material production. These are after all products of a special order. In distinction to ordinary material goods, scientific products do not disappear in the course of their use. Their reproduction is not required for use at another place.

The practice of cost-accounting contract relationships at scientific-research institutions in past years has provided many examples where the high earning power of an organization was achieved through the repeated sale of one and the same development to various clients (disguised to look new on the basis of purely external features). Individual VUZ subdivisions became particularly good at this. Some of them learned, on creating one or two "profitable" developments, how to then live for many years without developing anything new. Such an occurrence must not be allowed to assume a mass character with the all-round transition of science to cost accounting.

It is important to establish a procedure of selling scientific products wherein only the first sale of a development to a customer is done at its full cost. All subsequent sales of the development should definitely be made within the country on the condition of dissemination of documentation, and only services for attachment to place, consulting or adjusting would be paid additionally. The personal interest of scientific-research institutes and design bureaus in broader (repeated) introduction of developments clearly needs to be created

primarily through the introduction of a fair mechanism of deductions into their funds as a part of the economic effect from additional profit secured by users of the development.

The Engineering Corps

In the light of the requirements of the 27th CPSU Congress, at the present time all sectors and elements of the national economy face exceptionally difficult tasks with respect to cardinal raising the technical level of production. Even in the course of the 12th Five-Year Plan the use of basic technologies should be expanded 1.5- to twofold and attention sharply increased on the development and use of basically new technologies promising multiple growth of labor productivity and a marked rise in the effectiveness of use of capital resources, raw and other materials and power. They cannot be solved without making science more active in its interaction with enterprises. But at the same time, it is extremely important to raise the tone of creative work throughout all production.

V.I. Lenin noted that the "intelligence of tens of millions of creative people makes something immeasurably higher than the greatest and most gifted foresight."

A decisive turning point must occur in the engineering corps, especially in the sphere of design of equipment and development of technologies. The number of engineers in the USSR already exceeds 6 million persons, which is 3.2-fold greater than in the United States. But "many" here does not necessarily mean "good." The predominant part of these workers performs functions by no means on the engineering level. How to overcome the devaluation of engineering activity and how to direct it to real creative work and invention are central questions in emergence of equipment and technology to the highest world level.

The solutions adopted in recent years while taking into account the experiment on changing the wage system of scientific workers, designers and technologists being conducted in Leningrad and other cities provides broad opportunities for the primary reward of those who are capable and went to work and create effectively and make it possible to release scientific-engineering units from the ballast. This process, however, has been developing slowly so far. There are many cases where the transition of organizations to the new wage system is carried out formally. At the same time, the ability to fully use the new procedure of labor remuneration of designers, technologists and other creators of new equipment can serve as a criterion of the ability of a collective to really work on restructuring as outlined by the party.

One of the most important conditions of raising the technical and economic level of production involves the serious restructuring of investment policy in all sectors and enterprises. Unfortunately, numerous facts, particularly the expert assessments of USSR Stroybank of a

large group of construction and modernization plans of enterprises recently reviewed and reapproved by ministries and departments show that the attitude toward the investment process is still changing very slowly. The overwhelming majority of checked plans which secured new approval from ministries and departments cannot lay claim to the highest world achievements.

Under the conditions of transfer of economic units to self-financing, both for economic science and for the practical work of management, the validation and introduction of an effective mechanism prompting ministries, associations and enterprises to organically combine the investment process with scientific and technical progress in coordination with the long-range program of social and economic development is becoming the number one task.

The transition to forms of production renewal adequate to the tasks of comprehensive intensification of production also is of special importance. The main thing here is to provide in each economic unit a trajectory for the quickest possible materialization of capital investment in objects of a high technical and economical level (regardless of how small the volume of investment might be at the disposal of the given unit).

The whole experience of the Land of the Soviets, with its achievements and costs, attests to the great internal resources of the socialist system for highly effective scientific and technical development. At the present critical stage, it is important not to be diverted from the path by emotional negations of the past and by designing of purely speculative schemes of economic management, but as completely and as comprehensively as possible to comprehend the real practice of acceleration of scientific and technical progress while taking into consideration the advantages and possibilities of socialism.

Footnote

1. The full text of the decree will be published in *Ekonomicheskaya gazeta*.

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Restructuring, Acceleration of Basic Research
18140065 Moscow IZVESTIYA in Russian 17 Nov 87
p 2

[Interview with Academician Zhores Ivanovich Alferov, director of the Physical Technical Institute imeni A.F. Ioffe of the USSR Academy of Sciences and winner of the Lenin and State Prizes, by *Izvestiya* correspondents V. Nevelskiy and K. Smirnov (Leningrad): "What Is Was Also Necessary to Prove. Basic Research and Restructuring"; date and occasion not given; first paragraph is *Izvestiya* introduction]

[Text] It was possible to launch a satellite back during the life of Newton. Theoretically. In practice several centuries were needed for this. While the distance

between the theoretical idea of semiconductors and its implementation was covered in just a few years. The acceleration of the effect of basic knowledge on the economy and on all our life is a law which can be seen, as they say, with the naked eye. So why are considerable inertial forces opposing this law? *Izvestiya* correspondents speak about this with Academician Zh.I. Alferov, director of the Physical Technical Institute imeni A.F. Ioffe of the USSR Academy of Sciences and winner of the Lenin and State Prizes.

[Question] Zhores Ivanovich, the intensification of basic research is now being specified as an important principle of the restructuring of science. But what is the novelty here? For such research has entailed for a long time profound, truly revolutionary changes in science and technology. This is an axiom!

[Answer] Much of what was yesterday accepted on faith, today is undergoing checking by actual practice and requires proof by deed. Incidentally, Academician Lev Andreyevich Artsimovich long before our days appealed to scientists not to idolize basic science and not to turn it into a truth that does not require proofs. Carrying his idea to the point of a paradox, he said: it is very easy to define the difference between applied and basic research, since the former will find application, while the latter never will. If one is to draw the serious meaning from this joke, it must be added: never—without the practical efforts of people and organizations, without their proper understanding of not only the theoretical significance of basic knowledge, but also of how to apply this knowledge in practice in order to achieve the most appreciable return; how to treat in general this "bizarre plant," so that its roots would branch and go deep, while the top would become higher and higher and thicker and thicker.

