JPRS-UST-90-008
23 JULY 1990

FOREIGN BROADCAST INFORMATION SERVICE

JPRS Report

Science & Technology

USSR: Science & Technology Policy

Science & Technology

USSR: Science & Technology Policy

JPRS-UST-90-008 *23 July 1990*

CONTENTS

Miscellaneous

Conferences, Expositions

Awards, Prizes

Academician Calls for More Reforms, Less Bureaucracy

907A0225A Moscow IZVESTIYA in Russian 21 Apr 90 Morning edition p 2

[Article by Academician A. Abrikosov, director of the Institute of High Pressure Physics of the USSR Academy of Sciences: "There Is Nowhere to Further Retreat. New Principles of the Organization of Science and Education Are Necessary"]

[Text] The forthcoming election at the USSR Academy of Sciences differs appreciably from all those held up to now. The government and the academy itself lived in the conviction that professional scientists should make science, while professional administrators should manage it. The academy assumed the pose "What can I do for you?" and everyone was content. True, this was of little use for science and for the state as well, for the academy, instead of giving correct and independent recommendations, merely said yes to all harmful and expensive projects like the construction of plants on Lake Baykal.

But the times are changing, and much has to be revised. And now a question is arising: Is it not better to entrust the management of the academy to real scientists, who have made a substantial contribution to science and enjoy international recognition? For these people have a large number of advantages. They are independent, since they do not hold on too much to the executive easy chair. They are democratic, while in a different situation real science withers away. They have a good deal of common sense, for without this there is no science.

In my opinion, only serious scientists are capable if only of moving the academy along the path of the accomplishment of the most difficult tasks which face it: The long years of ostentation and stagnation did harm not only to the economy and social morality, but also to science.

What are these tasks? First of all it is necessary to rid the academy of the incredibly expanded bureaucratic apparatus which has attached itself to it.

In his report at the recently held general assembly G.I. Marchuk particularly stressed the implemented staff reduction. Not having detailed statistical data, I do not presume to judge: Perhaps, the number of people did decrease. But it is sufficient to look at the new directory, and you will see: Administrations have emerged where there were departments; main administrations have emerged where there were administrations. The impression is created that they fired typists and accountants, but recruited high-ranking loafers, whom they undeservedly pay a large wage.

Bureaucracy has also penetrated the departments of the USSR Academy of Sciences. The basic function of the departments is the coordination of the activity of institutes. An entire staff of "curators" is kept for this. A natural question arises: Why not establish bureaus of the departments made up of the directors of institutes, having added to them a small number of members of the department so that all directions would be represented? And it would not hurt the academician secretary if only once a year to visit the institutes of his department. Then no "curators" would be needed.

Recently on television the architecture of the new building of the presidium of the USSR Academy of Sciences on Gagarin Square was discussed very critically. The ugliness of this building can compete only with the extremely poor site of its location. But if you think about the fact that this entire enormous building will be filled from top to bottom with bureaucrats, it is really dumbfounding!

At the general assembly at the end of March the idea of turning this building over to humanities institutes was heard. I personally liked this idea: After all, the humanities constitute the basis of our culture. It is also possible to add to this other institutes, which, except for computers, do not need any complicated instruments. For example, the world-famous Institute of Theoretical Physics imeni L.D. Landau, which has not had its own premises since the day of its founding in 1965. In general, there is someone with whom to fill the building.

But the main issue is the lag of our research. They are writing about this everywhere, but it seems to me that it is necessary to take an individual approach to this issue. The lag for the most part concerned experimental disciplines, that is, those fields, in which very much depends on equipment. In recent years I have had occasion to visit laboratories in various directions of solid-state physics in Italy, the United States, France, England, and the FRG. As compared with them we are absolutely destitute. The state must understand that today's discoveries in modern basic science (at any rate, in solid-state physics) will be tomorrow the basis of new technology. If you do not want to fall behind, you must invest money, and a lot of it. In the West this money comes not only from the state, but also directly from industry. In our country it is possible to count only on the state. If there is no money, there will be no science. But where is one to get it? Let us recall what Wassily Leontief, a Nobel Prize laureate and an honorary member of our academy, said. It is necessary to decrease the number of bureaucrats and to reject foolish and expensive projects.

For example, why establish the Russian Academy of Sciences? For this signifies the origination of an additional apparatus and a new detachment of very questionable "Russian academicians," who receive an academic wage. It is necessary to add to this the construction of special premises. A large number of academicians raised this question at the general assembly at the end of March, but the president avoided the discussion of this theme.

I will return to the question of equipment. It would be possible not to purchase many instruments in the West for foreign currency (although one cannot get by without this), but to make them oneself. In the 25 years that I

have been at the academy, I have heard all the time talk about the necessity of developing our own instrument making base. However, there both were no and are no instruments. The scientific technical association under the supervision of M. Aleksandrov, which has been established in Leningrad, is engaged in developing new instruments and defending dissertations in accordance with them. But it does not seem to be their task to organize the series production of instruments.

But literally every institute needs some instruments. For example, a unit for layer-by-layer molecular beam epitaxy. How much work is now being done with heterojunctions, quantum wells, and superlattices! But we are lagging behind.

Undoubtedly, in the organization of science in the West the system of grants, that is, the financing of projects on the basis of competitions, is playing a considerable role. I will not repeat that is well known. I will merely say that for the changeover to such a system it is necessary that money and funds would be at the disposal not of the departments, but of the scientific councils. This is a new function of the councils, for which for the present they are little suited. It is necessary, therefore, to begin with the careful examination of the entire system of councils, so that all fields would be covered by this system, as well as to approach practically the formation of their staff. This, in my opinion, is the immediate task of the departments. It is also necessary to establish interdepartmental councils for the financing of complex jobs, which are now "nobody's." For precisely these intermediate directions are the most promising with respect to future discoveries.

At the same time it is necessary to dwell on two things. First of all financing should be centralized, that is, all money and funds should be distributed through the corresponding councils. At present state programs, money for which the State Committee for Science and Technology distributes, programs of the presidium of the USSR Academy of Sciences, programs of the departments, and simply the budget of the USSR Academy of Sciences exist. This creates chaos: one receives double or triple financing, the others receive next to nothing. Such a situation is intolerable, for it leads to wastefulness and low efficiency.

The second thing is the fact that inasmuch as financing will be carried out for a specific period, it should be accompanied by a contract system of the hiring of scientific personnel. Such a system, of course, is exacting, but only it can force people to catch up with the rest and will enable institutes to get rid of hopeless lazybones.

Now about the training of young scientists. I do not want to discuss the venture with the ordering and redemption of graduates of higher educational institutions. I will dwell on an old sore subject—the combining of science and education. The Moscow Physical Technical Institute and Novosibirsk University, which rely on base scientific research institutes of the Academy of Sciences, have been operating for many years. This system has completely proven its effectiveness. A large number of graduates are now themselves members of the academy. Nevertheless, the State Committee for Public Education is treating these educational institutions with poorly concealed irritation and is in no hurry to disseminate their experience. Instead of this poorly comprehensible discussions about "VUZ [higher educational institution] science" are being conducted.

In my opinion, "the system of the Physical Technical Institute" should become dominant in our country. For this it is possible to take a number of steps. First of all it is necessary to give higher educational institutions special money for the hiring of people holding more than one job from scientific research institutes of the USSR Academy of Sciences and industry with the prohibiting of the use of this fund for any other purposes.

