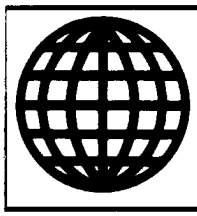
JPRS-UST-89-001
17 JANUARY 1989



JPRS Report

Science & Technology

USSR: Science & Technology Policy

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[Report by President, AN USSR [UkSSR Academy of Sciences], Academician B.Ye. Paton at the meeting of Presidium of AN USSR 5 May 88 "On Goals of UkSSR Academy of Sciences at the Current Stage of the Perestroyka"]

[Text] Members of the newly elected Presidium of our Academy have taken up their functions. Principal objectives and goals we are facing have been formulated by the session of the General Assembly. They are aimed at giving the Academy a new qualitative status, while retaining certain continuity in basic principles of its activity, and at further development of valuable elements from previous experience. This report is to a certain extent a continuation of my report at the session of the General Assembly.

Today, we must discuss and delineate practical measures aimed at implementation of strategic directions of further extension of perestroyka. I mean first of all the development and support of priority scientific directions, increasing the practical effect of implementation of research results under the new business and science financing conditions, improved management of the Academy at all levels, including Presidium and its staff, and strengthening the personnel potential.

Prior to proceeding to the presentation of these problems, I would like to remind you once again the basic principles we follow in our activities. The most important principle is that the thrust of all work on restructuring has been shifted to institutes, where, strictly speaking, science is "made". Another principle is the implementation of a consistent policy of research priorities. Finally, it is drastic improvement of the Academy structure and level of management, based on democratization and glasnost.

In connection with the start of operation of the newly elected Presidium, we asked all Presidium members to present their thoughts on the immediate goals of the Academy. Suggestions they submitted have been carefully analyzed and taken into account in preparing this report, which is therefore is to a certain degree a result of joint efforts.

As before, we should concentrate our attention first and foremost on the development of basic research. We determined main shortcomings in this area at the session of the General Assembly. First of all, this is the loss of leading positions by certain institutes, presenting wishes as facts, the decrease in the number of awarded Lenin and State Prizes and the number of publications abroad etc. All this forces us to ponderseriously.

In order to rectify the situation, we must revise, resolutely and immediately, a large number of habitual problems of organization of the research process. And the main say here belongs to institutes. Each institute must be specifically responsible for certain directions and, of course, ensure the appropriate level of basic research, as well as influence the respective branch of the national economy. If this is not so, an institute looses its right to exist. I am far from trying to intimidate anybody. But under the conditions when the role of competitive positions increases, this prospect can become fairly real, and in the immediate future at that.

We consider the practical implementation of the policy of priorities the most important precondition for improving institutes' performance in the area of basic research. At the session of the General Assembly of the UkSSR Academy of Sciences it was noted that at present we have 50 priority directions. Is it too many or too few? Think for yourself. Priority means giving preference. Obviously, we cannot afford to support effectively so many scientific directions. It is the same thing as to feed thousands of hungry people with five biblical loaves. I would like to remind you that two years ago we were talking about having not more than ten all-Academy priorities.

The situation in the way we have been identifying priority subjects is similar. There are now 270 such subjects out of the total of over 1,800. Of course, this is too many. But it is not enough to identify a priority subject. It must be given personnel and material and technical support. Simple arithmetic calculations demonstrate that, given available resources, we cannot properly support this many priority subjects. Probably this is the reason why neither institutes nor Presidium, frankly speaking, have given any appreciable help to most urgent works.

Unfortunately, one has to admit that we have not been able to completely overcome selfish aspirations of institutes' management to see their subjects on the priority list, no matter what. Thus, at institutes of the Earth Sciences Department, 70 percent of all priority subjects are headed by members of their management. The picture is similar at organizations of the Information Science, Computer Technology and Automation Department and Economics Department. We think this is the result of insufficient openness and unwilingness to take this important problem seriously and choose really the most important subjects.

And in some cases, one does not ponder whether subjects that have been chosen in such way conform to All-Union and world priorities. We also do not see real care that, first of all, the choice of priorities take into account actual capabilities of the Academy, and second of all,

that the priorities become an effective tool for giving the research process a new qualitative status. Here, the responsible attitude on the part of institutes is needed first of all, and they must get help from Sections and Science Departments.

One must develop an efficient system for identifying priority works. The system must include elements such as competitive selection of works at institutes, based on forecasts and scientific discussions, then examination at Science Departments and outside the Academy, and the procedure for allocation of funds for additional financial and material and technical support.

I shall note specifically that competitive selection of priority subjects at a scientific organization must be done at an enlarged session of the Scientific Council, whereto professionals on the appropriate subject from other institutes have been invited. The selection must be done by secret ballot, after hearing reports by leaders of proposed subjects and comprehensive discussion of the subjects. And one must proceed from the fact that a scientific organization can have no more than two to three priority subjects.

The chosen subjects and needs for personnel and resource support thereof are then examined in great detail at a session of the Bureau of the Science Department, with the participation of Scientific Councils on the prooblems. If necessary, the Department Academician Secretary orders a paid examination of the subject. Later, each priority subject might be arranged as an order from the Science Department to the scientific organization. May I remind you that we now have the right to pay examiners for their work. We must more actively use this right in the future. Incidentally, the new method of paying official opponents of the Highest Certification Commission is already bearing fruit.

In order to accelerate the development of the most important studies, we intend to transfer to Science Departments Presidium's payroll reserve. This will be equal to approximately R 100-120 thousand per Department. In addition, it is contemplated to provide other types of resources, such as scientific equipment, laboratory areas, positions at post-graduate schools, and business trips abroad. These problems are being handled by the Science Organization Department, together with other divisions of the Presidium, on presentations of Science Departments.

It is very important that institutes' Directors understand clearly the reality of this support. The main thing is internal reserves, which must be looked for at institutes by closing low-urgency subjects and dismissing employees that have lowered their output or have lost completely their interest in research work. This is one of the most important conditions. Here, Directors have a wide field for action. They only need to be resolute and, of course, follow the law.

In this regard, I would like to note that a justified choice of priorities depends to a large extent on the availability of high-quality forecasts. The session of the General Assembly noted the inadmissability of an amateurish approach to preparation of forecasts. I should also add that it is absolutely inadmissible to treat forecasts as something secondary and unimportant, something that distracts one from one's principal assignments. I am stressing this, because this was exactly the attitude that was demonstrated last year, when preparing forecasts for the development of the most important scientific sectors and directions in the Republic Up to the year 2000. A low, to put it mildly, quality of most forecast materials resulted in the need to substantially rework them, which for some directions has not been finished yet.

The attitude to forecasts at Science Departments and institutes must be as responsible as their attitude to conducting planned research. Forecast development assignments must be included in subject plans. Along with scientific forecasts, institutes must pay more atention to the development of S&T forecasts, which play are connecting links between scientific organizations and sectors of the national economy in the implementation of the long-term strategy of technological retooling of production.

I think the work should be organized so that the question of assigning priority status to a direction, both at an institute and a Science Department of the Academy as a whole level, is not considered at all without first developing a high-quality forecast.

It is time to start forming permanent groups at institutes that would organize forecast development. In doing so, one should widely use the capabilities in cooperating the efforts of academic institutes with each other, as well as with VUZs and sectoral organizations. Also, one should probably think of regular publication of forecasts, which will facilitate the improvement of their level and their effective utilization. Nowadays, this is a common place in the world science.

At present, a deep restructuring of the entire system of planning of scientific R&D is taking place in our country. The USSR Academy of Sciences together with republican Academies conducts huge work on creating a unified system of State programs of basic research on priority scientific directions.

Two types of programs are being formed. The most important ones will beapproved by the Presidium of the USSR Academy of Sciences, and the rest will be approved by its Science Departments. This is a large-scale undertaking, a qualitatively new approach to the development of basic research.

So far, a list of 16 programs has been compiled at the USSR Academy of Sciences Presidium level, and each program contains a number of important proposals. Our organizations have presented their proposals. At the

same time, as you know, institutes are preparing their proposals to project of scientific programs that are being formed at the level of Science Departments of the USSR Academy of Sciences. Obviously, scientific programs of our Academy must be revised from the standpoint of their integration with Union programs and elimination of undesirable and unnecessary duplication.

This work is of the utmost importance. First of all, the inclusion of our research into the programs indicates the appreciation of their real priority character from the standpoint of All-Union criteria, as well as the possibility to fulfill them. Second of all, it is contemplated that problems of financing of science from the budget will be closely linked to these scientific programs. And if we are not able to join in the execution of the programs, then during the next Five-Year Plan we might, as they say, see our oxygen supply shut off.

This is why, comrades, we are expecting from you a real initiative and active and resolute actions in this area. Now is the time, before the situation has stabilized and the staff of executors has been finally determined, to do all that is necessary to enter the programs. This is not a simple thing. We understand that nobody is waiting for us there with their arms open. We have to overcome certain counteraction on the part of AN SSSR [USSR Academy of Sciences] Science Departments. Often, we even encounter unwillingness on the part of AN SSSR employees to deal with our proposals. But there is no way we can retreat, as we must establish ourselves at the Union level. I would like to stress that this is mainly not the staff work. It must be done by scientific leaders of institutes and Sceience Departments in cooperation with their colleagues at the USSR Academy of Sciences.

As far as S&T programs are concerned, principles for forming them are being revised, both at the Union and the republican level. Most probably, their number will decrease drastically. Only target programs that are specific projects of creating S&T and production facilities will stay. There is already a tentative list of 19 State programs of interbranch character. Incidentally, our Academy proposed to include in the list programs such as "Integrated Mechanized Production of Economically Efficient Highly Reliable Weldments in Machine Building and Construction", "A Ceramic Engine" and "The Use of a Natural Gas-Gasoline Mixture as a Vehicle Engine Fuel."

During the next Five-Year Plan, republican target programs will be mainly aimed at solving resource saving problems. It is contemplated that our Academy will be responsible for the development of subprograms "Material Content", "Water Content" and "Information Science and Automation". We must ensure their economical and technological orientation and determine from the very beginning the leading trends, while closely relating them to national economy targets that are the most important for our Republic.

The system of S&T programs reflects national priorities, which we have no right to ignore. This is why we must accelerate their creation even in tohose areas where we do not yet have an appropriate background and personnel potential. This is required by the country's and Republic's interests. It does not pay to try to "be in all places at once" by participating in as many programs as possible. This will inevitably result in lowering our real contribution to each program. It helps to remember the well-known Lenin's thesis: "Better less, but better". Nowadays, this thesis becomes the standard against which one measures the seriousness of our attitude to perestroyka.

Now. World and national priorities are fully reflected in the Integrated Program of S&T Progress of CEMA Member Countries Up to the Year 2000. This is what determines our attitude to the participation in the implementation of its targets.

At the session of the General Assembly, we briefly touched on the status of the Program, which is, frankly speaking, is not comforting, despite individual successses. So far, work pace is far from that stipulated by the Program. The threat of not meeting deadlines becomes ever more real. Of course, there are a lot of circumstances we have no control over. But we must be that much more energetic and persistent in striving to change the circumstances and work better.

Here, institutes, especially head ones, have a wide field for demonstrating their independence and initiative, including the establishment of direct ties with foreign partners. In doing so, they must pay more attention to expanding the cooperation, creating joint collectives and entering third country markets. One should not rely on Presidium staff for solving all these problems, because there is practically nobody on the staff to help one.

Successful implementation of priority subjects covered by the above programs is facilitated by organization of target-oriented basic research. As you remember, the Academy once came forward as the initiator of making it a dominant form of organization of research process at science and nature and technical institutes. But then certain slump occured in this area, which affected overall effectiveness of research at the Academy.

Instead of developing target-oriented research, some institutes resort to purposless and poorly substantiated studies, which for decades have not and cannot produce anything. Others are not against presenting as target-oriented their old applied works, which, frankly speaking, have no clue of any "basics". Such substitute becomes ever more dangerous,because of the expanding scope of business-contract works under the new business conditions.

Of course, one should expand applied developments, but not at the expense of main directions of institutes' activities. Here, reasonable proportions are required,

and not just Presidium, but also institutes themselves must take care of maintaining these proportions. Otherwise, the implementation will just "eat" the basics.

I shall dwell separately on initiative search studies. As a rule, these form a deep foundation of research. They are left totally to institutes and will be financed by the part of the budget left at their discretion. The money will be appropriated on the competitive basis, with an open discussion of goals and results.

One must remember that theoretical frontiers, at which we form large-scale research, were at the time conquered by the "scouts". We shall therefore keep considering initiative search studies an integral part of the research process, without which all other research would degenerate, sooner or later, to routine applied development.

Expanding the ties with production and increasing the scope of implementation of research results in the national economy is an important sphere of insitutes' activity, and its importance increases due to the implementation of the policy of priorities. The set of these problems have always been at the center of our attention. But the new business mechanism introduces corrections into the system of ties that have formed between the Academy and various branches of the national economy. We must enrich our experience, more fully utilize the potential of tested forms by "fitting them in" into the new economic reality, and persistently search for possibilities to strengthen S&T cooperation. Because of the importance of this complex of problems, a decision has been made to bring them up for special examination at Presidium. I shall dwell now on those aspects where the role of institutes must be manifested to the fullest.

It is well-known that in recent years a system of Interbranch Scientific and Technical Complexes (MNTK), two of which are headed by institutes of our Academy, has been created. Now that the euphoria overtheir creation has receded, it turned out that they have not yet become shock detachments for the breakthrough along the most important directions of S&T progress. We understand quite well that the situation has formed mainly due to reasons beyond our control. But we do not have the right to allude to outside circumstances and do nothing; we must do everything we can for our MNTK to gain real momentum. We must also liven up the work of all our institutes that are part of other MNTK. The weakest link of MNTK are the very organizations that participate in their work. Ministries simply ignore this work.

About engineering centers. It has been stressed at the session of the General Assembly that the centers have not yet become real science and industry outposts at the front line of S&T progress. In this respect I would like to note that the increased independence of institutes and industrial enterprises and the new business conditions are creating favorable prospects for improving the efficiency of engineering centers' activity. Creation of a new engineering culture, I would say a new way of thinking, which includes integration of basic and applied research and the use of an interdisciplinary approach to solving complex technical problems, guarantees continued interest on the part of industry branches to developments by institutes and enterprises. Directors of those insitutes that already have or are going to create engineering centers must see prospects of the centers and inherent huge opportunities for commercial realization of their products, making profits and drawing resources of interested Ministries and agencies for research purposes. Interestingly enough, a lot of engineering and engineering and technical centers are being created nowadays in our country at Ministries and VUZs.

However, this is not the end of it. The experience of foreign countries, and the USA in particular, demonstrates that they too haveresorted to creation of such centers. Due to integral combination of their inherent functions and a thought-out mechanism of interaction with industrial companies, their engineering centers actually act as heralds othe f technical culture of the future. There, engineering talents blossom.

I think we should investigate it in detail and creatively use the most valuable elements of the USA engineering centers in our country. Of course, Presidium will keep encouraging the creation of new engineering centers at our institutes along the most important directions of S&T progress. We see a well-founded increase in the number of these centers and bringing them to the optimum number as the manifestation of the new qualitative status of the Academy. This used to be under Presidium jurisdiction, but we must transfer this power to institutes. They can better see both the prerequisites for the creation of the centers and the opportunities of making a contribution to industry retooling.

More attention must be paid to activities of our bases. In the near future, we will specifically discuss this problem at a Presidium meeting, where we will analyze causes that inhibit the development of this progressive form of links with production. It should be noted that in this area institutes face favorable opportunities for reproducing and selling their developments and making profit, whereas a lot of implementation work is done by branches of the national economy themselves. On this basis, institutes could solve a number of important problems of financial support of their research, material stimulation and social and cultural development. But they must demonstrate more initiative and enterpreneurship.

By the way, commercial implementation of S&T achievements, including their implementation abroad, is becoming ever more important. Under the conditions of decentralization of foreign trade activity, institutes have been given the right to create their own funds of hard currency deductions from export. Their independence in selecting partners has also been expanded.

All this brings up an acute need for institutes to master a number of sophisticated and to a large extent new for them functions, such as advertising, market research, selecting optimum forms and terms of sales, and setting contract prices. We must learn to sell S&T products, comrades. Unfortunately, a lot of us have not comprehended this yet. Elementary problems related to commercial activity often drive executors and corresponding institutes' departments into a dead end. Maybe, we should conduct a several days long seminar on this important problem, involving professionals.

We shall now examine the problem that has caused us a lot of excitement - financing of scientific research. It must be said upfront that unfortunately this is not completely clear yet. However, basic aspects have taken shape, and I shall dwell on them. We already have a number of documents, such as "Rules of Financing of Scientific Research And Experimental Design Work", approved by the USSR State Committee for Science and Technology, Gosplan and Minfin SSSR [the USSR Ministry of Finance], "Regulations on Contracts for Development (Transfer) of S&T Products", adopted by the USSR State Committee for Science and Technology, Minfin SSSR letter "On Changing the Rules for Financing of Institutions and Organizations Financed From the USSR State Budget, and on Utilization of Saved Funds by Them" etc.

It follows from the above mentioned documents that nobody is going to convert the academic science to full cost accounting, let alone self-financing. The question is only new financing principles and methods. Budget appropriations are not being eliminated, neither is Presidium's right to allocate them. This is the source of financing of basic research conducted by academic scientific organizations in the area of natural, technical and social sciences, as well as of assignments of directive bodies and the USSR State Committee for Science and Technology issued in the form of State orders.

Substantial changes will take place in the volume and rules of allocation of appropriations. The main change, and one that already has been discussed at the session of the General Assembly, is switching from financing of activities of scientific organizations to financing of individual scientific problems and subjects via a system of orders. Besides, one can clearly see the trend to prevalence of competitive items in the allocation of budget appropriations.

This means that budget appropriations will be allocated first of all to subjects chosen on a competitive basis. Scientific leaders of subjects that have not won the competiton will have to think of ways to support themselves, i.e. look for customers. But as far as we can see, a customer is not interested in basic research as much as he is interested in applied results.

It would be natural to assume that there will be exceptions to the above scheme, but probably only minor ones. Therefore, institutes should not procrastinate in providing various types of resources for their research.

Receipts of funds according to business contracts must become a powerful source of financing of the academic science. From now on, such contracts will be financed with funds from Ministries, agencies, associations, enterprises and organizations, based on contract prices. I shall specifically emphasize that a contract price has no limits, as long as the customer can afford it. And this is true for all customers, including the so called "The Nine". In other words, the more we charge for our S&T products, the more money we will have for further development of science. Of course, cost accounting calculations will stay, and they will be controlled.

The important thing is that now nobody is going to limit the volume of business contract work at institutes. They can sign as many business contracts as they can manage. In this case, firm standards for the creation of payroll fund for every year of the Five-Year Plan are established.

For our Academy, a high level of financing in accordance with business contracts has always been typical. Suffice it to say that in previous years only one-third of our expenditures for scientific research and experimental design work was paid for by receipts from the budget. Nowadays, when a lot of limitations have been removed, institutes should be more active in strengthening their creative interaction with enterprises and scientific organizations of branches of the national economy, while smartly managing funds received in the process.

Another new moment is institutes' right to keep all savings from budget appropriations (provided they have fulfilled their subject plan), including payroll savings, which can be used for material stimulation, pay raises etc. I should note that if before directors were "taking the beating" for not fully using up their payroll funds, the new business conditions make it possible to view this as a positive phenomenon. In effect, it reflects the growing role of intensive factors in institutes' activities.

There are also other innovations that are unleashing the initiative of creative collectives. One of the innovations is the removal of upper limits of pay raises for high-skilled scientific associates for performing work on sophisticated and critical subjects, as well as removal of limits on the size of bonuses for achieving world-level results.

Of course, all this is very nice. But the temptation is great too; it might tempt one to step over reasonable and legal boundaries, as far as material stimulation is concerned. First of all, this would inevitably lead to violations and create conflict situations in collectives. Therefore, I hope that institutes will demosntrate a responsible and careful approach and will strictly adhere to the principle of commensurability of work remuneration with the actual contribution of executors.

I would also like to note that it is contemplated to establish firm unified standards for creating the payroll fund for subjects covered by business contracts also for organizations that have the experimental design and production base. Other important changes in their life will take place too. Without dwelling on it in great detail, I should say that we will have to develop new principles of functioning of research enterprises that meet requirements of the current economic reform and agree with institutes' course on expanding priority research.

Nowadays, when the new economic mechanism is in place, we must not let our base organizations to become regular enterprises that manufacture products and make profit. Yardsticks used in sectors of the national economy are not applicable to them. One should not forget what they were created for. However, this does not mean that there must be no yardstick at all.

Nowadays, our base enteprises have better opportunities to concentrate on supporting the research process at institutions. This in turn also poses serious requirements to institutes, which have been given full responsibility for keeping their enterprises busy and in good economic shape. This means that cost-accounting subdivisions have the right to count on a share in institutes' State orders and business contracts. This is what will make the functioning of the enterprises profitable even under the conditions of partial cost accounting and will ensure timely renewal of their fixed production assets and hence the high quality of their products.

To conclude the conversation on the experimental design and production base of the Academy, I shall say that its enterprises must determine principles of their further existence. Here, one can see three alternatives. On the one hand, they can be a part of S&T complexes of the Academy; on the other hand, they can function independently. Finally, they can operate as subdivisions of institutes. The choice is completely up to the institute, not to Presidium. I think Science Departments must play an important role in making the decision.

The transfer of the center of application of all our efforts in the perestroyka to institutes forces us to display a new, especially responsible approach to the organization of personnel work. As you know, the Academy consistently conducts the policy of rejuvenation of scientific personnel, preparation of highly skilled specialists in new scientific directions, and formation of the reserve of managers of institutions and subdivisions.

At the same time, personnel work must be substantially strengthened, especially in the selection of managerial personnel. The following data show the scope of the problem. 12 Directors of institutions have their terms expired. In eight institutes, Directors have been dismissed in accordance with their requests. In three more institutes, they are being dismissed because they have reached the limit age. Besides, two new institutes have been organized within the Academy - the Problems of Information Registration Institute and Problems of Energy conservation Institute. So, by the end of the year it is necessary to elect and approve Directors of 26 institutes, or over one-third of the total.

But the quantity is not the only problem. The thing is, under the new rules of filling positions of institute Directors and other managerial positions, reaffirmed in the Academy Charter and the Scientific Research Institute Charter, the role of collectives and Science Departments must increase sharply. We should strive that open competition and open discussion of candidates and other democratic norms actually bring talented and full of initiative scientists to institutes' management, rather than turn into conflicts of ambitions, lead to flourishing of cliquishness etc. For correct solving of these problems, we count first of all on the leading role of institutes' Party organizations and on concerned attitude of Bureaus of Science Departments and personally Academicians Secretaries and Vice Presidents.

One must understand that in an Academy institute Director is a key figure, a generator of ideas. He must comprehensively and fully understand scientific directions of his institute. Electing such scientists is a difficult but truly the most important task.

In turn, the management of Academy institutions and organizations must relinquish obsolete stereotypes in personnel work. Presidium has prepared, and today's session will probably approve, a decision that significantly broadens institutes' rights in personnel matters.

Thus, their managerial boards are given charge of filling positions and dismissing senior scientific associates, managers of support subdivisions and services and chief and leading specialists, and at the experimental design and production base organizations - of managers of all structural departments, sections, laboratories and production shops.

The number of various approvals and coordinations is being reduced, and petty guardianship on personnel matters on the part of Presidium is being eliminated. However, this has nothing in common with uncontrollability and connivance. Presidium will keep demanding thatmanagers at all levels steadfastly follow Party principles of personnelselection, placement and training. In this area, attempts at asubjective, voluntaristic approach, protectionism and ignoring the interests of collectives are intolerable. Thus, the "Trust But Verify" principle must be fully enforced here.

The above also fully pertains to the experimental design and production base organizations, whose managers, according to our Charter, must be elected at Scientific Councils of their institutes, taking into account the opinion of labor collectives, and then approved by Presidium.

We must finish as soon as possible the implementation of the well-known decision on dismissing from scientific-organizational positions people that have reached the limit age. In our institutions, there still are three Directors, two Deputy Directors and eight Department Heads that belong to this category. It again must be emphasized that there will be no exceptions in this area. One cannot understand positions of the management of institutes and Academician Secretaries of Science Departments where this work has not been completed yet. The majority of people that must be replaced have already been dismissed according totheir requests. Mind you, this process has been completed almost in all republican Academies. It is also nearing completion in the USSR Academy of Sciences.

The goal of attracting capable young people to institutes remains urgent. The opportunities accorded to it by cooperation with VUZs and schools are not being fully utilized yet. The Academy Presidium and institutes must be more active in performing this important work and switch over to the contract system of target preparation of specialists for the UkSSR Academy of Sciences, using the available experience. This will fail if we do not build buildings with small-size apartments. Here, we place great hopes on the active work of our new Vice President V.V. Skopenko.

Under the conditions of comprehensive restructuring of Academy's activities, the role of Presidium as the Academy leader also changes substantially. Of course, it must become much more important, but not due to commanding and administrative measures. By transfering a large number of functions to institutes, Presidium ever more shifts accents in its work to problems of the methodological, conculting and control character. It will concentrate its attention on defining the long-term strategy of scientific research and main ways of Academy development, and on developing progressive organizational forms of research and implementation.

Not to make unfounded statements, I can tell you that our institutions have already be given functions such as sale of fixed assets and marketable and material values, distribution of housing, cars and passes to resort institutions, development and approval of their structure and personnel, limits of restrictions on payment to theiradministrative apparatus, and awarding bonuses for the development and implementation of new technology. This work will be performed in the future too, based on the revision of the functions and structure of the central staff of Presidium of the UkSSR Academy of Sciences. In the near future, we will reduce by 40 percent the number of Presidium nomenclature positions and will transfer to institutes and organizations the authority to pay bonuses for implementation of inventions, and their rights in the area of planning and business activity will be broadened. Other proposals are currently under consideration.

Possibly, one should also think of further changes in the Academy structure. In particular, this pertains to redistribution of institutions between Science Departments. This would make it possible to create more favorable organizational prerequisites for improving the effectiveness of Sections and Science Departments and more evenly distribute the load between Academician Secretaries and the staff. I should add here that at the AN SSSR, as before, the center of gravity of all work is at Science Departments. It is possible that its Science Departments will die off, except for the Social Sciences Section.

We are also planning other changes. In particular, due to the expansion of Presidium's consulting functions, it is expedient to reorganize the existing permamently acting Commission on Checking the Economic Efficiency of the Implementation of Results of Scientific Research of Academy Institutions into a Commission on the Methodology of Science Management. It is contemplated that the Commission will prepare recommendations on a broad spectrum of problems of Academy's life and the life of its institutions under the new business conditions, which will form the basis for appropriate management decisions.

In implementing all these changes, we proceed from the assumption that Presidium and its staff are here for institutes, and not the other way around, and that the center of all work is at the institutes. The goal is to bring in new ideas and guidelines on increasing the initiative, independence and creative courage to the primary links at institutes - their departments, laboratories and groups, as well as to cost accounting organizations, so that these new ideas and guidelines are actually implemented in their work. This is our common cause, and we count on full mutual understanding with institutes.

Academy objectives, both the ones I have talked about and the ones I did not have a chance to, are rendered concrete in Measurements on the Implementation of Decisions of the Session of the General Assembly, which we must approve today.

Summary of Academy Activities

18140035 VISNYK AKADEMIYI NAUK UKRAYINSKOYI RSR in Ukrainian
No 8, Aug 88 pp 15-24

[Report by Academician B.Ye. Paton at the session of the General Assembly of AN USSR [UkSSR Academy of Sciences] "Principal Results of Activity of the Academy of Sciences UkSSR and Its Goals at the Current Stage." Passages in boldface as published]

[Text] Last year was marked by intensified efforts of scientists of the Academy of Sciences on deepening the perestroyka, imrpoving the end results of scientific research and increasing its influence on the progress in the economy and in the social and cultural areas. Academy activities during the last five years have been characterized by increased attention to the development of basic research, orientation toward the implementation

of the policy of priorities, accelerated development of new highly-efficient technologiesand improving the management of the scientific process.

Today we can already talk about the first results of the perestroyka. Just in 1986 and 1987, six discoveries were recorded, which is three times as many as in 1983-1984. The number of Certificates of Authorship for inventions and of licenses and contracts increased more than one-third. The number of works implemented in the national economy increased two-thirds. The results are covered in greater detail in the report, which all of you have had a chance to familiarize yourselves with. I shall therefore only dwell on key problems of the development of the Academy of Sciences.

When organizing the work on restructuring, AN USSR Presidium was proceeding from the need to **concentrate Academy's potential on the strategic directions and achieving world-level results**. Taking into account the trends and dynamism of the development of modern science, 50 priority directions were identified, and two new institutions were created.

Unfortunately, we still have institutes that stick stubbornly to traditional subjects they have been working on for decades and are trying, by hook or by crook, to present them as priority subjects. This pertains to the research of electronic properties of metals at the Donetsk Physical Technical Institute, stratigraphy research at the Geological Sciences Institute, research of carbonhydrate dehydration catalysts at the Petroleum Chemistry Department at the Physical Organic Chemistry and Coal Chemistry Institute, studies of the problem of reunification of Ukrainian lands at the Social Sciences Institute etc.

And the following fact has also come to our attention. Virtually all subjects headed by Directors and heads of large departments are assigned a priority status. It seems that in some places there is lack of adherence to principle, glasnost and democracy. In the end, such position inevitably results in a reduced effectiveness and lower level of research and in institutes losing their face.

Of course, Presidium will not get involved in establishing priority of each specific subject. This is the prerogative of Scientific Councils of institutes, Scientific Councils on problems and Science Departments. But by the same token, priorities cannot be considered as something cast in concrete and invariable. They must be reviewed systematically.

Our Academy holds leadership positions in the country on a number of directions in computer technology, welding and special electrometallurgy, powder metallurgy, ceramics, molecular and cellular physiology, certain areas of economics of the agroindustrial complex and several other areas. Scientific programs have been formed and are being implemented in areas such as high-temperature superconductivity, primary converters of physical and chemical quantities (transducers), membranes and membrane technologies, catalysis, radiation-chemical technologies and biotechnologies. In these areas we have solid theoretical results, and we have every reason to expect tangible results in the immediate future.

Unfortunately, good intentions are not always supported by concrete effort. We already see slowing down after an impetuous start in theresearch of high-temperature supercondutcivity and transducers. Apparently, Vice President V.I. Trefilov has not paid sufficient attention to organisational problems and was not able to give anappropriate pace to priority works.

Especially worrisome is the status of implementation of the "Biotechnology" program, which is the responsibility of Vice President F.S. Babichev. This last January the progress in the fulfillment of the program was subjected to serious criticism at a Presidium meeting. One should draw correct conclusions from the criticism and deal daily with this important problem. Fulfillment of scientific programs must be at the center of attention of the new Academy Presidium.

The unified system of priorities and corresponding scientific programs, which is being formed by the USSR Academy of Sciences in cooperation with Academies of Sciences of Union Republics, is acquiring principle importance. Institutes have a vital interest in participating in such programs, because they will determine the State order to science. The efficient work along this direction will make it possible to improve the prestige of basic research. Here, full of initiative work with Science Departments of AN SSSR [USSR Academy of Sciences] is necessary.

I would like to stress that one should also strive to head some programs. This is not an easy task. One has to deal with severe competition and with,let us face it, pretensions of certain science centers to a monopoly position in their respective fields. But we do not have the right to shirk such difficulties. It is high time to get rid of provincial shyness and resolutely establish ourselves at the All-Union level.

One has to state with regret that institutes such as Plant Physiology and Genetics Institute and Zoology Institute imeni I.I. Shmalgauzen, as well as the TsRBS [Central Republican Botanic Garden] and Donetsk Botanic Garden, demonstrate intolerable inertia and even avoid participation in scientific programs. None of chemical institutes has placed itself at the head of any of the 32 priority directions in the field of chemistry and chemical technology. We have the right to bring serious claims against Academician Secretary V.P. Kukhar. A similar reproach has to be addressed to such large and powerful institution as Cybernetics Institute imeni V.M. Glushkov. One ought to regard such position of institutes as a lack of understanding of the seriousness of the matter.

Implementing the course of **achieving the world level**, Presidium has radically reorganized Scientific Councils on problems and strenghtened the responsibility of Science Departments for the level of subjects under development. The procedure of approving plans and results of scientific research work has been substantially changed, and comprehensive examination thereof has been established. We see this as one of the main objectives of our restructuring.