It is impossible to accomplish the tasks, which were posed by the 27th party congress, without science. But it is a question not of science "in general," but first of all of research and results, which will make it possible to achieve a revolutionary leap in the development of society. Such a thing will become possible only on the condition that the breakthroughs of science in the future are in close unity with the modernized economic mechanism. For scientific and technical progress in the country was also hindered because it was not fundamentally included in economic processes.

[Question] What specified do you have in mind when you speak of the efforts of people and organizations and of a change of the attitude toward basic science?

[Answer] First, it is necessary to firmly establish in public consciousness, first of all in the consciousness of the managers of the economy and science itself, the proper understanding of the role of its most far-sighted and "potent" ideas.

Second, to create all the conditions for extensive and free research. The primary one of them is a powerful pilot experimental base. Without it there is no real science.

Third, in the main basic directions it is necessary to support the relay race of research generations and, relying on the best traditions of Soviet science, to form qualitatively new detachments of scientists, who will be able to achieve the world level and surpass it along the entire front of research.

[Question] The proper understanding of the role of basic science.... Do people in our country really understand it incorrectly?

[Answer] Yes, in many respect this is so. And to this day, for example, inspectors come to our institute and begin trying to find out: "And what is the economic efficiency of your work? How many rubles of profit are you providing per ruble of expenditures?" How is one to explain to them that, let us suppose, the first semiconductor laser, which operated continuously at room temperature, opened the way to the use of fiber optic communications lines? That the development of an entirely new sector of industry is decisive here? That we are obtaining communications lines and information systems, which previously did not exist?

The efficiency of basic research is measured by the fact that it gives rise to new directions in science, while they in turn give rise to the latest directions in technology.

That is precisely how, incidentally, the question is posed in the recently adopted decree of the CPSU Central Committee and the USSR Council of Ministers "On the Changeover of Scientific Organizations to Full Cost Accounting and Self-Financing": "Academic and VUZ scientific organizations are obliged to focus basic attention on the utmost development of basic research in the most important directions of the natural, technical, and social sciences as the basis for the steady movement of the country along the path of progress."

[Question] But what are the criteria, in accordance with which it is possible to evaluate basic science under the conditions, when an economic mechanism, which is cost accounting in its essence, is being formed?

[Answer] The only correct criterion is the conformity to the world level and its exceeding. Make such a rigid claim, and you will find in the country many academic institutes, at which they pretend that they are engaged in serious work, but when it comes to the test they are simply idling away their time. Of course, not free of charge. Close such "directions," laboratories, institutes—there is a saving for you, there is cost accounting for you!

It is necessary to compare the level of work in the country and abroad every 5-10 years. Skilled commissions, on which leading scientists and specialists could be

included, are capable of this. Moreover, they should evaluate a wide range of research, key directions, and "points of growth." For we learned long ago to achieve world level or to lead it in tiny areas, in some details, although these details mean nothing for science as a whole.

Not such tiny areas, but the timely evaluation—and in state orders to institutes as well—of the "points of growth" in science is important. For it is necessary to establish in advance strong, fundamental bridgeheads in its promising directions.

Take the present sensation in physics over superconductivity, which they have begun to achieve at the temperature of liquid nitrogen. It is not necessary to be a specialist to understand what practical applications the new discovery promises. Does it mean forward, hurrah, how do you do? The whole point is that it does not. After the fireworks of the sensational results, which were obtained in various countries, a large number of "whys" arose. And the problem already today is not so much in what laboratory the next result will be recorded, as who will be the first to answer exhaustively all the "whys" and to provide a scientific concept, in which the experimental data will be crystallized and which will pave the way to practice and to the development of thus far unprecedented superconducting materials for industry.

Concepts that revolutionize science itself are always behind technologies that revolutionize production. But they can be formed only in large research collectives which work at the world level. The very existence of such academic centers as the Physics Institute, the Institute of Chemical Physics, and the Institute of General Physics of the USSR Academy of Sciences, our Physical Technical Institute, and a number of other organizations would not make sense, if they trudged along in the wagon of modern science.

[Question] The point of view that we are lagging behind foreign countries in technology, but in basic research are on equal terms with them or are even ahead, has become quite widespread. How does this fit with your assertion that without a powerful pilot experimental base there is no real science?

[Answer] Before us is one of the chimeras that live in our consciousness, although they lost long ago any real basis. I have repeatedly disputed this point of view, including at the general assemblies of our department of the USSR Academy of Sciences.

I will cite an example from a field close to me, for the state of which I myself also bear a certain degree of responsibility. The idea of semiconductor lasers was expressed for the first time by Soviet scientists, but it was implemented abroad. This idea acquired a second life in lasers based on heterojunctions. Here there are both our idea and its experimental confirmation. We were the first to understand the importance of heterostructures

for semiconductor electronics. But, once again, practical scientific development proceeded at a leading pace not in our country, but in the West, where work is being performed by many laboratories on a broad research base.

Today semiconductor lasers are video and audio players, the memory of computers, laser printers, and much more, which have already been assimilated by foreign firms. But we let the moment pass. Now we have to make up for lost time.

Why am I saying this? In modern science it is important not only to say "but." After the first "why" a large number of others arise. The answer to them also signifies the thorough scientific elaboration of the problem. Without a significant experimental base it is often impossible to get such an answer. In other words, the truth is such: whoever lags in technology will also not forge ahead in science. For today science itself is also technologically effective.

[Question] Is this technological effectiveness always useful to it? The urgency of the problem of introduction had the result that large academic centers are striving to establish their own "small industry," while the most advanced sectors are striving to set up, in essence, their own "academies." How justified is this trend?

[Answer]

If by "small industry" one understands attempts of academic science to assume the bringing of developments all but up to industrial series, I see nothing good in this. This inevitably decreases the class, the level of research. Sectors also do not need their own academies. Subordination to departments with their purely directive style of management of science did not benefit even such industrial institutes as the State Optics Institute or the All-Union Electrical Engineering Institute, which have been engaging a long time in basic research.

The technological effectiveness of science is directly connected with the state of its pilot experimental base. Not simply different instruments than before are needed for conducting some modern experiments. Completely different institutes, which technically and technologically have been organized differently, are needed.

Serious steps are now being taken in the country for the development of scientific instrument making. But it must be stated frankly that this is also occurring with a great delay, because for long years the psychology of doing the utmost to get "currency" equipment prevailed over us. We did not develop our own base. Now we have to pay for this with a lag in science itself.