Further it is necessary to begin the gradual transfer of entire higher educational institutions or individual faculties to the authority of scientific research institutes with the right of the complete replacement of the teaching staff and the syllabus. Finally, it is necessary to organize new, specialized higher educational institutions attached to scientific institutes or groups of such institutes.

It is already now possible and necessary to do all this. However, I do not believe that the State Committee for Public Education is capable of this. Several years ago I was the chairman of the scientific methods commission for physics attached to the USSR Ministry of Higher and Secondary Specialized Education. And at that time I tried to convince G.A. Yagodin of the necessity of changing the syllabus and increasing the time allotted for the teaching of physics at higher technical educational institutions, for today's physics is tomorrow's technology. I got nowhere: The number of hours was drastically reduced, and I left the commission, which practically ceased its existence. But now in the FRG industry prefers to hire precisely physicists, and not engineers.

In my opinion, it is necessary to transfer many higher educational institutions to organizations, at the disposal of which there are scientific research institutes—the USSR Academy of Sciences, the academies of sciences of the union republics, the USSR Academy of Medical Sciences, and several ministries.

In short, it is necessary to change the entire set of approaches to the organization of science and education, but only people, who combine competence, enthusiasm, the highest level of decency, and the talent of an organizer, are capable of this. The new leaders of the USSR Academy of Sciences should also be elected precisely from among these people.

USSR Academy of Sciences Seen to Resist Decentralization

907A0212A Moscow IZVESTIYA in Russian 9 Apr 90 Morning edition p 1

[Article by IZVESTIYA science commentator B. Konovalov: "Waves of Creation and Resistance. Perestroyka in Science Is Impossible Without the Independence of Scientists"]

[Text] Nine years ago, when present Corresponding Member of the USSR Academy of Sciences Rivner Fazylovich Ganiyev organized at the Institute of Machine Science of the USSR Academy of Sciences the department of vibration technology, it was a purely theoretical subdivision. The small collective dealt intensively with one of the basic sections of mechanics—the theory of nonlinear oscillations of multiphase systems, which consist of a liquid, a gas, and solid particles. The shift to experimental work was accompanied by the discovery of a large number of phenomena and effects.

At that time scientists looked in a new way at many traditional industrial processes, which involve the grinding, mixing, and transportation of substances, and saw that far from the optimum technologies were being used. And here theorists and experimenters simultaneously also became skilled workers—they engaged in the development of specific technological processes.

The use of wave technologies made it possible to increase sharply the production rate of low-yield wells, which use various methods of the "stimulation" of petroleum production. At thousands of wells in Tataria and Western Siberia it was possible to increase their capacity by 15-20 percent, to increase the petroleum recovery of reservoirs, and to reduce the production costs. Chemists obtained new effective methods of mixing various substances. Construction workers are waiting for wave concrete mixers, which are capable of producing new valuable materials based on waste products and increasing the strength of concrete. Food industry workers need wave butter churns, milk separators, and homogenizers, which serve as the basis of milk processing. Power engineers are testing a new liquid fuel—a mixture of fuel oil and water, which does not separate for years.

This is far from a complete list, which is increasing with every day, because the theory of the economical organization of technological processes with the use of oscillations and waves is in the hands of scientists. And we are dealing here with a typical case of a mighty technological breakthrough, which originated within the walls of an academic institute. And the fate of this academic work proved to be just as typical.

The "shaking" of money from the government has its limits. It is also necessary use other possibilities, particularly the changeover if only to partial self-financing of those academic institutions which desire this.

But President of the USSR Academy of Sciences Academician G. Marchuk recently stated on the pages of PRAVDA that, "however paradoxical, in academic science hardly anyone wants to become completely free." In reality the paradox lies in another thing: The Academy of Sciences is not giving this freedom to those who want to become free.

They seem not to be depriving wave technologies of attention: Everyone is "for." The Interbranch Scientific Engineering Center of Wave Technology—the Volna MNITs attached to the Institute of Machine Science—has been established. R. Ganiyev was appointed director. He seems to have all rights with the exception of a "little trifle"—legal independence. Hence: no account at a bank, no lease, no freedom of contracts. The center is not breaking from the institute, but wants independence.

"We are prepared," R. Ganiyev says, "to pay the USSR Academy of Sciences several million for legal independence, but they are not giving us it."

At the Volna MNITs there are only 80 people, and they do not want to become a large institute, as is needed for independence in the USSR Academy of Sciences. Unfortunately, here the "expenditure mechanism" still operates to the utmost: The more money you receive from the budget, the greater your authority and independence are.

But the experience of the Volna MNITs shows: If the USSR Academy of Sciences and the USSR State Committee for Science and Technology do not develop without delay a mechanism of the granting of independence and the changeover to the joint-stock form, perestroyka in science will remain just an empty word.

High Prices at Research Institutes, Design Bureaus Criticized

907A0210A Moscow NTR TRIBUNA in Russian No 5-6, 23 Mar 90 p 6

[Article by Doctor of Technical Sciences V. Burkov, head of a laboratory of the Institute of Control Problems, and Candidate of Economic Sciences A. Kazakov, deputy chief of an administration of the USSR State Committee for Science and Technology, under the rubric "Economics: The Facets of Reform": "The Curbing of Prices. A Possible Version"; first paragraph is NTR TRIBUNA introduction]

[Text] Cost accounting in science has raised unjustifiably the wage at scientific research institutes and design bureaus and the price of the scientific product (for example, "Money to Burn," NTR, No 12, 1989). The article being published is about one of the experimental solutions of this problem.

The changeover of science to cost accounting fell short of the expectations—you do not have either an increase of the scientific and technical level of developments or a decrease of their cost....

And it not only increased, but also continues to grow.

In the strict sense of this term it is also impossible to call such an increase of the price an increase in cost.

Only the bringing of the price of the scientific product in line with its real cost occurred, which, of course, is positive.

How was it previously? For the substantiation of the price the developer submitted a costing with the indication of all the necessary expenditures (the production cost). On the basis of this sum the price as the sum of the expenditures and profit was also determined. The profit in this case was defined as an amount which is directly proportionate to the expenditures. The coefficient of direct proportionality, which is called the profitability, was established...from above or at best was limited (for example, the profit should not exceed 30 percent of the expenditures). That was a naive attempt to check the "jacking up of the profit." It prompted the jacking up of...expenditures, having as if become the father of the expenditure principle "the greater the expenditures, the greater the profit." That is how the increase of prices out ahead of...technical progress suited itself.

The changeover to contract prices would seem to have broken this vicious circle. We say "would seem," inasmuch as now ministries and departments are attempting to limit the level of profitability in the price of the scientific product, especially with respect to state and sectorial orders. Nevertheless, in many cases the contract price is determined mainly subject to the utility of the given development for the client. While here the expenditures of the developer do not interest the latter (such a price has even acquired its own name—"the price of the client").

The result was not slow in appearing. Developers began to increase readily their load. The additional volumes are additional profit and, accordingly, the increase of the fund for the remuneration of labor and the fund of scientific, technical, and social development. And everything would be fine, if it were not for the complete lack of connection of the contract price with the expenditures. It also gave rise to a very original transition—from the expenditure principle "to make more expensively and to sell at a higher price" to "to make more cheaply—to sell at a higher price."