The orientation toward the world level has already produced tangible results. I shall mention some of them that have been achieved recently. One has developed axiomatics of asymptotic methods of nonlinear mechanics. This opens up the possibility of qualitative analysis of nonstationary processes, which prevail in today's production, and ofdevelopment of new in principle approaches to solving a broad class of appplied problems in machine building, construction and transportation.

The discovery of mechanisms of underground fracture of rock has become an important scientific achievement. We hope that by taking these mechanisms into account one will be able to considerably improve the effectiveness and safety of mining of mineral resources from deep stressed interlayers. I would like to emphasize that this is the first recorded discovery in the field of mining mechanics.

The world's first generalization of the relativity theory has been offered. It is based on the concept of supergravitation, superspace and supersymmetry transformations. On this basis, one has developed versions of the unified field theory, which combines gravitation with other types of basic interactions.

Broad opportunities are opening up due to the development of scientific foundations for manufacturing of massive condensed materials, whose structure can change from amorphous to diamond-like. They are needed, in particular, for fine filters used in biochemical production processes, complex optical systems and special tooling for the machine building industry.

Clarification of the law of boundary surges in electrochemical systems has resulted in a revision of theoretical foundations of chemical kinetics.

The discovery of selective mutagenic action of exogenic DNAs broadens substatnially the possibilities of changing the genetic apparatus of various organisms and creates necessary conditions for breeding high-yielding agricultural crops and races.

However, I must say that we still have very few world-class results. Unfortunately, certain institutions do not demonstrate necessary understanding of the importance of this problem. This pertains to institutes of the Mechanics, Earth Sciences, Physical and Technical Problems of Power Engineering and General Biology Departments. A large share of blame here is to be put not just on institutes' Directors, but also on Academician Secretaries of Science Departments A.N. Guz, A.V. Chekunov, G.Ye. Pukhov and A.M. Grodzinskiy. Problems of development of basic research in individual fields must be more often brought to the attention of Science Departments, and the most urgent ones - also to Presidium's attention.

The course aimed at achieving the highest world level is not equivalent to the desire to have absolute leadership in all fields. Nowadays, nobody can be the first everywhere.

In this respect, I would like to stress the extreme importance of a new approach to the **development and application of scientific forecasts**. If before we used to treat forecasts as only an additional means for improving the level of subjects, nowadays they must become an integral part of the entire research process.

And our attitude to forecasts must change accordingly. An amateurish approach to them cannot be tolerated anymore. The frivolity of forecast development adversely affects the quality of the most important preplanning documents, such as the Integrated Program of S&T Progress, the Scheme of Development and Distribution of Productive Forces, and Concepts of Economic and Social Development of the Republic. Due to the same reasons, our institutions repeatedly have not been ready to present competent evaluations and proposals on complex problems and large-scale national economic projects.

Orientation toward the world level and the competition of ideas it causes make the cooperation of scientific forces, both at the All-Union and international level, very important.

This becomes especially important in meeting the targets of the **Integrated Program of S&T Progress Of CEMA Member Countries**. Today, 37 institutes of our Academy take part in the Program. 95 contracts and license agreements have been signed and are being implemented. Two Soviet-Bulgarian and two Soviet-Hungarian joint collectives have been organized.

Two years of experience in the implementation of the Integrated Program have demonstrated the hopelessness of works that only constitute a sum of minor uncoordinated assignments. We are therefore switching to theimplementation of large-scale target projects, aimed, in particular, at the development of ceramic engines, turbines, equipment for manufacturing of products made of metal powders, and application of protective coatings to parts of machines and mechanisms operating under extremal conditions. At present, they are being coordinated with CEMA member countries.

Here too, it is very important to make sure that at the moment of organization of their industrial production the S&T level of the products corresopnds to the highest level of the world science and technology.

Participation in works per the Integrated Program of S&T Progress of CEMA Member Countries opens up new for us and fairly sophisticated areas of activity. I am talking of commercial realization of developments and joint entry with our CEMA partners of third countries' markets. We must more fearlessly use the rights we are being given due to thedecentralization of foreign economic activity and simplification of the procedure for issuing documents for travelling abroad, and actively accumulate the experience.

Under the conditions wherein new thinking is getting established ever stronger in the practice of international relations, one must pay much more attention to the scientific development of the above problems. This is the job of the Social and Economic Problems of Foreign Countries Institute. We also must substantially improve the level of organization of cooperation with scientific centers of both socialist and capitalistic countries and the effectiveness of international scientific exchanges.

Speaking of principal results of the activity of the Academy of Sciences, I would like to dwell specifically on the **work of our social scientists**. Among their recent achievements, I shall mention a number of works on problems of acceleration of S&T progress, improvement of agricultural relations, formation of production associations and the development of the concept of price and financial and credit regulation under the conditions of full cost accounting. Very important are studies of ways for the activization of the human factor, consolidating the socialist democracy, strengthening the socialist law, problems of literature and art, language construction and increasing the role of spiritual culture.

Still, one must frankly admit that so far our social scientists **have been publishing more than they have been creating**. Unfortunately, we still have few studies which would indeed help the process of renewal. Speaking of the largest detachment of social scientists, the economists, they eagerly critisize the existing practice of business relations, but make few specific suggestions helpful to the problem of restructuring the economy and management. They bear a certain deal of responsibility for the fact that one has not been able yet to overcome in all places the orientation toward extensive factors. Not just the Council on Studying Productive Forces, but also other institutions of the Economics Department must be making a more tangible contribution to solving these problems.

And can we consider normal the situation when there is no single concept of culture of the Ukrainian people, while comprehensive summarizing studies of the history of its development are clearly in short supply? In the meantime, the Harvard University Center for Ukrainian Studies has already begun publishing dozens of volumes of primary sources of ancient Ukrainian literature. I am afraid that with this situation we will soon have to study our own historical heritage from foreign sources. A question arises: under these conditions, what world level can one talk about?

In the meantime, social scientists must undoubtedly arm themselves with this criterion. The best studies by our archeologists and linguists prove convincingly the groundlessness of objections of those who evade this, alluding to ideological differences.

In assessing the status of research in the field of social sciences, the Central Committee of the Communist Party of the Ukraine came to a conclusion that heavy responsibility for slow restructuring of institutes' activities rests with Vice President I.I. Lukinov and Academicians Secretaries A.N. Shlepakov, B.M. Babiy and V.M. Rusanovskiy. We wholeheartedly share this opinion.

Social scientists must reassess habitual opinions on the economy, politics, the social and spiritual spheres of our society and the State and legal construction, and give answers to complex questions generated by our life. Historians have ahead of them huge work on the truthful and comprehensive interpretation of the past of our people. Sociologists also have a wide field of action. Unfortunately, we have not seen any tangible changes yet.

Recent events in certain regions of our country have demonstrated that problems of national and international relations merit serious attention. The lack of comprehensive studies in this area makes it impossible to forecast with confidence and timely prevent crisis phenomena originating on ethnic grounds. An important task is to look for ways for optimum solution of the problem of bilingualism, which is of great political and moral importance for our Republic too. One must also diligently develop an integrated plan of publishing literature that reflects results of most recent studies in the field of social sciences.

Carrying out the management of restructuring, Presidium attaches primaryimportance to **increasing the practical payoff of research and intensifying the pace of implementation of research results into the national economy**. During the previous Five-Year Plan, a large number of new technologies, equipment and materials were developed within the Academy, such as the technology of application of recording coatings on substrates of information media of memory devices forpersonal computers, which has no analogs in the world practice.

The technology of manufacturing of superconducting monocrystals with stable properties at elevated temperatures opens broad prospects for progress in power engineering and electronics. The technology of hydraulic puncture of oil and gas pools significantly increases the output of production wells. The scrapless technology of

capless manufacturing of cutting tools makes it possible to eliminate a number of complicated operations and save scarce refractory metals.

Nowadays, the requirements to technologies as the main link of S&T progress are getting considerably more stringent. The time has gone when one could be satisfied with any technologies, as long as they increased productivity. Today, one must make sure they meet and exceed the world level, and think of their resource- and energy-saving orientation, ecological cleanness and operational safety. Achieving the optimum combination of numerous contradicting requirements is a complex problem, which cannot be solved without an integrated assessment of technologies under development.

I must note that not all technologies developed by us meet such requirements. Among those who underutilize their potential capabilities are the Low Temperatures Physical Technical Institute, Donetsk Physical Technical Institute, Geology and Geochemistry of Combustible Materials Institute, Physical Chemistry Institute imeni O.V. Bogatskiy and some other institutes. Unfortunately, atr those institutes one has no reason so far to speak of any concerted effort.

Problems of developing advanced technologies are linked especially tightly to **Academy's participation in State Programs** of various levels and purposes. Currently, our institutes work on assignments of 106 All-Union and 18 republican S&T programs. In three All-Union and five republican programs, they have been assigned the functions of head organizations. The Academy initiated the formation of three All-Union S&T programs - on economically efficient weldments in machine building and construction, on ceramic engines and on the use of natural gas as a motor fuel. The Academy has already been approved for the first of these programs by the head agency.

At the same time, I must say that our contribution to Republic's economy is still insufficient. Last year, three times more developments were implemented outside the Ukraine than within the Republic. Institutes such as the Radiophysics and Electronics Insitute, Donetsk Physical Technical Institute, Marine Hydrophysics Institute, Zoology Institute imeni I.I. Shmalgauzen and Biology of Southern Seas Institute imeni A.O. Kovalevskiy, do not participate in republican programs at all.

The Academy must respond more effectively to problems of intensive development of Republic's economy and retooling needs of its sectors. Our initiatives must be given a multistage character, which stipulates a consistent transition from one stage to another and timely interaction with directing bodies. All these problems must be submitted to the Academy Presidium for special consideration.

One can see certain progress in the operation of **our ScientificCenters**, which concentrate their effort more comprehensively on solving problems that are urgent for Republic's regions. Thus, for instance, the Western Scientific Center developed an interoblast S&T program "The Ukrainian Carpatians", which has been given the status of a regional program of republican significance by the UkSSR Council of Minsiters. An important role in the Centers' work is played by exhibitions and fairs of technical ideas, where production personnel familiarize themselves with the newest scietific achievements and theconditions for their practical implementation.

Still, the influence of our Scietific Centers on regional development increases slowly. Today, we somehow shy away from talking of contracts with oblasts: it turned out that there are few real actions behind loud words. Vice President K.M. Sytnik, who is responsible for Centers' activity, has not demonstrated proper initiative and consistency in eliminating these defects.

An active search for effective organizational forms integrally coordinated with economic management methods must become the main direction of restructuring the activity of Academy's Scientific Centers. And, of course, Presidium members who head regional centers must make an energetic effort in order to expand the participation of Academy's institutes, including Kiev ones, in solving regional problems.

Development of scientific foundations for rational utilization of natural resources, environmental protection and normalization, and safety of S&T progress is one of the most important directions in Academy's activity.

Recently, proposals on the development of nuclear power in the Republic, the General Scheme of Integrated Utilization of Scrap and Recycled Materials at the Donetsk Oblast Enterprises Up to the Year 2000, and conclusions on nonfeasibility of building the Danube-Dnieper water distribution complex have been prepared, and the integrated scheme of protection of the water area of the Sivash and the Eastern part of the Karkinite Bay was examined. Proposals on forming a "Water Content" program have been sent to the UkSSR Gosplan.

However, the ecological situation in the Republic keeps deteriorating. This is the result of the imperfection of regional management, insufficient environment protection measures contained in Ministries' and agenices' plans and ingoring expert assessments by the Academy. As a result, not just individual natural objects, but **the entire territory of the Republic is in need of serious ecological protection.**

We must admit that we too share a great deal of responsibility for the ecological situation that has formed in the Republic. Nowadays, under the conditions of glasnost, some scientists appeal to public opinion and the Government and often require to close enterprises and stop work on projects already under development, into which large sums of money have been invested. But

may I ask them: "Where have you been before, when there still was the possibility to prevent the great damage caused to the environment?"

In connection with the creation of the USSR State Committee for Preservation of Nature, we must concentrate our effort on scientific problems of ecology, integrated assessment of the conditon of the environment and preparation of recommendations on improving the structure of Republic's economic complex. These problems must become the points of great attention of the AN USSR Scientific Council on Problems of the Biosphere (Council Chairman K.M. Sytnik) and Chairmen of respective Commissions we have created I.I. Lukinov, V.G. Baryakhtar and V.P. Kukhar.

The perestroyka puts in a new light the problem of **interaction between science and production and implementation of scientific achievements** into the national economy. The main characteristic of today's situation is a substantially higher degree of independence of both enterprises and scientific institutions. Plans of joint work of the Academy and Ministries are staying, but now they will assume a more consolidated character. Probably, we should continue to actively use such effective form of relationship as joint sessions of the Academy of Sciences Presidium and Ministries' and agencies' Collegiums. Vice Presidents and Academician Secretaries must organize coordinated work of various institutes on solving complex problems of strategic development of branches of the national economy.

Under these conditions, our institutes must improve the system of "implementation relations" with their direct counterparts in industry. One must also pose much more stringent demands to the quality and the degree of completion of developments offered to enterprises. If we do not achieve this, Academy's influence on the acceleration of S&T progress will diminish.

During the last five years, Academy's activity has been characterized by the improvement of already existing and development of new forms of relations with production. As you know, we place great hopes on **Interbranch Scientific and Technical Complexes (MNTK), engineering centers and implementation bases**. Speaking of MNTK, they have not gotten the necessary complex of real rights, despite certain successes, and sometimes remind one of "paper tigers". Problems of "joining" MNTK developments with series production become very urgent. In this area, additional measures at the Government level are required.

The effectiveness of ten engineering centers of our Academy increases, albeit not as dynamically as we would like it to. Their links with Kiev enterprises remain weak, and very few works in the interest of Republicamn Ministries and agencies are conducted. And the fact that the new advanced form is inheriting this common shortcoming of academic institutes is a matter of special concern.

Our institutes' bases, of which there are now around 50, are going through a complicated process of formation. Academy's experience was supported by the USSR Council of Ministers and recommended for the broadest implementation, but, unfortunately, we ourselves have not expanded it sufficiently. Only 15 institutions are practicing this advanced form, which indicates the lack of understanding of its advantages and benefits. The new Presidium has a lot of work to do in this respect.

Real restructuring in the Academy is inconceivable without a radical **improvement of performance of enterprises of our R&D and production base**. It is well-known how much we gained at that time by creating this base. Now, when we face the new realities, we must revise our views on its role and modernize its functions and structure.

I shall note that in recent years the share of products manufactured according to institutes' developments has increased, and their quality has improved. At the same time, some important problems are being solved with great difficulty. For instance, the development of our own base for **scientific instrument making** is proceeding unsatisfactorily. We are only succeeding in getting certain increases of appropriations, but all our efforts to create a specialized instrument making organization and stir up the development of new in principle instruments at institutes have not yet produced the anticipated results. Here, Vice President I.K. Pokhodnya has been working without sufficient initiative.

But this is actually the only available to us way to intensify research, because nowadays one cannot count on import of instruments in large, and even not so large, quantities. Moreover, we have here a great opportunity to earn currency ourselves, provided, of course, we skillfully organize the work and, certainly, broad cooperation.

The perestroyka also demands that we solve other problems in the activity of enterprises of our R&D and experimental base, ready answers for which are not yet available. Yardsticks used in branches of the national economy are not suitable here. We are firmly convinced that cost accounting at our enterprises cannot be full, because that would mean that institutes lose their influence on them. Here, one must take care of developing such principles of mutual relations that it would be more beneficial for our enerprises to work to institutes' orders rather than seek earnings elsewhere.

Incidentally, I shall note that the economic reform radically changes the **rules for financing the science**, this, figuratively speaking, feeding artery of the academic organism. Funds from the State budget will now be appropriated for **performing the work, rather than supporting** institutes, as was the case before. The scope of work in business contracts will be determined by institutes themselves, with payments made according to contract prices. Now, in order to get budget financing,

institutes must defend their subjects, and on a competitive basis too, and they have to make business contracts under tough conditions, when customers have started carefully counting their money. In essence, both State orders and business contracts stipulate selling scientific products and making profit. But to do this, we all will have to work hard and ponder and comprehend a lot, first of all, in areas of planning of scientific research and wide use of examination and competitive positions. Unfortunately, the majority of our institutes are still far from making necessary decisions on these problems.

Perestroyka success hinges on the **effective utilization of our personnel potential**. The main thing here is to find and support talented and energetic people that can think creatively, see long-term prospects and overcome difficulties. Frankly speaking, we must find and rear obsessed people.

In recent years, Academy's qualifications structure has improved significantly; the number of Candidates and Doctors of Sciences has increased, while the total number of employees has stabilized. We have attained the situation when we have professionals with the highest qualifications virtually for all directions we develop.

At the same time, we have not succeeded yet in creating an efficient system of renewing the Academy membership, and because of this we have not been able yet to reach the currently required five-percent target. This is a serious shortcoming in the activity of Academy's Presidium, Sections and Departments.

A radical problem of our personnel policy is reinforcement of the Academy with gifted young people, first of all, from among VUZs graduates. It becomes especially important in light of resolutions of the February (1988) Plenum of the CPSU Central Committee on restructuring of the secondary and higher education. Even though the number of branches of VUZ chairs at our institutes has increased recently to 40, we have to wait for results for two to three years. We must admit that we were late to come to our senses. But even now, not all institutes participate in this important work. I am talking of the Mechanics Institute, Physics Institute, Geophysics Institute imeni S.I. Subbotin, Biology of Southern Seas Institute imeni A.O. Kovalevskiy, History Institute and Literature Institute imeni T.G. Shevchenko.

Over a year ago we made an agreement with Kiev State University on creating a Goal-Oriented Training Section under the auspices of the Academy of Sciences. But practial implementation of the agreement is lingering intolerably. Our education chairs have not become structural subdivisions in their owh right, as is the case, for instance, at the Kiev branch of Moscow Physical Technical Institute. I think cooperation of the republican Academy of Sciences and the capital university must be raised to a new in principle level. We count here on inspired work and correct understanding of this important problem on the part of KSU Chancellor V.V. Skopenko.

We must start training our scientific replacement not even at VUZs, but at schools. The correctness of this truth is confirmed by the experience of the Mathematics Institute, Metal Physics Institute and Applied Problems of Mechanics and Mathematics Institute. Unfortunately, their experience has not been properly propagated yet. Things are very slow at eight special schools that were created on our initiative and assigned to academic institutes. In particular, the Physics Institute and Surface Chemistry Institute conduct this work only on paper.

The status of work on preparation of Doctors of Sciences in priority specialties gives rise to anxiety. The 1987 plan of defending Doctorate dissertations was only fulfilled 60 percent. And it was compiled according to institutes' and Science Departments' proposals.

There are also serious shortcomings in forming of and working with the reserve of managerial personnel. The result is current difficulties in selecting candidates for positions of institutes' Directors and Deputy Directors.

Some institutes still have an unhealthy moral and psychological climate and are characterized by complacency and inertia, which adversely affects their performance results. This pertains first of all to theDonetsk Physical and Technical Institute, Technical Thermal Physics Institute and Biochemistry Institute imeni A.V. Palladin. A large part of blame for the development of conflict situations in their collectives and for diminishing creative and social activity rests with institutes' Directors and their Party, Komsomol and trade-union organizations, who do not pay sufficient attention to criticism and self-criticism, glasnost and democratization of their collectives' life.

This past January, the first **elections to the Academy of Sciences** under the conditionds of perestroyka were held. They differed from previous elections in more stringent demands in selecting candidates, who had been comprehensively discussed by the scientific community. For the first time, secret ballot was used, when nominating candidates at scientific institutions.

I would like to note that average age of newly elected Academy members is 11 year younger than before the elections, which cannot but make one happy. However, the Academy as a whole has only become a year and a half younger, and this demosntrates that the problem of Academy's aging is still pressing.

I shall now dwell on the work of Presidium itself, whose term expires this year. To a large extent, results achieved by the Academy of Sciences are due to Presidium.

In implementing resolutions of the 27th Party Congress and Plenums of the CPSU and CPU [the Communist Party of the Ukraine] Central Committees and the resolution of the General Assembly of our Academy of Sciences, Presidium has been implementing the course of energetic development of research along topical scientific directions, achieving world-class results and accelerated implementation of scientific developments into the national economy. At Presidium and Presidium Bureau meetings, problems of restructuring and**improving the management** of Academy's activity have been given proper attention. Problems of meeting the targets of the Integrated Program of S&T Progress of CEMA Member Countries and All-Union and republican S&T programs have been at the center of Presidium's attention. Important measures were taken in relation to eliminating the consequences of the accident at the Chernobyl AES.

Presidium has substantially broadened institutes' independence and gave them broad rights in determining research subjects and their own structure, personnel selection and placement, allocation of financial and material resources and awarding bonuses. The practice of filling managerial positions and forming Scientific Councils **on the basis of electivity** and open competition of candidates, taking into account their collective's opinion, is being expanded. The democratization of scientific activity and full glasnost mean the freedom of scientific thought, which science needs as the breath.

But I must admit frankly that perestroyka at institutes is being implemented not without complications. Some collectives and their managers have not yet gotten rid of a parasitical attitude, avoid making important decisions, are afraid of independence and do not use to the full extent the rights they have been given. A lot of people still do not understand what they must do personally in order to really restructure their work. We can clearly see it with the Superhard Materials Institute as an example. Its management and Party organization have not been able to radically change the situation at the institution, although some positive changes have taken place.

Presidium was forced to forcibly make changes in scientific directions of some institutes, such as the Geology and Geochemistry of Combustible Materials Institute, Gas Institute, Plant Physiology Institute and Genetics Institute. Management of these and a number of other institutes, where restructuring was not sufficiently goal-oriented,has been strengthened.

However, one must admit that Presidium often heard institutes' reports formally and superficially. Science Departments' positions were not sufficiently critical either, and therefore their decisions did not have the desired effect. One had to take more energetic steps on restructuring at the Mathematics Institute, Theoretical Physics Institute, Donetsk Physical Technical Institute, Colloidal Chemistry and Hydrochemistry Institute imeni A.V. Dumanskiy, Biochemistry Institute imeni A.V. Palladin, Botanics Institute imeni N.G. Kholodnyy and Social Sciences Institute. I think we need a new procedure for examining institutes' activities by Science Departments with mandatory participation of Vice Presidents. We must enhance Vice Presidents' responsibility for institutes' activities, because that is where science is made.

I must say that Presidium has not been able to cover the full scope of problems of restructuring and react with proper poignancy. Unfortunately, Presidium members make unequal contributions to solving problems of restructuring that face the Academy. They have not always been paying proper attention to fulfilling their assigned duties, seldom visited institutes and, let us face it, even Presidium, not even during hours per business schedule. We should admit with self-criticism that we sometimes lacked creative initiative, persistance and adherence to principles in implementing the developed policy. The analytical work has not always been conducted at a proper level either. We must resolutely eliminate these shortcomings, for which I as President of the Academy share a great deal of responsibility.

Presidium performs day-to-day management of restructuring in the Academy through its staff. Recently, the level of staff performance has increased, albeit not as much as is necessary nowadays. In our opinion, the staff has not yet sufficiently mastered the ability to critically analyze the activity of institutions, define their immediate and long-term goals and prevent negative trends. There are also signs of certain bureaucratization and whipping up the number of employees, which makes the staff sluggish and reduces performance efficiency.

At the new stage of perestroyka, Presidium staff must demonstrate more goal-oriented work on identifying and supporting priority subjects, in-depth knowledge of the situation at the local level and the ability to solve important problems that are fundamental in character. Chief Scientific Secretary V. Ye. Tonkal should take more energetic steps in order to ensure qualitative changes at all departments and administrations, putting in order the staff structure and improving the style of its work.

Under the new business conditions, coordinated effort of Presidium, Sections and Science Departments on "keeping" institutes in the field of basic research and their business contract activity within reason is of fundamental importance. The coordinating role of Presidium staff is very important here. And this is a serious mission for the Chief Scientific Secretary of Presidium.

In solving various problems of restructuring, we must intesify our attention to **problems of scientists' working and living conditions**. The social program of the Academy is supposedly being implemented, but objectively we are making no headway. We must frankly admit that whereas the situation was far from brilliant before, now it is deteriorating. Not only the waiting list for housing

has not dwindled, but it is getting even longer. As before, it is extremely difficult to get passes to sanatoriums, holiday hotels, holiday homes and Young Pioneer camps. There has been no tangible improvement in the quality of medical care; the network of preschool institutions and public catering establishments is expanding very slowly. In this area, we have the right to make critical comments about the Office Management Department.

External reasons cannot serve as excuses, when there is sluggishness of the Office Management Department and unwillingness on the part of institutes to use their own and enlisted funds for social development and join efforts in construction of housing and other facilities. Meanwhile, there are a lot of excellent examples in Kiev, and paticularly in the Leningradskiy rayon, where our Academic Village is located. And, of course, one must strive that social services and benefits are available not only to high-ranking personnel, but also to rank-and-file employees, and especially to young scientists and postgraduate students.

We have entered the second stage of the perestroyka. We are facing complex tasks, which call for nonstandard solutions and induce constant creative search. What we have accomplished so far is only part of enormous work, which must continue and in which we see the guarantee of important changes and further successes of the Academy of Sciences.

Gosplan Official on Importance of Economic Norms

18140049b Moscow TEKHNIKA I NAUKA in Russian No 8, Aug 88 pp 12-15

[Article by Doctor of Economic Sciences Grigoriy Yakovlevich Kiperman, Scientific-Research Institute of Planning and Norms attached to USSR Gosplan, under the rubric "Economics Department": "Norms Control Production"]

[Text] Today when the command and order style of management is yielding its place to democratic methods of management and planning, the question arises of how to combine economic independence of enterprises with observance of state interests? It is possible to achieve such a combination without commands and orders and without infringing on the interests of enterprises primarily with the aid of economic norms.

Economic norms are a form of state control over the measure of labor and consumption inherent in the economy's planning system. Formerly they also were used rather widely in planning (norms of amortization deductions, norms of effectiveness of capital investment and profitability and others), but until recently they played a secondary role in the economic mechanism.

Today economic norms have to occupy a central place in the management system since they lend it the necessary flexibility, maneuverability and the ability to adapt to changing conditions of production.

Economic norms perform various functions in the economic mechanism: regulating, distributing, stimulating and evaluating. The regulating functions of norms consist in the fact that with their aid observance is achieved of the proportions specified in the state plan. Individual deviations from these proportions are possible, but their limits are regulated. Thus a special norm is defined as the ratio between the growth rate of the average wage at an enterprise and that of labor productivity. For each percent of labor-productivity growth, for example, the average wage at an enterprise cannot grow by more than 0.5 percent.

Distributing functions are implemented with the aid of norms determining sizes of payments out of profit or income of enterprises into the state budget, ministry and so forth. Evaluating norms are manifested in their use for the determination of the correlation of the results of enterprises' work and their level of management of public needs. If, for example, the norm of effectiveness of capital investment is 12 percent (that is, they must be repaid in 8.3 years; 100:12=8.3), but actually it is repaid in 10-12 years, then such a level of operation does not meet public requirements.

Another example. In order that excessive stocks of material resources do not accumulate in the national economy and in order that their freezing does not take place, each enterprise is set a norm for the maximum level of stocks per ruble of products sold by it. Let us assume that a norm is established for an enterprise of commodity stocks with a value of 15 kopecks, but actually for the first quarter with a sales volume of 24 million rubles the stocks totaled 3,840,000 rubles, or 16 kopecks per ruble of sales. The stock level then exceeds the norm by 220,000 rubles. Because of this, the enterprise pays into the budget from its cost-accounting income a kind of fine—an additional payment in the amount of 3 percent of the above-norm stocks, in the given case 6,600 rubles.

It is clear that one and the same norms perform different functions at the same time. Thus, the norm of formation of the material-incentive fund combines stimulating functions with distributing functions and so forth.

The enterprises' operation is regulated by a system of interrelated economic norms. Under the conditions of full cost accounting and self-financing a particularly significant influence is exerted on the financial position of an enterprise by distribution norms of income or profit between the an enterprise, the state budget and the higher organ (ministry). They include:

- the payment norm for funds is set in size from 2 to 8 percent of the average annual value of fixed production capital (including uninstalled equipment) and norm-set working capital (commodity stocks relating to working capital);
- the payment norm for manpower resources is set in the amount of 300 rubles a year for each worker and in some labor-surplus regions—200 rubles (regular unprofitable and low-profit enterprises can be temporarily relieved of payment for funds into the budget as well as for manpower resources or one of these payments);
- the norm of deductions from profit into the state budget (including local);
- the norm of deductions from profit into a centralized fund for development of production, science and technology and reserve of the ministry (department) (it cannot be larger than the norm of deductions into the state budget);
- the norm of payment for water and other natural resources (they have not been established so far and will be introduced at the beginning of the next 5-year plan).

Another group determines the directions of use of the cost accounting income of an enterprise and the correlation between the sums allotted for the payment and stimulation of labor and for social and technical development. They include the norm of formation of wage funds, material incentives and social development and the fund for development of production, science and technology and formation of an enterprise's financial reserve.

It can be seen even from this incomplete list that there are many economic norms regulating the most important aspects of an enterprise's operation. Nonetheless proposals constantly appear on approving for enterprises ever new norms regulating the reproduction process of fixed capital, for example, the level of its use, and others. Apparently, because of the indisputable fact that economic norms possess significant advantages compared to formerly approved targets, some have concluded that the more norms, the better. This is a misconception. If the barricade of approved targets regulating each step of economic managers is replaced by a barricade of approved norms, then little will remain of the proclaimed economic independence of the enterprise. The number and composition of norms should be optimal, rational, necessary and adequate for combining the interests of the labor collective and the state.

For economic norms to correspond to their purpose, they must meet a number of requirements. First of all, stability: established at the time of transfer of the enterprise to full cost accounting and self-financing, they will not be subject to change up to the end of the 5-year plan. This rule is essentially observed, cases of deviation from it are becoming increasingly fewer.

Norms must be worked out on time, approved and brought to the notice of enterprises before they start to compile their plans. In the given case, time is not a formal factor, it to a large degree determines the role of norms. If norms are received early by an enterprise, it is guided by them in working out the plan. In this case, the norms contribute to the compilation of intensive plans, taking production reserves more fully into account. If norms are received by an enterprise after it has worked out its plan, they influence only the course of its fulfillment but naturally in no way affect the actual plan.

Finally, and this is the main thing. Economic norms should have a scientific basis and be formed not on the basis of an "attained level," not on the basis of subjective ideas, but subject to objective factors. These factors include, on the one hand, the most important national-economic and sectoral proportions stipulated in the state plan and, on the other, the end results of an enterprise and the resources that it possesses.

From the public character of norms and their correspondence to national-economic and sectoral proportions stems the theoretical validity of common and sectoral norms. In practice, however, individual norms unfortunately predominate. With rare exceptions, each enterprise has its norm of deductions from profit into the budget, its norm of formation of the material-incentive fund, the fund for the development of production, science and technology and the so on.

Individual norms are fundamentally faulty, they open up unlimited room for subjective decisions. There can be no talk at all of any public requirements in this. On the contrary, these requirements somehow adapt themselves to the actually existing level of operation of each enterprise.

At the same time, it is necessary to resign oneself to the fact that it is impossible at this time to introduce scientifically based common norms: differences in objective conditions in which enterprises find themselves, first of all in their technical level, are too great. And if common norms are introduced now, then well-equipped enterprises will gain, while the others in a technical sense will not only lose (this would be tolerable) but in general would be unable to work on the basis of the principle of cost accounting and self-financing. Some think that that is the way to go, let them pull themselves up to the average level or go bankrupt, for they themselves are to blame for their lag.

But, first, there are quite many such enterprises: 13 percent areunprofitable ones and about twice as many are low-profit ones. If they should be levied on the basis of common norms payment for funds and manpower resources, there would not be any money left for anything else and they would find themselves without economic stimulation funds and would be unable to develop.

And, second, are they alone to blame for their technical lag? After all, capital investment up to the present time has been allocated centrally. Some were able to receive money for retooling and modernization and others were not. Equipment also was distributed centrally and not everyone got the newest. But one is not permitted to overlook these circumstances and introduce common norms.

The result is a kind of vicious circle: common norms cannot be introduced while individual ones are fundamentally faulty. Nonetheless there is a way out of the situation that is quite customary for such situations: compromise and introduction of group norms. To group enterprises according to some objective criterion (grouping indicator, as they say, in statistics) and. depending on its size, to establish norms that are the same for each group. Such an approach would provide obvious advantages.