[Question] Does it not seem to you that the development of the pilot experimental base was also hindered by certain notions about economics, which recently still dominated? When alternative projects and the rivalry of

different versions of solutions (and the financing for them) seemed an excess? When one scientific school, one institute, or even a project had exclusive right to the truth?

[Answer] Yes, such a thing existed. But in truth the miser pays. Only not twice, but a thousand times.

It is a sign of the times: now the insight, the understanding that expenditures are inevitable, if we do not want to find ourselves all the time in the position of people trying to catch up, has finally come. According to a utilitarian calculation two collectives, which are dealing with the same problem, but are taking different paths, cost more than one. But in practice the most far-sighted organizers of research always acted that way. The monopoly position of some individual scientific collectives turned into immeasurably greater losses for society.

And here is what else it is necessary to remember: the results of basic research are not new instruments (even if they are developed here), but, by their nature, the introduction of new thinking. Indeed, the first masers in the world and the first Soviet lasers came from the laboratories of Basov and Prokhorov. But they played an even greater role, having become a center of ideas, which introduced a new scientific concept into the consciousness of scientists and engineers.

It is extremely important that scientific centers would become generators of ideas and would attract newer and newer like-minded people. But what do we see in life? Large academic collectives are hardly training scientists for sectorial science. But meanwhile at American universities, which are equivalent to our leading academic institutes, research personnel for industry are being intensively formed. This is a little more important than the simple introduction of the latest equipment.

The Presidium of the USSR Academy of Sciences in union with ministries should train in good time at its institutes and laboratories researchers in the most promising directions. Moreover, extensively, on the scale of the country. This will also be the real introduction of new thinking and new scientific ideology, for researchers, who have been trained at leading scientific schools, will become the best vehicles of their innovative ideas.

Science needs a more democratic mechanism of the discussion and support of new ideas. Therefore, in the overwhelming majority research should be open. I am not taking the special cases of defense development or technological secrets, which exist in every state. It is a question of bureaucratic secrecy, of open secrets.

Scientific ideas should be published and discussed and cause a chain reaction of new ideas. The more of them there are, the more useful they are for the country and the higher the level of domestic science as a whole is.

Today it is necessary first of all to speak of the responsibility of scientists themselves. They are the first to notice what no one else yet sees. It is bad when their social vision weakens, when they do not want to assume responsibility and do not desire to take risks. Risk taking is a noble deed. Hear: noble. Something connected with honor. Science is strong in its unexpectedness and indefiniteness. Without risk taking, which relies on the foresight of knowledge, you will not do anything serious in it.

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Structure of Research Laboratories at Power Engineering Institute

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[Article by Doctor of Technical Sciences Ye.V. Ametistov and Candidate of Physical Mathematical Sciences V.V. Blazhenkov under the rubric "Scientific and Technical Progress: Problems of Acceleration": "The Experience of the Organization of Scientific Research Laboratories at the Moscow Institute of Power Engineering"]

[Text] The Moscow Institute of Power Engineering is one of the largest educational scientific centers of the country. In addition to the training of many thousands of students scientific research is being conducted here in various fields of electric power and heat power engineering, electrical engineering, thermal physics and electrophysics, computer technology, and so on.

One of the scientific and technical directions, which have been developed especially actively at the Moscow Institute of Power Engineering in recent years, is the formulation of the scientific and engineering principles of the monodispersion of the most diverse substances, which is being carried out at the scientific research laboratory (NIL) of the Chair of Cryogenic Engineering.

Readers have been able to familiarize themselves with the problems, which are being solved within this direction, in the article of Corresponding Member of the USSR Academy of Sciences V.A. Grigoryev, scientific supervisor of the laboratory, which was published in this journal.¹ The successful development of the direction, which involved the solution of a large number of current scientific and technical problems, required the concentration of the efforts of a quite large scientific collective, which united specialists of various occupations. It should be noted that the very posing of the task presumes the conducting of in-depth theoretical and experimental research in the field of thermal physics, electrodynamics and hydrodynamics, and other fields and the accomplishment of the entire set of engineering and technical tasks which are connected with this problem. The development and introduction of prototypes of the devised systems in various sectors of the national economy should be the result of this work.

The results and problems of the experience of the development at the higher educational institution of work on the urgent comprehensive theme are discussed below on the basis of the example of the laboratory of physical technical problems of monodispersed systems (FTPMS).

The laboratory originated in the Chair of Cryogenic Engineering of the Moscow Institute of Power Engineering in 1981 and was finally formed by 1983, when VUZ science changed over to the structure of a scientific research institute and research laboratories were formed under the chairs. Including the instructors who combine jobs, the laboratory numbers about 50 people, the annual amount of economic contractual scientific research work comes to 110,000 rubles and that of state budget scientific research work comes to 150,000 rubles. The structural diagram of the scientific research laboratory illustrates the comprehensive nature of the problems being solved.

It is far from easy to unite by one theme specialists of different types within an academic institute, and especially a chair of a higher educational institution, which has, as is known, its own specific nature. Chair scientific research laboratories, even at such a polytechnical higher educational institution as the Moscow Institute of Power Engineering, have, as a rule, a quite narrow orientation and in the overwhelming majority of cases unite scientific associates of one or several related directions. The problem and sectorial laboratories, which exist at chairs, are not an exception.

A distinctive feature of the scientific research laboratory of cryogenic technology is the composition of its collective. Specialists in the field of cryogenics, theoretical and experimental physicists, cryophysicists and thermal physicists, specialists in the field of electronics, computers, and the automation of the experiment, and programmers are fruitfully cooperating within a single theme. They are all working, according to current terminology, on "a single contract."

The fact that in one scientific research laboratory, within a single theme it was possible to unite representatives of not only different specialties, but also various scientific schools, is of no small importance for the successful creative work of the laboratory. Contrary to the practice, which has taken root at polytechnical higher educational institutions which have become accustomed to managing in everything with their own personnel, along with graduates of the Moscow Institute of Power Engineering, specialists, who received training at Moscow State University, the Moscow Institute of Engineering Physics, the Moscow Physical Technical Institute, and other higher educational institutions of the country and attended schools of academic and sectorial scientific research institutes, were hired for work at the scientific research laboratory of monodispersed systems. Such a "transfusion of fresh blood" into the body of the scientific collective, in our opinion, is one of the reasons for the fruitful work of this laboratory.