This would be nothing, if there were competition. In case of it in the fight for the consumer, who pushes for the development of a scientific product with high consumer properties (a high scientific and technical level, quality, reliability, and so forth) and its sale at normal (competitive) prices, the expensiveness no longer depends on the arbitrariness of the "seller"—it depends only on the real effectiveness of his efforts.

But given our shortages and the monopoly status of many "firms" the "competition-free market" conditions of cost accounting also led to the unfounded increase of prices and the remuneration of the labor of scientific collectives.

And they, as they say, developed such a taste that they "rushed" to sell developments, methods, algorithms, and programs, that is, the scientific store which had been accumulated in previous years. The undermining of the foundation of promising research began. It is not difficult to foresee the result—the increasing lag of the domestic scientific and technical potential behind the world level.

The government could not but react to such a danger (and far from just because of the disbalance of the consumer market!). Hence the emergency measures on the elimination of adverse trends, and first of all those checking the increase of assets which are used for the remuneration of labor.

But we need a reliably operating mechanism which works according to the principle "to make more cheaply—to sell more cheaply," moreover, precisely under the conditions of the shortage and monopolism. Only such a principle is actually an anti-expenditure one: It in practice enables not only the developer, but also the consumer of the scientific product to gain from the reduction of expenditures.

Is a system of taxation, which implements this principle, possible? For an answer to this question in the middle of last year an experiment on anti-expenditure taxation in science was begun both on the initiative of the USSR State Committee for Science and Technology and in accordance with a decision of the Commission for the Improvement of the Economic Mechanism attached to the USSR Council of Ministers.

There were selected for experimental testing five of 11 versions that were proposed by scientific organizations

of various sectors. One of the peculiarities of the experiment lies in this—it is being conducted on the basis of proposals "from below." Another peculiarity is the voluntary nature of participation.

Four of the five selected versions (the first, third, fourth, and fifth) are different versions of the system of mild progressive taxation. Thus, a progressive tax on the fund for the remuneration of labor is the basis for the first and fourth versions (in idea these versions are close to the now prevailing system of the progressive taxation of the fund for the remuneration of labor). The third version is characterized by a progressive tax on income, while the fifth is characterized by a progress tax on the profit.

The second version, which was proposed by the Institute of Control Problems of the USSR Academy of Sciences (the author of the version is Professor V.N. Burkov), is an exception. In this version an attempt is also made to implement the principle "to make cheaply—to sell cheaply," that is, to implement a truly anti-expenditure tax mechanism.

What is the essence of the idea?

A standard level of the average income (that is, the income per worker a year) is established for the organization. In case of efficient work (that is, if the collective makes things cheaply, but sells them at a high price) its average income will exceed the established standard level. A certain portion of this excess (from 50 to 70 percent in the model statute) is added to the standard level and forms the so-called boundary level of the average income.

If the actual average income does not exceed the boundary level, the tax rate is equal to the established (minimum) amount. If the actual average income exceeds the boundary level, the tax rate increases sharply. The increase of the tax rate is so great that it is economically disadvantageous for the organization to have an actual average income that is greater than the boundary level!

What is to be done?

The only solution is to decrease the cost of a number of operations (to adjust the prices of a number of contracts) so that the actual average income would be equal to the boundary level.

Let us explain this key feature with a numerical example. Let the standard level of the average income equal 8,000 rubles per person, but in accordance with the results of the year the organization plans to derive an average income in the amount of 12,000 rubles per person. Let us assume that the boundary level is formed by the addition to the standard level of an amount which is equal to 50 percent of the excess of the planned average income over the standard level. In our example the boundary level will be equal to 10,000 rubles per person.

Now, note that if the organization retained the former prices, the actual average income will be equal to the planned average income and will exceed the boundary level. Here the tax rate will increase to 30 percent as against the established tax rate of 10 percent. The organization will pay tax in the amount of 30 percent of 12,000 rubles per person, or 3,600 rubles per person. If the organization reduces the prices for a number of operations on the average by 2,000 rubles per person, the actual average income will be equal to the boundary level, and the amount of tax according to the established rate of 10 percent will come to 1,000 rubles per person. The cost accounting average income of the organization will come to 9,000 rubles per person. With allowance made for the tax and the reduction of prices the organization will lose 3,000 rubles per person, which is substantially less than the progressive tax of 3,600 rubles if the organization does not reduce prices. Thus a reliably working stimulus "to sell cheaply" is created.

However, is the stimulus "to make cheaply" retained?

Let us return to the example. Suppose the organization performed the same amount of work (that is, all the contracts concluded with clients) with fewer expenditures, which led to an increase of the planned income to 14,000 rubles per person. Accordingly the boundary level also increased to 11,000 rubles per person. Now it is advantageous to adjust the prices of a number of contracts downward so that the actual average income would come to exactly 11,000 rubles per person, that is, the average reduction of prices should come to 3,000 rubles per person.

Thus, in case of the reduction of expenditures (given the same volumes and quality of the performance of operations) the consumers of the scientific product gain (thus, given a staff of the scientific organization of 1,000 the additional reduction of prices will come to 1 million rubles).

The state also gains, inasmuch as the deductions for the budget in accordance with the established tax rate of 10 percent will come to 1.1 million rubles, that is, will increase by 0.1 million rubles.

Finally, the organization also gains, since the cost accounting income will come to 9.9 million rubles, which exceeds the previous income (9.0 million rubles) by 0.9 million rubles. And hence the remuneration of the labor of every worker will increase, inasmuch as it constitutes a specific proportion of the cost accounting income.

Thus, everyone—the developer, the consumer, and the state—gain from efficient work!

Let us note that the version, which was proposed by the Institute of Control Problems, has a solid theoretical basis, inasmuch as the theory of anti-expenditure mechanisms of control constitutes today a well-developed section of the theory of active systems (this theory deals with the development of mechanisms of control in socioeconomic systems with allowance made for the factor of the activity of man—the human factor). Moreover, the principle of anti-expenditure taxation has been

repeatedly checked by the method of business games. Nevertheless, the unusual nature and novelty of the proposed tax system had the result that only three scientific organization took the risk of experimenting with the second version.

What are its first results and lessons?

The two organizations of the Ministry of Communications are characterized at the moment of the start of the experiment by a comparatively low base level of the average income (less than 5,000 rubles per person). Therefore, a standard level of the average income, which is higher than the base level, was established for them. Owing to this the organizations substantially increased the volume of work, and in accordance with the results of last year the average level of income had approached the standard level, while in accordance with the plans of this year they are achieving the exceeding of the standard level, when the mechanism of the reduction of prices will begin to operate.

The Institute of Control Problems, on the contrary, is characterized by a relatively high level of the average income. Therefore, a standard level of the average income, which is less than the base level, was established for it. In accordance with the results of the year it was advantageous for the institute to reduce the cost of the performed work by 0.4 million rubles. Otherwise due to the increase of the tax rate the institute would have paid far more to the budget (on the order of 0.6 million rubles).

But an unexpected difficulty arose here.

The performers of the contracts refused to pose to the client the question of the reduction of prices. The valid apprehension that the client would understand this incorrectly and difficulties would emerge in case of subsequent contacts (particularly in case of the determination of the contract prices for new operations), arose. The attempt to go to a number of clients with the proposal to adjust prices downward showed the validity of such apprehensions. The reaction was negative. How strong the ingrained expenditure reflects are in us after decades....

In order to avoid tax overpayments, the Institute of Control Problems had to transfer a portion of the amount due to charitable foundations.

The experiment is continuing....