The criteria of groups, just as of norms, have to be different. For example, norms of deductions from profit into the budget can be made dependent on profitability; deductions from amortization into the fund for development of production, science and technology dependent on the degree of wear of fixed production capital; deductions into the material incentive fund dependent on labor productivity and so on.

Elements of subjectivism are completely eliminated. If it is possible now by hook or by crook to manage to get from a ministry a "more favorable" norm, then their formation on the group scale would put an end to such a practice. In distinction to individual norms aiming at actually existing correlations and at expenditures and needs of enterprises, group ones depend on objective factors. It is no secret that the individual norms now being used correspond to actually existing needs or needs

specified in the plan of enterprises in monetary resources for these or those objectives. An enterprise possibly operates better, but if the plan provides for smaller expenditures on its development, there would be less left of the profit following approval of the reduced norms and the other way around.

It can be explained only in this way, for example, that the Plant imeni S. Ordzhonikidze of the USSR Ministry of Machine Tool and Tool Building Industry prior to the transition to self-financing deducted for the ministry 2 percent of the profit, but now the deduction is 29 percent. The Ritm Plant of the USSR Ministry of Instrument Making, Automation Equipment and Control Systems paid 10 percent, but now it pays 40.5 percent. There is no connection between the end results of an enterprise's operation and the amount of the profit left for it. For example, the Yelets Honey Equipment Plant of the USSR Ministry of Instrument Making, Automation Equipment and Control Systems has a profitability of 17.4 percent, but its payments into the budget amount to 36.2 percent of calculated profit and to the ministry 18.6 percent, while the Saransk Prombribor Production Association with a profitability of 65.9 percent pays less into the budget—25.4 percent and is released in general from payments into the ministry's centralized fund. Such examples could be cited from the practice of all ministries, except for the USSR Ministry of Chemical and Petroleum Machine Building where norms of payments into the budget depend on objective criteria and payments to the ministry are made on the basis of a single norm of 7.5 percent. Incidentally, excessive deductions into a ministry's centralized fund in a number of cases are a hidden form of the long condemned practice of redistribution of the profit of well-operating enterprises for the benefit of poorly working personnel.

Norms of distribution of profit or income of a labor collective, formation of the wage fund and correlation of the growth rate of the wage wage and labor productivity and others are structured in such a way that labor collectives, guided by them in their interests, at the same time ensure the observance of state interests. Let us say that for an enterprise a wage norm of 27 kopecks was established per ruble of production, the size of which amounted last year to 1 million rubles. The enterprise is interested in increasing its wage fund. This conforms to the interests of the state and society as a whole, but on the condition that such an increase is economically justified by a corresponding growth of production output. The norm serves this purpose. While trying in its interests to increase the wage fund, but obliged at the same time to adhere to the norm, the enterprise must increase its production output.

Let us say that an enterprise achieves an increase in the wage fund from 270,000 to 324,000 rubles. But for this it must with this same wage fund increase production output from 1 million rubles to 1.2 million rubles (1.2 X 0.27 = 0.324). Should production volume be less, then the wage fund will be reduced. Here there is no explicit assignment for the enterprise to increase production output, but it by itself strives for this as the norm orients it toward this.

Statements are encountered that norms for the formation of economic stimulation funds in general are unnecessary, why regulate "from above" the distribution of cost-accounting income belonging to the enterprise? Would not the labor collective itself have a better understanding of how much money to allot for material incentives, for social development or retooling of production?

Such reasoning outwardly seems attractive, but it is in essence fallacious. Money should be distributed while taking account not only the needs of an enterprise but also the means of society as a whole. Norms of distribution of cost-accounting income should be coordinated with the planned proportions of public production and the volume and rate of growth of production of goods and paid services and the like. Furthermore, intelligent coordination must be provided of current needs with long-term ones, so as not to permit "frittering away" of money intended for expansion or retooling of production. For this reason, centralized determination is required of norms of formation of economic stimulation funds providing for a combination of the interests of each labor collective with the interests and means of the national economy as a whole.

The transition to primarily economic methods does not mean weakening of centralized planned guidance of the economy as many foreign sovietologists hope. Only the forms of management are changing. Today these remind one of the graceful movements of a conductor's baton: despite all their ease, they provide for the balanced, coordinated sound of the archestra. The same is true of economic norms: without administrative pressure, they orient enterprises and economic managers toward the adoption and implementation of decisions beneficial to society.

'Progressive' Tax on Scientific Production Brakes Technical Progress

18140070 Minsk NARODNOYE KHOZYAYSTVO BELORUSSII in Russian No 8, Aug 88 pp 14-15

[Article by Yu. Myalo, junior scientific associate of the Institute of Economics of the Belorussian SSR Academy of Sciences, under the rubric "The Lessons of Cost Accounting": "Science in Excess of the Plan: The 'Progressive' Tax of Scientific Output Is Hindering Technical Progress"; first paragraph is NARODNOYE KHOZYAYSTVO BELORUSSII introduction; last three paragraphs are NARODNOYE KHOZYAYSTVO BELORUSSII conclusion]

[Text] The most important principle of cost accounting is an economic interest in the results of labor. The tool of the implementation of this principle is the stimulating

functions of the wage fund, the material incentive fund, and the fund for scientific, technical, and social development. In the structure of the income of personnel of sectorial scientific research institutes and design bureaus the share of the payments from the wage fund comes on the average to 80 percent and from the material incentive fund, 20 percent. Is this a lot or a little?

It is not a matter of the amount. Not the sum of the fund, but the mechanism of its formation has a stimulating potential. If the system of the remuneration of labor does not ensure a direct dependence of the income on the quality, time, and amount of the equipment being developed, however large the wage is, it will not have a stimulating effect.

The "fixed" salary, which is actually paid only for the time worked, also does not play such a role. Therefore, the efforts of a worker might be aimed only at a salary increase or a promotion....

Under the conditions of full cost accounting the wage fund of sectorial scientific research institutes and design bureaus is formed in accordance with the standard as a percentage of the amount of work in value terms. Moreover, the standard of the formation of the fund as a percentage of the above-plan amount of work is half as great as the standard of its formation as a percentage of the planned amount, respectively 25 and 50 percent. At first glance, the method of forming the wage fund conforms to the principles of cost accounting, by ensuring the leading increase of labor productivity as compared with the increase of the wage by twofold.

But in practice the scientific research institutes and design bureaus, which have changed over to full cost accounting, have been faced with a number of problems.

First, cost accounting organizations perform scientific research and experimental design work (NIR and OKR), the structure of the expenditures on which differs substantially. In experimental design work the material outlays on the production of a prototype, and at times several prototypes, take up the bulk. In scientific research work the remuneration of the labor of scientists and enterprises predominates; here material expenditures, as a rule, are altogether absent. But inasmuch as the standard of the formation of the wage fund is reduced to the total amount of work, research proves to be less profitable. The interest in material expenditures and in the increase of the share of experimental design work is undermining the foundation in the development of new equipment.

Second, the lower standard of the formation of the wage fund decreases appreciably the interest in shortening the planned time of the completion of work. It turns out that intense labor receives half as much remuneration as work with a normal intensity. The situation with above-plan themes is analogous. If a client suggests a development already after the formulation of the plan, the remuneration will be half as much, since here, too, the standard for the above-plan amount is half as great.

Finally, under the conditions of cost accounting the relations of the scientific research institute and the client are based on contract prices for the scientific product; moreover, the prices can be graduated and floating. Graduated prices presume several strict levels of the price subject to the parameters of the equipment being developed, the time of completion, or other terms of the contract.

The floating price appears as a function. Here the lower level, which satisfies the requirements of the technical assignment, is given, while the increase of the price depends on improvements of the technical and economic parameters. For example, by 1 percent for each percent increase of productivity. The main task of graduated and floating prices is to stimulate the increase of the qualitative level of the equipment being developed and not to confine science to a rigid framework. But under such conditions it is practically impossible to establish the planned amount of work exactly: it, like the price, will be indefinite, being formed from the floating prices. It is possible to specify strictly only the lower level of the planned amount of work, on the basis of the lower level of the prices for scientific products. But this means to drive scientific and technical progress into a rigid framework. While superior organizations need the planned amount only for monitoring the wage fund, rather its above-plan share.

When forming the amount of work in value terms scientific research institutes and design bureaus, of course, proceed from the lower level of the prices. For if one directs attention to the average or highest level and does not achieve it, even in case of the fulfillment of the terms of the contract the organization will not fulfill the plan on the amount with all the ensuing consequences. The losses in the income of the collective will be very appreciable. Therefore, the prices do not perform their main function—to stimulate the development of world-level equipment and to give the developer the right to take risks.

The client also increases the price in order to obtain a competitive product and to provide himself with an outlet to the world market. While for the developer in case of the existing methods of forming the wage fund the exertion of intellectual and physical efforts proves to be unprofitable.

It is obvious that the wage fund should be formed in accordance with unified standards. First, this will conform to the conditions of the functioning of graduated and floating prices and will not check their stimulating potential. Second, free range will be given to the initiative of scientific research institutes and design bureaus in

the increase of the amount of development, the shortening of its time, and the increase of quality. This is far more important that the observance of the traditional principle of the lead of the growth of labor productivity over the wage, the necessity of which has not been proven, especially for science. The future of our economy—the basis of society—depends on the acceleration of scientific and technical progress. By clinging to old habits, it is possible to win kopecks, but to lose millions and even more, which cannot be measured in rubles.

External cost accounting at scientific research institutes and design bureaus objectively presumes the development of internal cost accounting, without which it is possible to compare the organization with a tree, from which they have cut the root system. The root for some time will be luxurious and green, but it will invariably wither, and there can be no talk of new young shoots. Internal cost accounting at scientific research institutes and design bureaus is now extremely undeveloped, in the true sense it simply does not exist. It turned out that the majority of organizations are unprepared for work under the new conditions.

Specialists in the field of the economics of science are needed. For the present at many scientific research institutes "specialists" with a humanities education or retired servicemen manage the economic services.

The far-sighted managers of several scientific research institutes and design bureaus found a temporary solution, having linked up academic and VUZ science on a contractual basis for the introduction of internal cost accounting. But these forces are insufficient. Therefore, the majority of managers are waiting humbly for instructions and directions from above. And meanwhile not one higher educational institution of Belorussia is training specialists in the field of the economics of science, although the republic specializes in the production of science-intensive products and the powerful scientific and technical potential of many union ministries is concentrated here. Is the training of economists for trade really more urgent and prestigious than for science?

From the Editorial Board. Just one of the large number of problems, which arise during the changeover of sectorial scientific organizations to cost accounting, is touched upon in the article. The city applied science conference "The Problems of the Introduction of Cost Accounting at Sectorial Scientific Research Institutes and Design Bureaus," which was held in Minsk on 26 May 1988, was devoted to their study. The conference established that an effective mechanism of the self-financing and management of research and experimental design work, unfortunately, for the present is lacking.

The former "cauldron" method of forming the wage and bonus funds has been retained; the resources of scientific organizations are being used inefficiently; temporary creative collectives, which operate in the priority directions of scientific and technical progress, in practice are lacking.... In short, the stimuli, which are envisaged by 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," thus far are not working to the full extent.

It is obvious that the new mechanism, which has been in operation since early 1988, has not yet overcome the inertia of stagnation. Now in Minsk only about half of the sectorial scientific research institutes and design bureaus are operating on self-financing, but during 1988-99 all will change over to the new conditions. Will this increase, in conformity with the laws of classical physics, the "rest" mass or will accelerating factors prevail? The consultation center for problems of cost accounting in science, which is being established at the Institute of Economics of the Belorussian SSR Academy of Sciences in accordance with the recommendations of the conference, will also be added, we will hope, to them. In subsequent issues the journal will tell in greater detail about them, as well as about the most interesting statements.

Current Financing Norms Increase Risk of New Technology

18140058 Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 29 Oct 88 p 2

[Interview by B. Polukhin with A. Samokhvalov, director of the Moscow Petroleum Refining Plant, 19th Party Conference delegate: "Payment for Risk"; first paragraph is SOTSIALISTICHESKAYA INDUSTRIYA introduction. Passages in boldface and italics as published]

[Text] **Technical need advances science farther than a handful of universities—this thought was expressed by F. Engels in his day. There are hundreds of unsolved problems in our industry, yet industry and science are in no way managing to form a productive symbiosis. It is commonly thought that the root of this problem is production workers' weak interest in innovations. However, under cost-accounting conditions, it is even more risky to reject innovations: obsolete technology goes hand in hand with unprofitability. Why has the new economic management system not brought decisive changes with itself (at least for the time being)? A. Samokhvalov, director of the Moscow Petroleum Refining Plant, 19th Party Conference delegate, thinks about this:**

A. Samokhvalov: I think that it is best to examine the mechanism for applying some specific development and analyze "bottlenecks." For example, consider the dramatic story of the creation of a technology for obtaining polypropylene at our plant. It began with the fact that

more than 20 years ago, on the initiative of D. Ivanyukov, then director, a research laboratory was set up at the enterprise. Scientists were invited for joint work with the plant's technologists.

After 3 years, polypropylene had already been obtained. However, at that time they had not succeeded in achieving the process continuity needed for mass production. The new technology was considered unpromising. The laboratory broke up. Today, we know what a premature evaluation can lead to. Although it could have been otherwise, our country had to purchase this technology in Italy, along with the necessary equipment.

This situation, you will agree, is not really so uncommon. Although the director of the plant displayed initiative in this case, and not a representative of science, the result nonetheless was "not in our favor." Thus, it is not a question so much of an inherent conservatism in industry. Of course, we are not without fault. We do sometimes prefer to hold on tightly to the bird in the hand and not pursue the two in the bush. However, in my opinion, the basic reason for the difficulties on the path of scientific and technical progress should not be sought here.

Let us assume that the petroleum refining workers had successfully brought the new technology for obtaining polypropylene to conception and had convinced all the authorities that the project was worthwhile. Immediately, a question arises: where will we get the equipment? After all, one must begin with literally nothing—from the drawing board. Then, one must manufacture experimental industrial models and, finally, a plant technological complex. Just try to squeeze such an order into the already-approved plans of the machine builders!

It is impossible to successfully solve scientific and technical problems, without first having solved the organizational and economic problems. A technological breakthrough can be compared to an attack, which inevitably misfires without the support of "all arms of the service." A half-attack is undoubtedly doomed to failure.

SOTSIALISTICHESKAYA INDUSTRIYA: Everything, it seems, comes up against the notorious "objective circumstances?" However, after all, a great deal has changed with the conversion to cost-accounting. Solid funds for scientific and technical development have been formed by profitably operating enterprises. How come the directors have not thrown themselves into the attack in concert?

A. Samokhvalov: So that they do not go bankrupt in concert. The reason does not lie in the fact that work in "breakthrough" areas is sometimes related to a high risk of failure. The present-day economic conditions are such that science can ruin us more rapidly than obsolete production.

Let us assume, having taken funds from those planned for reconstruction, we have invested a million rubles to develop some new kind of technology. A miracle occurs: the plant not only introduces it in the same year, but also obtains a million-ruble profit, paying back all of the expenses. Wonderful! So to speak... The enterprise receives less than a fourth of its earned million. This is our share (22.38 percent) of the profit, according to the deduction norms established by USSR Minneftekhimprom.

This means that expenses for the innovation will be paid back no earlier than 1993 and, taking into account amortization and other deductions, this time period becomes even longer. Over these years, the millions given to science have dropped out of the plant's circulation. For the collective, such an investment of funds is a direct loss. In other words, we need a scientific development which, per million rubles of outlay, would bring in 5 million in profit the first year alone. However, this is already getting into science fiction. More often, an idea, checked "in the test tube," works poorly or not at all in practice. So, that is our money down the drain then.

The experience of Western applications companies shows that, out of the total of proposed inventions and promising ideas, only 20 percent of the projects they finance actually bring in a profit. In such a situation, would a normal director risk investing large sums in an innovation, out of the collective's pocket?

SOTSIALISTICHESKAYA INDUSTRIYA: That is probably why enterprises also prefer economic contract "trifles," in which they risk virtually nothing. Perhaps, the answer lies in leaving the plant a significantly greater share of the profit from applying new things? If one plans to take a risk, one would like to know for the sake of what!

A. Samokhvalov: The norms for deductions from profits are the topic of another serious discussion. Let us take a closer look at what is holding back the initiative of production workers today. As I see it, there are two main reasons. First, the need for renovation is imminent, but as a rule, the enterprise has little "risk" capital. Secondly, the collective shares the profit gained by mastering new equipment and technology, but in case of failure, it "cries" alone.

How are these problems solved in the West? Venture companies in the United States, for example, attract the investments of large corporations and the state instead of their own capital. A well-known example is the Trilogy Systems Company, which undertook to create a supermicrocircuit for a new generation of computers in the early 1980s. It obtained a record sum—270 million dollars of "risk" capital—from various sources. Although the company may be unable to fulfill its obligations, the principle itself of this approach to innovation is important for us.

SOTSIALISTICHESKAYA INDUSTRIYA: Are you saying that we also need a similar mechanism for forming the innovator enterprise's "risk fund"? However, after all, we have no gigantic corporations, interested in finding new, highly profitable areas for investing their capital?...

A. Samokhvalov: What prevents a sectorial ministry from acting in the role of such a corporation? Why should not the ministry and the state become the plant's shareholders for financing scientific developments? That is, a certain (possibly even large) part of the funds from the centralized fund could be invested, not directly in science, but in science by way of an enterprise which desires and is ready to apply a world-class invention.

As a basis for shareholder participation, one could use the same percentage of the normed profit distribution. For example, if we deduct 52.7 percent for the ministry, 14.9 percent for the state budget, and keep 22.3 percent of the profit for ourselves, then their investment in new development should also be divided in the same proportions. In case of success, each participant receives his share of the additional profit—according to his investment.

SOTSIALISTICHESKAYA INDUSTRIYA: What if the project which was risked fails?

A. Samokhvalov: Broken down among all the participants in financing, a failure nonetheless will not cost the enterprise as much, as if it alone had had to pay for the innovation. Indeed, in this case the probability of a "puncture" itself is significantly lower, since each party will be economically interested in overall success.

When the threat of losing, in one fell swoop, a great sum of money (with which the collective could, for instance, construct a brick shop and put up an apartment building for the workers) ceases to hang over the plant, the directors themselves will go to the scientific research institutes for innovations. It will be the most far-sighted to finance exploratory research. Moreover, sharing the innovation risk would force the ministries, as well as the GKNT and Gosplan, to approach the development of plans and programs for scientific and technical progress with great responsibility and a realistic attitude.

Formation of Cost Accounting Associations in VUZ's

18140069 Moscow EKONOMICHESKAYA GAZETA in Russian No 42, Oct 88 p 15

[Article by I. Mikhalchuk, senior scientific associate of the Belorussian Polytechnical Institute, under the rubric "Scientific and Technical Progress: Economics and Management" (Minsk): "Under One Roof": first paragraph is EKONOMICHESKAYA GAZETA introduction]

[Text] The scientific and technical association, which was established at the Belorussian Polytechnical Institute and is one of the first in the country, has gathered scientists, students, and production workers under one roof.

First of all it is necessary to answer the question: Why was it necessary to establish a cost accounting association on the basis of a higher educational institution? Primarily in order to afford students the opportunity to try their hand both in the role of scientific developers and in the role of designers and to reinforce the acquired knowledge in practice. The training of skilled specialists is impossible without this.

At our institute 55 scientific laboratories, a special design and technological bureau with a pilot works, a pilot experimental plant, and a computer center are in operation. As you see, a base exists for the implementation of all the stages of the innovation cycle. But for the present it is being used in far from the best manner. We have put out twofold more methods, recommendations, and reports of all kinds than experimental models, the focus on petty topics has swallowed them up. These troubles are typical of many higher educational institutions of the country. Such "testing grounds," of course, are not conducive to the training of high class specialists. It was necessary to proceed to a vital matter: the filling of the orders of enterprises and the comprehensive solution of intersectorial and regional scientific and technical problems. But for this it is necessary to gather all the forces together.

It is no secret: although all the subdivisions listed above thus far were within a single higher educational institution, they each lived in their own way. The distribution of the amounts of work, the wage fund, and material resources was in the hands of the Belorussian SSR Ministry of Higher and Secondary Specialized Education. The plans of the institute, the design bureau, and the plant were poorly interconnected. Moreover, their legal isolation forced the institute for the fulfillment of a single scientific research job to conclude three contracts—with the client, the special design and technological bureau, and the plant. While this meant that much of the time, which was allotted for development, was wasted on formal consultations.

Therefore, having decided to change science over to full cost accounting and self-financing, we chose such a form of its cooperation with production as the scientific and technical association. The scientific research institute, the special design and technological bureau with a pilot works, and the pilot experimental plant became a part of the Politekhnik Scientific and Technical Association. The scientific research section was specified as the head section. The prorector of the institute for scientific work became the general director of the association. The structural units within the scientific and technical association are legal entities, while the association itself has an independent balance sheet and as a legal entity acts on behalf of the institute.

The labor collective of the scientific and technical association consists of the permanent personnel of its structural units, and this is 1,800 people. Moreover, the professors and instructors, educational and training personnel, and students are being enlisted in the work. It is particularly gratifying that the adopted structure enables the student during the time of studies at the higher educational institution to familiarize himself with various spheres of engineering labor. He can try his hand in production, designing, or research work and determine precisely what is to his liking.

From the management point of view the association makes it possible to ensure comprehensive planning—from scientific development to introduction in production. Hence the possibility of shifting resources and the efficiency and goal orientation of actions.

When choosing a model of cost accounting, we settled on the first one. The thematic plans for this year, which were formulated before the establishment of our scientific and technical association, prevent us now from choosing the second model—there is not enough profit, we risk being left without wages. Nevertheless, we hope in 2-3 years to create the necessary base for the subsequent changeover to the second model.

In order to get on our feet quickly and firmly, we introduced elements of internal cost accounting at the Politekhnik Association. In particular, we granted the structural subdivisions the right to conclude economic contracts on behalf of the association. Scientific and production equipment was attached to them.

Cost accounting has just begun to undergo the test of practice. For the present it is too early to give an estimate of the effectiveness of all its aspects. But it is now already possible to say that with the establishment of the Politekhnik Scientific and Technical Association "research" operations for the sake of spending assets, which are far from the demands of practice, are receding into the past.

Financing Policies Detrimental to VUZ Research Efforts

18140078 Moscow KOMSOMOLSKAYA PRAVDA in Russian 9 Oct 88 p 2

[Article by V. Shukshunov, deputy chairman of the USSR State Committee for Public Education: "'The Sciences Are Sustaining Youths.' But Who Is 'Sustaining' Science at Higher Educational Institutions?"]

[Text] Science thus far remains unprofitable. And, hence, education is also unprofitable. Such is the sad legacy of the years, when "gross" economics and the dictation of the producer, which was aggravated by the lack of competition both on the part of the domestic market and on the part of the foreign market gave rise to a kind of immunity which reliably protected the national economy against the spread of new equipment and technology. Science became a foreign body—it prevented adjusted production once and for all from operating smoothly and from putting out as many products as possible, which are as heavy and bulky as possible.

All this could not but also affect the quality of science itself—and, as had happened more than once in our country, they attempted to offset the lack of quality with a surplus of quantity. The managers of sectors of production believed that it was possible to correct the state of affairs by the number of their own scientific research institutes and design bureaus. As a result sectorial science has expanded excessively and has become the basic devourer of financial and material resources—in our country it accounts for two-thirds of the assets which are allocated in general for scientific purposes (a share which is 2.5-fold greater than, say, in the United States). This enormous mountain gave birth to two wretched mice: a meager practical return and weak scientific personnel. According to the data of the USSR Higher Certification Commission, at one sectorial scientific research institute in five there are not even doctors of sciences.

And what about the higher school? For half of all the candidates and doctors of sciences of the country—half of our intellectual potential—are concentrated precisely here. But this, so to speak, is in the numerator. While in the denominator.... At the majority of higher educational institutions the material base is simply unsuitable for serious science. Here there is equipment worth only 5,000 rubles per researcher. We will not compare this figure with the corresponding $100,000 per person in the leading scientific collectives of the United States and other developed countries—let us say only that it is one-fifth as great as at our sectorial scientific research institute and two-elevenths as great as at the USSR Academy of Sciences.

And, besides, the VUZ scientist hardly has time to work on this equipment: for he is a scientist as if last of all, and before that he is an instructor, a methods expert, an educator, a public figure.... In conformity with the existing individual plan from 1 to 4 hours a day are planned for scientific purposes for the instructor of a higher educational institution.

Let us also add this to the "denominator"....

The situation is aggravated by the fact that VUZ science, it can be said, feeds itself: whereas of every 10 rubles the Academy of Sciences receives 8 rubles from the state budget and earns only 2 rubles through economic contracts, for us everything is the opposite. So, of these 8 honestly earned rubles VUZ science spends today on itself—that is, on the development of its own material and technical base and on pilot experimental production in its own interests—only 40 kopecks (plus a 10-kopeck piece—by means of a kind of "stipend" from the state budget)....

But these are also not yet all our losses. After all, so that ideas would turned into a material product, they should be used somewhere. Where? In the same sectors. But there the fates of science are decided by its own scientific research institutes, the role of which reduces to "keeping out" competitors. Keeping out competitors, but not their ideas: the monopoly enables sectorial science to parasitize VUZ and academic science, literally changing in some cases the title pages of studies and inscribing there its own surnames.

Taking into account that the sectorial scientific research institute most often has the right of a primitive "veto," here you will not have free scope.... And, honestly speaking, you would not want to. Having found themselves outside the law, higher educational institutions were forced to undertake the fulfillment of minor, one-time orders of enterprises.

Therefore, VUZ developments existed, as a rule, in a single execution. In spite of the fact that they often proved to be better than the ones which sectorial scientific research institutes "duplicated" at subordinate enterprises. A legitimate question arose: Why are VUZ designs used so inefficiently? Might it be that it is necessary to duplicate precisely them? In order to answer this question, KOMSOMOLSKAYA PRAVDA organized back in 1984 the first All-Union Student Trade Fair at Novocherkassk Polytechnical Institute, of which I worked as rector at that time.

A somewhat terrifying picture formed: there were too many good developments. Every higher educational institution, it can be said, had invented its own "bicycle"—and at none were there enough forces to make its sensible, to bring it up to a series.

This was not unprofitable either for the enterprise, which at any moment could turn to the inexpensive market of VUZ intellectual resources, or for the sector, which such scattering of competing forces enabled to "divide" and rule and to retain a monopoly.

A paradoxical stratification occurred: on the one hand, there is production, which is interested in scientific personnel, but is not interested in their ideas. On the other, there are scientific personnel, who are interested in their own ideas, but are not interested in working in production.

As a result, higher educational institutions were formed for decades as closed collectives, reproducing scientific personnel who did not work a day in the national economy. Student—graduate student—docent—professor—head of a chair....

For a significant portion of VUZ scientists it became a customary thing to pass off a desirable, fundamental solution as a definitive solution, a mockup as a finished item.... We also observed this at the trade fair.

It would seem that the instructor was relieved of the "excessive load" in the form of scientific research precisely so that he would train personnel better. But personnel became as a result worse and worse: according to official data, the former student had to spend 2.5 years on adaptation under the conditions of production. The higher educational institution failed to give him nearly half an education.

Today it is time to turn this "fraction" upside down, having reduced to one-third to one-half the assets, which are being allocated for the development of sectorial science, and having invested them in VUZ science. With these assets higher educational institutions will set up or expand their own pilot production and thus will themselves be able to implement their own ideas. And they themselves will also derive a profit from them. The higher educational institution will cease to be idle, the material base and, hence, the quality of the training of specialists will improve. The latter will yield new ideas, which with time will give the higher educational institution even more assets....

The higher school today is a dependent whether it likes it or not. Examples of its successful competition with not only sectorial, but also academic science already exist. Here, say, is the sensation of the 20th century—high-temperature superconductivity: not by chance did the USSR Council of Ministers assign a leading role in the study of this problem precisely to VUZ science. This was honest competition. "Morally" the higher educational institution is also ready for such competition in the future. But it is necessary also to back this readiness materially—to give the higher educational institution a kind of "critical mass"—and the chain reaction will go on farther.... Note: it is a question not of the creation of special conditions, but of their elementary equalization.

In order just to oppose something to the monopoly of sectorial science, higher educational institutions are uniting within the framework of comprehensive goal programs. But this is just the first, primitive level of cooperation, the level of "the association for the joint tilling of land." For example, within the framework of such a program 100 higher educational institutions will undertake the development of 100 parts for a motor vehicle of the 21st century and, believe me, they will develop them! But where is the guarantee that, put together, these superparts will actually make a super motor vehicle? We need not simply the arithmetic addition of forces, but their multiplication.

VUZ science should take its place in the national economy. It is necessary to return this place to it. After all, for the present it, in general, is empty. The February (1988) CPSU Central Committee Plenum also noted this fact with alarm.

A simple example: while literally flooding the country with millions and thousands of tons of products, the chemical industry could not provide either itself or science, incidentally, with kilograms and grams of the most necessary chemical reagents. It is unprofitable: there is much trouble, but little output (which they were accustomed to measuring by weight).

Today there are more and more such tasks, in which intellectual resources are far more necessary than any others. For example, the same program product for computers, which in general does not weigh anything, but is valued more than gold....

In the United States even the special term "small business" has appeared. Thus far we do not have such business. It would seem that VUZ science was directly established for it: here there are a high "concentration of minds," the lack of any rigid plans, the opportunity to reorganize literally on the go.... For example, precisely VUZ science would fill in the best possible way the same individual orders of enterprises for experimental design and planning work: after all, you will not put everything onto a conveyor, and it is not necessary! But so that this would not develop into "nibbling," into the patching of holes, one must not leave VUZ science "grazing"—it is necessary to give it the opportunity to develop basic research.

Otherwise higher educational institutions will, like today, literally eat through their own harvest.

And without this they also are already expanding their own production, their own experimental design base: the higher educational institution is outgrowing its own usual boundaries—scientific research institutes, design bureaus, special design bureaus, special planning, design, and technological bureaus...are appearing under it. But the present procedure of financing is creating at such a higher educational institution truly centrifugal forces: VUZ scientific research institutes and design bureaus, like foolish children, attempt to free themselves a little sooner from the "burden," to set up on their own, to change over to their own balance sheet.... The questions:

"What do we need a student for?", "What do we need people who combine jobs for?" are being heard. Such a situation is not only economically foolhardy, it is immoral!

A sensible state policy is needed here. The state order should become its vehicle—here is the lever which will pull higher educational institutions out of the "stagnant" swamp. Today such a state order for 7 million rubles has already been received. According to our calculations, this will make it possible by 1995 to bring the amount of research at the higher school up to 1 billion rubles.

Education and science should take a step toward each other. I say this as a former rector, who combined in one person the duties of both the director of a design bureau and a chief designer.

Education, incidentally, has already attempted to take this step. The famous method of the Physical Technical Institute—when students after the 2d year begin to work at the base of the most prominent scientific centers—emerged. But this means is good wherever such centers exist. While wherever they do not exist, higher educational institutions themselves can become such centers. It is necessary merely to meet them halfway.... This is advantageous!

Even a few sectorial ministries have already understood this. The Ministry of the Chemical Industry, for example, jointly with the RSFSR Ministry of Higher and Secondary Specialized Education several years ago became the initiator of the establishment of the Reagent Program. Within the program the Ufa Petroleum Institute is producing today about 400 descriptions of the most valuable reagents, which previously had to be purchased with foreign currency.

Gold rubles remain in the country. While with ordinary rubles, which were derived from the proceeds of products, the institute, having developed an area of about 10 hectares, is building its own advanced flexible works.

And this is not the only example of the path which VUZ science should travel. Such a path, which it has already traveled in all developed countries, where precisely higher educational institutions are the leading national scientific centers.