Naturally, the question arises: How was it possible to interest and unite specialists in a collective that is so unusual for existing practice? In our opinion, there are several components here. First of all this is the creative atmosphere of the laboratory, which is governed by the high scientific level of research and by the scale and comprehensiveness of the problems that the collective is working on. This is the real prospect for each of the associates for professional and scientific advancement, including by the preparation of candidate (through graduate studies of the chairs of the Moscow Institute of Power Engineering) and doctoral dissertations. Of course, the principles of the moral and material stimulation of the workers of the scientific research laboratory play not the last role.

Along with the bonuses of the institute for the high-quality performance of economic contractual and state budget scientific research work, as well as the corresponding bonuses of the USSR Ministry of Higher and Secondary Specialized Education the associates of the laboratory regularly receive bonuses directly from the fund of enterprises, by actively participating in the work in accordance with contracts on the transfer of scientific and technical achievements. The existing reserve of theoretical and applied developments is enabling the laboratory to perform above-plan scientific research work: in a quite short time (in 6 months or a year) a specific development, which yields a real economic impact, is completed and turned over to the client. The performance of such work makes it possible—even within the system of the remuneration of labor, which exists today at the higher educational institution—to stimulate materially the creative nature of the activity of scientific associates. The fulfillment of two or three contracts on the transfer of scientific and technical achievements in a year has become for the scientific research laboratory a kind of norm, while the two or three monthly salaries a year, which are received as bonuses by the most productively working associates of the laboratory, are a quite clear example of such material stimulation.

A few words about the system of collective self-management, which has formed in the laboratory. The council of the laboratory, which is elected in accordance with the Law on Labor Collectives, consists of the five most competent associates, and plays a very noticeable role in its daily life, has been working successfully here for a number of years. The council prepares proposals on the optimum distribution of forces in the laboratory in case of the performance of specific scientific research jobs and evaluates the creative contribution of each of the associates after its completion, discusses with the management of the laboratory questions, which are connected with personnel transfers in the laboratory and with material stimulation, prepares competitive and certification references of associates, and submits arising questions for consideration by the management of the scientific research laboratory and the administration of the chair.

The high level of instrument and computer supply of the laboratory and, what is the main thing, the work in it of highly skilled specialists make it possible to conduct basic research.

Among the already obtained scientific results of a basic nature it is possible to name the development of a nonlinear theory of the convective instability of jets of Newtonian fluids and the conducting of theoretical and experimental studies of the effect of sound on the monodispersed decay and the magnitude of monodispersity of macroparticles. Methods of the application of an electric charge to macroparticles and the control of flows of charged particles have been developed. Extremely interesting theoretical results have been obtained in the area of the thermal physics of macroparticles, particularly when studying the processes of radiation heat transfer in flows of monodispersed particles, when the characteristic length of the wave of radiation proves to be on the order of their dimensions. A method of the contactless determination of the temperature of macroparticles, which is based on the dependence of the quantum yield of the fluorescence of the solutions of several salts on the temperature, was developed. A number of physics experiments, which made it possible to develop mathematical models of the behavior of flows of monodispersed macroparticles under various conditions, were conducted.

The successes of the laboratory in the area of the development of automated systems of scientific research (ASNI's) are also appreciable. In particular, the efforts of the scientific research laboratory on the development of microcomputer networks of computers on the basis of CAMAC-180-A microprocessor controllers and MERA-60 computers are of unquestionable interest. The integrated automation of all the experimental research being conducted in the laboratory, which includes a system of the gathering and processing of data from eight experimental units, was carried out on their basis.

In accordance with the results of the performed scientific research work the associates of the scientific research laboratory in the past 5 years have put out 4 thematic collections of articles and 12 reports on scientific research work and have published in all more than 70 articles. A weekly scientific seminary of the laboratory is operating successfully.

The intensification of scientific research is leading in the end to the increase of the quality of developments of the scientific research laboratory, while the intelligent combination of basic research with applied development is making it possible to effectively implement these developments in industry. The annual economic impact from the introduction of the results of the scientific developments of the laboratory in various areas of industry in 1985 came to 340,000 rubles, while in 1986 it had already exceeded 670,000 rubles.

At present with respect to the scientific potential and the gained experience the scientific research laboratory of monodispersed technology is capable of carrying out the rapid development and introduction of a number of the latest technologies and devices at the level of the best world models. For example, the automated unit of cryodispersed technology, which was developed and introduced in industry and is intended for obtaining powders with set properties from various materials, does not have analogs in domestic and foreign instrument making.

The competitive developments of the scientific research laboratory are of interest to the CEMA countries. Thus, in 1986 the sale of five system programs to the Polish People's Republic was carried out; with the assistance of foreign trade organizations another three contracts have been prepared and are at the stage of registration.

It is natural that the organization of such a laboratory at the chair of the higher educational institution cannot but have an influence on the organization of the educational process and on the life of the chair as a whole. The good technical supply of the laboratory with computer hardware (the computer pool now includes 2 MERA-125 computers and 8 MERA-60 computers; 36 terminals have been installed in the scientific and educational laboratories) and the availability of highly skilled specialists in this area made it possible in a short time to establish in the chair a student display classroom and to conduct the extensive instruction of students in the use of computer and microprocessor hardware. Now the students of the specialty "cryogenic engineering" of the Moscow Institute of Power Engineering are fulfilling all types of individual assignments (educational research and scientific research work, standard calculations, course and graduation projects) with the use of computers. The curriculum of this specialty envisages work in the laboratory of the Chair of Computer and Microprocessor Equipment, as well as the performance of educational research work at chair stands with the use of automated systems of scientific research. Every student of this specialty during instruction at the institute has 200-250 hours of display time, that is, time of direct contact with the computer in interactive mode.

Now a computer is also being used in the chair for word processing (the drawing up of articles, reports, and so on), the keeping of educational and scientific documents, the accounting of physical and technical assets, the storage of rapid information, and so on, which is increasing the labor productivity of many services.

The availability of a modern experimental base, which is furnished with an extensive set of measuring equipment, computers, and automated systems of scientific research, as well as the numerous experimental methods, which have been developed at the scientific research laboratory, are a sufficiently reliable springboard for the development of scientific research at a qualitatively new level in the other three research laboratories of the chair.