Training Successes, Problems of Moscow Physical Technical Institute

907A0215A Moscow NTR TRIBUNA in Russian
No 5-6, 23 Mar 90 pp 12, 13

[Interview with Corresponding Member of the USSR Academy of Sciences Nikolay Vasilyevich Karlov, rector of the Moscow Physical Technical Institute and USSR People's Deputy, by NTR TRIBUNA commentator F. Vladov: "The Thirteenth in the 'Bermuda Triangle'"; date and place not given; first three paragraphs are NTR TRIBUNA introduction]

[Text] Everyone is now complaining about the level of the vocational training of Soviet specialists, in which we recently reveled complacently. More than enough critical arrows have been shot at this target. In this connection in our country, particularly in NTR, people frequently write about the effective systems of training of specialists of the highest skills in the developed countries of the West....

But, it turns out, we also have something to learn from ourselves.

You will be convinced of this from the published interview, which Corresponding Member of the USSR Academy of Sciences N.V. Karlov, rector of the Moscow Physical Technical Institute and USSR People's Deputy, granted our commentator.

NTR TRIBUNA: Nikolay Vasilyevich, you are one of the first rectors in the country, who were not appointed, but were elected.

N. V. Karlov: Yes, 2.5 years have already passed since then.... In 1947, when I was thirteenth on the list of the first enrollment of students of the Moscow Physical Technical Institute, I did not think about this. After the defense of my diploma there were graduate studies, teaching, and professorship. Collaboration with A.M. Prokhorov in the field of quantum electronics and lasers. For long years I chaired the Council of Young Scientists, even when I myself had become far from young. Perhaps because of that I am not aging that quickly.... In science, did you know, it is more important not to become antiquated than not to grow old. Our pupils have to be very receptive to the updating of knowledge and to changes. And many students of the Physical Technical Institute are succeeding in this. That is why at such a leading institute as the Institute of General Physics of the USSR Academy of Sciences graduates of the Physical Technical Institute make up one-third, the Physics Faculty of Moscow State University accounts for another third, while the rest are graduates of other higher educational institutions.

Statistics clearly testify to the extent to which people from the Physical Technical Institute are up to standard. At academic institutes and in collectives of many thousands of science-intensive sectors of industry among the scientific and engineering personnel 20 percent are graduates of the Physical Technical Institute, while among the management there (heads of departments and so on) already 80 percent are them. Of the present members of the Academy of Sciences 40 also graduated from our institute. I simply cannot count the number of winners of the Lenin and State Prize. In this connection there is even a joke: If they publish a list of 16 winners of the State Prize, there are from the Physical Technical Institute...17 of them.

NTR TRIBUNA: With what do they begin, "the whales from the Physical Technical Institute"?

N. V. Karlov: With the school desk. We are doing much work on the formation of our own matriculant corps. Our system of the correspondence physical technical school is 10,000 correspondents, that is, 200,000 letters a year.

NTR TRIBUNA: Permit a digression. As far as I know, the fact that the examinations for admission to your institute began earlier than for other higher educational institutions, and matriculants initially came here, contributed to the quite exacting selection for the Physical Technical Institute. They broke this system. Was the formation of the physical technical school a response to such a change or did it occur independently?

N. V. Karlov: No, the school was formed earlier. But your question is like salt in a wound. How people cling in our country to leveling! But for higher educational institutions this is disastrous: Standardization gives rise to mediocrity....

Let us return to our physical technical school. It is here a correspondence school and was established long ago. In it there is also an evening division for Muscovites. We are trying with all our might to serve as a "Korolenko spark of inspiration."

At the Physical Technical Institute thus far the admission statistics are stable: 17-18 percent are Muscovites, 12-13 percent are from Moscow Oblast, the remainder are talented young people from all regions of the country. And this, if you wish, is our policy: Genetically gifted people are born everywhere, and it is unjust, of course, to regard a Moscow residence permit as a "passing grade."

NTR TRIBUNA: But what does your school give? All the same one has to take the entrance examinations....

N. V. Karlov: Undoubtedly, everyone takes examinations. But our school helps to enter our system. The examinations show: From 50 to 70 percent of the enrollees went through this school and about half are prize winners of contests.

I will say more: The examination load for our matriculants is higher. They still go through interviews. The person interests us: We want to understand the moral and general cultural principles of the individual and his interests.

The heads of the chairs talk with each matriculant one at a time. A grade is a grade, but it can also depend on the level of coaching. The main thing is that we strive to draw out the person, when the grades are not so high (let us assume that he studied at a poor school), but he has displayed the outstanding talent, say, of a rocket designer. It is not without interest to find out how a person understands the external world, we value very much the purposefulness of thinking.

Thus, careful selection showed adequate training. The difficulties, however, for the lucky person are just beginning. In the first three years the instruction here is basic and very difficult—in physics, mathematics, and language.

We have begun to give the social disciplines in a new way. And, note, here they attend them! We have formed a chair of the history of culture, at the same time the most different specialists—from the history of religion to the history of Chinese philosophy—give 12 courses of lectures. And people attend them with, it must be said, voluntary attendance.

All this is alluring, but the load, I will repeat, is formidable. And, therefore, the requests for academic leave after three years at the Physical Technical Institute are not a rarity. We give these "timeouts," for an increasing load lies ahead. We are interested in having them also bear it.

A base chair awaits the 4th year student. He is already not only a student, but also an associate, who works in a collective that has been put to work in science or a science-intensive sector of industry. It is not science that has been attracted to teaching here, while our still only students are entering science.

NTR TRIBUNA: You have base chairs at various scientific and "industrial" institutes, but with time they fill up more and more with your graduates. However, the collective has a limit of growth. How do you get out of this situation?

N. V. Karlov: We organize new ones. Since 1952 the scale and set of chairs have changed greatly. Moreover, the institutes, the personnel of which we bring up to strength, have a sufficient number of business partners—they also convey new knowledge to them. And with our assistance, together with its living bearers.

NTR TRIBUNA: Hence, are there no difficulties in assignment?

N. V. Karlov: We have three or four requests for each graduate.

NTR TRIBUNA: Hence, there is a great demand, but how are things with the competition?

N. V. Karlov: In recent years there have been more than three people per place. This year there are fewer (after the reform of the call-up for the army and with the carrying over of the start of examinations to the standard calendar of VUZ [higher educational institution] admission)—2.5 people. But then precisely our people have returned to us from the army.

We are enlisting extensively in teaching people who hold more than one job—those who are actually and fruitfully working in science, both academic and "industrial." Specialists from the Mathematics Institute of the Academy of Sciences teach our students mathematics, specialists from the Institute of Physical Problems and the Physics Institute of the USSR Academy of Sciences teach them physics. All our chairs, except the chair of foreign languages, are enlisting people, who hold more than one job, in cooperation with our staff instructors. Although it would also be good to take instructors from the Ministry of Foreign Affairs or the Ministry of Foreign Trade, so that the language would be more uninhibited and more fluent.

NTR TRIBUNA: All this is still a model, so to speak, of the first Physical Technical Institute. But does its further development, say, foreign practical studies, lie ahead?

N. V. Karlov: Our model initially was thought out thoroughly. But it, of course, needs adjustments with correction for time. And we are now intensively developing international ties.

We are sending to the West students and professors, I will note that "there" they enjoy a high "exchange" value. Assume that we sent a student for a semester, but then they invite him for graduate studies there. So that the intellectual potential of the Moscow Physical Technical Institute is also very high by international standards.