Council of Ministers Creates New Computer Clubs, Centers

Summary of Decree

18140046a Moscow KOMSOMOLSKAYA PRAVDA in Russian 21 Sep 88 p 1

[Article: "Information Science on Cost Accounting. The Decree of the USSR Council of Ministers 'On the Development in the Country of the Sphere of Information and Computing Services' Has Been Adopted"]

[Text] In the adopted decree, in particular, it is stated:

For the purposes of the development in the country of the sphere of information and computer services and the stimulation of the work on the solution of the problems of the spread of information technology in Soviet society and on the assurance of the computer literacy of broad strata of the population and especially young people

— to adopt the suggestions of:
— the USSR State Committee for Computer Technology and Information Science on the establishment during 1988-1990 of 205 information science centers (on cost accounting), including not less than 30 centers in 1988;
— the All-Union Komsomol Central Committee on the establishment during 1988-1990 in consultation with the USSR State Committee for Computer Technology and Information Science of 400 computer clubs attached to the centers of creative scientific and technical work of youth or Komsomol committees, including not less than 30 clubs in 1988, which operate on the principles of cost accounting and self-financing.

To carry out the establishment of the indicated centers and clubs in cities and other population centers of the country in consultation with the Councils of Ministers of the union republics.

To regard as the most important task of the information science centers and computer clubs the organization of work in the area of information science among broad strata of the population with the enlistment of clubs of amateur creative technical work, centers of the creative scientific and technical work of youth, and cooperatives, which are participating in work in the area of computer technology and information science.

To endorse the initiative of the All-Union Komsomol Central Committee on the enlistment of young people in the establishment and development of information science centers and their active participation in their activity.

To assign to the USSR State Committee for Computer Technology and Information Science:
— the scientific methods supervision of the system of information science centers and computer clubs;
— the All-Union Coordinating Council of Creative Scientific and Technical Work of Youth, which was formed by Decree No 321 of the USSR Council of Ministers, the All-Union Central Council of Trade Unions, and the All-Union Komsomol Central Committee of 13 March 1987, jointly with the USSR State Committee for Computer Technology and Information Science is to draft and in a 3-month period is to approve in consultation with the USSR Ministry of Finance and the USSR State Committee for Labor and Social Problems a model Statute on Computer Clubs.

The USSR State Committee for Computer Technology and Information Science jointly with the ministries and departments, at the organizations, enterprises, and associations of which information science centers are being established, is to envisage:
— in the drafts of the plans for 1989-1990 the special-purpose allocation of computer hardware and technical information media for the supply of information centers and computer clubs;
— the allocation in 1988 for the supply of the computer clubs being established 200 personal computers (in accordance with the order of the All-Union Komsomol Central Committee).

To permit the sale to organizations of the USSR State Committee for Computer Technology and Information Science, the All-Union Komsomol Central Committee, the Komsomol Central Committees of the union republics, kray, oblast, city, and rayon committees of the All-Union Komsomol, and centers of creative scientific and technical work of youth during 1988-1990 of home personal computers, color televisions, and cassette tape recorders for the supply of information science centers and computer clubs for cash (including on credit) in the retail trade network and through firm stores of the USSR Ministry of the Radio Industry, the USSR Ministry of the Electronics Industry, the USSR Ministry of the Communications Equipment Industry, and the USSR Ministry of Instrument Making, Automation Equipment, and Control Systems.

The USSR State Committee for Computer Technology and Information Science jointly with the All-Union Komsomol Central Committee is to formulate and to approve within a 3-month period in consultation with the USSR State Planning Committee measures on the assurance of the development and the organization of the production of mobile (including in buses) information science centers and computer clubs for remote regions of the country.

Komsomol Leader Comments

18140046a Moscow KOMSOMOLSKAYA PRAVDA in Russian 21 Sep 88 p 1

[Article by V. Kopyev, chief of the Department of Creative Scientific and Technical Work of Youth of the All-Union Komsomol Central Committee: "'Give an Association of Computer Clubs!' the All-Union Komsomol Central Committee Suggests"; words in boldface as published]

[Text] For the present the number, as well as the quality of the majority of personal computers being produced in

our country are inadequate. But this, too, cannot halt the rapidly increasing interest of young people in them. Youth computer clubs and associations of users of various types of computer hardware are being established.

The decree of the USSR Council of Ministers "On the Development in the Country of the Sphere of Information and Computing Services" gives the state support that this movement needs so much.

What steps is it proposed to take? Today, according to our data, more than 200 associations, which have various types of personal computers, are already operating. Any of these associations, as well as the clubs of creative computer work of youth, which are being established under Komsomol committees or (in accordance with the decision of the appropriate coordinating councils) under centers of creative scientific and technical work of youth, can become a part of the Yunost network of clubs of creative computer work of youth. What does this mean? These formations are obliged to perform work on the spreading of computer literacy, the establishment of game zones, and the development of software in accordance with the orders of state enterprises, cooperatives, centers of creative scientific and technical work of youth, and other economic organizations. The unified youth fund of computerization is formed by means of contributions from the revenues of the club, while the results of the developments of programmers are integrated in the unified bank of programs of the Yunost network.

[Boxed item: Incidentally.... In Smolensk the Delta Cost Accounting Computer Center was established by young specialists in the field of information science and programming headed by A. Naydenov. The instruction of all those who wish in the principles of information science and the training and advanced training of staff members of enterprises of the city are being carried out here.]

[Boxed item: Your Opinion? The preparation of the documents of the All-Union Coordinating Council of Creative Scientific and Technical Work of Youth, the All-Union Komsomol Central Committee, and the USSR State Committee for Computer Technology and Information Science, in which the procedure of establishing computer clubs and youth computer associations will be specified, is being completed. If suggestions and ideas in this regard have come to you, we invite you to share them.

On the envelope make the note: "Computer."]

Incidentally, the first contribution to this bank already exists. The collective of the interschool design bureau of the Institute of Informatics Problems of the USSR Academy of Sciences decided to place the program system of the designing of animated cartoons, computer games, and educational aids, which were developed by it, with the set of documents at the disposal of the Yunost network free of charge and to transfer the assets, which have been received from the sale of this development, to the fund of computerization.

The head organization, the Yunost Center of Creative Computer Work of Youth of the All-Union Komsomol Central Committee, in accordance with contracts with clubs is providing them with information and methods materials, is organizing the supply of clubs with computer hardware, and is making advertising and exhibition services available to the clubs of the network.

Here we would like to stress one, in our opinion, fundamental thing. It is a matter of an association on an **exclusively voluntary** basis.

The idea of the necessity of combining the creative efforts of young people in the area of information science was also heard at the meeting of representatives of computer clubs and associations of Moscow and Moscow Oblast, which was held in the spring of this year at the Moscow Palace of Youth. Analogous suggestions are being heard in the numerous letters and suggestions, which are arriving at the All-Union Komsomol Central Committee from various corners of our country.

[Boxed item: If Questions Have Remained.... Call the Yunost Center of Creative Computer Work of Youth of the All-Union Komsomol Central Committee (telephone number: 187-99-95).]

The All-Union Komsomol Central Committee believes that the establishment of such an association of youth computer unions makes it possible to solve many problems jointly.

Here the establishment of mobile information science centers and computer clubs should become a most important matter. The cooperation of organizations of the State Committee for Computer Technology and Information Science, organs of public education, and Komsomol committees made it possible to solve this problem in Yerevan, Dushanbe, Sverdlovsk, Gorkiy, and many other cities. But for the present this is a drop in the ocean. In many remote regions of the country they are waiting impatiently for our computer landing parties....

The decree of the USSR Council of Ministers, which KOMSOMOLSKAYA PRAVDA is publishing today, enables Komsomol committees and centers of creative scientific and technical work of youth to actively join in the work on the spread of information technology in our society. The mechanism of state support is set forth clearly. It is important that the initiative of young people would fill it with a content.

Glavlit Officials Explain Policy on Classifying S&T Material

18140055a Moscow NTR: PROBLEMY I RESHENIYA in Russian No 19, 4-17 Oct 88 pp 1, 4

[Excerpts from the tape of a discussion by N. N. Gladzatov, deputy chief of USSR Glavlit, and D. V. Pavlov, member of USSR Glavlit's collegium, with correspondents F. Vladov and V. Pokrovskiy: "Glavlit Has the Floor—A Retreat from Secrecy"]

[Text] We are interested in a dialog. For long years, the chief criteria for evaluating work in the field of protection of state secrets in the press were for the most part ministries and departments, that is, holders of information. The position of authors and press personnel should be studied more deeply and in greater detail. We need to look at ourselves not only from within but also from their position. Many proposals and comments, including critical ones, are addressed to Glavlit. They are often correct, but now and then they are not so much fair as emotional. In most instances such cases are to be explained simply by the authors' inadequate information. It nevertheless seems that it is time to shift discussion concerning our department to another channel that is more calm and more constructive.

That is how N.N. Gladzatov, deputy chief of USSR Glavlit, and D.V. Pavlov, a member of USSR Glavlit's collegium, began their talk with our correspondents F. Vladov and V. Pokrovskiy. The appearance of top figures of Glavlit's press is perhaps one of the few such in recent years. During this time, what can one say, a multitude of topics for a discussion have accumulated. Of the 3-hour recording of the discussion, we have selected, in our view, the most significant ones, those which are of interest to the readers of our paper. Thus, Glavlit has the floor.

—USSR Glavlit together with other interested departments is implementing measures for fulfilling the resolution "On Glasnost" of the 19th All-Union CPSU Conference calling for a clear "definition of the limits of necessary secrecy and official secrets...."

1. There is no need to prove that glasnost and secrecy are not mutually exclusive. Throughout the whole world, the most diverse secrets exist and are very carefully guarded: political, military, commercial, technological, scientific-technical and so forth exist. No one doubts that the protection of state secrets is necessary even in our country. But now many discussion materials appear in the press asserting that since during the period of stagnancy our science and technology fell behind Western science and technology in many directions we are not hiding our achievements but our lag and therefore all or almost all our scientific and technical information needs to be openly published. The facts, however, speak to the contrary.

Although of late our country actually did lose its once high position in a number of directions of scientific research, the Soviet "industry of ideas" as before enjoys high prestige in the world. Our potential is even greater. The achievements of Soviet fundamental work in mathematics and mechanics, space research, quantum electronics, creation of new structural materials and so on are universally recognized.

The press has repeatedly pointed out that Western firms have succeeded by legal and illegal means in acquiring from the USSR many kinds of equipment and technology. In this connection, THE WALL STREET JOURNAL (1985) admits that most people "are not aware of the number of licenses and patents acquired by American companies from the Soviet Union." This is supplemented by the American journal CHURCHMAN (1987): "We borrow, copy, steel and use Soviet technology and Soviet ideas, including for military purposes."

In D. Peterezell's article "From Russia with Profit" (TIME, 1988), it is also pointed out that "surprisingly a large number of American industrial and scientific plans and specifications are using technology originating in communist countries." As examples, it reports that at the Los Alamos National Laboratory within the framework of the SOI [SOI] "a radio-frequency quadruple device" created in the USSR is being studied as one of the principal elements of a weapon utilizing beams of neutral particles. An American firm in the city of St. Paul, TIME notes, started a flourishing company using a Soviet technology of coating metal instruments with tritanium nitride.

We do have things to guard. The problem is, while taking into account the existing system of exchange of scientific and technical information within the country and expanding mutually beneficial international cooperation based on equal rights, to prevent leakage abroad of information and data whose disclosure could inflict damage to the interests of our country. This is a very complex, multifaceted, serious problem. It requires serious approaches. It must not be simplified or tried to solve hurriedly.

2. The present system of protecting secrets in the press as part of a general system of guarding state secrets in the country possesses certain defects. Present criteria of restricting information sometimes are in contradiction of the needs of real practical work. But we must not simply destroy, as some authors propose, the existing system of protection of state secrets. It is necessary to create a new, more flexible and perfected mechanism of guarding them.

This is one of the chief problems which Glavlit together with other departments is solving at the present time. It is necessary to change approaches and criteria of secrecy, to study multivariant systems and to look for optimal systems, those that would be in accord with the present

international situation and needs of the national economy. One of the variants of a solution of this problem has been considered with quite a good line of reasoning and in detail by V. Rubanov, a staff member of the KGB Scientific-Research Institute, in an article published in this year's No 13 issue of the journal KOMMUNIST.

We should adopt in this regard more precise legislative positions incorporating rights for the establishment of state secrets, their limits and, what also is very important, responsibility for their disclosure.

The influence of the realia of our economic life and the development of forms of cooperative and other independent scientific and technical creativity are already being exerted on problems of secrecy as a whole and consequently on work in the field of protection of state secrets. With growth of legal and financial independence of enterprises and expansion of cost-accounting forms of work of scientific and design organizations, their technological and creative independence and personal interest in retention of certain information, for example, in the field of the latest technologies, will grow. The number of "firm" secrets, which authors because of economic considerations do not want to disclose without compensation, is growing. There will have to be carried out strengthening of the control of enterprises over scientific and technical information inasmuch as it will be buttressed by quite realistic stimuli. Undoubtedly state secrets and state control over their preservation will be retained.

These so to say are long-term problems. But quite concrete questions exist which are already being resolved today. Glavlit organs, it would seem, feel them more acutely than other departments. We, because of the specific nature of our work, occupy a position that permits us to know quite well the requirements, needs and opinions both of organs of the press and real and potential authors as well as enterprises, organizations and departments. This helps in a number of cases in finding optimal solutions which would be in keeping with today's requirements. Changes in our approaches are perceptible even in comparison with documents that are a year old.

First of all, a decisive release from much that is obsolete and has lost its topicality is taking place. Groundless restrictions have been removed on the publication of statistical data relating to social and political questions—on population morbidity and mortality, the number of drug addicts, on the production of traumatism, accidents in transport and in the national economy, committal for trial and investigation of members of the militia, indicators of conviction and number of persons serving time, on population migration, on pollution of the environment and so forth.

Restrictions have also been abolished on the publication of a series of information data on economic indicators, and the manner of publication of materials of a scientific and technical character has been simplified. Work in this direction is continuing. The principal difficulty lies in inadequate legal support of such work and the necessity of numerous agreements with interested departments.

It appears to be necessary to review considerably more frequently than in the previous period (for example, once a year) documents establishing restrictions on publication in order to have the possibility of more effectively incorporating changes in them.

In the future, it is intended to rework and reduce the secrecy of our documents and to make some of them open. Today many of their positions are so detailed and concrete that a document in consolidated form requires placement of the stamp of secrecy.

3. Regardless of how important and responsible work on revision of restrictions on open publication may be, it is not the only way of improving the existing system of protection of state secrets in the press. The profusion of excessive prohibitions has been combined, and even today is still being combined, with an unjustifiably complicated procedure of going through materials. Glavlit has just issued and sent out a document regulating this procedure, which in our opinion favourably differs from the prior one. It concretizes the subject matter, bent, character and types of materials subject to examination. These materials primarily pertain to questions of our country's defense capability as well results of scientific-research and experimental-design work, the premature publication of which could inflict damage to the economic interests of the state. Formerly, this line of demarcation was blurred and articles on humanitarian questions, for example, were subjected quite unjustifiably to being examined.

It was also established that materials from independent authors (pensioners, students, authors engaged in individual labor activity and the like) could be accepted for publication without an expert conclusion.

As has already been reported in the NTR (14, 1988), a basically new form of expert conclusions has been introduced requiring only one signature—formerly the conclusion was signed by all members of the commission (often five or more persons). The range of persons with the right to conduct an examination was expanded. Many positions were excluded regulating the manner of work and the composition of expert commissions and the form of participation of the author in the examination of his work. Today this is entirely determined by the organization head.

On the whole, the document aims at expansion both of the rights and obligations of enterprises and organizations in the examination and selection of materials intended for publication. Right now such a decentralization is also characteristic of other comparable documents.

It is hardly proper how some authors are attempt to do this, to declare that secrecy is the chief hindrance to scientific and technical progress (this is contradicted, for example, by the results of our space-missile [raketno-kosmicheskiye] research), although it would be wrong to deny its negative influence. There is a need for constant comprehensive evaluation of all the pluses and minuses of publication. Protection of scientific and technical information from divulgence and questions of its introduction are two sides of the same question and they should be linked much more strongly than is the case at present. Any forms of prohibition should not inflict any damage (first of all economic) on the national economy.

Our problem is that under the same conditions of openness of scientific and technical information abroad and in our country, we quite unequivocally handicap ourselves in regard to foreign firms with significantly higher possibilities of its use and introduction. At the same time, strange as it may sound, our literature is still distinguished by unprecedented detail in description of the substance and details of new technological achievements (and as shown by our practice not only the results of our own research but also the work of subcontractors). Not a single country in the world gives away its know-how so "generously" that it is commented on abroad with undisguised surprise and understandable interest. Quite frequently, Soviet scientific and technical ideas return to our country in a material form, and we pay for this but they do not pay us.

The greater independence and responsibility of enterprises and institutions in the organization and forms of conducting expert examination of materials should have a positive effect even on the nature of the expert examination.

Occasionally the opinion is voiced that expert commissions should be abolished and the right to evaluate the prospect of publication of materials of a scientific and technical character should be turned over entirely to the author. Practice shows that one cannot agree with this. V. Dal believes that the expert is "an authority, a skilled and experienced person in the matter." Apparently experts must be appointed from among such specialists for determination of the possibility of open publication of materials. Essentially this is what is done. The institution of experts has existed for more than 40 years and on the whole justifies its designation.

The author by no means always has the possibility of comprehensively evaluating obtained results and properly handling such a right. Occasionally, he does not have the necessary information (it could be classified) for the determination of the prospects of applied military use of obtained results.

The expert, and he could be the head of an organizational unit (administration, department, laboratory and so forth) where the author works, can do this. The author cannot, and he even should not know all the restrictions for the press. The expert is obliged to know and to correctly apply them.

In solving these questions professionally, experts, moreover, criticize the positions of the instructions that give rise to formalism and validly raise questions of the introduction of new restrictions or abolition of existing ones and assist authors in the use of open from classified data. Such a right was granted a long time ago but is evidently quite rarely used by them under the influence of the syndrome of playing it safe and the refusal to get involved with classified materials, which is one of the negative consequences of excessive imposition of secrecy.

As for the conclusions mentioned in the press concerning possible abuses of experts, they seem farfetched. The reintroduced procedure of expert examination of materials does not hinder the author from participating in a discussion of his work. If experts differ in the evaluation of the possibility of publication of the material, an additional expert examination should be conducted with the involvement of other experts or the decision made in a superior organization.

In our view, the work of experts on the whole deserves a positive rating although it is far from perfect. And the practice of control of materials by Glavlit organs quite convincingly confirms this. Some experts occasionally display formalism and even irresponsibility.

In our view, the result depends both on the organization of the examination of materials of scientific-research and experimental-design work designated for publication and on the quality of conducting this same expert examination. The heads of a number of organizations inadequately stimulate and monitor the work of experts although expert examination pertains to the performance of basic official duties.

4. Today, when the protection of industrial, scientific and technological secrets increasingly more clearly acquires decentralized principles, these questions demand a great deal of interested consideration on the part of managers. Incidentally, at leading Western firms, 20 percent of the expenditures on scientific-research and experimental-design work are spent on questions of protection of industrial secrets.

The problem of secrecy and restrictions for the press is closely connected with questions of international exchange of scientific and technical information. The agreements reached recently on military and political questions for all practical purposes have not resulted in mitigating and weakening the "technological blockade" of the USSR.

Our country constantly comes out in support of expansion of international scientific and technical cooperation on the basis of equality. But it is proposed to us as a rule in those fields in which we lead the West and is restricted there where their position is more preferred.

For example, in connection with the refusal of American visas, a delegation of the USSR Academy of Sciences in May 1988 was unable to make use of an invitation of a number of U.S. firms leading in the field of mass-produced and personal computers and directed in this regard an open letter to the President of the United States R. Reagan.

Nonetheless at the present time measures have been adopted on simplifying the examination and legalization of materials taken abroad, including for publication in foreign publications.

The changes in work under conditions of secrecy are being conducted increasingly more actively at ministries and departments. The abolition of obsolete departmental restrictions is going on, and work is being conducted on opening for the press the names of so-called "postal boxes." True, organizations do not always eagerly take such a step. But recently some already-open enterprises have been trying again to become "invisible" to our press. We do not agree with this since something should not be made secret which has already become open property....

We know that the imposition of secrecy on information does not apply to the precise sciences. But this work now as never before calls for a scientific approach and a weighed and comprehensive examination. USSR Glavlit is specifically taking this route. Work under conditions of secrecy should not be considered in isolation. It reflects public attitudes existing in the country and will be improved together with them. And what we have done today is only the beginning.

Legislation Needed for Computer Related Issues

18140088 Moscow PRAVDA in Russian 25 Nov 88 p 4

[Article by Yu. Stroganov: "Where Is the Lawyer for Computers?"; first paragraph is PRAVDA introduction]

[Text] Can civilized society exist without laws? It is a rhetorical question. But what about computerized society, of which people and computers are members? The time has come to ask this question as well.

The 1st All-Union Conference on Social and Legal Problems of Information Science, which the USSR State Committee for Computer Technology and Information Science (GKVTI SSSR), the USSR Academy of Sciences, the USSR State Committee for Public Education, and the USSR Ministry of Justice are holding, has begun in Moscow. Having begun a conversation on this with I.Z. Karas, chairman of the Section of the Standard Legal Support of Information Science of the Scientific and Technical Council of the USSR State Committee for Computer Technology and Information Science and one of the organizers of the conference, I did not anticipate that it would be a matter of "computer crime."

"Legally we as if do not have it," Ilya Zinovyevich says, "but in fact it exists and is flourishing. One must not shut one's eyes to this fact."

I. Karas is chairman of the board of the Informatika Cooperative Union, which was established in November of this year and one of the goals of which is the aspiration to aid domestic programming. Ilya Zinovyevich speaks about something well known and urgent. I elaborate:

"Do you have in mind, evidently, the cases, which in recent times have become widely known, of a danger computer disease, which is connected with a computer 'virus'?"

"This question is also extremely serious, but it is only a part of the problem of 'computer crime.' Incidentally, I would compare what happened at one of the Soviet enterprises, when a careless programmer fed into the computer an 'infected' program, having upset the control of the production process, in consequences with sabotage; but they are trying him for the deliberate damaging of equipment, while here our legislation proved to be practically helpless. The programmer received, in my opinion, ridiculous conditional punishment as compared with the damage. While in the United States a fine of up to $10,000 or imprisonment for a term of up to 10 years is envisaged for similar actions. However, it would be incorrect to reduce the social and legal problem in this area only to the destruction of information in a computer. The use of computer systems has complicated the evaluation of the behavior of a person, since the computer is also capable of making 'independent decisions.' Here is an example: a nurse, who gives an injection, is responsible for administering precisely the medicine which the physician designated. But if a computer is charged with giving the injection, who will be responsible for a mistake? The programmer? The person operating the computer? Clear answers are needed. Problems of exchanging computer programs, which have acquired the properties of a commodity, are also arising for us."

"But if programs have become a commodity, they should probably have a price."

"Quite correct. However, in the USSR the present situation with information science is a follows: total anarchy reigns, there is no copyright, the right of ownership to programs in practice is not recognized. Everywhere they are appropriating them arbitrarily, but for some reason do not see anything bad in this. If a disk costing 500 rubles with a program recorded on it worth 100,000 rubles is stolen, they will try the thief only for the theft of the disk itself. The following unsound practice also exists: when being discharged from an enterprise, a specialist frequently ruins 'his own' program, and then sells it to another organization. This is obvious nonlabor income. If, for example, they appropriate only a program, is there no crime? Incorrect! The question is assuming particular urgency with the development of inexpensive means of duplication. The same program is

repeatedly resold as a newly developed one. A change of psychology with respect to machine information is needed. And until we officially recognize the rights to it as a commodity, we will also not be able to trade normally. Computerization in the country will be kept in check."

"I do not imagine how the right to 'one's own' program is to be claimed. How is one to prove the fact of its theft? It is intangible. It is not a thing like a tape recorder with a serial number, on which, in addition, finger prints are left."

"I repeat: the main thing is all the same a change of psychology. For normal people do not steal money, but they do steal programs. Moreover, it is possible to identify programs; legal organs, which have special knowledge and powers, also have not the last word here. In my opinion, in the USSR not less than 10,000 lawyers in the sphere of the law of information science are needed today. For the present there are a handful of such specialists. Computer criminology is also needed.

"We are becoming an information society. In the world there are already computers, the 'intelligence' of which approaches human intelligence. They even learn language like children do. Perhaps, during the interval of 1995-2000 thinking machines will be developed. While this, of course, will give rise to new social and legal problems and new methods of their solution."

Pivotal Role of Information Science for NTR

18140046b Moscow NEDELYA in Russian
No 38, 19-25 Sep 88 p 13

[Interview with Academician Andrey Petrovich Yershov, head of the Department of Information Science and Programming of the Siberian Department of the USSR Academy of Sciences and chairman of the Council of the USSR Academy of Sciences for the Complex Problem "Cybernetics," by IZVESTIYA correspondent Andrey Illarionov under the rubric "The Guest of Page 13": "Academician Andrey Yershov"; date, place, and occasion not given; first paragraph is NEDELYA introduction]

[Text] Today the guest of Page 13 is Andrey Petrovich Yershov, head of the Department of Information Science and Programming of the Computer Center of the Siberian Department of the USSR Academy of Sciences and chairman of the Council of the USSR Academy of Sciences for the Complex Problem "Cybernetics." He is the holder of the Silver Core, an honorary award which is conferred by the International Federation of Information Processing for outstanding services in this field. Among the titles of the academician there is also the following one: honored member of the British Computer Society.

NEDELYA: But, incidentally, within our memory they strongly cursed cybernetics....

A. P. Yershov: Oh, as they say, from the house tops! At that time they swore at genetics, while computers were reputed to be "a bourgeois invention which undermines the foundations of science." The swearing still continued, when they had already taken serious and business-like seminars on cybernetics at Moscow University. The well-known scientists Keldysh, Berg, Sobolev, and Lyapunov displayed at that time genuine civic courage, while demonstrating the value of cybernetics as a most urgent science on the general laws of information and control.

NEDELYA: Well, but has not the very word "cybernetics" become obsolete today?

A. P. Yershov: Today it is less applicable. The area of application of cybernetics has as if been taken in by information science. In the development of science this is normal. But we are not trying to change the name of the council for cybernetics, nor its traditions, which were laid by Aksel Ivanovich Berg, the first chairman of the council.

NEDELYA: What does information science mean for you?

A. P. Yershov: This is a part of my attitude toward the world. In several countries they dignify information science by the name of information society. In my opinion, this is the same thing that Vernadskiy called the noosphere. The computer is becoming before our eyes a universal means of the shift of mankind to a new level of the scientific and technical revolution. Mankind can develop further only on the basis of the sound use of reliable and exhaustive knowledge.

The most different, if would seem, aspects of the activity of people have become interconnected. Today no unit of the human fellowship can, in my firm conviction, survive without the full and undelayed use of advanced achievements. The inhabitants of the earth are beginning to peer into an ecological abyss and have not yet moved away from the abyss of nuclear self-destruction. All these circumstances are lending a special meaning to the policy, which our state is advancing, and to the new political thinking. At the same time owing to computers and means of communication the human fellowship is as if acquiring a central nervous system, which will help it to foresee in advance complications that are becoming imminent, to avoid a catastrophe, and to be at its best.

NEDELYA: On a global scale the role of information science and computerization has been described very convincingly by you. But what about in the special problem? Say, the overcoming of bureaucracy in the sphere of management? This problem is also being solved by the reduction of staffs. But what if you furnish managers with computers and advanced methods of

management and order them, while improving work, to reduce their staffs themselves and to release a portion of the saved assets for the material stimulation of the remaining workers?

NEDELYA: It is necessary to proceed from the fact that the computer is an enemy in principle of the bureaucrat. In order to assign to a computer the problems of management and optimization, one should supply it with information. One should create an information model of the enterprise, the sector, the national economy of the country, and, in the foreseeable future, the entire world. Such an information bank would become a treasury of knowledge, which is presented as a summary of precise data and rules. The bureaucrat usurps the information that belongs to society. The transfer of such information to a computer knocks the weapon from the hands of the bureaucrat. Having been deprived of the monopoly on information, he will become a mere mortal. But this is connected with difficult problems. It is necessary to develop a mechanism of the protection of information against abuse, a mechanism of its alienation from the bureaucrat. And still such a means of combating bureaucracy is practicable.

NEDELYA: About the same problem in its quantitative aspect: it seems that the number of workers in the sphere of the management and regulation of the economy of the United States (including banks, insurance companies, and marketing and forecasting institutes) is significantly larger than at our corresponding institutions. Here such a number of bureaucrats interferes, while there it seems to help conduct affairs better?...

A. P. Yershov: In the United States the absolute majority of people, who work for hire, are employed in the field of information processes. Not less than 50 million people. Computers free them from paper shuffling—for creative labor. They have enough time, strength, and skill to see to the flourishing of production and the service sphere. We will arrive at this, when we have solved the problems of computerization. The process of the spread of information technology in our society is equal in scope to the entire process of restructuring. When information systems have become a kind of nervous system of our society, global problems will be solved jointly and in the shortest time. For the present computerization in our country is limited to the spheres, in which one simply cannot do without it, for example, cosmonautics. Or, assume, the automatic reservation of seats on airplanes.

NEDELYA: How does our domestic information now look in light of these unsolved problems?

A. P. Yershov: The intensity and forms of its organization do not satisfy the requirements of the times. Our information science is closed, provincial, imitative. It lacks both scope and resources. In our country much original and valuable scientific research work has been performed, but our degree of participation in the world development of information science is more than modest.

NEDELYA: Now, perhaps, the most difficult question. The development of the national economy depends on the level achieved by science. While this level, in turn, depends on the development of the national economy. It is a closed circle! What is the solution?

A. P. Yershov: We have to repeat the experiment of pulling ourselves from the swamp by our hair. How is this to be done? It is difficult. But a precedent exists in history. In 1918-1919-1920 we were simply poverty stricken and at the same time understood the need and found the opportunity to open research institutes.... There was dislocation and such an intensity of the building of science!

Today for all the difficulties it is much easier for us. It is necessary merely to clear away the obstructions of administrative bureaucratic restrictions and to organize without delay a system of contracts, special-purpose financing, and the formation of temporary special-purpose scientific collectives. The scientific supervisor should become the sovereign master of financing, material and technical supply, personnel, and staffs. Like eye surgeon Fedorov.

It is necessary to change radically the attitude toward creative labor. For the present every flower of creativity, not only scientific, but also inventing and artistic, in our country should penetrate the asphalt layer of the domineering of a vital matter by outside and uninterested, and at times anti-interested instances. Bureaucrats even encroach upon intellectual property: they say, if an idea originated during working time and at the workplace, the creator of the idea as if has nothing to do with it. Such an attitude is a result of the formed fiscally forced exploitation of creative labor. There are also other enemies of creative work—unwarranted wage leveling and the envy of mediocrity. It is time to rehabilitate the concept of private or, to put it better, personal initiative. I have already posed the question of this on the pages of the journal KOMMUNIST.

NEDELYA: On the one hand, the problems of science are not solved by a majority of votes, while, on the other, democratization presumes the involvement of society in the fate of promising scientific ideas and effective, but expensive programs and directions of research....

A. P. Yershov: It would be astonishing naivete to attempt to democratize science by national endorsement or prohibition. The scientific idea is obliged to live the difficult intrauterine part of its life, which is protected against viewing from outside, before it will become accessible to national consciousness, and only then will its social significance begin to become clear and will its social

evaluation begin to be formed. The road signs on this route and the rules of conduct at crossroads form the fabric of the culture of society in its attitude toward creativity.

NEDELYA: Academician Sagdeyev on Page 13 of NEDELYA spoke about the isolation of science from education as one of the obstacles of our development.

A. P. Yershov: It is impossible not to agree with Raold Zinnurovich. I believe that the inspiration of education by science is a subject of the training of teachers. On the one hand, they should be earthly people and understand children well, while, on the other, they should have infinite respect for science.

NEDELYA: But you yourself are not allowing such isolation: you teach at the university and at the school of young programmers, which you also organized. Are you satisfied with this school?

A. P. Yershov: I am. It has infected us with the confidence that it is possible to teach children information science, this is a realistic pedagogical task. School children master the ideas of information science far more rapidly than adults do. Moreover, it proved to be an ideal example of what is called the pedagogy of cooperation.

The teacher must say to the school children: "Let us study information science together!" I am trying to make what contribution I can to the harmonization of the problems of the development of science and the restructuring of our education. And here information science has a dual task. As new knowledge about computers it can and should itself become an object of pedagogical efforts, while as an element of the spread of information technology in society it should change greatly the technique and methods of instruction owing to the use of the latest information technologies.