While this, in turn, is creating the basis for the changeover to the advanced system of the Physical Technical Institute of the training of students directly at the higher educational institution, since starting already in lower classes they can participate in active scientific research work at the modern experimental base.

It is natural that during the period of the establishment and during the operation of the laboratory considerable difficulties were and are being encountered. The bulk of them are of a common nature for the development of VUZ science and are dictated by the shortcomings in the existing system of material and technical supply, by the acute shortage of laboratory facilities and modern production equipment, and by the prevailing system of material stimulation. Specific problems of the scientific research laboratory, which are connected with the coordination of the activity of various specialists, the understanding by associates of their role in the common cause, the efficiency of the use of working time, and so on, also exist.

At present the laboratory of physical technical problems of monodispersed systems jointly with other scientific subdivisions of the Moscow Institute of Power Engineering is preparing for the changeover to the new system of the remuneration of labor. In our opinion, this will make it possible to change over finally to the new forms of the organization and stimulation of scientific labor, including the material stimulation of the creative activity of scientists, and, thus, to take another step in the direction of the intensification of the development of VUZ science as a whole.

VUZ science is still greatly indebted to society. The qualitative restructuring, which is being carried out today and is connected with the organization of VUZ science, should aid the accomplishment of the tasks which were posed for Soviet science by the 27th party congress and the April (1985) CPSU Central Committee Plenum.

Footnote

1. V.A. Grigoryev, "Cryodispersed Technology: The State and Prospects of Development," *Vestnik Akademii Nauk SSSR*, No 4, 1987.

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Frolov on Role of Soviet Science in S&T Progress
18140019b Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 8, Aug 87 pp 65-71

[Article by Academician K.V. Frolov under the rubric "Scientific and Technical Progress: The Problems of Acceleration"; "Soviet Science and Scientific and Technical Progress"¹]

[Text] Nearly 70 years ago, in April 1918, V.I. Lenin wrote the famous "Rough Draft of a Plan of Scientific and Technical Work." In this small, but extremely important document the basic principles of Soviet science were formulated: the planned nature of its development, the orientation of the achievements of science toward the well-being of man, and a comprehensive approach to the development of all sections of scientific knowledge—the natural sciences, technology, and the social sciences. And "The Rough Draft of a Plan of Scientific and Technical Work" was written at the time when the young Soviet state was waging a bloody struggle for the right to remain on the political map of the world. Subsequently V.I. Lenin not only formulated the basic principles of the organization and management of science in socialist society, but also did much for their practical implementation.

The development of science and technology in the USSR is an entirely unusual, unprecedented phenomenon in history. This is not only the discovery of the laws of nature and the formulation of scientific theories and methods, not simply the transition from one level of scientific knowledge to another, immeasurably higher one, and even not simply the assimilation of natural resources owing to the development of new equipment. The development of science and technology in the USSR is historically the first attempt at the radical change of the social role and, hence, the social essence of science: the inclusion of scientific and technical activity, as V.I. Lenin said, in the creative work of tens of millions of workers and peasants on the practical realization of socialism.

During the years of Soviet power several generations of Soviet scientists, engineers, managers of scientific production subdivisions, and instructors of higher educational institutions have been trained. Practically all the now actively working personnel of domestic science and technology and all the leading scientists of our country were formed as specialists during Soviet times.

Scientific research and development in the country are being conducted comprehensively over the entire spectrum of sectors of the national economy and along the broad "front of science." Scientific outskirts are now no longer on the map of Soviet science. All the republics and regions of the country and all the nations and nationalities, which inhabit the Soviet Union, are making their worthy contribution to the development of science and technology, to the increase of their qualitative level, and to the strengthening of world prestige. A new important step on the further development of science was recently made: regional departments of the USSR Academy of Sciences were established in the Far East and the Urals after the pattern of the Siberian Department, which, as is known, played and continues to play its special role in the scientific and technical progress of Siberia. The organization of the new regional departments of the

USSR Academy of Sciences is a vivid display of the concern of the party and government about the development of science in our country.

The 27th CPSU Congress posed the task to create in the next 15 years an economic potential, which is equal to the potential that was accumulated during all the preceding years of Soviet power, to increase labor productivity by nearly 2.5-fold, and to increase the national income by twofold. In this connection the work of scientists is acquiring particular historical importance and responsibility: they have to bring the country up to the leading levels in the decisive directions of scientific and technical progress.

The role of science in the implementation of the policy, which was formulated by the 27th party congress and the January (1987) CPSU Central Committee Plenum, of the restructuring and comprehensive modernization of Soviet society on the basis of the principles of democratization, glasnost, criticism, and self-criticism is also great. Restructuring itself is based on the thoroughly weighed and comprehensively analyzed scientific concepts of the socioeconomic development of our society.

The restructuring of science affects not only the present interests of society, but also its future. It is extremely important to imagine the development of science for a decade ahead first of all because precisely profound theoretical ideas have a revolutionizing effect on society as a whole, on the development of productive forces, and on scientific and technical progress.

General Secretary of the CPSU Central Committee M.S. Gorbachev believes that theory "is necessary for literally each of our steps forward. No practical question, which is in any way important, can be settled without being interpreted and substantiated theoretically...."²

"One must not separate theoretical tasks from practical tasks, but one must also not replace theory with the simple registration of facts. Theory should lead practice, should take phenomena more broadly, should take a deeper look, and should see 'what has been concealed by time.'

"Science and theory are irreplaceable wherever and whenever conventional methods of action 'do not work,' where past experience and practical aptitude can no longer give the necessary advice, where fundamentally new decisions and nonstandard actions are necessary."³

In many directions of scientific and technical progress we have good scientific reserves. Soviet science holds a leading position in a number of sections of mathematics, theoretical mechanics and physics, radiophysics, and astronomy. Outstanding results have been obtained in the field of space research, elementoorganic chemistry, and the development of light alloys and new materials

and in several areas of molecular biology, medicine, health care, and agricultural sciences. We should retain the leading positions in these areas and advance vigorously.

The successful implementation of the Vega space project was an outstanding achievement of Soviet science and technology of recent years. It should be stressed that this is a fundamentally new, systems, and simultaneous study of two space objects—the planet Venus and Halley's Comet, which does not have precedents in the history of world science.