However, the snag is in the budget. As at all Soviet higher educational institutions, here it is very meager. Hence, too, the result: Ties should be reciprocal, but we are experiencing difficulties with the acceptance of foreigners. Our living conditions are very far from the level which makes it possible to carry out the exchange of students and professors.

NTR TRIBUNA: It seemed to me that you have quite great possibilities....

N. V. Karlov: This is an illusion. All the science is at our basic chairs, and they, not the institute, receive the profit.

NTR TRIBUNA: Thus, are you supply high-quality specialists free of charge? But have you not tried to change this?

N. V. Karlov: The 3,000-ruble fee for a specialist, which has been introduced throughout the Union, is a mockery. We are conducting the corresponding talks, but not all enterprises are capable of paying the real price. The ones carried on the state budget cannot at all, cost accounting ones can, but do not always want to.

NTR TRIBUNA: What fee do you consider realistic?

N. V. Karlov: Thirty thousand rubles. In general, according to my estimate, our specialists are worth approximately twofold more, but we are requesting half, and we are succeeding in coming to an agreement with some enterprises. However, there is also another regrettable circumstance here: The city soviets require about 30,000 rubles for a residence permit. There are, say, funds and limits for a residence permit in a suburban Moscow city, but the city soviet needs 30,000 and we need 30,000. But the STK's do not bear this—group egoism is at work.

But money—even if we succeed in getting it—also does not solve everything. Funds are needed, but this is another difficult road through the bureaucratic labyrinths.

The institute is located in Dolgoprudnyy—this also limits our possibilities. We are squeezed in a triangle between the Savelovskiy Branch Line of the railroad, the Canal imeni Moskvy, and the Ring Highway. For us this is a sort of "Bermuda Triangle," because it limits the possibilities of the construction of production and educational buildings and dormitories. It checks development.

Under such conditions the leveling trend existing in the Soviet educational system (earrings for all the sisters, but actually one earring for each sister) is having a very oppressive effect on our work.

Quite the opposite is needed! It is necessary without fail to support the strong and to stimulate in every way the training of precisely a scientific and technical elite.

Better Engineering Aptitude Testing Needed

907A0216A Moscow NTR TRIBUNA in Russian
No 5-6, 23 Mar 90 p 13

[Interview with Doctor of Psychological Sciences Yakov Aleksandrovich Ponomarev, specialist of the Institute of Psychology of the USSR Academy of Sciences, by G. Nikolayeva, under the rubric "The Professional of the 21st Century": "Evaluate the Engineer"; date and place not given; first two paragraphs are NTR TRIBUNA introduction]

[Text] The social order for scientific and technical creativity is on the doorstep. True, for the present they are talking more about it and the matter is not going farther than words. But this will not go on endlessly. We are approaching a critical boundary, and society will realize any moment now: The country cannot develop at all times, further, while ignoring scientific and technical progress. But another problem is arising. Will the social order prove to be feasible? For we have already ceased to pride ourselves in the largest engineering corps in the world and have acknowledged (even from lofty rostrums) that the majority of those receiving an engineering diploma today at best are suited to be technicians: The intellectual level is low.

Where are the roots of the sad phenomenon? We attempt to understand this in the interview with Doctor of Psychological Sciences Ya.A. Ponomarev, a specialist of the Institute of Psychology of the USSR Academy of Sciences, who for many years has been studying the problems of the psychology of creativity.

NTR TRIBUNA: Yakov Aleksandrovich, one has occasion to hear more and more often from production managers that the generators of ideas are growing old and a leaving production, but there are no successors. That is, there are specialists, the headquarters have been filled up, but the engineering level of those working does not meet the requirements of the day. Who is to blame? The institute which teaches poorly?

Ya. A. Ponomarev: Most likely the institute teaches the wrong thing. Let us make a small digression and recall the definition of philosophy. This is the science of the laws of the development of nature, society, and thinking. We have separated man and thinking from nature, as though they do not obey the general laws of its development.

At one time many Soviet scientists supported the theory that any normal person can show his worth in literally all aspects of activity. The theory is humane, beautiful, but utopian. Let us "train," "raise" a second Mozart. It will not succeed. It is exactly the same with engineers as well. They admit anyone to technical higher educational institutions, provided that he has passed the examination. Yet not all the graduates, but very few, those who have natural aptitudes for this, will become genuine engineer-creators.

NTR TRIBUNA: In such a case there should probably be a real indicator of these aptitudes.

Ya. A. Ponomarev: I, for example, would not admit to technical higher educational institutions any of the school graduates, whose psychological mechanism of intelligence has not achieved the optimum development. I will explain what this is. At one time we conducted research among preschoolers, school children, and adults, studying their ability to do work in their mind. (There were a large number of experiments, so that we have statistical reliability and it is possible to generalize the conclusions.)

As a result of the research it was possible to obtain a certain curve of the development of a person. It turns out that the ability to perform operations in the mind, which is incorporated in us from birth, develops not infinitely, but only up to the age of 12-15. We distinguished five stages of this development

At the first stage the child cannot do work in his mind and subordinate his actions to a verbal task, although he is capable of manipulating objects in front of him.

At the second stage he is capable of accomplishing a task that has been posed verbally, but only by manipulating surrounding objects.

At the third stage the child can manipulate notions about objects, but he does not yet succeed to an adequate extent in subordinating these manipulations to the requirements of a task that has been posed verbally.

At the fourth stage such subordination proves to be possible, and as a result of trial and error the child arrives at a solution, he makes the obtained solution the basis for the plan of repeated actions. In implementing this plan, he is already strictly relating each action to the conditions of the task.

At the fifth stage this ability achieves, at last, complete development. The child analyzes the internal structure of the task and forms on the basis of this a plan of its solution, to which he then clearly subordinates his subsequent actions. That is, at the fifth stage of development a person has an internal plan of actions.

Moreover, it turned out that with the achievement of the fifth stage of development the first four do not disappear. And when we work on a creative task, the course of its accomplishment turns out to be a gradual ascent through these levels. That is why I say that one should not admit to technical higher educational institutions those people who do not have the optimum development. This does not mean that they will not be able to invent—they will, but at the level of technical improvement. However, such engineers will simply lack the mechanism of development in order to create pioneering developments.

NTR TRIBUNA: Very well, nature has incorporated in us the psychological mechanism of intelligence. So then, does it gather momentum itself to the maximum level, say, just as teeth grow spontaneously?

Ya. A. Ponomarev: No. It is necessary to extract the genetically incorporated capacity for development by instruction and training. If you rate the level of development according to a five-point system (based on the five structural levels), the average level of development of those who participated in the experiment is 3.75. Very few achieve the optimum. But this does not testify that nature was short of talents. We are simply implementing poorly what it has incorporated in us.

The situation with today's engineering personnel resembles a cut forest. But it is impossible to live without a forest, and they replant it. Therefore, if we want to think about the future and about the realization of the creative abilities of man, it is necessary to turn to children and to the school.

NTR TRIBUNA: The school has already become a proverb. However, in spite of everything, it continues "to plant the forest" according to the old technology. If nothing changes, our prospects in the area of scientific and technical progress are the 100-percent "importing" of ideas and machines. What would you suggest to the school?

Ya. A. Ponomarev: First of all not to set the demands on children too low. For example, their previously studied Latin and Greek. They are difficult subjects, but they aided development, hence, it is necessary to return them to the school. It is necessary that pedagogy would adopt again psychological science and without fail the psychology of creativity. Why do I say again? Because even during the first years of Soviet power tenfold more time was allotted at pedagogical higher educational institutions for the study of this discipline than is now being allotted.