On the basis of experience of working with children we are organizing pedagogical experiments: we are giving information science starting with the 4th grade and are beginning an information science course not in the graduating classes, but in the 7th-8th grades, in order during the final years of school education to use it, as they say, all out. So that the school of young programmers has given much not only to the children who have graduated from it. It has also given us points of support for the intensification of the computerization of the entire school.

NEDELYA: What would you say with regard to the debates about the democratization of the academy?

A. P. Yershov: The situation with the democratization of the academy is far from as bad as it sometimes seems. The general assemblies of the academy were always for me a school of the independence, the civic motivation of thinking. The academy always was a stable repository of progressive dissent. Take if only the persistent preservation of the academic prerogative of Academician Andrey Dmitriyevich Sakharov.

Of course, the academy was at one time terribly strained by repressions and years of stagnation. Many "loyal" statements came from it. But it remained inflexible on a number of questions of principle. The academy now needs to shake the dust off its knees and to come out as the initiator of the liberation of the individual nature of creative activity (in which for the present, alas, it holds a taciturn position).

NEDELYA: The notion has formed that an academician should be not only a prominent scientist, but also an even more prominent organizer of science, at last the director of an institute....

A. P. Yershov: If I have the right to be proud of anything in my own scientific fate, it is the fact that I became an academician while being in the same position, which I entered upon the completion of graduate studies: the head of a laboratory. I am also proud of the fact that our department of the Computer Center received the title of "information science" 15 years before a department of the same name was established in the USSR Academy of Sciences.

NEDELYA: Your articles and speeches are distinguished by precision and at the same time by emotional imagery and expressiveness. Is some sort of humanities education behind this?

A. P. Yershov: I received a mathematical education, but cannot consider myself a professional mathematician. For me not so much the technical development of ideas as conceptual thinking is more important in work. If I want to grasp an idea, I should talk about it. Perhaps, this also led to a certain journalistic component of my "printed product." At 55, as they say, in old age, I experienced a 1.5-year period of illness with poetry writing. What else? I am a bookworm. For me the reading of Platonov's "Kotlovan" [The Foundation Pit] was an enormous shock.

NEDELYA: How do you relax?

A. P. Yershov: I have not noticed that I ever relax. A working idea does not yield to deviation.

NEDELYA: What continues to keep you in Siberia?

A. P. Yershov: Back in 1960 a very good man, Sergey Lvovich Sobolev, invited me here. In Siberia I always had the opportunity for independent work: no one indicated what I am to do and how. They only helped. Here it is good to work and to raise children, and I had to offend more than once scientists whom I respect, by rejecting complimentary suggestions that involved moving to Moscow.

Bureaucracy Holds Up Development of 'Fibonacci Computer'

18140075 Moscow PRAVDA in Russian 19 Nov 88 p 2

[Article by V. Reut: "Here Is Fibonacci for You! Is It Worth Driving a New Scientific Direction Into a Blind Alley?"; first paragraph is PRAVDA introduction]

[Text] In the folder of responses to the article "But May It Be That They Not Be Dreamers?" (PRAVDA, 7 April 1988) the envelope from Dresden appeared to be accidental. For the article was devoted to our domestic "restless discoverers" of ideas. Ideas which, although having received the support of individual scientists, were completely rejected by the corresponding scientific and production organizations. At the same time I began to think: Do such poor people suddenly exist in other countries as well? They did not encounter understanding "at home" and decided to appeal to friendly neighbors for help....

But, having opened the envelope, I became convinced that my conjecture was not confirmed. The characteristic Russian cursive writing, although also clear, testified: the author is our compatriot. From those sent abroad on some business there. And not a very important chief—he wrote himself, "in longhand." Thus....

"Doctor of Technical Sciences professor A. Stakhov, head of the Chair of Computer Technology of Vinnitsa Polytechnical Institute, writes you. At present I am in Dresden as an invited professor of the Section of Information Technology of Dresden Technical University. A special chair has been organized here for such scientists 'on the side.' I was the first Soviet professor who was invited to it.

"To some extent this has a bearing on 'the campaign for the introduction' of my scientific direction, which I have been waging for 12 years now. It is a question of a fundamentally new approach to the building of highly reliable computers, which is based on Fibonacci numbers and the golden proportion. The direction is protection by more than 100 inventor's certificates and 60 foreign patents — of the United States, Japan, the FRG, England, France, Canada, Poland, the GDR...."

The letter is detailed, but several questions all the same arose. I had to wait for the return of Aleksey Petrovich from the business trip. After this he and I called each other, and he added much. Moreover, he sent a folder of documents—what inventor's story does without them?

But here a short excursion into far more distant history—into the Middle Ages—is necessary for clarity. Who is Fibonacci? This is the nickname of the outstanding 13th century Italian mathematician Leonardo Pisansci, who is famous for his "Book on Counting." In it he presented the mathematical sequence of numbers, which has been known since then by the name "the Fibonacci series." For clarity I will cite this series: 1, 2, 3, 5, 8, 13, 21, 34.... As we see, in it each subsequent number, beginning with the third one, is equal to the sum of the two preceding ones.

This numerical recurrent sequence has amazing properties. For example, the ratio of the affine Fibonacci numbers within the limit tends to the famous "golden section" ("golden proportion"), which signifies the harmonic division of quantities, the principles of which have been used extensively since very distant times in architecture and fine art. The outstanding Italian scientist, architect, sculptor, and painter Leonardo da Vinci put the very term "golden section" into circulation.

Without going into the mathematical computations, I will note that the miraculous properties of Fibonacci numbers also came to light in other types of human activity, for example, in poetry and versification. Why God Himself, as they say, ordered mathematicians to use them. While still a quite young scientist, Aleksey Petrovich also followed this "order." And in the end he came to the conclusion that, by relying on "Fibonacci codes," it is possible to develop highly reliable computers.

As is known, the "Achilles' heel" of modern computers, which use traditional binary notation, is the not so rarely occurring "malfunctions" in the operation of the machines. In order to correct the "malfunctions," it is necessary to detect them by means of a system of the checking of logical conversions of information. This is achieved by the introduction in the computer of redundancy—structural, information, or program. For such redundancy was introduced by nature, for example, in the brain of man, which has high reliability. That computers would have such reliability! But traditional binary notation, which is used in modern computers, has, as they say, "zero" redundancy, which significantly complicates the solution of the problem of checking the logical conversions of information.

Stakhov formulated a theory of binary redundant, what are called "irrational" notations, for which Fibonacci numbers and the golden proportion are the basis. Here redundancy, which is sufficient not only for checking, but also for the immediate automatic correction of "malfunctions" or errors without any appreciable loss of useful machine time, is introduced in the information.

"It would seem that it is a sin for me to complain," Aleksey Petrovich notes. "My scientific career as a whole is forming successfully. Inventions are being recognized. The number of followers is increasing—in our chair in the new scientific direction 10 candidate dissertations have been defended and 4 monographs have been published. At the institute the Modul Special Design and Technological Bureau has been set up. A number of calculating and measuring devices based on Fibonacci codes have been developed by its design, technological, and production forces—true, for the present still very weak forces."

"Well, did the theoretical premises prove to be correct?"

"Entirely. We achieved the greatest successes in the development of analog-digital converters. Our 17-bit microprocessor analog-digital converter ensures a error in case of the conversion of incoming signals of not more than 0.005 percent. Here, what is very important, it has not only a high temperature (from minus 10 to plus 55 degrees Celsius), but also time stability, without requiring for a long time any adjustments and readjustments. The conversion time is 500 microseconds. Now our design bureau is setting up the production to test batches of such analog-digital converters in accordance with the orders of enterprises of the country. The experimental design development of a fast 14-bit converter, which ensures both the analog-digital and the digital-analog conversion of information, has been completed. The devices were displayed at the Exhibition of USSR National Economic Achievements and were awarded a certificate of the first degree, the developers were awarded a gold, a silver, and seven bronze medals."

"But you are still dissatisfied...."

"I am satisfied with the recognition. But not with the pace of development of the direction. In spite of the favorable responses of interested organizations, in practice it turns out that far from all are interested."

I examine the documents. Prior to the patenting of the inventions abroad the materials first were in the Ministry of the Electronics Industry, the Ministry of the Radio Industry, and the Ministry of Instrument Making, Automation Equipment, and Control Systems and received endorsement. Patents were sought in the countries, where much attention is being devoted to the progress of electronic engineering, thus, they are also well acquainted with the achievements in this field. Not one refusal to issue patents was received, hence, the world novelty is obvious. Not one direction in the field of computer technology has yet received in our country such extensive patent recognition.

At the right time one would rejoice at the outstanding successes of domestic science on this front. But the more rapidly scientific and technical achievements are implemented, the higher their price is. I will not recall the numerous fruitless petitions of the author himself and the State Committee for Inventions and Discoveries to various instances with requests "to introduce" the developments, I will speak merely about the latter.

In July 1986 the State Committee for Inventions and Discoveries appealed to the USSR State Committee for Computer Technology and Information Science, the USSR Academy of Sciences, and the Ukrainian SSR Ministry of Higher and Secondary Specialized Education, reminding them that in November 1985 the new scientific direction was approved at a conference in the State Committee for Science and Technology under the chairmanship of Academician G. Marchuk and it is time now to proceed from endorsements to work. For it is clear that Vinnitsa Polytechnical Institute alone is not capable of solving the problem as a whole.

The Ukrainian Ministry of Higher and Secondary Specialized Education, although it reacted somehow to this appeal, did not have any real influence on the other organizations.

True, in the plans of the current five-year plan there is the assignment for the Ministry of the Electronics Industry to develop "analog-digital and digital-analog converters (ATsP, TsAP) based on notations with irrational bases like 'the golden proportion' (Fibonacci codes)." Moreover, both the numbers of the inventor's certificates and the developing organization—Vinnitsa Polytechnical Institute—are indicated. But, as it turned out, among the specialists of this field there appeared their own ideas in this respect, to which they are giving preference. In May of last year an expanded conference on the problem was held in the scientific and technical council of the State Committee for Inventions and Discoveries. It once again came out in favor of the new direction. And it decided: "...to ask the Ministry of the Electronics Industry and the Ukrainian SSR Ministry of Higher and Secondary Specialized Education to conduct...comparative tests of the analog-digital converters of Vinnitsa Polytechnical Institute and the Ministry of the Electronics Industry in accordance with a coordinated program." In order to ascertain the truth.

I ask A. Stakhov: What are the results of the tests?

"There never were any! It turned out that in the Ministry of the Electronics Industry there are no analog-digital converters with such technical characteristics as ours. Not by chance did several organizations of this ministry address to us the request to produce for them test batches of our analog-digital converters. But while all this bureaucratic red tape is dragging on, western firms are wide awake. Several years ago one American firm had already assimilated the production of microelectronic analog-digital converters in Fibonacci code of 14-digit precision, which corresponds to an error of 0.006 percent."

"Does it turn out, Aleksey Petrovich, that everything is proceeding according to the well-known proverb—no prophet is accepted in his own country?"

"Nearly. However, I am certain, if these ideas had originated, say, at an academic or even a sectorial institute in Moscow, they would have been given a green light long ago. But in Vinnitsa? Or else.... They say, what can it do, a province? But it would have been worthwhile long ago for the people, who deal with the use of the achievements of science, to understand that now they are ascending to its heights not only at prominent centers. Although, I repeat, my fate as an inventor is far better than that of many people. As to my lectures in the countries that have issued us patents, this, after all, is

also a campaign for the development of the new direction. Soon the era of ultra high speed computers with a speed, which is calculated in billions of instructions per second, will come. And right here one will simply not manage without irrational notations and without Fibonacci codes. Many people already understand this."

"And all the same...."

"Yes, things are going slowly. I encountered the genuine interest of scientists and specialists while delivering reports in the GDR. Incidentally, Academician V. Kempe, director of the Institute for Cybernetics and Information Processes, sent his review of them to the USSR and Ukrainian Academies of Sciences, look at it."

I read this review and am amazed at the breadth of the problems, upon which Professor Stakhov touched in his reports. In stating them, Academician Kempe concludes: "I consider it my duty to direct the attention of the USSR and Ukrainian SSR Academies of Sciences to the scientific direction of Professor Stakhov as one of importance for the development of a number of advanced directions in science (including thermodynamics, mathematics and the theory of coding, the theory of self-organizing systems, and computer technology). The Institute for Cybernetics and Information Processes of the GDR Academy of Sciences is prepared to cooperate with Professor Stakhov in the area of the use of Fibonacci codes and the golden proportion in information technology."

"How did our academies respond to this appeal?"

"So far no reaction has followed from the USSR Academy of Sciences. The republic Academy of Sciences proved to be more prompt: the scientific council of the Institute of Cybernetics heard my report, the Information Science Department of the Ukrainian SSR Academy of Sciences displayed an interest in the works, a discussion on the establishment of a scientific research laboratory of the Ukrainian SSR Academy of Sciences and the Ukrainian SSR Ministry of Higher and Secondary Specialized Education and on the development of the Modul Special Design and Technological Bureau is under way. True, as soon as it came to specific matters (the supply of computer hardware, technological equipment, and so on), all our proposals hung in the air."

"Hence, it is necessary to promote more extensively in our country what has been achieved, to that Soviet scientists would be better acquainted with your scientific direction. Then actions will also follow more quickly."

"I have published several books on the problem. The latest of them, 'Kody zolotoy proportsii' [Codes of the Golden Proportion] (1986), long ago became a bibliographic rarity. But the direction is still being developed. Unfortunately, our central publishing houses are in no hurry to consider my suggestions on the publication of books. Since 1986 the suggestion on the book 'Zolotaya proportsiya v teorii izmereniya i kodirovaniya' [The Golden Proportion in the Theory of Measurement and Coding] 'has been gathering dust' in the editorial office of physical mathematical literature of the Nauka Publishing House. The suggestion on the publication of the book 'Fibonachchi-kompyutery' [Fibonacci Computers] was considered for several years at the Radio i svyaz Publishing House. And here is the response: 'The publication of the book is premature in connection with the lack of data on the testing of the circuit engineering solutions which are examined in the book.' This is written at the moment when a test batch of 'Fibonacci' microcircuits has been produced, while the direction itself has received recognition abroad...."

"And have foreign publishing houses displayed an interest in your scientific direction?"

"Why, but of course! The publishing house of the GDR Academy of Sciences suggested that I write a monograph. The international publishing house Pergamon Press (New York) ordered a large article—three printer's sheets—from me for the very prestigious international collection 'Symmetry-2.' It will be published in early 1989. Incidentally, this publishing house has its own departments in Oxford, Frankfurt, Sao Paulo, Sidney, Tokyo, Toronto, and other centers."

"The response will turn out to be actually international."

"Quite naturally, for this research has a bearing not only on computer technology, it touches upon a number of basic problems of science, such as harmony, symmetry, and measurements. It also concerns the science of living nature, which also follows harmony, by obeying the golden proportion."

"For example?"

"Take if only the pine cone or sunflower and you will be convinced that for some reason they arrange their seeds in conformity with the Fibonacci mathematical series. In 1984 Belorussian philosopher E. Soroko published the book 'Strukturnaya garmoniya sistem' [The Structural Harmony of Systems]. His 'law' of this harmony is based on the generalized Fibonacci numbers and generalized golden sections, on which the theory of irrational notations is also founded. Last year Polish physicist Jan Grzedzelski sent me his very interesting book 'The Energy and Geometric Code of Nature,' in which he attempts to substantiate the physical meaning of the golden proportion as a proportion of thermodynamic equilibrium.

"This is to what they are taking Fibonacci numbers! Incidentally, one of my lectures is entitled 'The Golden Proportion as a Fundamental Numerical Regularity of Nature, Science, and Art.' In Berlin I delivered the report 'The Golden Proportion as a Proportion of the Thermodynamic Equilibrium of Self-Organizing Systems.' Both

speeches were received by German specialists with great interest. Thus far, however, I have not decided to direct such reports to our academy—I am afraid of not being understood."

"In what do you see a way out of the situation?"

"I believe that we now have the rare chance for 'a spurt ahead.' Having concentrated efforts on the new scientific direction, we can in the shortest possible time (2-3 years) bring individual types of electronic equipment up to the world level. In Vinnitsa all the necessary prerequisites for this exist: there is a patent-clean scientific direction, a scientific collective and an organization, in which the direction is being developed—the Modul Special Design and Technological Bureau—have been established."

"This, as they say, is just to begin with...."

"Of course. On the basis of the Modul Special Design and Technological Bureau it is possible to organize an interbranch scientific technical complex, of which the corresponding organizations of the USSR Academy of Sciences, the Ministry of the Electronics Industry, and other interested departments would be a part. The first steps are the development of a new element base for Fibonacci computers and the supply of the Modul Special Design and Technological Bureau with the latest technological equipment, computer hardware, and computer-aided design systems. This task is entirely within the capability of the Ministry of the Electronics Industry and the USSR State Committee for Computer Technology and Information Science. The problem of the construction of the engineering and laboratory building, which we planned to begin in 1989, greatly worries me as director of the Modul Special Design and Technological Bureau. It is also necessary to build an apartment building for the staff members."

"And where will you get the money?"

"The State Committee for Inventions and Discoveries addressed to the State Committee for Science and Technology and the USSR Council of Ministers the suggestion to open two state orders in our scientific direction. In them it would also be possible to envisage the accomplishment of these tasks, which are connected with the development of the direction. For it is hardly legitimate to put off further the solution of the problems of the future of computer technology within the organizational framework of a small design bureau, which does not have the status of a scientific institution."

"Indeed, scientific research institutes exist at several prominent higher educational institutions."

"Fine scientific centers at the higher school also exist abroad. And they are working rather well. For example, physicists of the University of Michigan (the United States) back in 1985 developed a new crystal for an optical computer and called it a Fibonacci superlattice. They made the Fibonacci numerical series the basis for it, owing to which they succeeded in obtaining very high, as they write, unique technical characteristics. Here is Fibonacci for you!"

Status of CEMA Comprehensive Program

18140066 Moscow PLANOVOYE KHOZYAYSTVO in Russian No 10, Oct 88 pp 96-101

[Article by Candidate of Technical Sciences V. Vashchenko under the rubric "Scientific and Technical Progress": "The Comprehensive program of Scientific and Technical Progress of the CEMA Member Countries: Status and Prospects." Passages in boldface as published]

[Text] In the CEMA member countries in the 1970's and early 1980's a decrease of the growth rate of the productivity of national labor, which is due mainly to the fact that a spurt was not made in scientific and technical progress, occurred. Moreover, the disparity between the scientific and technical potential, the scientific reserve, and the low technological level of production appeared more and more sharply. As a result the economy of the socialist countries became less and less receptive to scientific and technical innovations.

In the materials of recent congresses of a number of fraternal parties the inadequacy of the development of scientific and technical progress and of its influence on the economy was noted. Serious anxiety over the slow pace of scientific and technical progress in our country was voiced at the 19th All-Union Conference of the CPSU.

The increasing lag in the most science-intensive sectors, the production of new materials, computerization, and the spread of information technologies is especially alarming. But these are the spheres which are providing the bases of scientific and technical progress in the next few decades. Today the developed capitalist countries are speeding up the saturation of science, production, and management with computer equipment and are developing in every possible way the computer literacy of the population. In Western Europe 3 million personal computers are presently being used, in the United States 22.6 million are being used, while in the CEMA countries there are only 400,000-450,000 of them, including about 100,000 in the USSR.

The basic factors, which led to such a lag, consist in the imperfection of the economic mechanism, the inadequacy of the innovation potential and the currency and financial support of research and development, and the weak technical base of scientific institutions. Until recently the return from the scientific and technical cooperation of the fraternal countries was also extremely low. Less than 5 percent of the joint developments were completed at the level of inventions, and only 10-15 percent of the completed jobs were introduced in production.

In the middle of the 1980's the majority of the CEMA member countries made some adjustment of their scientific and technical policy and took steps on the lending of greater dynamics to and, what is the main thing, on the increase of the effectiveness of scientific research and development. The implementation of these steps requires substantial expenditures on the increase of the scientific and technical potentials, but the overall adverse economic situation is checking the allocation of the resources necessary for this. In the indicated area, as nowhere else, as world experience confirms, the uniting and concentration of forces, as well as assets in the key directions are important. The specialization of the countries, the division of labor, and scientific, technical, and production cooperation should serve this.

It is also impossible not to take into account that in the present international situation scientific and technical progress is becoming a sphere of keen competition and not only the authority, but also the future of the socialist community depend on how quickly the CEMA member countries assimilate the greatest achievements of science and technology.

Thus, the bringing in the forefront of major integration measures in the scientific and technical sphere has become for the CEMA member countries an objective command of the times. In December 1985 at the extraordinary 41st CEMA Session the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000 (KP NTP SEV) was adopted. This is an important step in the settlement by joint efforts on the basis of a coordinated, and in several areas a unified policy of the most important scientific and technical questions and in the restructuring of the entire system of cooperation of the socialist states on the basis of far-reaching scientific, technical, and economic integration. The main emphasis in the Program is placed on the active introduction of new advanced forms of interaction between organizations and enterprises of the fraternal countries and on the creation of the necessary economic and organizational conditions for their activity.

The Program has two components: the object component (specific scientific, technical, and production tasks) and the management component (the economic organizational mechanism of their accomplishment). These components are not equivalent. The former is easier owing to its relative autonomy. The latter is inseparable from the national economic mechanisms, the international aspects of pricing and credit relations, the circulation of currencies, and the state of the domestic and foreign market.

More than 2.5 years have passed since the adoption of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000, but substantial results in the accomplishment of the goals set by it so far have not been achieved. The Program has exposed many problems not only in foreign economic affairs, but also in the internal economic development of the countries and the state of management personnel (their ability or inability to think and act in a new way). The fast pace and high quality of work, which were specified by the highest party management, at the stages of its preparation and adoption then decreased drastically.

It would be an oversimplification to see the causes of such a situation only in the lack of discipline and irresponsibility of the ministries, departments, and organizations, which are involved in the implementation of the Comprehensive Program. It seems that, perhaps, the following circumstances are less obvious, but more decisive. **First,** the very essence of the Program—the subject of cooperation—was eroded. It as if does not have its own content. The head organizations on the basis of its 94 problems in all 5 priority directions (electronization, integrated automation, atomic power engineering, new materials, and biotechnology) formulated 116 detailed problems, as a result of the fulfillment of which about 1,800 new types of equipment, technologies, and materials should be developed. The product range of this output is so broad that it extends from laboratory test tubes to a supercomputer and a ceramic engine. Moreover, it includes much of what was developed earlier. A significant portion of the developments end merely with the stage of research and development, that is, do not encompass the entire innovation cycle. Production cooperation was specified in many cases only in general outline.

Such "erosion" of the Program occurred because the head ministries and organizations—and all of them are Soviet—perceived it only as a new name for that part of the already existing multilateral and bilateral cooperation, which is connected with the distinguished 5 priority directions and 94 problem areas.

As a consequence, a paradoxical situation arose: the forecasting estimate of the technical level of developments and items based on them was made after the approval of the detailed programs, instead of making precisely the world technical level one of the primary criteria of inclusion in the Comprehensive Program. As a result for nearly a year in the USSR State Committee for Science and Technology they dealt with the "drawing" of the parameters and indicators of developments, which were incorporated in the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000, up to the proper level (and they "drew" them up to 97.7 percent, having reduced along the way the total number of items being developed initially to 2,080, and then to 1,522).

But the paradoxes did not end with this. As follows from the materials of the 37th meeting of the CEMA Committee for Scientific and Technical Cooperation, during 1986-1987 in all the countries of cooperation more than 650 developments which had been completed within the framework of the Program, including 262 in the Soviet Union, were turned over to production, that is, it would be possible to say that in 2 years it was fulfilled by more than a third. But then where is the influence of these results of the economies of the countries and on the broadening of their export potentials?

Serious anxiety in this regard was heard at the 43d CEMA Session, at which a critical assessment of the state of the implementation of the Comprehensive Program was given. The formed situation, so it seems, is explained by the fact that many of the developments included in it are minor or even insignificant (based on its lofty goals) and are not aimed at the accomplishment of tasks of truly a world level.

Second, significant errors and miscalculations in the selection by ministries and departments of the head organizations came to light. Here scientific and technical problem areas, and not specified developments, were the main criterion. Accordingly among such organizations there were mainly scientific institutions, and not production associations and enterprises. But precisely the head organizations should be the motive force in the implementation of the Program. Many of them so far are not such.

The lack of preparation of the head organizations for exercising the rights granted to them in establishing direct ties and the lack of experience, skilled specialists in the area of commercial activity, and the necessary economic organizational, material, and technical conditions are also having an effect. Moreover, the aspiration to restrict the independence of subordinate units is being traced on the part of the ministries that are involved in the Comprehensive Program, as a result of which many rights, which have been granted to the head organizations, are not being exercised.

The mechanism of interaction with the coperformers of the work on the problems has not been adjusted. Without having real economic levers, the head organizations in a number of cases cannot enlist Soviet coperformers in the work on the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000. The situation has also been aggravated by the reluctance of several ministries to involve organizations, which are subordinate to them, in this work.

The practical work of the head organizations is being complicated by their unsatisfactory supply with material and technical resources, by the lack of ruble coverage of currency assets, which have been allocated for the Program, and by the dragging out for a long time on the part of individual ministries and departments of the settlement of the questions of the transfer to their immediate disposal of assets for the sending of specialists to the CEMA member countries. The head organizations are also experiencing difficulties in the realization of currency assets, which are intended for the implementation of work at the stage of research and development, inasmuch as the deliveries from the fraternal countries on the strength of these sums go beyond the volumes which are envisaged by already signed protocols on the commodity turnover.

Today the growing process of the expansion of the direct interaction of cooperating enterprises, associations, scientific organizations, and collectives is occurring. More than 1,000 pairs of organizations, which have entered into direct ties, have been recorded. But among them no

more than 50 have anything to do with the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000. And this is given the fact that within the Comprehensive Program, in which all the performers are known, precisely direct ties and joint collectives and organizations should be the basic tool of interaction, while each of the 108 Soviet head organizations have less than 2 partners in the other countries. For example, on the part of the GDR 140 organizations, of which only a handful have entered into direct ties, are participating in it. With Poland it is planned to establish the largest number of direct ties and to set up joint organizations (400 and 33 respectively), but only no more than 5 percent of them have a bearing on the Program.

Third, questions of planning are an important aspect of the implementation of the Comprehensive Program. Initially it was established that starting in 1987 special sections on the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000 would be in the state five-year and annual plans of USSR economic and social development. The assignments on the output of new products, which have been developed as a result of joint work on the Comprehensive Program, as well as the on the volumes of their reciprocal deliveries are specified by planning organs and sectorial ministries and departments (and now also by economic organizations themselves) when coordinating five-year plans with the fraternal countries and drafting annual plans.

Taking into account that by the time of the adoption of the Comprehensive Program the coordination of the state plans of the USSR and the CEMA member countries for 1986-1990 had already been completed, it was proposed to make in consultation with the countries the necessary changes in the results of coordination, as well as to implement additional measures, including on the formulation of annual plans and protocols on the commodity turnover. But, as experience showed, it was not possible to do this, and in 1986 all the work on the implementation of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000 was performed only on the basis of already adopted plans of sectors, enterprises, and institutes. In conformity with these plans it was envisaged to complete 146 scientific research and experimental design jobs and to produce 54 trial industrial batches of new types of products in accordance with the assignments, which are now considered assignments of the Comprehensive Program.

In 1987, as has also been noted, a special section on the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000, in which there were 145 assignments, including 71 on the production of prototypes and 74 on the assimilation of new types of products, were introduced in the state plan. In all 115 assignments (64 and 51 respectively) were fulfilled. Moreover, in 1987 in accordance with the themes of the Comprehensive Program 267 scientific research and experimental design jobs were completed.

However, within the State Plan for 1988 there is no longer such a section, while all the assignments on the Program have been included in the section "Deliveries of the Most Important Types of New Products, Which Realize Developments of Interbranch Scientific Technical Complexes, Assignments of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000, and State Scientific and Technical Goal Programs of an Intersectorial Nature." The selection of themes for the State Plan for 1988 was made by the USSR State Committee for Science and Technology and the USSR State Planning Committee on the basis of the suggestions of ministries and departments, based upon the significance of the items being developed and their influence on the acceleration of scientific and technical progress. As a result only 33 assignments on the Comprehensive Program got into the state orders, which are approved by the USSR Council of Ministers, in the corresponding section of the plan. This figure in itself says hardly anything. But if you consider that as a whole by 1988, 262 new items in accordance with developments, which had already been completed within its framework, had been proposed for industrial assimilation, 33 is not simply not many. This puts in doubt the entire substantive part of the Program. Especially as many of these 33 items, in the opinion of specialists, are of a narrow departmental nature, will not ensure any new quality and structural changes in the national economy, and will not influence the expansion of exports.

Fourth, the implementation of the Comprehensive Program is also being complicated by the complex, in many respects bureaucratic system of management and by the lack of initiative and the lack of an organizing role on the part of a number of Soviet ministries and departments, which are responsible for its fulfillment.

All the indicated factors testify that the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000 so far has not acquired the needed quality, does not have the required nature of fundamental novelty, and has not been able to light up clearly the outlines of the very object of cooperation. The overwhelming majority of detailed programs did not contain technical and economic substantiations. Moreover, from the start value and resource characteristics were absent in the Comprehensive Program. Hence, too, the main cause of the passivity that appeared subsequently, as well as the temporizing and lack of interest of a number of performer organizations—the unspecific nature or lack of promise of the object of joint work and financing, which are of primary economic interest for the countries. The fact that so far the appropriate economic mechanism of the Program has not been developed, has also had an effect. All the management of the progress of its implementation reduces exclusively to administrative

pressure. In practice economic interest is lacking at the level of economic organizations. This is at variance with the Law on the State Enterprise and with the changeover of scientific research institutes, scientific production associations, and production associations to self-financing and cost accounting.

Another circumstance also seems important. The Comprehensive Program should not be perceived as another program on the level of others. This, after all, is not only a means of coordinating the scientific and technical policy of the countries, but also a powerful lever of the effective accomplishment of such urgent tasks as the achievement of the highest technological level and rapid production assimilation of developments by the combining of the scientific and production potentials of the countries of the community. This fundamental peculiarity has not yet been completely realized by many organizations, and first of all ministries and departments. They perceive the Program as a burden, as additional work that diverts them from the main tasks. Moreover, within the Program it is also possible to elaborate (to experiment with) more rapidly and more effectively (owing to its political status) such difficult questions as the currency and financial, credit, and price mechanisms are.

On the other hand, the Comprehensive Program itself also needs qualitative improvement. This was pointed out back at the Working Meeting of Executives of the Fraternal Parties of the CEMA Member Countries in November 1986 in Moscow. While at the 43d CEMA Session specific steps were elaborated in order to correct the situation in the shortest possible time. This concerns the substantive part of the Program, the mechanism of management, and the general economic conditions of multilateral cooperation. **It is planned to single out within it and to make the main content major special-purpose scientific production and technological projects, which actually revolutionize production and ensure a breakthrough to the highest world level and a significant economic impact. These major projects should become the core of the collective Concept of the International Socialist Division of Labor and the Commencing Coordination of Plans for the Next 5-Year Period.**

The 44th CEMA Session (July 1988) adopted the collective Concept. As N.I. Ryzhkov noted while addressing the session, "the joint implementation of the Comprehensive Program of Scientific and Technical Progress is the main means to the improvement of the structure of reciprocal exchanges and to the implementation of the collective Concept."[1]

The understanding that its basic provisions were to be developed and specified during the coordination of the plans for 1990-1995, was reached. The implementation of the major special-purpose projects within the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000 and other large-scale programs will be carried out with allowance made for the development and intensification of interstate, intersectorial, and intrasectorial specialization and cooperation. It is planned to complete the preparation of the special-purpose projects with the necessary technical and economic substantiations and suggestions on implementation by the end of this year.

The point is that the Comprehensive Program should provide such a filling of the collective Concept, in case of which the coordination of the plans for the next 5-year period would lay the foundations for truly radical changes in the intensification of the specialization and cooperation of production among the countries of the socialist community. Therefore, the major special-purpose projects and other integration measures, which are aimed at the accomplishment of such changes, are acquiring particular importance.

However, **it is also impossible not to take into account such an important peculiarity of the commencing coordination of plans as the inclusion in this work of the basic economic unit—the immediate performers and producers—which makes it possible to put the major reserves of the division of labor to use and to increase the effectiveness of the interaction in the sphere of science and production.** While if we go farther, during the period of coordination one should lay the foundations and even begin the formation of international production technological complexes, which can sharply increase the technical and economic indicators of production and promote the expansion of reciprocal trade in science-intensive products.