In recent times interesting scientific results have been obtained in the area of the theory of machines and mechanisms and in the implementation of fundamentally new technological processes. A qualitatively new stage of the development of high-performance computer equipment has been covered. By 1990-1995 the series production of domestic supercomputers for various purposes will be assimilated. Scientists of the USSR Academy of Sciences, sectorial institutes, and the higher school are making a large contribution to the solution of this problem. New plans of wave propulsion devices and new sources of energy have been proposed.

At the same time there are a number of directions, in which we lag behind the world level. At the USSR Academy of Sciences collectives of leading scientists have devised forecasts of the development of the most important directions. Programs of the achievement of the world level of science will be formulated on their basis.

In all 135 promising directions of scientific research, the development of which is of enormous national economic importance, have been selected. This is basic research in the area of the mathematical sciences, general physics and astronomy, quantum electronics and optics, nuclear physics, particle physics, biochemistry and biotechnology, and the entire, quite extensive set of technical sciences and earth sciences.

It is necessary to direct particular attention to the fields of knowledge, which govern not only the level of modern technology, but also the progress of science in general. First of all this concerns information science, machine science, the development of new substances and materials and methods of their processing, as well as scientific instrument making. The first appreciable changes have already occurred precisely here, but much more has to be done.

It is also necessary to broaden significantly the front of research in molecular biology and genetics, computer hardware and technology, immunology and medicine. Of course, science now also has ideas, which await practical developments and embodiment. And, as is

known, for this much is being done by the joint efforts of the USSR Academy of Sciences, the USSR Ministry of Higher and Secondary Specialized Education, and sectorial ministries.

The retooling of the national economy and its radical restructuring depend on many factors, and one of the main ones is the development of basic research in the interests of machine building, in the broad understanding of this term. The foundations of fundamentally new technologies, which are conducive to the increase of labor productivity and product quality, complete automation, and the large-scale and comprehensive use of computers, are being laid precisely here. The Academy of Sciences has formulated a program of basic scientific research in the field of machine building, scientific collectives of academic institutes, the higher school, and industry are taking part in its fulfillment.

In machine building advanced technological processes differ favorably from traditional ones by the fact that in addition to the saving of material, energy, and manpower resources they ensure the increase of the precision of the items being obtained, the stability of the quality and the reliability of products, the continuity and the shortening of the time of the occurrence of processes, their small number of operations and waste-free nature. The use of advanced methods of the automation of production processes makes it possible to free man from direct participation in the technological process and to transfer his functions to a machine and to use modern metrological aids more extensively.

Advanced domestic and foreign experience gives numerous examples of the introduction of automated flexible technologies, which are based on the latest achievements of the basic sciences, including technologies that are based on the use of high speeds, pressures, and temperatures, a vacuum, the effects of superplasticity, and highly concentrated energy sources (pulse loads, the laser, the explosion, plasma, ultrasound, induced high-intensity fields, and others). For the development of new technologies the Institute of the Superductility of Metals was founded at the USSR Academy of Sciences and temporary scientific collectives and academic laboratories were established directly at industrial enterprises.

Scientists and designers of academic and sectorial institutes of our country have already proposed many original technical and technological solutions of the use of advanced technologies. In particular, laser technology with the use of means of automation and robotization is affording new means for highly productive processes of the processing of metal and especially hard natural and synthetic materials, the obtaining of ultrapure substances, as well as the hardening of parts of machines, the combating of corrosion, and others.

During the current 5-year period the scale of the introduction of advanced and fundamentally new technologies will increase by several fold. In order to achieve this,

practical steps are already being implemented in the country on the decisive turn of science toward the increasing requirements of practice, the assurance of the continuous replenishment of scientific and design ideas and developments, and the increase of the efficiency of the use of the available scientific and technical potential.

However, whatever the advanced technology is, it can be implemented in production only in new equipment, therefore, the output of qualitatively new generations of machines, equipment, and instruments is already planned during the next few years. In this direction the transition from the development of individual types of equipment to the output of systems and technological complexes of machines first of all in the sectors of agricultural production, transportation, construction and road machine building, and the timber and extractive industries is an important stage. Thus, for example, it is envisaged to develop approximately 450 new machines and mechanisms just for the complete mechanization of agricultural production.

The changeover to the production and use of equipment of new generations, which increases labor productivity by many fold: rotary and rotary conveyor lines, flexible production modules and automated systems, and robotic complexes, is planned. By the end of the 12th Five-Year Plan it is planned to place into operation at enterprises of the country more than 1,800 flexible production systems and modules. This will make it possible to increase production efficiency and product quality significantly, to reduce the time and expenditures on the assimilation of the output of new types of items, to improve working conditions, to decrease the need for manpower resources, and to increase labor productivity by two- to fivefold. Along with flexible production sections and lines it is envisaged to place automated shops into operation.

As a whole during the 12th Five-Year Plan not less than two-thirds of the increase of the productivity of national labor should be obtained by the use of the achievements of science and technology. Here the proportion of manual labor will decrease to one-half, owing to which more than 20 million people will be freed from unskilled labor.

In discussing the means of developing machine building, it is impossible not to touch upon another most important problem—the quality of a product, its reliability, and its life. The 27th party congress singled out this problem as a priority one. Its solution is possible only on the basis of the development of new metrological aids, diagnostic systems, and advanced test complexes, that is, unified technological systems that ensure high product quality. In developing such systems it is necessary to implement the achievements of electronics and technical physics, which scientists and engineers can do in close cooperation.

Precisely for this reason particular attention is now being devoted to the new organizational economic form of the interaction of science and production—interbranch scientific technical complexes. More than 20 such complexes in urgent directions of scientific and technical progress have now been established, institutes of the USSR Academy of Sciences are the main institutes in 8. However, in connection with the fact that interbranch scientific technical complexes should in practice assimilate the latest achievements of the basic sciences, academic institutes are participating in the work of nearly every one of them. The development of information files, of course, automated ones, which will reflect the latest achievements of domestic and foreign science and technology, also rests on the shoulders of interbranch complexes. They also coordinate the research and development being conducted in the country in accordance with the corresponding assignments of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000.