And, of course, there is the selection to be teachers. One will not break out of the vicious circle otherwise, for, as is known, as you sow, so shall you reap.

When we conducted our research among school children, at the same time, on request, of course, we also evaluated the level of development of teachers. Of the 30 surveyed educators only two had the optimum development. And these were teachers of one of the schools in the center of Moscow.

NTR TRIBUNA: We all ought to have the fifth level of development, and, apparently, it is impossible not to take into account that not everyone's genetic preconditions are identical. Most likely, someone will not be able to achieve the optimum. So then, is this a verdict?

Ya. A. Ponomarev: No, it is not a verdict. I want to repeat once again my thought: Every person should engage in a job which corresponds to his natural gifts. Labor is diverse as much as the peculiarities of people are probably diverse. So that each person would find his place and be content. There are a large number of occupations which do not require the optimum development. For example, my colleagues conducted research at a theatrical school, and it turned out that the average level of development of these students is 3. But this does not rule out at all their artistic gift.

But those, who intend to devote themselves to science and technology, need the fifth level of development without fail. And I have said why. We have 6 or 7 million engineers. In the United States there are significantly fewer of them, but the creative return from them, as is known, is greater.

NTR TRIBUNA: Hence, is there occupational selection?

Ya. A. Ponomarev: Without fail. In the FRG, for example, no firm hires staff members without the taking of the corresponding tests, and it hires only those who suit it. And this has its humane point. If it is possible to identify inability before they hired a person, this does not cause stress and he begins to seek a job for himself elsewhere.

And, of course, this selection should start earlier, back in the school. The school engages in vocational guidance, but general vocational guidance, without regard for individual peculiarities. But meanwhile already at the age of 11-12 it is possible to say with certainty about a

child in what area subsequently he will obviously not be a genius. But such results of psychology do not interest the school. Therefore, when young people go out into the world, they cannot relate their desire to acquire one occupation or another to their own capabilities. As a result, how many of the same graduate engineers are not working in their specialty, having understood that they chose the wrong thing in life.

NTR TRIBUNA: But even more are working. Is it possible to hope that they will be able all the same to increase their intelligence to the level which the times require? In general, what is intelligence?

Ya. A. Ponomarev: Specific intelligence is the psychological mechanism of development, which has been given by nature, plus a wide range of knowledge, which a person acquires throughout life or, at any rate, should acquire.

I believe that intelligence—it is common for everyone. And man does not have technical thinking. Thinking is the same. The difference lies in the very precisely chosen system of knowledge. For example, such a system of knowledge of an engineer should include heuristics and the methodology of technical creativity. And I greatly value the work of the inventor's schools which provide such knowledge. But it is quite important on what base the new knowledge will be put. Why is the intellectual level of our engineers low? Because the "foundation" of the majority is not a five-point one. Therefore, they cannot properly master the offered amount of knowledge and cannot deal efficiently with new knowledge.

NTR TRIBUNA: In the 1950's there was a kind of information boom in the area of the problems of technical creativity. Actually, as a result of the interest in them the inventor's schools, which to this day are doing their useful work, also emerged, but time is going by and requires a new quality of work from them. What do you think about this, Yakov Aleksandrovich?

Ya. A. Ponomarev: First, with regard to the boom. In my opinion, it was sooner not an information boom, but a publication boom. I once held in my hands a directory, in which there were 7,000 descriptions of superb studies in the area of creativity. But these thousands of works have not been generalized to this day, hence, the efficiency of even the best of them is terribly low. It is impossible to say that this is bad or a shortcoming. This is a stage of empirical multidimensionality, through which it is necessary to pass. But this stage has dragged on too long. New schools are appearing, new researchers are appearing, and each one is beginning from scratch. Why? The zero mark was passed long ago, it is necessary to go farther. It is time to face the science of creativity, which would engage in the study of the entire set of factors that help to form a person with a high creative potential. But our researchers are isolated. And while they work that way, the basic science of creativity will hardly arise.

Awarding of Advanced Degrees Without Dissertation Defense Criticized

907A0239A Moscow OGONEK in Russian No 15, Apr 90 p 25

[Interview with Academician Vsevolod Sergeyevich Avduyevskiy by Vanda Beletskaya under the rubric "A Topical Interview": "Doctors of Sciences...According to the List"; date and place not given; first paragraph is OGONEK introduction]

[Text] Academician Vsevolod Sergeyevich Avduyevskiy is a prominent specialist in space technology and materials science. The objections of the scientist to the recent decree of the Higher Certification Commission on the awarding of academic degrees to the specialists, who worked on the Energiya-Buran system, without the defense of dissertations sounded all the more unexpectedly.

V. S. Avduyevskiy: Do you know the facetious slogan: "You might not be a scientist, but you are obliged to be a candidate"? Thus, now it will become far more easy to accomplish it in reality. In accordance with the new decree of the Higher Certification Commission a special council, which has the right to award academic degrees in general without a defense, without the taking of candidate examinations, and without the writing of one's own scientific work, is being established. It is incredible, but a fact! We are fighting against privileges and now are creating new ones. So that in practice it is now possible to become doctors of sciences in accordance with special lists....

Such a statement of the question simply staggered me, and during the discussion I spoke out sharply against it.

OGONEK: And did you probably immediately make yourself enemies? For you yourself work in the field of space technology....

V. S. Avduyevskiy: I do not know about enemies, but there were telephone calls with reproaches, and quite a number: They say I am depriving worthy people of a well-deserved reward. But, first, for long years of good work they give prizes and orders, not academic degrees, and, second, specialists, who deserve these degrees, are capable of writing a scientific work and of defending themselves in the usual manner.

But I will honestly say that the reproaches of colleagues upset me. I thought a lot about whether I am mistaken, whether I have the moral right to object to the new system. And I understood—I do. What they are proposing to us will have a harmful effect on scientific and technical progress of the country. We have have fallen hopelessly behind as it is in nearly all areas of science and technology.

OGONEK: But in the decree it is question only of the Energiya-Buran space system. Is it worth drawing such far-reaching conclusions?

V. S. Avduyevskiy: Today an exception has been made for Buran, tomorrow an exception will be made for some other job, while the day after tomorrow "the appointment of doctors of sciences in accordance with a list" will assume a mass nature. We are well aware how often an exception in our country becomes the rule.

OGONEK: The information about the Energiya-Buran system is contradictory. On the one hand, they have played it up extensively, on the other, only one test flight of Buran has been made, it is still a long way to the use of the obtained technologies in the national economy.

V. S. Avduyevskiy: True, although Buran is a good job. Even a very good job. That is not the point. The new system of defense is of no use to the leading specialists for Buran, they are themselves interested in writing a dissertation, in generalizing their design and technological experience, and in laying their own bricks in the building of science. The goal of the new decree, I believe, is different—to open wide the backdoor for those who are not capable of either writing or defending a dissertation.

OGONEK: But could the decision of the Higher Certification Commission be due to the secrecy of the work on Buran?

V. S. Avduyevskiy: Secrecy is merely a cover. In accordance with the program of conversion Buran is grouped with civilian products. The secrets here are commercial, not military. And in general with regard to "secret" science, such science simply does not exist. The references to it have merely had the result that our country has dropped out of the international scientific community. Enough of dividing science now according to the class principle, now into "secret" and "public" science. Science is unified.