It is clear that it is important not only in the interests of the implementation of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000 itself to make it the core of the collective Concept, inasmuch as without the major special-purpose projects of the Program the collective Concept would remain a not very useful set of general assumptions and declarations and would not introduce a new quality into the coordination of plans.

At the same time it also cannot but be disturbing that, just as earlier, when drafting the detailed programs, the formulation of special-purpose projects proceeds from the already available reserves and achievements. This can have the result that the special-purpose projects will also not be breakthrough projects, but will remain ones for catching up or for making up for lost time. Undoubtedly, such projects are also needed, but what does the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000 (as it was conceived) have to do with it here? For all the importance of such projects as, for example, the Interizo Project (the development of technological equipment for the production of new materials), the VVER-1000 Project (the power-generating unit of nuclear electric power plants with a reactor of increased safety and with improved technical and economic indicators), and the

Interbioazot-2000 Project (the development of preparations of nitrogen-fixing microorganisms), these are still the yesterday, not the tomorrow of world technology and equipment.

And there is another consideration. From the suggestions on projects it is possible to conclude that "the special-purpose project" for the present is not a project in the proper meaning of the word. This is rather a program of scientific production cooperation or coordinated actions in the field that is specified by its name. And, finally, the adoption of a project should be accompanied without fail by its serious evaluation (an international one is better) and defense in some form.

For the purpose of the further actualization of the Comprehensive Program it is necessary to prepare and coordinate suggestions on the updating of its themes on the basis of forecasting elaborations and the world trends of the scientific and technical revolution. The implementation of these steps should actually lead to a new quality of the Program, which is seen as the peak of cooperation, which rests on what has already been achieved and developed, and not as the replacement of the old name with a new one.

The updated Comprehensive Program appears within three most important aims:

—the formulation and pursuit of a coordinated scientific and technical policy;
— multilateral cooperation on the solution of the key problems in the priority areas of the development of science and technology for the purpose of creating scientific and technological reserves for the future;
— the joint implementation of major special-purpose projects, which ensure a significant economic impact and the broadening of the export base on the basis of the extensive development of production cooperation and specialization.

In connection with the singling out within the Program of special-purpose projects it would make sense to approach in a new way the specification of the head organizations and their coperformers, giving priority to scientific production associations and interbranch scientific technical complexes. During the implementation of the Comprehensive Program the head organizations should turn into a real independent subject of the economic relations with partners from the other countries on the basis of direct ties and other forms of cooperation. It would be possible to carry out within CEMA the competitive selection of the performer organizations for each of the projects and to formulate and provide the priority economic conditions and stimuli. For several of the projects it would be possible to establish international centers.

It would be possible already now to involve in this work the interbranch scientific technical complexes and scientific production associations, which are operating in the USSR (to undertake the implementation of the projects over the entire innovation cycle within economic contractual relations with codevelopers and consumers). Subsequently it would be possible on their basis to establish joint enterprises and associations with the CEMA countries and international organizations. With the concentration in them of the production of individual types of the final product such organizational structures would become dominant in the meeting of the needs of the national economy of the CEMA member countries and, under certain conditions, the demands of the world market. The existence of clear prospects in production specialization and cooperation within the special-purpose projects and in the assurance of a high technical level of the end results of joint development and their competitive ability on the world market will make it possible to eliminate the trend, which recently emerged in a number of countries, toward the diversification of production in individual sectors of the national economy and toward the expansion of the output of products, which are being developed simultaneously in several countries.

On the other hand, within the major special-purpose projects alone it will be possible to solve the problem, which arose during the fulfillment of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000, of the interconnection of the research which is being conducted in its various priority directions. Today there is actually no system of the cooperation of such work. Meanwhile, the obtaining of timely and high-quality results of development, for example, on integrated automation, in many respects depends on the achievements in the area of electronization and the development of new materials. Therefore, **the work being performed in the different, but interconnected priority directions should be coordinated with respect to the time, stages, and intermediate and end results of research and development.** When implementing special-purpose scientific production and technological projects within the Program such coordination is becoming an objective necessity.

The questions of the financing of the expenditures on research and development, the proportionate participation of the countries, and the distribution of the results and economic impact among the partners are acquiring great independent importance in the organization of the work on special-purpose projects. The use of common funds of financing, which are created for each specific project, could become, so it seems, the most advisable means of covering the expenditures. In the practice of implementing the Comprehensive Program this form of financing so far has not found adequate dissemination. The singling out of special-purpose projects with specifically designated intermediate and end results is affording extensive opportunities for the creation of common funds of financing. International councils of representatives, which would also settle the questions of the attraction of borrowed assets in the form of credits of international banks of CEMA and the mutually acceptable distribution among the participating parties of the derived revenues subject to the contribution of each of the parties to the joint development, could become the managers of such funds.

The actions in these directions could also contribute to the quickest solution of other problems of cooperation and to the finding of points of the linking up of the economic mechanisms of the CEMA member countries.

All the difficulties, which are being experienced by the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000, are undoubtedly connected with the problems of the development of the economy in each country of the socialist camp (in the USSR first of all with the cardinal economic reform). The restructuring of the management of scientific and technical development both in the individual country and in the community as a whole has a most important component—the choice of the priority directions of progress and the implementation at the state level of such programs and projects, which revolutionize social production and determine tomorrow's technological character of national economic complexes and sectors. In our country this is the primary task of the USSR State Committee for Science and Technology, which is the state client in the area of science and technology. But for the present it is coping with it poorly, inasmuch as it does not have the necessary special-purpose resources (and does not have administrative functions) and, what is the main thing, an innovation fund, it merely advises and recommends. So that this committee could fully perform the coordinating and organizing functions and actually influence the progress of the implementation of the Comprehensive Program of Scientific and Technical Progress, it is expedient to form at its disposal a special centralized fund (in addition to an operating reserve), which is intended for the financing of especially important operations of an international nature, including the assignments on the speeding up of development and the introduction of the results, which are fulfilled by the coperformers. These assets could be transferred directly to the head organizations. On this condition the USSR State Committee for Science and Technology could actually carry out the coordination and monitoring of the entire set of operations, including the development of prototypes and the production of trial batches of products, and give in necessary cases the appropriate financial assistance to the head organizations.

Today the increase of the role of the USSR State Planning Committee in the assurance of the functioning of the system of the planning of the production assimilation of the developments of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000 and its resource accompaniment, as well as in the implementation of steps on the improvement of the economic mechanism of the management of the Program seems especially necessary and urgent.

The development of the Program and the intensification on its basis of specialization and cooperation inevitably should lead to the establishment of a common socialist market, which will stimulate the large-series production of science-intensive products and create opportunities for the reduction of the specific expenditures and the speeding up of the recovery of the outlays on research. In the future this should also lead to the expansion of technological transfer and barter between East and West.

The Comprehensive Program is a new and, therefore, difficult matter, which requires a creative approach and constant searching. It is possible to accomplish the tasks set by it by collective effort. Today all the political prerequisites for this have been created.

Footnote

1. PRAVDA, 7 July 1988.

Frolov on Human Factor in Technical Progress

18140068a Moscow IZVESTIYA in Russian
5 Sep 88 p 2

[Interview with Vice President of the USSR Academy of Sciences Academician Konstantin Vasilyevich Frolov, director of the Institute of Machine Science of the USSR Academy of Sciences and a delegate of the 19th All-Union Party Conference, by Kim Smirnov: "Technology: Is the Credit of Confidence Exhausted?"; date and occasion not given; words in boldface as published; first two paragraphs are IZVESTIYA introduction]

[Text] What has happened with technology? Many of its outstanding creations—from nuclear plants to ultra high-speed aircraft—which just recently evoked the pride of mankind for their might, are being linked more and more often in the consciousness of people with danger. Every day the teletypes bring from different corners of the planet reports on accidents. Has man "fallen so low" or has technology outstripped his possibilities so far that he cannot control the "genie," whom he himself let out of the bottle? Not by chance did I come with this main question, which is repeated many times in the letters of readers, to the office of the director of the Institute of Machine Science of the USSR Academy of Sciences and at the same time its vice president and a delegate of the 19th All-Union Party Conference.

The person I am speaking with is Academician K.V. Frolov.

IZVESTIYA: Konstantin Vasilyevich! Do you agree with the readers who believe that the union of technology and man is now seriously cracked, since the development of technology has reached a certain critical boundary and has entered "the zone of risk"?

K. V. Frolov: It is necessary to look deeper for the crack—in the very policy of the development of new machines, in the fact that precisely at this stage the union, about which you are speaking, is often ignored. Life long ago led us to the need to develop unified "man-machine-environment" systems, but as before we are designing individual machines.

In our machine building things are very bad with the specific consideration of the human factor. For example, according to the check, which was made not that long ago by the All-Union Central Council of Trade Unions and the USSR State Committee for Standards, of the 2,000 models of machines and mechanisms, which enterprises of 12 machine building ministries series produce, only 8 percent satisfy the requirements of labor safety and the conditions of adaptability to man. During 1985-1986 alone at enterprises of the USSR Ministry of the Machine Tool and Tool Building Industry 350 types of machines and equipment, which had caused injuries, had to be removed from production.

Undoubtedly, the miscalculations in machine building testify not that we have poor scientists, designers, or engineers, but that the **policy** of developing machines, which is actually being pursued not from the standpoint of the development of a **unified** "man-machine-environment" system, is incorrect.

Many people understand the slogan of the acceleration of scientific and technical progress in an oversimplified manner, hence, too, the hasty technical decisions. The practical reserves of acceleration lie first of all in the activation of the human factor on the basis of the democratization of social life and the development of equipment and technology, which are tailored most for man.

IZVESTIYA: Restructuring without the activation of the human factor is actually ephemeral and unpromising. But are the real working conditions of scientific collectives adequate today so that the scientist would feel like an individual, on whom both the fates of his science and the fates of the country depend?

K. V. Frolov: I believe that they are inadequate. The most urgent problem of the restructuring of science itself is the return to it of the status of the vanguard in the gaining of new knowledge. This is impossible without the restoration of legal democratic norms and without the scientist actually becoming the manager of his own research work. I believe that serious organizational steps are also necessary in order, on the one hand, to include science in the overall state planning system and, on the other, to constantly foster the intellectual worth of the scientist and to develop the spirit of the romanticism of the technical sciences. Here, too, it is always necessary to solve first of all the problem of the human factor.

The disregard of this problem could not but turn into moral and material harm, the extent of which in our days is becoming especially appreciable. For example, in 1987 in motor vehicle accidents alone 40,000 people died and 250,000 were injured. Not to mention the fact that the material harm in this case amounts to 7 billion rubles.

About 75 percent of these accidents occurred through the fault of drivers. In aviation and in the fleet approximately 65 percent of the accidents and catastrophes are due to the fault of equipment. The boundary between "the fault of man" and "the fault of equipment" is very arbitrary. Just recently a serious catastrophe occurred on the October Railroad. It is well known that the irresponsibility of specific people, who rescinded the order to reduce the speed of the train, "came into action." But, after all, the changeover of this equipment to new speeds broadened the zone of risk (slower moving trains would pass through the "risky" section without an accident).

IZVESTIYA: There always were accidents, but, perhaps, it seems to us that there have been more of them owing to the fact that the entire truth is now being told to the people.

K. V. Frolov: Here it is a matter not only of greater glasnost. Errors have the tendency to accumulate, including errors due to the lack of consideration of the human factor.

Even when the fault of a person is established, it is necessary to analyze carefully whether the incident was induced by the low performance of the equipment. Why do they refuse at times in the West to purchase our machines—motor vehicles, tractors, and combines? Mainly due to the inadequate ergonomic level, low comfort, and violation of international standards of protection against a harmful effect on a person (noises, vibrations, toxicity of the exhaust, and so on). It turns out that "they" understand the degree of danger of these imperfections, while "we" do not.

IZVESTIYA: But in what specifically is this lack of understanding find expression?

K. V. Frolov: You know, not only in the production of imperfect machines, but also, for example, in the aspiration to "economize" on equipment. Technology is now developing rapidly. During the life of one human generation not just one generation of machines is replaced. It is necessary to constantly learn, finish learning, and learn over again. Mass organizational services of the support of such a process are lacking, the retraining of personnel is taking place purely formally. Hence, the profession level of a specialist, if it did exist, is decreasing.

Special difficulties with training arise when it is a matter of work on complex and expensive machines. In case of the educational training of jet pilots one must take into account the high cost of each flight. In case of the training of operators of power plants (nuclear and others) the behavior in pre-emergency and emergency situations is very important.

One of the solutions is to use advanced trainers, which simulate in nearly natural form the necessary situation. But in the mastering of this means we still lag greatly behind the industrially developed countries, particularly the United States. As, incidentally, we are also lagging behind them in the study of the human factor and its influence on equipment.

About 30 scientific journals, which are specially devoted to the problems of the human factor in connection with the development of new equipment, including computer equipment, are published there. So far we do not have such a special similar journal, domestic scientific works in the field of ergonomics are published in various journals. True, in recent years more and more monographs and collections—on ergonomics and on engineering psychology—have been appearing. In the United States there is 1 specialist in the human factor for every 300 specialists who are developing new equipment. In the USSR there is such a specialist for every 30,000 developers.

The time has come to change resolutely the situation in this area. The Scientific Council of the USSR Academy of Sciences for the Complex Study of Man is now called upon to unite the efforts of scientists and specialists of different types. It is necessary to introduce at technical higher educational institutions courses on sociology, physiology, labor hygiene, engineering psychology, and ergonomics. In other words, it is necessary to increase the humanities standards of the engineer.

The Economics Chair of the Moscow Institute of Radio Engineering, Electronics, and Automation, which is headed by Corresponding Member of the USSR Academy of Pedagogical Sciences V.P. Zinchenko, has done much useful work in this respect. But on the scale of this country this is insufficient. It is necessary to lend a systems nature to the training and advanced training of specialists in the human factor. This is the task first of all of the USSR State Committee for Public Education.

IZVESTIYA: In essence, you are talking about a comprehensive, program approach to the problem of the human factor. However, earlier we also had many comprehensive scientific programs. The fate of several of them is very sad....

K. V. Frolov: It is possible in a generalized manner to characterize as follows the weaknesses of our former comprehensive programs of the development and devising of new equipment, technology, and materials—inadequate thinking out, a lack of knowledge, and a lack of understanding of interdisciplinary and intersectorial relations. Namely, the lack of a systems approach.

Hence there also follow what are often called "interdepartmental barriers," which form not due to departmental vanities, but due to the inability to solve difficult problems scientifically. For they are not solved locally—at the level of departments and even, as the experience of recent years shows, at the level of individual states.

The progress of technology is placing in the forefront the problem of the scientific substantiation and improvement of the standards on the safety of machines and equipment. Now it is becoming possible to avoid many mistakes in the area of the creation of safe working conditions owing to the use of new types of computers, on the basis of which computer-aided design systems (SAPR's) are being developed.

There already exist many specialized versions of computer-aided design systems—for computers, motor vehicles, airplanes, and so on—and, moreover, for various design tasks, including design ergonomics. For example, the Institute of Machine Science of the USSR Academy of Sciences in cooperation with the MosavtoZIL and GAZ production associations is developing methods of the computerized designing and testing of motor vehicles, which take into account international standards on harmful effects on a person. The financial support of such development is also improving.

The situation with "ecological adaptation" is worse, although in this area individual rather good developments already exist in our country. But it is necessary to change these undertakings over to a broad computer base.

Here interstate cooperation will also be useful. It is necessary to carry out international cooperation in the area of the activation of the human factor, the humanization of technology, and environmental protection from the standpoint of the priority of human values over all others. The Comprehensive Program of Scientific and Technical Progress of the CEMA Countries should be supplemented with the problem of developing means of the automation, diagnosis, and monitoring of machines and the environment.

IZVESTIYA: If the talk has turned to the ecological problems of technology, the theme of standards illuminates them in a new way, as viewed from ecological imperatives—commands, prohibitions, and norms. Will scientists and designers of new equipment be able to reply to these demands and in practice to "ecologize" machine building?

K. V. Frolov: Not only will they, but they are also already embarking on this path. Considerable work is being performed in the collectives which are headed by Academicians N.D. Kuznetsov, A.A. Tupolev, G.V. Novozhilov, and G.P. Svishchev. A fresh example is the test flight in April of this year of the first passenger plane in the world operating on hydrogen fuel. Ahead lies the conversion of heavy helicopters to natural gas, which is essential for the development of Siberia and the Far North.

The ecological strain in our country is very great. It was created by very diverse means, but there were always at its basis a disdainful attitude toward nature and, in the end, toward the health of man and a lack of understanding of the fact that the interaction of technology, the environment, and human society is an entire set of problems, the solution of which requires new thinking and a new view of technology precisely as a unified "man-machine-environment" system. This set of problems itself needs careful study.

Take the decrease of the toxicity of the exhaust of automotive internal combustion engines! This is very important literally for each of us, and especially for city inhabitants. For in half of the 450 large and medium cities of the country the basic source of the increased gas pollution is precisely motor vehicles.

But these are all the obvious sources of the "ecologization" of equipment. Less obvious or latent reserves are incorporated in the very technologies of producing machines. Here, for example, is the combating of wear. It leads not only to the loss of materials and the decrease of reliability, but also to the deterioration of the working conditions of the operator (noises and vibrations increase). If you consider that annually 120 billion rubles are released for the needs of machine building, while 400 billion rubles are released for the repair of machines, it is clear that the production of more durable equipment will provide a substantial saving of natural and human resources. In all 20 tons of standard fuel, 50 tons of oxygen, and 1,000 tons of water are used for the remelting of 1,000 tons of worn out parts and 120 tons of carbon dioxide are discharged into the atmosphere. From what was said above the other ecological reserves of production are also clear. The Machine Reliability Comprehensive Program, which was formulated and is presently being fulfilled at the USSR Academy of Sciences, takes into account the most important role of advanced technologies, new materials, and the human factor in the development and use of items of machine building.

Of course, it is also possible to continue such examples. It would seem what is simpler—save nature and thereby save yourself. But we did not! Our administrative command system conducted an imposing experiment on the survival of nature. Owing to glasnost it was possible to halt the execution of only a few major planned mistakes. But how many ecological infringements have not yet gotten into the beams of "the searchlights of restructuring"?!

About 2,500 years ago the ancient Greek philosopher Protagoras of Abdera voiced the idea that man is a measure of all things. Today we are attempting not for the first time to understand the secret meaning of this formula, and the creations of modern technology are becoming here not only an object, but also a means on the path to the solution.

Social Implications of Introducing New Technology

18140060 Novosibirsk EKO: EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA in Russian No 8, Aug 88 pp 189-199

[Article by Margaret Kouv and Khedva Sarfati, International Labor Organization, Geneva, under the "Economy of the Developed Capitalist Countries" rubric: "The Use of New Technologies: Social Problems"]

[Text] Beginning in the 1970s, most spheres of economic activity have been influenced by automation. This has significantly affected labor content and organization, workers' skills and management methods. Potentially, new technologies ought to improve labor conditions: rid man of monotonous and dangerous work, reduce his work time, facilitate access to information, and even preserve health, thanks to medicine, using computers and data bases for the better and earlier diagnosis of diseases. The instruction and training of cadres, professional orientation, financial planning and other areas of activity will prove to be less expensive and more accessible due to automation.

However, there is another aspect to the matter as well. Under contemporary economic conditions, many technological improvements are intensifying unemployment and increasing the gap between the industrially developed and the developing countries. A new kind of stress is arising: a fear of the "automated" future, in connection with a lack of guaranteed employment.

Thus, two opposing viewpoints on the progress of technology have formed. They are held by those who see a "golden age" ahead, and those who see nothing ahead except universal catastrophe. The other third are biding their time, observing and hoping...

Displacement of Human Labor by Machines

As stated in a report made by a European research group for the Common Market, people are only now beginning to realize what sort of consequences robotization can lead to in enterprises. Meanwhile, there is scant information about the displacement of human labor by machines when new technologies are introduced; it is very difficult to find trustworthy statistical data.

Although robots are capable of replacing people in many cases, the effectiveness of this replacement can vary. It depends on how productively the use of robots is coordinated with design and production systems and the use of computers, as well as on production volume. An investigation by the International Federation of Metal Workers revealed a very mixed picture which, on the one hand, shows a loss of jobs, and on the other—employment stability, and on yet another—even a growth in jobs. Other studies have shown that the labor-saving potential of robots fluctuates from 1.2 jobs per robot to 3.7-4 jobs. According to estimates in a study carried out by the Volkswagen Automobile Company and the FRG Ministry of Research and Technology Affairs, one robot eliminates 3.2 jobs annually. Other studies conducted by this ministry show the range of displacement of human labor by one robot: from 0.8 to 6.2 jobs. In this regard, the penetration of robots is a slow and gradual process.

Under the influence of automation, the share of employees in the processing industry is growing. The activities of an assembly worker, looking after automated production behind a control console, is no different from those of an operator behind the console of a large computer. In his work "*Posledstviya Avtomatizatsii*" [Consequences of Automation], Pol A. Shtrassman advocates introducing a new class of job specializations, so that we would be better able to recognize the changes which are taking place. In suggesting the introduction of a new category, "workers in information science," he asserts that the scales of changes which are already occurring have been underestimated. When computer terminals can be found at work places, in warehouses and in the manager's apartment, the previous definition of office work loses its meaning.

Many studies indicate that the influence of technology on employment cannot be separated from the more extensive questions of socioeconomic policy.

Government Policy

In the sharp struggle on the world markets, many governments proceed from the fact that the competitiveness of their countries in the coming years will basically depend on capital investments in new technological processes. The decades-long European strategic program of research in technology in the field of information science is a collective effort by West Europe countries to catch up to American and Japanese competitors. Until 1988, about 1 billion dollars was allocated by governments for the approved projects and an equal sum—by participating organizations. Joint projects by companies, research centers and governments forewarn of future competition. In this regard, the following is characteristic: the European Federation of Metal Workers has demanded that priority be given to projects which contribute to developing employment.

Unquestionably, the European strategic program is a step forward in the cooperation of dozens of countries. The projects being financed encompass: software, the most advanced information processing methods ("thinking" systems), office equipment, use of computers in industry, advanced microelectronics, and super-large-scale integrated circuits (SBIS) and chips, containing up to a million transistors.

A supplementary program of forecasting in the area of science and technology is also functioning. In particular, this program evaluates technological changes which should occur within the next 20 years. Researchers working in this program believe that tremendous potential for jobs exists in the mastery of new technologies related to information science and to the development of new types of services.

Similar trends are being pursued in the CEMA-member countries. A strategic goal has been established—catching up to Japan and the United States in advanced technologies. This requires both mastering new technologies, retraining the work force, as well as restructuring of the entire system of economic management. CEMA-member countries view robotization as a means to overcome the manpower shortage in all sectors of industry, as well as a way to raise production quality. The People's Republic of China is also moving forward, planning to achieve a high level in new technologies.

Consequences of Automation for Workers

According to claims by some specialists, automation leads to reduction in the number of workers and growth in the number of office employees. Plants are being converted into offices. However, will such "offices" have enough jobs for the people who are displaced by machines? There is no shared opinion on this question.

The Institute for the Study of Manpower at Sussex University (Great Britain) does not share the opinion that vacancies for office work will appear in the market. The point is that a serious shift has occurred in the correlation between the number of men and women among office workers: employment of the former reduced to 170,000, but that of the later increased to a quarter-million, primarily due to part-time jobs. Another document, the OESR Report, claims that the reduction in employment is not fatal in nature, since the introduction of new technologies requires the appearance of new professions. Apparently, unemployment will basically affect the young and the elderly, as well as women and immigrants.

Many economists believe that no previously given amount of work which must be done exists, which in no way indicates that there will be less work for men if machines do more. Human needs know no limits. The problem lies in developing skills to satisfy these needs.

A number of countries are undergoing a considerable structural reorganization, stipulated by the joint influence of new technologies and economic recession. Technological changes combined with other factors can lead to the violation of many presently accepted models, including the understanding of work time and the concept of a worker with a "full-time job." The operation of the Rank Xerox "network" of companies serves as an example of this. Here, work time depends on the presence of computer terminals in the employees' homes. They are not employed by Rank Xerox, but work as consultants. Several state postal services in the FRG operate similarly. Meanwhile it is unclear whether or not similar models will become a reflection of the trends which have taken shape. "Home" work has given rise to its own contradictions. Should working people really return to the position of home workers, defenseless in the social respect, or to isolation and disconnection?...

The Role of Trade Unions

Since new technology leads to higher labor productivity and large profits, the working people, as trade unions believe, also have a right to improved working conditions. Indeed, technological changes in general should not be introduced without forewarning. Until their introduction, joint consultations and meetings are required. The possible negative consequences of the new technology should be foreseen and compensated for as much as possible. Today, trade unions in Australia, Belgium, Canada, France, the FRG, Japan, Switzerland, Great Britain, the United States, and the Scandinavian countries, on both the national, as well as the international level, have come at the opinion that the working people should realistically undertake to participate in solving problems concerning the introduction of new technology.

Although it would be premature to speak of a fundamentally new dialogue between trade unions and entrepreneurs, it can be asserted that mutual understanding is being displayed at certain levels. In May 1984, the Permanent Committee on Employment of the European Community unanimously approved a number of recommendations in this area. They include the determination of general principles for legislative and contractual acts concerning professional training for both the administration, as well as the working people. Trade unions in the FRG, for example, are trying to reinforce the role of labor councils at work places and to strengthen their influence on the decisions made by entrepreneurs. In the U.S., similar efforts by trade unions suffered defeat: in 1983, the Federal Court on Labor Relations established that labor councils in the "Pan-American" company had no right to determine whether or not to install displays for the dispatchers. True, this decision was subsequently annulled, when it was proven that the use of this technology could raise labor intensiveness. Labor councils in France, on the example of the Scandinavian countries, have obtained the right to invite outside experts to evaluate the consequences of introducing new technology.

Although all contracts between trade unions and entrepreneurs usually include measures concerning guaranteed employment, preservation of income, retraining, early retirement, reduced work time and the lengthening of vacations and breaks at work, significant differences exist in protecting the interests of workers within another country. A study of contracts concluded in 15 industrial sectors of the FRG, conducted by the Confederation of German Entrepreneurs, convinces one of this.

In most contracts, the trade unions acquire the right to the disclosure of information on new technologies. Thus, the report, requested by the European community and done at Ruskin College (Oxford, Great Britain), discusses the following question: how do the representatives of the working people utilize their rights to new information for purposes of influencing technological changes? Four cases were studied in each of five countries (the FRG, Italy, the Netherlands, Sweden and Great Britain), each in one of the following sectors of industry: small-scale production, the chemical industry, the banking sector and the processing of food raw materials. Technical changes were studied related to the introduction of automation in design, in packing and loading-unloading work, in industrial process management in the chemical industry, and in the use of production control systems and terminals for: accounting calculations, the automation of bottling lines and the mechanization of sorting and the food industry. In four cases, trade union representatives promoted a postponement of changes, in another four cases they promoted their acceleration, and in 12 cases they had no effect whatsoever.

The contract for postal employees in Ireland stipulates compensation for workers who are forced to change place of work or become unemployed. The leading Swedish automobile company, Volvo, agreed to joint consultation before introducing new technologies and to organizing the retraining of workers displaced by machines.

Among measures to guarantee employment, the FRG company Volkswagen stipulates early retirement with full pay, reduced work time, non-replacement of retired workers, and longer vacations and breaks at work. Telephone station workers in Spain enjoy contract privileges which prohibit reducing the number of personnel or wage as the result of introducing technological changes. In the developing countries, similar problems lead to analogous answers.

Although the need for trade union contracts concerning technology is obvious to everyone, the results are currently not obvious. It is difficult to say to what extent they can guarantee employment, although with their help several forms for defending the working people are being introduced.

Labor Hygiene and Safety: A Particular Example

Debates continue on the effect of displays on the health and safety of office employees. Studies emphasize the importance of ergonomics: lighting, the placement of seating, lights, and the need to regularly test eyesight. A significant number of the contracts being discussed with regard to labor hygiene and safety, establish specific procedures for work with equipment possessing a display screen. All of these contracts include regulations on granting operators frequently breaks during constant work with a display. Usually, a 10-15 minute break is recommended per every hour of work, in some cases the length of work with a display is limited per day. According to a recommendation by the Canadian Congress of Labor, it cannot exceed 4 hours per day. Some of the symptoms which operators complain of include stress, eye strain, backaches and headaches.

Regardless of extensive studies being conducted, many people continue as before to question the safety of displays for pregnant women. World-level experts agree that there are no grounds for acknowledging the alleged danger for pregnant women during work with displays. Meanwhile, however, little is known about their long-term influence on health.

In Canada in 1980, after a number of statements about the large number of cases of abnormal termination of pregnancies among operators working with displays, studies were conducted on the influence on pregnant women of the harmful factors of work with displays. To this day in Canada, Great Britain and the United States, as it reported, 15 other groups of unfavorable pregnancies have been revealed. This question has sparked bitter debates in the United States. Presently, pressure is being put on legislative bodies to introduce a law which would regulate work with displays.

Regarding the fact that this problem causes constant worry, pregnant operators who work with displays are urgently demanding the conclusion of contracts for transfer from work with displays during pregnancy to other work, without losing wages or length of time employed. Beginning in 1983, pregnant women working at a university in Boston have the right to choose between work involving displays or to transfer to other work. Although the university believes that "at the present time studies have not shown that work with displays entails harmful consequences for health or labor safety," at the same time it recognizes the "worry of workers with regard to a potentially unfavorable effect on pregnancy" as valid. In past years, a high percentage of miscarriages was noted among operators working with displays at the university. In Canada, the Ontario State Employees Union achieved a court decision to the effect that pregnant women working with displays have the right to transfer to work where there are no displays, with full preservation of salary; the British State Employees Union in Columbia (Canada) achieved a similar guarantee. In Great Britain, a court for examining production conflicts resolved that an employer had groundlessly considered a pregnant woman's refusal to work behind a display as a case of insubordination, and not a decision made out of concern for her health. Her firing was deemed "invalid."

Professional Training

Labor automation in plants and establishments leads to changes in job specializations and skills of workers. The concepts of "a disappearance of professions," the "complication of professions," and "popularization of trades" have arisen. However, the opinions come down to one thing: as a result of the introduction of new technologies, new specializations inevitably appear. Many, including the OESR, are predicting a reduction in the share of unskilled and office employees, low-level management and supervisory cadres and an increase in the share of workers involved in installing and repairing new equipment and who work with it. The first jobs to be threatened may be those employing women: light assembly work and the sectors of retail trade, financial and accounting calculation and office work.

Optimistic views towards automation also exist. Nobel Prize-winning economist Vasiliy Leontyev and his colleagues at the Institute for Economic Study, New York University, claim that not only will there be no mass displacement of workers by machines, but rather there will be a shortage in the manpower needed to operate these machines. Given a sharp reduction in the number of office employees and an overall increase in the skills of the work force, a reduced number of production workers will not be catastrophic. Evidently, they will be taken into the industrial sectors which are springing up.

V. Leontyev's collective is studying every sector of the U.S. economy on the basis of outlays and results. It is claimed that, by the year 2000, technical changes will not reduce, but increase the demand for a work force, in much the same way that this occurred during the industrial revolution.

The main condition for converting from old to new technologies will be the presence of workers who have received professional training and have skills conforming to the new work. If urgent measures for changing education and professional training and orientation are not made, the professional structure in 1990 will conform to technologies which were used in 1975. The answer is that "there will be jobs if adaptation occurs sufficiently rapidly."

A special committee on employment in Great Britain subscribes to V. Leontyev's conclusions. It reported that hundreds, if not thousands of vacancies exist in an entire range of professions, yet at the same time the number of unemployed exceeds 3 million people.

In connection with mass layoffs in the U.S. automotive industry, the United Auto Workers Union ended up on the leading edge of the struggle to secure professional retraining for employees affected by technological changes. Collective contracts with the Ford and General Motors companies include extensive instruction programs both for laid-off employees, as well as for those who kept their jobs, but due to specialization and professional skills may turn out to be unemployed when new production processes are introduced. In 1984 alone, 13,000 Ford employees were assisted by three centers for aiding in repeated job placement, and this work has continued.