While addressing the All-Union Conference of Heads of Chairs of the Social Sciences, M.S. Gorbachev said: "The developing restructuring is giving a most responsible social order to the entire system of social sciences. Our notions about the dialectics of productive forces and production relations, socialist property, cooperation, national self-management and democracy, the development of public consciousness, and the causes and means of overcoming negative phenomena need enrichment on the basis of the material of modern life....

"The party is counting on the increasing contribution of economic science to our campaign for the development of productive forces, the use of advanced technologies, the qualitative improvement of production relations, and the change of the forms of management and administration.

"Without this acceleration and the 'actuation' of the main factor—the human factor—are impossible."⁴

As was noted at the General Assembly of the USSR Academy of Sciences in March 1987, acceleration in the reorganization of the work of social scientists is necessary. In the social sciences dogmatism, which depicts science as a set of infallible "truths" and assumptions, has not been completely eliminated. Many social scientists are striving to limit their activity just to commenting on the provisions, which are contained in party documents and have already received the endorsement of the community. But the main task of the scientist is to develop science and to pose new problems for practical solution. A very important task—to make a substantial contribution to the elaboration of the theoretical problems of the acceleration of the socioeconomic development of our country—faces Soviet scientists who work in various fields of the social sciences.

The party is providing a good example of the principled evaluation of the mistakes and omissions of preceding years. In the area of the social sciences, just as in other spheres of science, it is necessary not to limit oneself to the statement of the lag of research behind life, but to seek constructive means and methods of overcoming this lag and to develop theory which equips practical activity.

The need for the utmost intensification of social production and the assurance of a new quality of economic growth and the well-being of the Soviet people requires more vigorous and purposeful scientific research and the overcoming of slowness in the materialization of scientific ideas in the national economy. It is possible to intensify the economy only on the basis of intensively developing science. The reorganization of scientific work in the country is also aimed at this. It affects all sectors of science and practically all aspects of activity: organization, the remuneration of labor, the planning and coordination of scientific research, personnel policy, and material, technical, and information supply. The goal of restructuring lies in the increase of the efficiency and responsibility of scientific collectives for the end results of their activity.

The sweeping away of frozen organizational forms at institutes should ensure the influx of talented young scientists, while the flexible structure should react quickly to continuously arising new directions of research and eliminate the subdivisions that have already become unnecessary.

The reorganization of the work of the USSR Academy of Sciences is aimed at the elimination of excessive centralization, the increase of glasnost and responsibility, and the giving of a new role to the departments of the academy in the management of scientific research. Full responsibility for the development of basic research in the corresponding field of science, for the state of research at the institutes belonging to the department, for the obtaining of scientific results, which are at the level of world achievements or surpass them, and for the coordination of the basic research being conducted in the country is now being assigned to the departments.

In all the processes of restructuring in science the central role belongs to personnel—the human factor. Especially many unsolved problems and static phenomena have accumulated in this sphere. It turned out that many management positions of institutes, departments, and laboratories for long years were replaced through competitions by the same scientists. Such a situation objectively hindered the influx of young creative forces, although it is well known that, as a rule, young scientists under the supervision of venerable scientists make major discoveries. The General Assembly of the USSR Academy of Sciences, which was held in March, adopted a program of the constant updating of the staff of scientists of the academy.

The improvement of academic scientists is closely connected with the important measures on the reform of the higher school. The CPSU Central Committee and the Soviet Government have adopted fundamentally important decisions which are aimed at the improvement of the work of the higher school. Their fulfillment should ensure a new quality of the training of personnel and radically improve their use, which guarantees the attainment by our country of leading levels of scientific, technical, and social progress. It is necessary to accomplish the leading development of higher education with respect to the retooling of the national economy and to implement a number of practical steps on the combining of the efforts of scientists of the USSR Academy of Sciences and the higher school, both in the improvement of the training of personnel and in the conducting of joint scientific research.

The most important direction of the reform of the higher school is its closest integration with production and science and the changeover to new principles of their interaction. A priority task of restructuring is to achieve a decisive turn toward the strengthening of the individual approach and toward the development of the creative ability of future specialists, by relying on their independent work and active forms and methods of instruction.

The utmost development of VUZ science is the basis of the improvement of the training of specialists. Its contribution to the accomplishment of the tasks of accelerating the socioeconomic development of the country has to be increased. The unity of scientific and educational work and the extensive enlistment of students in research should be ensured.

It is well known that science and technology in their development can yield results which are capable of serving both social progress and destructive processes, up to devastating wars. Mankind has entered a critical period of its historical development. It has been faced for the first time with a tragic choice: life or self-destruction. No one can remain aloof from the decision of how the mighty forces, which have been unleashed by human genius, will be used. Just as no one has the right to claim a monopoly and exclusive rights in deciding the fate of mankind. This was clearly demonstrated in February 1987 at the International Forum "For a Non-Nuclear World, for the Survival of Mankind," which was held in Moscow.

Scientists have calculated that in the 5,000 years of history of mankind there have not been wars on earth for only 292 years, while more than 15,000 major and minor wars have claimed about 4 billion lives. However, what will happen on our planet, if a nuclear war occurs, cannot be compared with what has been experienced by mankind during its entire history.

During the years of the test for maturity socialism again appeared to the entire world as a system, which is capable of offering a humanistic alternative to nuclear

madness. Our country came forth as the initiator of a radical program of freeing the world of nuclear weapons by the end of this century and is persistently seeking means of accomplishing this task. The proposals, which were formulated in the Policy Report of the CPSU Central Committee to the 27th party congress and were recently developed, are instilling new hopes in the hearts of our countrymen and the people of all countries of the world.

Soviet scientists are making their contribution to the realization of the hope of freeing mankind from the threat of nuclear war. In this connection I will also dwell briefly on the problems of international scientific cooperation. Soviet scientists have always spoken and are speaking in favor of its development, correctly assuming that mankind would only gain, if scientists of different countries united for the solution of vital global problems: the energy, food, ecological, medical, and other problems. However, the stereotypes of political thinking, which still prevails in the United States and several other countries, are hindering this. Without drawing conclusions from the lessons of history, there they continue to believe that the restriction of scientific exchanges and contacts is capable of hindering the development of Soviet science, the program of the modernization of our industry, and the economy as a whole. At the same time progressive scientists of the West are actively supporting international scientific cooperation and the new Soviet peace initiatives.