OGONEK: But is it not true that to this day the practice of the periodic destruction of what are called "secret" dissertations exists?

V. S. Avduyevskiy: Alas...it is true. In my opinion, it is an unsound practice. If a dissertation is strong, its results are wasted forever for science, if it is weak and an academic degree has been conferred not in accordance with one's services, no one will be the wiser, you will not check it. I am convinced that works that are "secret" today should be declassified after a certain time (a maximum of three years) and become accessible to science.

Genuine researchers, who work on "secret" themes, always tried to publish whatever possible in the open scientific press and to enlarge the group of scientists who accepted the discussion of the quality of a work and its reliability. Otherwise science will not advance. I will not hide it, they contrived a little, there was the following offense: In scientific articles, which were intended for publication, instead of, say, the "secret" word "plasma" they wrote "ionized gas," they called a missile an aircraft....

But then whoever was not certain of the good quality of his work, on the contrary, strove to include in his mediocre dissertation some secret element, in order not to allow the extensive discussion of the work and to defend himself more easily. Secrecy became a cover of mediocrity.

The Higher Certification Commission (VAK) also gave as a reason for its decision the fact that academic degrees were awarded to many cosmonauts without a defense. Hence, it is also possible to award them to designers and process engineers.

However, in the past 15 years there were isolated cases of the awarding of an academic degree without a defense, but cosmonauts were not among them.

In my opinion, the goal of the decree is to increase the power over the designer and researcher of his chief and the bureaucrat from the Higher Certification Commission: "I will award an academic degree to whomever I want, if you bow to me, you will also receive it."

OGONEK: However, the institution of the awarding of an academic degree without a defense "Honoris causa" exists throughout the world and in our country as well....

V. S. Avduyevskiy: Yes, for outstanding services in science and technology, with respect to a set of scientific works. I stress, scientific works, the same books. They have been written and published. It is possible to familiarize oneself with them. Scientists and experienced workers can make use of them. In the new decree it is a matter of the awarding of an academic degree in general without the writing of a work.

OGONEK: If one takes such a point of view: There is a machine, it works, hence, it is possible to regard it as a collective dissertation and to award academic degrees to all the developers—the designers, process engineers, and so on. To write each dissertation and to defend it is unnecessary bureaucratic red tape.

V. S. Avduyevskiy: There is enough bureaucracy in the work of the Higher Certification Committee. But it lies not in this. Just why is there, for example, the filling out of personnel registration forms, in which there is a column on membership in the party and on party penalties? For this does not influence the scientific level of work. Why is there a mandatory reference, which has been signed in party and trade union organizations, and so on? If one democratizes the system of defense, it is necessary to dispose of these unnecessary scraps of paper, not the writing of a scientific work, from which it is evident who is a degree candidate as a creative individual.

Science is an enormous building, which is being continuously constructed, and everyone lays in it a brick with his own name. For some reason they have now ceased to talk about this personal contribution of every scientist, they have literally forgotten that there is also no "collective" science, that it is made by individuals. An idea

originates in the head of a person in the old way and for each person in an individual manner. Everyone makes a different contribution to any collective work.

Recently there was a three-day extensive conference on the management of scientific and technical progress. Leaders of the country, scientists, and the president of the USSR Academy of Sciences spoke. I was at this conference. And it amazed me that no one spoke about the personality of the scientist. We have as if forgotten that specific researchers, whose names go down in history—Newton, Lomonosov, Tsiolkovskiy, Einstein, Kapitsa, Keldysh, Sakharov...—make science and discover new laws. Scientific debates and time test the quality of works. The new generation of scientists is trained through scientific works and through written books.

To record the train of thoughts, proofs of the correctness of an idea, and derived formulas is a natural need of the scientist, as well as the writer to leave a book. The instances, when a scientist has spent his last assets on the publication of his own works, are frequent. Tsiolkovskiy published his own books at his own expense. Therefore, the very idea—to do away with the writing of a scientific work—is abominable in its stupidity.

In the beginning was the Word. And the one who spoke it. This is the beginning of all beginnings.

OGONEK: Vsevolod Sergeyevich, did the decree, which disturbs you, first undergo discussion in the Committee of the USSR Supreme Soviet, which Academician Ryzhov supervises?

V. S. Avduyevskiy: The whole point is that it did not. And the Council of Ministers approved it without such a discussion. Committee Chairman Academician Yuriy Alekseyevich Ryzhov is also voicing his amazement and disagreement with such a decision. In addition to everything, there also is here disrespect for our parliament and for public opinion.

Now I am talking not only about the new system of the defense of a dissertation. The issue is much broader. In science the gradations of the personal contribution of a scientist and, hence, responsibility for one's own work have been lost. It disturbs me that the elimination of personal responsibility is being legalized with the aid of the Higher Certification Commission.

After all, it is well known that leaders create science. It does not advance along a broad front, it develops only when a breakthrough comes in one field or another. And it comes not in accordance with a list....

The new decree turns everything upside down. It does not do away with all kinds of bureaucratic documentation for a dissertation, which robs the young researcher of a large amount of time, but abolishes the scientific work itself for some chosen people at the request of the authorities, creating official loopholes for mediocrities and toadies.

I have been talking so long about this, since, in my opinion, many of our faults in the organization of science are visible in the work of the Higher Certification Commission. Here at times there are a low scientific level of dissertations, bureaucratic red tape, the vanities of the bureaucratic apparatus, and the lack of glasnost, which leads to the violation of moral and ethical criteria, which are so necessary in the relations of scientists. The Higher Certification Commission is a unique bureaucratic institution. There is nothing similar anywhere in the world.

As soon as you stop in at the building of the Higher Certification Commission, it becomes clear that you are in the citadel of bureaucracy. The marble finish of the walls, the carpets, the government telephones.... The chairman of the Higher Certification Commission has a more luxurious office than the president of the United States has at the White House. All this would be nothing, but the work of the new staff of the Higher Certification Commission for the most part is also proceeding along the line of the writing of an infinite number of instructions.

I am not saying that the very practice of issuing a diploma on the awarding of an academic degree from...the USSR Council of Ministers (the Higher Certification Commission is attached to the USSR Council of Ministers) seems quite strange to me and leads to the relieving of those, who have evaluated the scientific work of a degree candidate, of responsibility. Scientist and authoritative scientific institutions should issue diplomas.

Take foreign experience. The diplomas of different universities are valued in different ways by the world scientific community. This is taken into account when hiring a researcher and influences his salary. A diploma issued by irreproachable Oxford or Harvard is one thing, a diploma issued by a scientific institution with less prestige is another. All this increases the responsibility of scientists and the prestige of their occupation.

Science Officials Awarded Degrees Based on Phony Dissertations

907A0247A Moscow PRAVITELSTVENNYY VESTNIK in Russian No 18 (44), Apr 90 p 3

[Article by V. Kolobov under the rubric "Repercussions": "A Strange 'Amnesty'"]

[Text] So the new Statute on the Procedure of the Awarding of Academy Degrees and the Conferring of Academic Titles has been approved (PRAVITELSTVENNYY VESTNIK, No 3, 1990). An interesting innovation is the refusal to consider cases, on which decisions were made 10 years and more ago. What lies behind this outwardly decorous formulation? To whom did the Higher Certification Commission decide to give general "amnesty"?