France is the most active in the area of instruction and professional training. Even in 1979, it had introduced a 5-year program of action to provide schools with computers; in 1983 a general agreement was signed between the government and the Federation of the Metallurgical and Coal Industry regarding the professional training of both the unemployed, as well as of the employed, for purposes of modernizing this sector of the economy. Professional training is aimed at a specific work place for young people age 18-25 years. A decision was made to introduce experimental programs for professional training, according to job specializations. The first steps will be to create a new class of jobs. According to data from one of the French trade union confederations, about 4 million people will need training in work with computers by 1990.

Sweden is one of many countries where the income of companies is already taxed directly for purposes of financing professional training projects related to the introduction of new technologies. It consists of 10 percent of the 1985 profit and is spent only after consultation with trade unions. These funds will be put in a state "reserve for modernization."

In Great Britain, the government is expressing concern about the shortage of cadres in new job specializations and is calling for extensive actions: from introducing a new state system for professionally training young people, including 30,000 study places for the instruction of unemployed youth annually, up to creating a network of private companies which train people in information science. In Ireland, a system of retraining and guaranteed employment for young scientists and technologists has been introduced.

The Developing Countries

The governments of "third world" countries realize that if they do not develop their own industries along the path of the new technologies, their economic lag will increase.

In 1960-1970, in order to attract foreign capital and modern technology, many developing countries allocated special zones where companies which display an interest in creating enterprises were granted privileges and freedom from payment of taxes. A significant number of such zones exist in the developing countries, especially in South and East Asia. Many industrial sectors are represented there; electronics is first among them. Although foreign investments help to instruct the local work force in the necessary specializations to some extent, they are not always oriented towards the development of national economies.

The new industrially developed countries, such as Argentina and Brazil, have undertaken to develop their own computer equipment industries in earnest. Although both countries depend equally upon multinational enterprises, they solve the problem differently. Whereas the government of Argentina decided that "business circles no better," and abolished control over imported technologies, Brazil has achieved success precisely in connection with government interference. Thanks to a carefully planned strategy, Brazil was able to achieve the fact that the activities of multinational enterprises have not contradicted national interest. For purposes of creating a technological base of their own in Brazil, the use of foreign technology was reduced to a minimum. Cuba and Nigeria also have achieved significant successes in developing their own computer equipment industries. However, not a single "third world" country has a large internal market of its own.

The MOT study considered within what kind of limits new and traditional technologies "are combined," and ascertained that combination is possible. Seventeen cases of the introduction of microelectronics, biotechnology, new materials and satellite technology in regions with traditional types of labor activity were studied. According to the results, the conclusion was made that combining the new with the traditional is the best version, lessening the negative influence of automation, which can lead to reduced employment even in the "third world."

USSR, China To Exchange S&T Exhibitions

18140085 Moscow MOSCOW NEWS in Russian No 45, 13-20 Nov 88 p 5

[Article by Igor Danilin]

[Text] More than 30 years separate the first Soviet exhibition in China and the "Science and Technology of the USSR" exposition to be held in the PRC in November as part of the Days of Soviet Science and Engineering. This announcement was made at a press conference in Moscow by Vladimir Yeshkov, Vice-Chairman of the USSR State Committee for Science and Technology, Chairman of the Organizing Committee for the Days of Soviet Science and Engineering in the PRC.

Over 60 ministries and government departments, 95 research institutes, and more than 200 science-production associations, enterprises and factories helped organize the 3,000-entry exhibition. This latest Soviet exhibition in Beijing, said Yeshkov, is one of the largest scientific-technological shows ever held by the Soviet Unikon abroad.

Most entries anticipate the future of Soviet science and engineering and illustrate the cooperation being offered by our country to China. Soviet experts agree that the most promising spheres for joint efforts are power engineering, biotechnology, electronics and the exploration of outer space for peace, in addition to such traditional areas of Soviet-Chinese cooperation as ferrous and nonferrous metallurgy. The Soviet side is also offering new forms of cooperation—joint ventures. scientific laboratories and research centers.

Soviet scientists and experts will deliver reports on the development of priority lines in Soviet science and engineering at the PRC's enterprises, scientific institutions and educational establishments. There will be round-table conferences and meetings with Chinese specialists who graduated from Soviet institutes of higher learning.

The Days of Chinese Science and Engineering will take place in Moscow in May-June 1989.

Moscow Sponsors Conference on Automation, Information Policy

18140080b Moscow IZVESTIYA in Russian 26 Nov 88 p 2

[Article by Ye. Fedorovskiy under the rubric "Panorama of the News": "A Code for Computers"; first paragraph is IZVESTIYA introduction]

[Text] The 1st All-Union Interdepartmental Conference on the Social and Legal Problems of Information Science was held in Moscow. The more than 500 participants represented nearly all the sectors of the national economy and all regions.

"Today we have to our credit many suggestions on how we can overcome the lag in the area of computer technology and shift to the path of the spread of information technology in the national economy," Deputy Chairman of the USSR State Committee for Computer Technology and Information Science V. Korchagin, chairman of the organizing committee, said at the conference. "But at the present stage of restructuring I would like to try to find solutions which follow from the spirit of the economic reform. One of them is the laying of the legal foundations of information science and its standard legal support.

"Take if only algorithms and programs. Precisely they are capable of reviving computers, which are operating at half capacity, or else are becoming completely covered with dust in warehouses. They also stimulate best of all the real need of users for computers wherever they are thus far not available. It would seem, what could be easier: take and develop the industrial production of programs and disseminate them throughout the country. But the whole trouble is that for the present programs are in our country a national resource only in words, they do not always have a specific owner, who bears responsibility for its proper operation and use. For the present blind exchange in kind—I give you something, you give me something—still dominates, which is not creating the conditions of material interest in the development of good programs.

"A reliable commodity mechanism: the price, liability, stimuli, sanctions, should reign in program writing. If you have developed a good program, you compensate for the costs and derive a profit; if you have allowed defective output, you pay a fine and bear the losses. It is necessary to apply to programs, the products of intellectual production, the rights that are in effect in traditional physical production.

"Barter requires that the object of exchange—the commodity—pass from the hands of one person to the hands of another person together with the right of ownership, which is regulated in addition by contractual relations. Inasmuch as programs and algorithms can be the property of both the state and individual authors, it is necessary to define clearly the powers of legal entities with respect to the disposal of machine information—to accompany the purchase and sale of program products, including to transfer the rights to their prompt disposal. The unsanctioned copying of programs and unwarranted changes should be prohibited, while their destruction should be taken strictly into account, as the destroyed traditional physical product of enterprises is now taken into account. Here the legal liability of the authors and users for the results of the operation of programs should be clearly regulated, including legislatively.

"Recently the committee as an experiment introduced the copyright protection of programs. A large number of author's contracts have already been concluded, the first

author's guarantees have been stipulated, the first royalties have been paid. It seems that this will appreciably animate domestic programming.

"Now the total amount of legal documents, which pertain to computer technology and information science, is so great that the publication of a single compendium of legal documents is out of the question—the collections would be too supermultivolume ones. That is what kind of swell of enforceable enactments, guiding technical materials, statutes, and instructions, which have been written in sectors, has crashed down on engineers and information workers. But, what is the main thing, this entire enormous body of legal concoctions is superficial and contradictory, is not keeping pace with life, and is not following it. One of the tasks of the committee is to finish and publish basic standard documents, which encompass the most important aspects of computerization and collect all the experience in this area, which has been gained in the country and abroad. Such a publication will serve as valuable support to everyone who is engaged in the practical introduction of computers...."

Other unsolved problems, for example, the international legal aspects and questions of legal education and legal propaganda, were also examined. While during the breaks between meetings the conference participants, having gone downstairs to the foyer, availed themselves of the services of the consultation center, which was organized by one of the first cooperatives in the country, which work in the field of information science—the Eleks Cooperative. Experienced specialists were able to provide any information and recommendations on all questions of legal protection in the area of information science, including on questions of the activity of cooperatives.

Kazakhstan Sponsors S&T Information Resources Fair

18140080a Alma-Ata NARODNOYE KHOZYAYSTVO KAZAKHSTANA in Russian No 9, Sep 88 pp 60-61

[Article by L. Bergman, deputy director of the Republic Scientific and Technical Library: "To the Participants in 'The Trade Fair of Scientific and Technical Ideas.' What Libraries Can Do"]

[Text] At present the question of the maximum use of the enormous scientific and technical potential, which is available in the country and is capable of developing in the shortest time equipment of new generations, has arisen with all urgency. Precisely it can yield a manifold increase of labor productivity and open the way to the automation of all stages of the production process. For this purpose a search for highly effective technical solutions, which are based on promising principles, is necessary.

In light of these tasks the role of invention as a catalyst of scientific and technical progress is increasing immeasurably. For the purpose of the extensive enlistment of innovators of production and primary organizations of scientific and technical societies and the All-Union Society of Inventors and Efficiency Experts in the search for and selection of the best solutions, which are connected with the implementation of the most important scientific and technical, social, and economic programs of the 12th Five-Year Plan, the Executive Committee of the Alma-Ata City Soviet of People's Deputies, the presidiums of the Alma-Ata oblast trade union councils and oblast councils of scientific and technical societies and the All-Union Society of Inventors and Efficiency Experts, the city Kontakt Center of Creative Scientific and Technical Work of Youth, and the Kazakh Scientific Research Institute of Scientific and Technical Information and Technical and Economic Research decided to hold from 10 November to 1 December 1988 on the basis of the Kazakh Scientific Research Institute of Scientific and Technical Information and Technical and Economic Research and the House of Technology "a trade fair of scientific and technical ideas." The questions: "Technological Solutions and Developments, Which Are Aimed at the Saving of Resources and the Protection of the Environment" and "Developments, Which Are Connected With the Increase of the Consumer Properties and the Competitive Ability of Consumer Goods and Are Recommended for Production at Enterprises of the City of Alma-Ata," should find reflection at it. The scientific and technical developments, which are submitted for "the trade fair," should contribute to the increase of labor productivity and the improvement of product quality and to the efficient use of material and manpower resources.

The active use of the latest achievements of science and technology, which are contained in scientific and technical literature and documents, is one of the most important conditions of the acceleration of the pace of scientific and technical progress.

The Republic Scientific and Technical Library attached to the Kazakh SSR State Planning Committee (RNTB) is the information base in our republic. We remind the participants in "the trade fair of scientific and technical ideas" that the Republic Scientific and Technical Library has a collection of domestic and foreign scientific, technical, and economic literature, bibliographic reference publications, as well as a collection of special types of technical literature and documents.

The familiarization of production workers with industrial catalogs, which contain information on items of domestic enterprises and foreign firms, is important for ensuring the high technical level and competitive ability of technical products. The Republic Scientific and Technical Library has such catalogs from 1975 on in conformity with the specialization of the national economy of the republic.

The general-purpose, regularly checked collection of standard technical documents is at the service of the users of information. It includes state and sectorial

standards, all the prevailing republic standards of the Kazakh SSR, specifications, and international standards.

Foreign firm catalogs for various types of equipment are an important source of the familiarization of the specialist with new items of foreign technology. They contain in many cases valuable information, the complete technical data of various types of equipment, and the possibilities of their use for some operations or others. Foreign firm catalogs have also been acquired by the Republic Scientific and Technical Library since 1975. In the structure of the library there is the foreign language division, which annually receives about 400 titles of periodicals, 250 of them are subscribed to by means of currency allocations. The library acquires foreign publications, directing attention to the leading sectors of industry of Kazakhstan (machine building, chemistry, power engineering, light and the food industries, and others), as well as on the economics of industry, transportation, construction, and architecture.

The Republic Patent Collection (RPF)—a structural subdivision of the Republic Scientific and Technical Library—is the central depository of patent documentation in Kazakhstan. The collection is acquired in a general-purpose manner, for all sectors of science, technology, and agriculture. The patent documentation of 42 countries of the world for 30-35 years is represented in it. These are the descriptions of inventions and patent bulletins of the USSR, the CEMA member countries, and capitalist countries.

For specialists, who are the developers of new equipment, the Republic Scientific and Technical Library has bibliographic indices of the descriptions of USSR inventions for the sections "The Cleaning of the Exhaust of Internal Combustion Engines" and "The Treatment of Industrial Sewage." The information on inventions in the indices is presented by sections in accordance with the types of cleaning: mechanical, chemical, biological. In the bibliographic reference division the thematic card file "Environmental Protection" is also kept. The domestic scientific and technical literature since 1985 on the protection of the air basin and water resources is reflected in it.

In the archive of the Republic Patent Collection there are bibliographic lists and thematic selections of patent documentation, in which inventions regarding the problems of energy conservation and environmental protection: "The Use of Geothermal Energy," "Solar Power Plants. The Use of Solar Energy," "The Monitoring of Environmental Pollution," and others, are reflected.

It is important for the producers of consumer goods to know that a modern high quality item should not only meet technical and economic requirements—reliability, durability, and economy, but also satisfy specific esthetic requirements. In this connection the beauty of the form, the elegance of the finish, the convenience of use, the color, the texture, and even the packaging of an item are acquiring great importance. In many cases the external appearance becomes a decisive market factor, that is, the appearance of an item has a definite economic value. In accordance with the legislation of the majority of countries of the world the external appearance of an industrial product serves as the basis of their legal protection as production prototypes.

The information on production prototypes is reflected in the official publications of patent departments. Our patent collection has a photograph library of production prototypes of the world. The material in it is systematized in accordance with the classes of the International Classification of Production Prototypes.

For specialists, who are engaged in the development of new models of goods, the Republic Scientific and Technical Library has the literature indices "The Production of Consumer Goods From Waste Products at Enterprises of Local, Light, and the Timber and Wood Processing Industries," "The Increase of the Quality and the Enlargement of the Assortment of Consumer Goods," and others.

The Republic Patent Collection offers developers information on domestic and foreign inventions in the form of thematic selections and bibliographic lists of descriptions of inventions with respect to the sections "General-Purpose Kitchen Machines," "Mixers," "Accessories for Items of Light Industry," and others.

For enterprises, which want to take part in "the trade fair of scientific and technical ideas," the Republic Scientific and Technical Library can hold days of information and days of the specialist directly at the workplaces. All types of technical literature and documentation on the themes that interest developers can be made available to them. It is possible to become familiar with them in the reading rooms of the Republic Scientific and Technical Library or to request them for temporary use by interlibrary loan.

Propaganda Film Attacking COCOM, Technology Embargo Under Production

18140057 Moscow NTR: PROBLEMY I RESHENIYA in Russian No 19, 4-17 Oct 88 pp 1,3

[Interview by F. Vladov: "Hightechgration: Integration of High Technologies—One of the Most Important Paths for Scientific and Technical Cooperation Between West and East"; first three paragraphs are NTR: PROBLEMY I RESHENIYA introduction. Passages in boldface as published]

[Text] **It is 23 September, at the USSR Academy of Sciences Computer Center. There is unusual animation in the computer room, where there are several BESM-6. As they say, "a movie is being made." The English "Rapid Production" company, on an order from English television's channel 4, is filming a documentary on the expediency—or more correctly, the inexpediency—of the embargo on the sale of modern computer hardware to East European countries.**

The film group staff is international: the director and script writer are English, the consultants are Finnish and Soviet, and Novosti Press Agency has provided the camera operators.

Our first interlocutor is Kheyki Auvinen, head of the Finnish "ASUMERA" company and a specialist in information technologies.

[Question] **How do you, as a representative of Western business circles, regard the activity of the Coordinating Committee for Controlling Exports to Socialist Countries (COCOM)?**

[Kh.A.] I think that the embargo is a purely political measure. Businessmen are primarily interested in the market situation: they observe whether or not a "vacuum" of some kinds of goods exists, and if it does, then whether it can be filled, naturally, with a profit for themselves. In the film, we want to emphasize for our viewers that, on the one hand, such a vacuum does exist in the Soviet Union and, on the other, high technology exists here, just as in the West. The main point is that the skill and possibility exists for the Soviets, in case of need, to develop and create that which is needed themselves, regardless of any trade bans.

[Question] **How and with whom did the idea of the need for this film originate?**

[Kh.A.] Our script writer, K. Kakhill, published the monograph "The Trade Wars" in 1986, especially devoted to the technological embargo. I have also written several articles on this subject. In short, we were interested in the problem and turned to "Rapid Production." This company had separated from the BBC and specializes in producing television documentaries, which it then sells to various television companies. Interest in the still-unfinished film has been so great that 14 countries besides Great Britain have ordered it, even before the filming is completed. They include Finland, France, the FRG, Japan and other countries.

[Question] **What can you say about the basic concept of the future film?**

[Kh.A.] We would like to show that your technology exists even without goods which are unavailable because of the embargo, and that this technology is of a very high level in many cases.

[Question] **In other words, the embargo does not justify itself as an economic hindrance?**

[Kh.A.] Moreover, it causes large potential losses for Western companies, depriving them of opportunities (more correctly, rights) to enter the Soviet market. However, yet another circumstance is very important. We pay special attention in the film to your software, since, in my opinion, Soviet programs, especially high level programs, are not inferior to and often even surpass Western ones. It seems to us that a very promising path is opening up precisely in this area for interaction between East and West, which we call "Hightechgration (from the English, High Technology Integration). I think that this is a very promising concept which combines our interests.

A. Giglavyy, leading scientific associate at the Institute of Electronic Control Machines and a Soviet consultant for the film, joins the conversation.

[A.G.] Today, the following pattern is spreading throughout the world: the developed countries essentially get fairly cheap and reliable basic hardware and technology from the Asian region, and the basic software is created in the European countries and the United States. Everything concerning the next, more complex and specialized strata of software, can be and already is being created by Soviet programmers.

Thus, the high quality and low cost of "their" technology can successfully be complemented by the serious scientific development of domestic software. It is not a question, of course, of software products which can be duplicated in the millions. Far more experience has been acquired in this area in the West than we have, and the West has a publishing business aimed at the publication of large-scale, particularly everyday programs. However, I am referring to something else—to items distinguished by such high science-intensiveness that they can be called truly high technology products. These are primarily specialized programs intended for engineers and researchers, which operate on the leading edge of science and technology.

[Question] **Thus, is it a question of a unique three-way integration: the Eastern region, Western Europe and the USSR?**

[A.G.] Yes, although here Western Europe turns out to be the most tied-up link, because of the embargo. After all, the purchase, for example, of most types of personal computers is not forbidden (most come from the East), but COCOM prohibits unifying them into a network—on the basis of which Western businessmen would be able to gain a large profit. By the way, the joint Soviet-French-Italian enterprise "Interkvadro" is successfully doing precisely this. Our film group first visited a shop in the Soviet Union which puts together computer networks based on personal computers, and television viewers will soon see for themselves how ineffective the COCOM prohibitions are.

[Question] **What else will be in the film?**

[Kh.A.] Right now, we are filming in various scientific centers in the USSR, and television interviews are being taken with famous specialists in computer hardware and information technologies (for example, there is an arrangement with Academician Ye.P. Velikhov, USSR Academy of Sciences vice-president). The film group will then go to the United States, where it will meet with one or several COCOM organizers and supporters. They will be granted an opportunity to express any arguments in favor of the embargo, i.e., our film will be an "honest game," which will present the opinions of both sides. I think that only in this case will the viewers themselves be able to judge the expediency of the existing bans. Moreover, the views of European specialists will be mandatorily represented. Hightechgration, interpreted as the unification of scientific, industrial and commercial efforts on the basis of high technologies, has many supporters in England, France, the FRG... We intend to interview parliament members and legal experts from these countries, as well as members and experts from the European parliament.

[Question] **How have people in our country related to the creation of this film?**

[Kh.A.] They have helped us a great deal. I think that this is, in general, one of the first cases in which the doors have been opened wide for Western television in the USSR. This fact in and of itself already means a great deal to our viewers.

[Question] **So, how far have you obtained access?**

[Kh.A.] We visited, for example, the USSR Academy of Sciences Institute for Space Research, where we saw a 1992 satellite model, designed on the latest joint Soviet-Bulgarian computers. These are YeS series computers with a specialized processor and a speed of up to 100 million floating point operations per second. They explained to us that only beginning with satellites of this—the 1990s—generation, experiments will be starting in space which are now being planned and controlled, different versions of which had been checked earlier on alternative models using this super-powerful computer. We were able to film both the computers themselves as well as the model of the satellite created using them.

[A.G.] However, the most interesting thing awaits us tomorrow. Thanks to help from USSR Glavkosmos, we have become the first television group in the world—not even excluding Soviet television!—which has gained access not simply to the Space Flight Control Center (TsUP), but also the computer room at the TsUP Computer Center. Here, the new Soviet "Elbrus-2" supercomputer, which performs the most complex calculations, needed to successfully run space flights and, in particular, needed for the "Fobos" experiment now being conducted.

At this point, the filming at the USSR Academy of Sciences Computer Center computer room finished, and film director James Doran joined our conversation.

[J.D.] In terms of work style, I am a television investigator. This most accurately reflects my approach to filming. Many years of experience in journalism, first in Scotland and then at the BBC, contribute to it. I film topics on the crisis and collapse of large companies, pursuing such stories throughout all of Europe. I have also worked for regular news programs and for economic survey broadcasts.

[Question] **What problems have you had in making this film?**

[J.D.] Nine out of 10 Englishmen on the street have never even heard the word COCOM itself. Of course, it is far easier to operate in such a "dark environment," when society knows virtually nothing about this activity, than it will be after our film.

Moreover, for me, as well as for the producer, interested in a big sensation, it is very important that we were met half-way in the Soviet Union and access was provided to those Soviet supercomputers which are being used for the most important scientific projects and are becoming a key element of high technology. A great deal has been heard about these computers in the West, but almost no one has seen them. I consider the opportunity to show them to the entire world, "live," so to speak, one of the characteristic manifestations of the process of expanding glasnost, which has begun in your country.

In conclusion, we report that the film—its working title is "How the West Was Brought to Its Knees"—is expected to be finished this fall, and we hope that USSR Gosteleradio will see to it that it becomes available for Soviet television viewers as well.

U.S.-Japan Competition in Product Quality Analyzed

18140068 Moscow NTR: PROBLEMY I RESHENIYA in Russian No 20, 18 Oct-7 Nov 88 p 7]

[Article by Candidate of Technical Sciences V. Shper (Moscow): "Reliability: The Lessons of Competition"; first paragraph is NTR: PROBLEMY I RESHENIYA introduction]

[Text] One should not count on it that the quality and reliability of all types of domestic equipment will be able to quickly approach the world level. But if we want if only in the future for this goal to be achieved by us, we should radically change already today the very approach to the reliability and quality of our products. The analysis of the activity of the most developed countries—Japan and the United States—leads to such a conclusion.

Japan is the universally recognized leader in the area of the quality and reliability of technical items. As is evident from the figure [figure not reproduced] (the estimate of leading American specialist Doctor J.M. Juran), initially the Japanese needed about 20 years to catch up with the United States. Then American firms, having discovered that they were losing more and more in the quality of their goods, were able by vigorous steps (including by the use of Japanese know-how) to break this trend. As a result the gap in the quality of American and Japanese goods ceased at any rate to increase. Hence the main conclusion for us: only if the growth rate of the quality and reliability of our items is greater than that of foreign competitors, will we be able to count on the elimination of our present lag.

Now about the factors, by means of which the Japanese succeeded in achieving their breakthrough. Here it is appropriate to turn to the analysis made by American specialists, who at one time were forced to study the various components of "the Japanese miracle" and to compare their own approach to quality with the Japanese approach.

In their opinion, the main task, which Japanese entrepreneurs set for themselves and their works, is the constant aspiration of everyone to improve the quality of his own work at his own workplace (daily and always). No global tasks are set (increase the reliability by...fold, decrease the presence of defects by...fold), there is only one task: to work today just a little better than yesterday, and tomorrow just as little better than today. This is precisely why the Japanese consider it more preferable to achieve a 90-percent result in 200 days than a 50-percent result in 10. What, it would seem, can be easier, but meanwhile such an approach enabled, for example, Japanese steel companies to decrease the value of low quality metal to 1-2 percent of the sales volume as compared with 10-15 percent at American corporations, which have comparable equipment and technology.

Acquaintance with the methods, which are used by the Japanese for the introduction everywhere of such an attitude toward work, leads to the view that they, given the domination of private ownership of the means of production, have created (and quite successfully) within each staff member of the firm the illusion of participation in the management of production and in its results.

Further, the Japanese in the middle of the 1950's adopted the policy of mass universal education in questions of product quality control. As a result, whereas at western companies only about 5 percent of the management personnel have been trained in quality control methods, at Japanese firms this indicator is equal to 100 percent (true, about 10 years were required to achieve this). Let us note that that the system of training there is hierarchical: each superior chief trains his subordinates, and so it is from top to bottom. Education and training at Japanese companies use up for each worker on the average about 8 hours a week.

Finally, Japanese entrepreneurs are successfully campaigning for close cooperation between the producer and consumer of some items or others, the supplier and the consumer in their understanding are partners in the campaign for the improvement of quality and reliability. Their motto is: "The Next Stage of the Production Process Is the Consumer of Your Product." In contrast to this for Americans the interrelations of the producer and consumer are estranged, at times hostile. It should be added that whereas the Japanese are advocates of lenient steps of punishment without searching for the guilty parties, the American system presumes the search for the guilty parties and the taking of strict steps of punishment.

What does the Japanese system yield? Let us cite just one example. The constant improvement of the technological process at one of the Japanese plants in a little more than 2 years led to the decrease of the failure rate of soldered joints on the average by 50 percent every 3.6 months, which made it possible to decrease the presence of defects by a factor of 250. Moreover, the equipment, on which the Japanese achieved this result, was rejected by a neighboring American plant as obsolete, since its introduction made it possible to decrease the presence of defects to only one-third to one-half.

In short, the basic components of "the Japanese miracle" are:
- the constant aspiration of everyone for the increase of the quality of his own work;
- the cooperation of the producer and consumer in the campaign for the improvement of the quality and reliability of items;
- universal education in questions of quality.

With this it is possible to end the comparison of the Japanese and American approaches and to turn to the problem of increasing the reliability of domestic equipment. Even a superficial look shows that in addition to

the listed conditions there is another large set of tasks that require their accomplishment. Moreover, what we spoke about is only the difference between the Japanese and American approaches, other things being equal (the level of technological and testing equipment, similar approaches to testing methods and the analysis of failures, the extensive use of statistical methods, and so on and so forth). In other words, the named factors are only the necessary conditions for the long-term stable increase of quality and reliability. However, in addition to them there are also a number of other conditions, without which one cannot ensure the high reliability of items. Among them are:

— the development of new precision and automated technological and testing equipment, the use of new materials, and new methods of designing and development;
— the improvement of the methods of reliability tests, including accelerated tests; the development of equipment for conducting such tests;
— the extensive introduction of statistical methods of product quality control;
— the improvement of standard technical specifications and the questions connected with them.

A trifle as if remains—to correctly chose the direction of actions. For this the indicated tasks should be divided into those, which can be accomplished quickly, and those, which require much time.

It is quite obvious that it is possible to change quickly only the standard technical specifications in the area of reliability. The tasks connected with the development of new equipment are accomplished with much more difficulty and much more slowly, although their relatively quick accomplishment, in principle, is feasible, if it were possible if only to buy the appropriate equipment.

Finally, the slowest thing is the realization of all these conditions which are typical of Japanese industry.

The first two tasks (the attitude toward quality and the producer-consumer interrelationship) coincide with the tasks of economic reform, the introduction of cost accounting, and restructuring as a whole. They will be accomplished to the extent and at the pace, to which the restructuring of the national economy of our country is developed and to which the introduction of cost accounting and the democratization of the management of enterprises advance in the direction of full cost accounting and genuine self-management.

It is necessary to immediately undertake the accomplishment of the third task (universal education in questions of quality and reliability). High-quality and moderately priced manuals on these questions should be developed very quickly.

Centers for the analysis of the physics of failures are greatly needed. The corresponding equipment, as a rule, is very expensive; therefore, these centers should, perhaps, be set up on a cooperative basis (that is, in addition to the corresponding ministry and head enterprise all the enterprises, which are the producers of this type of equipment, should also make a contribution to their financing). Other versions, of course, are also possible. The rapid establishment of such centers for the entire element base of electronics and electrical engineering is especially important.

Work on the improvement of the methods of reliability tests, generally speaking, is being performed in all sectors. However, I would like to stress that the worldwide trend is to make the conditions of tests more rigid and to increase their comprehensive nature. More and more tests, in case of which they strive to ensure the maximum possible combination of various factors, are being conducted. Accelerated tests are being conducted more and more often not for the determination of the indicators of reliability, but for the comparative analysis of different versions of the design and (or) technology.

The standard on the methods of reliability tests requires radical revision. It is time to reject such an approach, when a fixed set of plans of tests, risks, and so forth is indicated for all types of items. This is a consequence of the dogmatic attitude toward standards and of the lack of understanding of the fact that different types of equipment require a differentiated approach. Therefore, the standard should give as broad a choice of plans as possible, while the question of the values of the risks and the confidence coefficients is to be settled by the producer in consultation with the client (or with the head organization for this type of equipment). It would be a good idea to heed the recommendation of Professor K. Isikawa, a leading Japanese specialist in quality control methods, who believes that the main thing is the meeting of the demands of the consumer, it is necessary to follow the standards only with some caution.

A few words about monitoring. Foreign experience testifies that monitoring on the part of the consumer is the only effective monitoring. Unfortunately, in our country this principle in many cases does not work—due to the monopoly of the producer. Therefore, wherever such a monopoly exists for the present, in addition to the monitoring of the consumer it is also necessary to establish additional monitoring from above (the head organization, state acceptance, and so forth). In all cases one should supplement the existing methods of monitoring so as to begin already today to shift the center of gravity gradually from punishments for poor quality and reliability to stimulation for good quality and reliability. (For example, to use extensively in practice the relaxation or even the lifting of monitoring in case of a stable good level of quality and reliability.) One should, however, clearly visualize that state acceptance can give only a temporary solution to a portion of the problems: it is possible by means of it to achieve the elimination of poor

quality and to shift to average quality. It is naive, to say the least, to hope for the achievement of the world level of quality and reliability by introducing state acceptance.

And a last remark—on the approach to product quality. American specialists in the area of product quality in recent times have been actively discussing the so-called Taguchi method. According to one of the theses of this method, product quality is the minimum losses which are caused by it to society from the moment of shipment. Consequently, a product, which yields the producer a profit and simultaneously causes society significant losses, is considered to be of poor quality. Although such an approach should have been (in our opinion) the prerogative of socialism, it was developed in Japan. It seems to me that it is expedient, without delaying long, to discuss the possibility of using this approach (in one form or another) for domestic products.

Measuring Effectiveness of S&T Progress

18140091 Moscow PLANOVOYE KHOZYAYSTVO in Russian No 11, Nov 88 pp 48-55

[Article by Corresponding Member of the USSR Academy of Sciences D. Lvov and Candidate of Technical Sciences V. Flis under the rubric "The Theory and Methods of Planning": "The Measurement of the Effectiveness of Scientific and Technical Progress Under the New Conditions of Management." Passages in boldface as published]

[Text] The policy of production intensification is posing in a new way the task of the efficient use of the scientific and technical potential of the country. It is important that of all the diversity of technical solutions the best ones, which ensure the greatest increase of the efficiency of the economy, would be selected. Scientifically sound methods of determining the economic effectiveness of capital investments and new equipment are called upon to play a large role in this. Thus far some experience has been gained, there is also a substantial scientific reserve, which is making is possible to improve the methodology and practice of feasibility studies of planning and design solutions. At the same time substantial gaps also exist here.

In the arsenal of planning organs there are more than 10 methods and procedural instructions on the evaluation of the effectiveness of capital investments and new equipment, the use of automated management systems and computer hardware, the development and location of production, and so on. Each of these methods served a specific sphere of planning activity and took into account its specific nature and peculiarities. According to the intention of their compilers for the most part they should be based on common methodological principles. However, among them there are not even two that are identical in the methods of calculating the economic impact, in the set of used standards, in the group of indicators that are taken into account, and so on. They began to evaluate in different ways the effectiveness of capital investments and new equipment. It turned out that they are not interconnected, although in reality the methods of determining their effectiveness should be identical, inasmuch as scientific and technical progress is realized by means of capital investments.

The situation was aggravated by the fact that the contradictions in the calculation of the indicators of effectiveness, which are used in cost accounting at the level of enterprises, associations, ministries, and departments, were added to contradictions in the methods of feasibility studies of planning and design solutions. Noteworthy in this respect is the debate which has developed in recent years in economic literature with regard to what it is better to use—the gross or the commodity—and how to calculate labor productivity properly—according to the net, the conditional net, or the standard net output; how the indicator of the accounting profit is better or worse than the indicator of the gross income, and so on. But the obvious fact that all three indicators change in essence precisely nothing, was overlooked. All of them were "the products of economic alchemy."