The USSR Academy of Sciences is successfully developing scientific cooperation and integration with the academies of sciences of the socialist countries. The Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000 is a vivid expression of this.

This year is an anniversary year, the year of the 70th anniversary of Great October. The best means of celebrating the anniversary of Great October is to step up the work on restructuring and to achieve new appreciable results in the acceleration of the socioeconomic development of the country.

The active embodiment of the decisions of the party is a fine tradition of Soviet scientists. Soviet scientists completely share and support the policy of the CPSU Central Committee and the Soviet Government and will make their worthy contribution to the acceleration of scientific and technical progress, restructuring, and the improvement of the entire socialist society.

Footnotes

1. An abridgment of a report at the Solemn Meeting devoted to the Day of Soviet Science in the Hall of Columns of the House of Unions on 19 April 1987.

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2. "The Speech of General Secretary of the CPSU Central Committee M.S. Gorbachev at the All-Union Conference of Heads of Chairs of the Social Sciences," *Kommunist*, No 15, 1986, p 3.

3. Ibid., p 5.

4. Ibid., p 4.

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Difficulties in Applying Basic Research

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[Editorial: "A Discovery has Been Made: Does it Contribute to Progress in Science and Technology or to Restructuring?"]

[Text] Researchers walk a difficult path to the heights of science. Striving to learn about things unknown, they scale steep mountains, move along paths strewn with sharp thorns rather than roses. Karl Marx wrote fittingly about this: "There are no royal roads to science. Its heights can be attained only by those who are not afraid of fatigue or of climbing up its stony paths."

Without exaggeration one can say that these heights are scientific discoveries. Things not known yesterday, but revealed today expand horizons not only of knowledge. The practical applications of many such achievements literally revolutionize entire sectors of technology and production. Even in our fast moving lives, does it seem long ago that the foundations of quantum electronics were laid? Now this field of science and technology influences many areas of human activity.

Of course, discoveries differ. Some, penetrating into nature's secrets, do not have immediate applications in practice, but this by no means diminishes their significance, for their fundamental nature has an effect upon further progress in science. However, even at their birth, many discoveries are surrounded by a family of new technological solutions. Often these are so-called pioneer inventions, as they arose on previously unknown foundations. Consequently most of them are highly effective.

Understandably, discoveries are not so frequent in our science as in the world as a whole. In the 30 years which have past since these discoveries have been registered in the State Registry there have been about 350. By no means every scientific institution in the country has been able to reach the "shining heights" expanding the horizons of progress. Thus, we must more carefully use those which we have. Here it is important that the development of successes be not only the concern of the discoverers themselves, but also of the organizations and collectives where such innovations might be fully used.

There are examples of this. Based on a scientific discovery by VASKhNIL [All-Union Academy of Agricultural Sciences imeni Lenin] Academician A. Sarkisov and others, a vaccine was obtained which gives mammals lifelong immunity from fungal diseases. This vaccine is protected by inventors' certificates and patents. It is being industrially produced and is successful here and abroad.

However, by no means all discoveries were born under such a lucky star. Doctor of Medical Sciences A. Azhipa and his codiscoverers found the so-called paramagnetic nitrosyl iron complexes in animal tissue. Their presence in the blood is evidence of poisoning. Quite naturally,

the VNII [All-Union Scientific Research Institute] for the Hygiene and Toxicology of Pesticides, Polymers and Plastics (VNIIGINTOKS, in Kiev) was commissioned to conduct research. One five-year plan after another passed, a mountain of correspondence grew, but, for various reasons the institute did not do the research. Incidentally, the USSR Ministry of Health did not assist its subordinate institution.

There are also cases where a discovery comes to life thanks only to the persistence and efforts of the discoverers. In *Pravda* there have been several articles about the misadventures of the anomalously low friction effect in solid bodies. This is the basis for the creation of "sliding" rubber. Only the discoverers' orientation towards specific organizations and enterprises made it possible to achieve practical results. The developers were given a lot of help by specialists at the Druzhba Administration for Petroleum Products, where the use of "sliding" rubber saved millions of rubles. However, the NII for the Rubber Industry, which was entrusted with work in its field, did not meet its targets.

In such cases one observes a passive role by ministries responsible for subordinate scientific institutions. Most often, they limit themselves to targets, but to not monitor implementation. So, it is necessary to make stricter demands upon ministries as well.

Recently the USSR GKNT examined the extensive introduction of new designs for tubular and plate heat exchangers developed on the basis of a discovery by Doctor of Technical Sciences E. Kalnin and other researchers. This original design is protected by inventors' certificates and patents. Recommendations have now been given to a good tenth of sectoral ministries.

It is an example worthy of support. Why didn't the USSR GKNT examine such questions during surveys of the use made of other discoveries which have long been protected by inventors' certificates and have still not drawn any interest by potential users? After all, many discoveries are still not doing the necessary work for progress in science and technology and for perestroika. There should also be an survey to see if the required elementary order has not been brought into the practical use of this intellectual wealth, a considerable part of which is, unfortunately, growing old. Can we continue to pretend that this is not needed by anybody, as such wealth is often brought in "from outside" and, "we didn't begin it, don't have us complete it", so to heck with it all! Of course not. It would be proper to find, for each discovery, a concerned developer, and sometimes several, depending upon specifics. Don't forget about monitoring this. How else can one call upon scientists and inventors to attain new scientific and technical successes. They must be called upon to do so, keeping in mind that now, when the national economy is being restructured and reequipped the need for new technology and the latest equipment is growing especially fast.

There should not only be a call to the scientific discovery front, but one to set up favorable conditions for creativity. Neither should one forget about improving important operations such as the examination of claims about discoveries. Recently in *Pravda* a group of scientists expressed the opinion that this process should be fully democratic at all stages. There must be no examinations of claims about discoveries, while pushing the discoverers out the door, which still happens. There needs to be an attentive hearing of their reports and conclusions and a careful look at all their data. These reviews should be supporting evidence for any decision made concerning the claims.

It would probably be worth it to attract to this intellectual wealth those theories, hypotheses and new ideas which have not yet been registered. Who has not heard it said that there is nothing more practical than a good theory? There is much truth in this. Perhaps the results from scientific creativity could be raised to the level of registered intellectual property? Many scientists hold this opinion. The people now working on the draft to the law on inventions should think about this.

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