What was behind this? The main reason consists not so much in the inadequate level of analysis of the problems as in subjective factors.

It is well known that the prominent Soviet economics scholars V.V. Novozhilov, L.A. Kantorovich, V.V. Nemchinov, and others established the basic principles of calculating the best use of resources. They demonstrated that the orientation of economic units toward common planning standard rules of the distribution, redistribution, and use of resources makes it possible to achieve the greatest efficiency of social production as a whole. It was a question of **a unified national economic approach** to the establishment of an interconnected set of economic standards of the efficiency of the use of resources, prices, and standards of the calculation of economic dynamics (the time factor). Their ideas underwent development in studies on the problem of the optimum functioning of the socialist economy. However, these studies were not introduced enough in practice. To some extent theory, which was analyzed in far from all the details up to the level of the practical introduction of individual procedural principles of it, is to blame for this. The theoretical elaborations were not completely finished with respect to such important aspects of the problem of effectiveness as the interconnection of the criteria of effectiveness of different levels of management; the substantiation of the set of economic standards of the effectiveness of resources with allowance made for social, ecological, and other factors; the interconnection of the indicator of the national economic impact with the cost accounting income of the enterprise, and so on.

At the same time the achievements of economic science in the area of economic measurements of production efficiency were introduced inconsistently in the practice of management. As a result, obsolete methods were not discarded, but were used together with new ones, as if

sharing "spheres of influence" with them. The system of the measurement of economic effectiveness, which operated in cost accounting, remained the basis. The gauges, which were used in designing, acted with respect to it as auxiliary, correcting, "shadow" gauges.

Such generalizing indicators as the adjusted expenditures and the national economic impact of new equipment, which are used when substantiating the drafts of technical solutions, figuratively speaking, were placed only at the threshold of the expenditure economic mechanism, which they were prohibited to cross in the most strict manner. That is why for a long time there was no proper attention to the system of measurements of the effectiveness of new equipment. The wrong notion of the conditional nature of the indicator of the national economic impact of new equipment, which ostensibly does not have a real bearing on planning practice, formed among some economic managers.

Padded figures began to be allowed everywhere in the calculations of the economic impact. Its estimated amount often proved to be two-to threefold greater than the real amount. Instead of revealing the causes and sources of such a negative phenomenon, some economics scholars and executives of planning organs began to blame everything on the methods of measuring the economic impact, and not the economic mechanism, which was giving rise to the appearance of great activity of scientific research institutes, design bureaus, and enterprises in the production and use of new equipment. Prices, subsidies to consumers, a low fee for productive capital, all-forgiving credit, and the minimized economic liability of the producer to the consumer turned out to guard such fictitious new equipment. Of course, as has already been noted, the methods also were not at their best. It is necessary to bring them in line with the requirements of restructuring and to ensure the unity of the criteria and methods of the measurement of the effectiveness of capital investments and new equipment on the basis of a national economic approach. Here it is important to stress the following.

The methods of evaluating effectiveness will be able to ensure the selection and implementation of truly everything that is new and advanced only when they are directly linked with the economic mechanism. And here we are approaching the main cause of the adverse situation in methods activity. The formed economic mechanism of management and the priority system of distribution, which is connected with it, did not create the conditions for the objective selection and use of what is truly effective and advanced. This gave rise to the appearance of great creative activity and to eclecticism. New versions of old methods, which did not eliminate, but aggravated the contradictions in the evaluations of the effectiveness of social production and individual economic measures, appeared. It was believed that the methods of evaluating effectiveness are good, when they completely correspond to the system of prices, plan indicators, and standards, which are used in cost accounting. In this connection a significant portion of the methods previously in effect were based on the formed set of priorities in the distribution of capital investments and on the sectorial differentiation of their effectiveness, which corresponds to it. Expenditures, the estimated effectiveness of which is not less than the level achieved in the corresponding sector or the standard of overall effectiveness (the incremental or overall output-capital ratio, the profitability of capital, and so on), are recognized as effective. As a result, the most preferential terms for the use of capital investments are granted to the sectors of the national economy, which have a low profitability.

To what does this lead in practice? First, low standards stimulate an increased demand of these sectors for capital investments and, second, reinforce economically their inefficient use. In other words, on the pretext of linking the methods of evaluating effectiveness with economic practice in the form of a standard "indulgence" was given for the low actual effectiveness of capital investments. Here an attempt was usually made to build a "theory" of the significance and priority of the development of these sectors. But priority is by no means identical to low demandingness on the effectiveness of the use of capital investments and other production resources.

Advanced economic practice in the same sectors shows examples of the highly effective management of the economy and the achievement of a high profitability, productivity, and output-capital ratio. **There are no economic grounds for the same model of new equipment to be evaluated by a different gauge subject to the sector in which it is used.** Such an approach precludes **objective** economic demandingness and an objective gauge of the efficient use of new equipment in the national economy and affords an opportunity for libertarianism and subjectivism. **Cost accounting is effective, when it promotes the increase of the efficiency of the national economy as a whole and does not create artificial, "hothouse" conditions for individual production facilities.** At times arguments about the importance of social factors and about the need to develop one works or another regardless of whether or not it is profitable from a national economic standpoint are cited to justify such a practice. Indeed, often the state has agreed and will agree to the development of individual works for the accomplishment of sociopolitical tasks. But in this case it is a question not of rules, but of exceptions to them. One would like to know why at works, which are economically unprofitable, but are important and necessary on the social level, one should create by means of preferential, drastically reduced standards of overall efficiency the artificial appearance that the capital investments being used are yielding an ostensibly high economic return?

Of course, it would also be incorrect not to see the **peculiarities** of cost accounting relations in sectors and at works with their quite broad differentiation of economic indicators and standards. But the differentiation should

not be carried over to the area of economic substantiations and planning and design decisions. Otherwise one can easily lose the reference point in the correct choice of promising, economically most effective directions of the rapid retooling of production on a new technical basis. One must not approach the settlement of these questions from the standpoint of current cost accounting, the established level of prices, and the differentiation of effectiveness in the sectors of the national economy. Here it is important to take as a guide the prospect and regularities of the development of the economy. The capital investments being allocated today will yield an effective return after one or two five-year plans. By that time both the established set of priorities and the differentiation at the sectorial level of the profitability will have changed, prices will also have changed. The use of the achieved level of the effectiveness of capital investments in long-range calculations is the direct conservation for the future of all the present adverse trends in the economy.

It is also necessary to take into account the fact that in the future under the influence of scientific and technical progress the levels of the technical equipment and capital-labor ratio of sectors will be equalized and, consequently, the differences in the sectorial output-capital ratio and productivity will be smoothed over. Of course, one must also not forget such an important peculiarity of the present stage of scientific and technical progress as the shift from individual isolated types of equipment to the development of complete technological systems, which integrate in a single production complex dissimilar technologies. The development, establishment, and effective use of such complexes presume the close mutual integration of sectors. And in this case it would be pointless to determine their effectiveness from the standpoint of differentiated standards. The comprehensive method, in which the orientation toward a single national economic level of the effectiveness of capital expenditures is strictly maintained, is based on approximately such logic.

Here, too, we are approaching the main thing. Now the methods of determining the effectiveness of investments in practice are isolated from the methods of establishing its standard. It turns out that this standard is not a component of the substantiation of the best version of the development of social production. In all existing methods the standard of the effectiveness of capital investments is established a priori with respect to the plan. Meanwhile, **only the plan and the rate of accumulation, which is specified by it, the structure of production, the assignments on the increase of labor productivity on the basis of scientific and technical progress, and so on are the necessary initial parameters, on which the value of the standard of effectiveness depends. One must not apply to the future the past conditions which determine the standards of effectiveness,** even if they were properly established. The best distribution of capital investments is inherent in every plan, and precisely it is responsible for the unified norm of effectiveness, which balances the planned supply and demand. However, the national economic approach to the calculation of the effectiveness of capital investments and new equipment was at variance with the established cost accounting and traditional principles of the evaluation of production efficiency.

In all the now prevailing methods the effectiveness of capital investments and new equipment was determined, as a rule, **for a single** separately taken, so-called accounting year of production. And in this respect the methods of calculation drew together with the evaluation of the cost accounting efficiency of enterprises. The obvious fact that **it is impossible to evaluate the effectiveness of a major project from the standpoint of 1 year** was not taken into consideration. In essence, the process of developing, producing, and using new equipment is a multistage process, which goes beyond a separately taken year or even five-year plan. At each of the stages the expenditures and results are not constant; they change in time. The loss during the first phases of the assimilation of new equipment is covered by the gain during the subsequent phases of series production. The qualitative parameters of equipment are also not stable in time; therefore, the operating costs also change. The capital expenditures also do not remain fixed. Equipment, which yields a loss during the accounting year, can provide a large impact over the entire planned period. That is why it is so important in the calculations of effectiveness to go beyond the separate year and to evaluate it with a cumulative total over the entire planned period of the production and use of the new equipment. Only on the basis of an integral evaluation is it possible to judge the national economic effectiveness of capital investments and new equipment and to make the correct decisions.

Of course, the changeover to integral indicators of effectiveness drastically increases the demands on the information base of the calculations and requires of the planner the study of the dynamics of expenditures not only in production, but also, what is most difficult, in the process of the use of equipment in production by the consumer. Now, as a rule, he does not have such information. But this cannot serve as justification for the rejection of calculations of the integral impact. Indeed, it is much more difficult to calculate the integral impact than the annual impact. But the comprehensive consideration of the dynamics of the expenditures and the effective results, which are connected with the production and use of new equipment, should become the starting point of the calculations of effectiveness. Unfortunately, for the present the same counterargument is being cited here—this is at variance with economic practice and the established system of cost accounting. However, it is not taken into account that the latter for a long time was oriented not toward the consumer, but toward individual conditions of production. This, in essence, was departmental cost accounting, without scientific and technical progress. The principles of the national economic approach do not correspond to such cost accounting.

Hence the initial demand on the set of indicators of scientific and technical progress—the presence in it of a generalizing (criterional) indicator, in accordance with which the choice of the best version of scientific and technical development is made.

Scientific and technical progress is not an end in itself, but a powerful means of solving the socioeconomic problems of the development of the economy. Not simply advanced equipment, but such equipment, which requires for the accomplishment of socioeconomic tasks the least amount of resources and ensures the leading increase of the end results over the expenditures, is needed.

Hence the second demand—the subordinate nature of the generalizing indicator of scientific and technical progress with respect to the ultimate indicators of socioeconomic development. The latter with respect to the former act as restrictions when forming the permissible set of versions in question (the aims of the plan, social standards, standards, and others). In this case the choice of the best version of scientific and technical development should be made from the permissible set of measures in accordance with social and other special demands (for example, in accordance with the conditions of the safety of equipment for the health and life of people and its ecological cleanness, in accordance with the scientific and technical novelty, priority, and promise, and others).

As has already been noted, the national economic impact acts as the generalizing indicator of scientific and technical progress. Subject to the degree of influence of scientific and technical progress on the end results of the development of the economy as a whole the national economic impact is transformed into the following set of evaluation indicators: the increase of the gross national product or approximately the national income in its present calculation by means of intensive factors—the national economic level; the increase of the national income or the net output by means of intensive factors—the level of union republics, large regions of the country, and sectors of the national economy; the increase of the net profit or the residual income—the level of the basic economic unit (the enterprise, the association).

At all levels of management the impact of scientific and technical progress is determined uniformly, as the difference between the increase of the effective result and the expenditures of resources.

The effective result of new equipment is a generalizing indicator of its utility (effectiveness), that is, the gross income which the user of new equipment or technology derives regardless of the expenditures on its acquisition. Individual qualitative parameters of the new equipment, which are important for the user, lend themselves to direct or indirect monetary valuation, and are reflected in its price, are taken into account in the generalizing indicator. Among them are:

— **the direct economic result,** which is ensured by the additional production of output and performance of work (services) and by the saving of resources through the use of new equipment (the increase of labor productivity, the decrease of the materials-output ratio, the increase of fuel economy, the saving of energy, the change of the capital intensiveness and capital-output ratio of items, and so on);

— **the associated economic result,** which reflects the social and ecological consequences of the use of new equipment, as well as the additional impact from the connection of new equipment and technology with related sections of production (the saving of expenditures in the sectors of the social infrastructure, the prevented economic impact from environmental pollution, the increase of the value of the sold output, which is obtained owing to the complete recovery of production waste, the saving or excess consumption of natural resources, and others);

— **the additional economic result** from the improvement of the consumer properties and the change of the qualitative parameters of products, the improvement of equipment service, which influence demand and the price.

A number of technical operating characteristics of new equipment, which are important for the consumer, cannot obtain reflection in the generalizing (value) indicator of the effective result, for example, the novelty, technical level, and so on. They are reflected in the charts of the technical level and in other technical documentation.

The **indicator of expenditures** is the consumption, which is expressed in monetary form, of the production resources, which are required for the production and sale of new equipment, productive and nonproductive capital, raw materials, materials, fuel, and power.

Taking into account the different orientation of the mentioned indicators and the impossibility of their direct comparison with the generalizing (value) evaluation of the effective result of new equipment, along with them the generalizing **indicator of the aggregate expenditures** is used in the planning and management of scientific and technical progress. Depending on the specific nature of the tasks being accomplished, it is transformed into the following set of indicators:

— the net standard expenditures (the sum of the expenditures of labor and the payments for production and natural resources in conformity with the national economic standards of the effectiveness of their use)—the national economic, sectorial, and regional level;

— the adjusted expenditures (the sum of the production costs and the payments for resources)—the level of the basic economic unit.

The comprehensive consideration of various aspects of the time factor—the duration of the designing of new

equipment, the lag of capital investments, the assimilation of a new product, and the attainment of the projected technical and economic indicators of its production, the inequality of the expenditures and results, which are made and are obtained at different moments of time—is necessary when evaluating the effective results, the expenditures, and the impact. Such consideration should be accomplished by means of a national economic standard of discounting, which in its value should correspond to the interest rate on long-term bank loans (10-12 percent).

The basic principle of the formation of the set of indicators of the effectiveness of scientific and technical progress is the assurance of a national economic approach, which signifies the need for the calculation of the generalizing indicators of the results and expenditures on the basis of a unified set of economic standards and prices. The principles of the calculation of such indicators, standards, and prices should form **a code of unique economic rules,** which specify the common demands which are made by society on the evaluation of the effectiveness of scientific and technical progress. Their coincidence is mandatory for everyone. The recently approved Procedural Recommendations on the Evaluation of the Effectiveness of Measures Which Are Aimed at the Acceleration of Scientific and Technical Progress, which were prepared by the State Committee for Science and Technology and the USSR Academy of Sciences, could be such a code.

The indicators of the national economic impact should be used not only for the choice of the best version of new equipment and technology from the national economic point of view, but also in planning and management:

— **at the national economic level**—the control figures in the form of a set of economic standards of the effectiveness of the use of resources and the consideration of the time factor, as well as the target and resource indicators, which are taken into account within state orders;

— **at the sectorial or regional level**—the target and resource indicators, which are taken into account within state orders;

— **at the plant level**—the target and resource indicators of the state order, the price and economic standards, which are connected with their fulfillment, the conditions of the delivery and turning over of finished items to the client, and analogous indicators for new products which are produced in accordance with economic contracts.

The indicators of the impact of scientific and technical progress—like the contribution of intensive factors of economic growth, the increase of the residual profit or income—under the new conditions of management should act as accounting indicators. It is impossible on any account to plan them.

Improvements Needed in S&T Support of Agriculture

18140056 Saratov STEPNYYE PROSTORY in Russian No 7, Jul 88 pp 10-13

[Article by A.G. Ishin, general director, "Elita Povolzhya," editorial board member: "Scientific Support of the Agroindustrial Complex"]

[Excerpt] The most realistic solution to the situation which has taken shape under the conditions of risk agriculture is to create favorable starting conditions for an upsurge in the economy by converting kolkhozes and sovkhozes to independent development of plans for profitable production, taking into account their resource potential on the basis of the achievements of science and leading experience. Here, a need arises to find new forms for integrating science and industry. A study of the contemporary state of scientific support for the agroindustrial complex indicates that the poorly profitable and unprofitable farms are the least receptive to scientific and technical progress. The economic interrelations which have taken shape in the agroindustrial complex make any improvement of technological processes disadvantageous for them, since precisely these farms, by being unprofitable, receive enormous state subsidies. At such farms, the leaders and specialists, as well as other types of workers, often receive higher wages than those earned at highly-profitable farms. Any improvement is undesirable for them and, consequently, there is also no need to integrate with science. This is truly a paradox from the period of stagnation!

Improving the economic mechanism and converting the agroindustrial complex to full cost-accounting and self-financing also fundamentally changes the interaction between science and industry. It is necessary to find contemporary forms for their genuine integration.

The basic ways to accelerate scientific and technical progress in agriculture were outlined by the CPSU Central Committee and USSR Council of Ministers decree "On Improving the Scientific Support of the Development of the Country's Agroindustrial Complex," passed in 1987.

The decree also criticizes agrarian science, in addition to the indicated shortcomings in the organization of the application of scientific achievements. In fact, many oblasts have great scientific potential at their disposal, operating in the agroindustrial complex and represented by academic, VUZ and sectorial scientific subdivisions. However, not all of these identically influence the increase in the effectiveness of APK work. The comprehensive application of scientifically substantiated agriculture and farming systems are not being ensured. The necessary set of local selection varieties for individual crops does not exist. A modern industrially-based seed-growing system is lacking. There are few good scientific developments for the effective use of irrigated land and

for intensive technologies in animal husbandry. To this day, there are no solutions to the problem of comprehensively mechanizing potato and vegetable production. Virtually no research is being done to improve the technologies for processing agricultural products, and economic science owes a great deal to industry.

VUZ science is not participating sufficiently actively in the scientific support of the agroindustrial complex. Here, too many subjects and the scattering of efforts and resources take place in research work, and comprehensiveness is lacking. Students are little involved with scientific and application work, which in turn leads to great shortcomings in the training of cadres with higher skills for agriculture. As a rule, future farm leaders and specialists are unreceptive to the achievements of science and leading experience. There is almost no coordination between the agricultural scientific institutions and the VUZs of the oblast in research and in the application of developments. Comprehensive and goal-oriented programs have been worked out, but are not being implemented.

Meanwhile, the scientific production associations and systems created in Saratov Oblast have not received the proper support and development, and measures for their specialization have not been carried out, as a result of which they are not having a noticeable influence on improving seed-growing and the application of intensive technologies.

Scientific research institutions and higher educational institutions have no modern material base and are ill-equipped with instruments, equipment and computers. All of this leads to stagnation phenomena, both in conducting scientific research, as well as in organizing the application of the achievements of science and leading experience in the agricultural industry.

One of the reasons for this situation is the fact that scientific developments were free for the consumer, since they were financed through the state budget. Now, the situation has changed drastically: since January of this year, science, just like industrial enterprises, has converted to cost-accounting and self-financing.

The new economic interrelations force science and industry to turn to each other: industry, because there is no other way to sharply raise its efficiency other than the broad application of the achievements of science and leading practice. Science, in turn, should earn funds for itself, fulfilling the specific orders of agricultural enterprises. The higher a scientific institution's authority, the greater value its development will represent and the greater financial opportunities it will possess. Thus, a path is opened up for the genuine integration of science with industry.

The planning and organization of the application of scientific developments play an important role in work to improve the scientific support of the APK. Unfortunately, in organizing the new form of management—agroindustrial committees—this link has dropped out sight. A special decree by the CPSU Central Committee and USSR Council of Ministers was required in order to create special structural subdivisions—the Centers For Scientific Support of the APK—within them, which should solve certain problems. The first priority is to eliminate inertia and sluggishness in implementing scientific and technical progress, since for a long time this vitally important process had been permitted to drift. It is extremely necessary to implement the effectual coordination of research by scientific institutions and higher educational institutions working for the agroindustrial complex. In Saratov Oblast, they number about 40, but have operated without coordination to this day.

The center organizes the development of comprehensive and goal-oriented programs and their implementation at the base farms and enterprises. In this regard, it is extraordinarily important to encompass all aspects of the work of collectives: both production and social, so that the base farms become thoroughly worked-out models which could be duplicated at other kolkhozes and sovkhozes, processing enterprises, etc.

The Center for Scientific Support should have the necessary financial and material resources at its disposal and, with regard to scientific institutions, should act as a customer for the application of scientific developments.

Scientific production and production systems, organized in order to solve problematical questions of the APK (see figure), are called upon to play a special role in the new system of scientific support for the agroindustrial complex. Initial experience with the operation of such systems in Saratov Oblast (the "Podsolnechnik," "Kukuruza Na Zerno" and "Sorgo" NPS [Scientific Production Systems]) has indicated the great possibilities of these unique cooperative associations, which operate on the basis of full democracy and cost-accounting.

It is exceptionally important, in order for the NPS to work effectively, to effect their goal-oriented supply with agricultural machines and equipment, fertilizers and pesticides, and to provide constant assistance and attention on the part of party, soviet and economic agencies. Presently, in the oblast the scientific production systems "Tverdaya Pshenitsa," "Chechevitsa," "Semena Trav" and others are being created. They should be of great help in implementing the program to sharply increase the production of valuable food, technical and fodder crops.

Production systems, organized with leading enterprises at the head, are of definite interest. They are called upon to disseminate the leading experience of the best farms, and to provide specific assistance in the application of progressive technologies, mastered well by their specialists. Such experience does exist. I will cite only one example. At the base for the Krasnokutskiy Selection and Experimental Station, a rayon scientific production system was created for grain crop seed-growing. Already,

the first year's work has made it possible, under unfavorable weather conditions, not only to fully provide Krasnokutskiy Rayon with high-quality seeds, but also to deliver a large quantity of these seeds for state resources.

Thus, the Center for Scientific Support of the APK, which unifies all scientific, design and technological and VUZ collectives, scientific production and production systems, and the base farms, makes it possible to create an effective system for applying the achievements of science and leading experience, which operates on the basis of volunteer and cost-accounting principles. The system facilitates strategic acceleration in the agroindustrial complex, since scientific and technical progress is the main battlefield on this path.

New Vice-President Osipyan Comments on Past, Future Perspectives

18140059b Moscow IZVESTIYA in Russian
22 Oct 88 p 3

[Interview by Kim Smirnov with Academician Yuriy Andreyevich Osipyan, USSR Academy of Sciences vice-president, under the "Names and Events" rubric: "The Choice of Goals"; first paragraph is IZVESTIYA introduction. Passages in boldface as published]

[Text] **Academician Yu.A. Osipyan (physical and mathematical sciences), a new USSR Academy of Sciences vice-president, is 57 years old. He heads the board of directors of the Noginskiy Scientific Center and is first vice-president of the International Union of Theoretical and Applied Physicists. He is a Hero of Socialist Labor.**

IZVESTIYA: Yuriy Andreyevich! Fifteen years ago, when the word "laser" was most popular for young people going into physics, I asked you, then still a young Academy of Sciences corresponding member, but already director of the academic Institute of Hard Body Physics, what this word would be in 1988-1990. You replied: "superconductivity." What is this? A prophetic gift?

Yu.A. Osipyan: No, simply the logic of science and my life within it.

IZVESTIYA: Your path in science? Were there any special turning points in it?

Yu.A. Osipyan: My path was normal, in general. School. The physics and chemistry department of the Institute of Steel. While I dreamed of theoretical physics, I still graduated from the mechanics and mathematics department of Moscow State University. I worked at G.V. Kurdyumov's Institute for Metal Physics. He was my teacher. I interacted with the Institute for Physical Problems very closely. When they suggested that I participate in organizing a new institute, P.L. Kapitsa, A.I. Shalnikov and others were literally its "god-parents," as well as G.V. Kurdyumov.

IZVESTIYA: How many years have you worked there?

Yu.A. Osipyan: Twenty-nine. However, I have been on staff officially since I was 32. I defended my candidate's dissertation at Moscow State University, and my doctoral dissertation at the Institute for Physical Problems. In short, the normal path.

However, there were, perhaps, turning points. For example, when our institute began studying the interaction of electrons with dislocations, and we created the so-called dislocation physics.

Of course, there was a turn toward superconductivity. Superconductors operating under room temperatures will become one of the most significant inventions in all of history: we will be able to store gigantic amounts of electrical energy and transmit it across intercontinental distances without losses. New, compact, but very powerful engines and motors, new kinds of transportation and new generations of computers and microelectronic components will come into being.

A bilateral Soviet-American seminar on superconductivity was recently held in the USSR, and leading scientists from the United States, representing world experimental physics, rated our research and results extraordinarily highly.

IZVESTIYA: Superconductivity is, all the same, only one scientific field. Yet, now you must keep all of material physics and mathematics in mind. How do you rate their condition in our country? What program of actions will you implement on your new path?

Yu.A. Osipyan: Our physical and mathematical research has been strong traditionally and is strong today as well. However, as you know, some scientists are raising the question of a crisis, the loss of world level even in the basic sciences. Thus, I must not and will not become placid. It seems to me, though, that we are losing this level primarily in experimental physics. My program of actions? First: as soon as possible, the drastic reinforcement of the instrument and experimental base. Second: overcoming the directive style in science and democratization not only of elections of institute directors and academicians, but, the main thing, also of the election of new, priority research trends. Third: support for strong scientific schools.

Of course, research trends and even entire sciences grow old, just like people. The antidote to obsolescence and stagnation is to fuse research with teaching. There is a sharp dialectical contradiction between them. Doubt in the unshakability of today's knowledge leads to discoveries. At the same time, instruction is based on upon this unshakability, upon fixed and therefore yesterday's knowledge. The solution is to merge both principles, to introduce young people to Marx's motto, the motto of science: "Doubt Everything!" Personally, the whole world does this in developing the latest science in universities.

IZVESTIYA: Well, to return to "prophesies," what word will be most popular among young physicists in the year 2001?

Yu.A. Osipyan: One word will no longer suffice. It will be the comprehension of the microscopic essence of life. Today, there is a very strong centripetal motion towards some kind of unified meeting point between biology, physics, chemistry, mathematics and information science. I think that the time of this meeting will be right at the border of two centuries. Some foreign companies are already devoting a significant part of their research to information models of nerve cells and man's brain activity.

I sense in the mood of the young that a great flood of intellectual forces are moving into this field. So it is that all sciences, physics as well, are returning to man.

New Vice-President Petrov Comments on Lysenkoist Past

18140059a Moscow IZVESTIYA in Russian
26 Oct 88 p 3

[Interview by Ye. Manucharova with Academician Rem Viktorovich Petrov, USSR Academy of Sciences vice-president, under the "Names and Events" rubric: "Helping the Living Protect Themselves"; first paragraph is IZVESTIYA introduction. Passages in boldface as published]

[Text] **Rem Viktorovich Petrov, the new USSR Academy of Sciences vice-president, is an academician of the USSR Academy of Sciences and of the USSR Academy of Medical Sciences. He was born in 1930. He is well-known here and in world science for work in the fields of immunology and immunogenetics. The methods which he discovered for stimulating immunity after irradiation and for the design of artificial vaccines have tremendous significance for clinical practice. He is the author of the first textbook on immunology.**

IZVESTIYA: Rem Viktorovich! You are responsible for biological sciences in the Academy of Sciences Presidium. The favorite areas of your predecessor, Academician Yu.A. Ovchinnikov, were the young sectors. Is such a scientific policy correct and will you, as vice-president, be true to it?

R.V. Petrov: Over the last 2 decades a great deal has been done by the Academy (and by Yu.A. Ovchinnikov personally) to develop molecular biology, physical and chemical biology and biotechnology. Gambling on these was correct. It has made it possible to raise thinking on classical biology to a higher level, and to provide science with a new level of methodological and equipment supply. As a result, descriptive biology has become analytical.

Right now, the significance of the physical and chemical and molecular levels of research is in no way decreasing, and attention on it is not declining. However, the emphasis is already being put somewhat differently now, since certain sciences have remained in the shadows for a long time. Above all, the significance of genetics must be singled out. This science suffered a great deal in our country, having experienced great difficulties. Lysenkoism left serious wounds and it cannot be said that we are finished with it once and for all—it nonetheless still has supporters. The long reign of Lysenkoism cannot help but affect the thinking of those who were attending VUZs at that time. I know this well from my own fate: I was taught not merely that there was no genetics. No: they pounded anti-science, anti-knowledge of the world—anti-genetics—into me.

It was not easy to break away from this. It required civic courage. It is hard to even imagine how many possible geneticists we have been deprived of because of such instruction. I would have lost my future science as well, if it had not been for scientists such as N.N. Medvedev, B.N. Tarusov, N.V. Timofeyev-Resovskiy, B.L. Astaurov, and D.K. Belyayev (and, in general, Novosibirsk's Akademgorodok as a center of free thinking). I was lucky: I encountered great scientists and reached out to them. They have determined a great deal within me as a researcher.

IZVESTIYA: Besides the planned development of the sciences, their development has a logic of its own—fields of knowledge are becoming (or not becoming) high-priority by themselves. The significance of immunology is still increasing. Why? Is it simply that people urgently need the science of life defense mechanisms?

R.V. Petrov: Of course, immunology was born out of severe and vital necessity. However, the long-term high-priority nature of any scientific trend is possible only when it is not restricted to one certain task, but extends its sphere of influence, penetrating into other sciences. Immunology has really become the kind of science with multiple significances.

With the development of new fields in immunology, great expectations related to it have increased strongly: the hope of obtaining medicines for many diseases—having strengthened defense and having developed early diagnosis, which is also related to immunology.

For instance, today a new field is coming into being—the creation of abzymes. These are biological substances which surpass those made through chemistry in terms of accuracy and precision targeting. After all, to this day we truly do not know how to deal with viruses which have infected an organism. Abzymes open up prospects for the precisely targeted disintegration of the protein of precisely that virus against which struggle is being waged.

Our science brings in millions in income. Of all the systems operating in the living organism (respiratory, cardiovascular, etc.), the honor of going into production has fallen precisely to the immune system. It enables us to make substances needed for diagnosis and treatment within hybridomes—artificially created chimera cells. A large hybridome industry is already working throughout the world.

IZVESTIYA: Could you give an example of research which exceeds the world level and enriches practice

R.V. Petrov: There are many examples among the Academy's basic biological developments, for instance, the genetic engineering synthesis of medically active substances, hormones, etc. There is also the creation of transgene plants and animals—highly productive organisms, for which similar ones (in terms of their properties)

did not exist in nature previously. Nevertheless, I would like to single out a development by Academician A.S. Spirin, the priority nature and great promise for practical work of which is hard to overestimate. I am referring to cell-less synthesis of proteins—a fundamentally new step in biology and biotechnology.

IZVESTIYA: You are doing a great deal to disseminate knowledge about your science. As a researcher, are books for the broad reader, such as "*Sfinksy XX Veka*" [20th Century Sphinxes], generally the work of a writer, useful to you?

R.V. Petrov]: Unquestionably. So are lectures. When you wish to explain something very precisely and understandably, you turn the idea over, this way and that, and you refute the idea yourself. In the end, you either bring the thought into clear focus or, conversely, thoroughly refute it. For instance, I finally understood the determining role of lymphocytes within the cell at last, when I decided to write a popular article. I wracked my brains for a year, until I realized that the essence of the interaction is reduced to the dictatorship of the lymphocyte. Thus the article was named. I think that this process is natural: that which is not expressed remains at the level of intuition or guesswork.

IZVESTIYA: What kind of steps are needed to break through to the world level in those sciences where we lag?

R.V. Petrov: We have no mechanism for transferring scientific achievements into practice, and without its creation and development, we will continue to spin our wheels. We should seek out and create new forms for active application. Right now, the MNTKs inspire hope. For instance, the "Biogen" Inter-Sectorial Scientific and Technical Complex is doing a great deal.

It is natural that, in order for scientific centers to work normally, a higher level of equipment (hardware, reagents, computers) is needed, as well as various possibilities for contacts with world science. Even postal correspondence with other countries is extremely slow: letters travel for a long time and often lose their significance. There are still no entirely normal working contacts with similar centers abroad in everyday research. In most cases, scientific publications come out after no less than a year and they are thus no longer very interesting to our foreign colleagues. In order to break through, we must be an inseparable part of world science, and not an island.