The beginning of this 10-year period of limitation falls to the last years of so-called stagnation, which are characterized for the Higher Certification Commission by the fact that academic degrees and titles were handed out among needed people, in accordance with their influence. Dissertations were written to order. It was considered improper for a director, and especially a chief a little higher up, not to have a degree—and they made it for him. But if it were a question only of respect and benefits! A person, who hardly understands what he copied and what they wrote for him, receives a management position. While we all sense not only from empty shelves how an incompetent person can show what he can do in it.

If you look at it formally, a 10-year period is sufficient to analyze any question. But a specific case of the scientific unscrupulousness of a dissertation author can be revealed both in a few years and even 10 years later.

The question of the chronic illness of our science, which appears in such extreme forms of scientific unscrupulousness as plagiarism, compilation, and the appropriation of the scientific result of another person, has been repeatedly raised in the press. But things have not budged.

Outwardly the Higher Certification Commission seems to be in favor of observing scientific ethics. Formally, yes, but not in fact. The tactic of delays and red tape long ago took place of adherence to principles. Now here is the period of limitation to the rescue. And can it be otherwise, when the Higher Certification Commission is itself both legislator and judge?

With the activity participation of the Higher Certification Committee complete abundance of...scholarly ladies and gentlemen with degrees and titles has been achieved in our country, there are more of them than anywhere, but then in the national economy matters are far from splendid. And the Higher Certification Commission obviously wants to evade responsibility for this. "We will forget, they way, everything that happened 10 years ago. While what happened not that long ago—we will hold out until the 'anniversary' date, and no one will be the wiser."

The establishment of a 10-year period of limitation for scientific unscrupulousness, the violation of scientific ethics, and simply cheating is an enormous step backward, a step into the same morass of stagnation, corruption, and moral degeneration, the morass, from which our society is beginning gradually to crawl out.

VOIR Establishes New Fund for Inventors

907A0186A Moscow RABOCHAYA TRIBUNA in Russian 29 Mar 90 p 5

[Interview with A. Pravikov, first secretary of the board of the fund for the promotion of invention and rationalization activity attached to the Central Council of the All-Union Society of Inventors and Efficiency Experts, by A. Naumenko, under the rubric "Details" (Moscow): "A Fund for Inventors"; date not given; first paragraph is RABOCHAYA TRIBUNA introduction]

[Text] The fund for the promotion of invention and rationalization activity has been established under the Central Council of the All-Union Society of Inventors and Rationalizers [VOIR]. A. Pravikov, first secretary of the board of the fund, tells about its goals and tasks:

A. Pravikov: To begin I will cite a sad figure. Production uses at best only a third of the innovations which inventors offer in a year. But this small number with incredible efforts also carves its way and is implemented at two or three enterprises. The remainder accumulates as dead weight in various technical archives. But why? Remember, in our country even the most important invention of the century—the laser—for decades did not find recognition. Perhaps, the main trouble was that the notorious "gross" was the basis for all introduction problems. Were managers in the mood for inventions, if first of all not the increase of profitability, but the fulfillment of the plan assignments at any cost worried them? Managers, as a rule, forget about the highest state interests—economic laws are stronger than morals.

Today a kind of tool of influence has appeared in our hands. Temporary creative collectives, centers of engineering and technical services, and other formations, which operate on the principles of cost accounting, have begun to appear under organizations of the All-Union Society of Inventors and Rationalizers like mushrooms after rain. They have also begun to engage in the development and introduction of technical innovations. During the past year alone the cost accounting collectives, which were formed by councils of the All-Union Society of Inventors and Rationalizers, united in their ranks more than 50,000 people. Work worth more than 200 million rubles is being performed.

In turn, this economic activity required skilled personnel and prompted experienced management professional to think about investment policy and, at last, about the production of experimental prototypes and finished technologies. Thus we arrived at the idea of establishing the fund for the promotion of invention and rationalization activity (FID).

RABOCHAYA TRIBUNA: And what does this promise? There was one, in essence, philanthropic organization, but there became two.

A. Pravikov: The fund for the promotion of invention and rationalization activity is by no means a patronage institution with philanthropic functions. Our fund, if you like, is a kind of mechanism for the introduction of valuable ideas and developments in production. Previously it did not exist. Now it has appeared and has produced a chair reaction. Under the aegis of the fund for the promotion of invention and rationalization activity temporary creative collectives have begun to develop into so-called small introducing enterprises and associations. Incidentally, the practical experience of developed countries has already proven their efficiency, especially in the sphere of science-intensive production and the use of technical innovations. For example, in Canada more than 75 percent of all the workplaces created in the last decade belong to enterprises with a staff of less than 50 people. In the United States more than half of the developments at the invention level are created precisely at small enterprises. And the fund for the promotion of invention and rationalization activity already has some experience in the establishment of similar small enterprises.

RABOCHAYA TRIBUNA: Are there examples?

A. Pravikov: Yes, in Moscow alone more than 20 introducing scientific production associations, enterprises, and centers have been organized. Among them, for example, is the Reliz Firm. The name originated from the combination of two words: realizatsiya izobreteniy [the implementation of inventions]. The collective of this association has already introduced much in production—for example, an apparatus for the automatic regulation of the temperature and humidity of the air in hothouses, vegetable storehouses, and livestock and poultry barns. The first 100 such apparatus have been installed, orders for another 10,000 have been received.

RABOCHAYA TRIBUNA: Who can become a member of the fund?

A. Pravikov: Any enterprises, which are interested in innovations, and various state and public organizations. The fund will spare them of worries over introduction.

RABOCHAYA TRIBUNA: Is the fund for the promotion of invention and rationalization activity capable of helping a specific person of creative thought?

A. Pravikov: Of course, here is an example. Several years ago one very talented inventor, whose last name I will not mention out of commercial considerations, invented an instrument for the rapid recharging of storage batteries. He went, as usual, around a closed circle and gave up hope of introducing it. The fund showed an interest and brought him to one all-union scientific production association. And today the valuable invention is being successfully used at one Moscow motor vehicle enterprise.

RABOCHAYA TRIBUNA: What else does the inventor get, in addition to the joy of seeing his brainchild at work?

A. Pravikov: He becomes a member of the temporary creative collective, which is concerned with introduction, and receives a considerable reward on a contractual basis.

Patent Official Defends Misunderstood Requirements

907A0242A Moscow IZOBRETATEL I RATSIONALIZATOR in Russian No 3, Mar 90 p 9

[Article by Candidate of Historical Sciences Igor Viktorovich Krylov under the rubric "One's Own Opinion": "Patent Illiteracy"; first paragraph is IZOBRETATEL I RATSIONALIZATOR introduction]

[Text] Igor Viktorovich Krylov was born in 1956. After graduating in 1979 from the Moscow Historical Archive Institute he worked at patent services of the capital. He graduated from the Central Patent Science Institute and graduate studies at it. Since 1983 he has been working at the Central Patent Science Institute and has also been teaching patent science at the VGKPI, sectorial institutes for the improvement of skills, and elsewhere. He is a candidate of historical sciences. He has works published in such publications as VOPROSY IZOBRETATELSTVA, NTR: PROBLEMY I RESHENIYA, and others. He has been cooperating continually with IZOBRETATEL I RATSIONALIZATOR since 1986.

An anxious inventor calls: "I submitted to the All-Union Scientific Research Institute of State Patent Examination an application for an inventor's certificate, but have now come across a cooperative that is willing to set up the series production of my invention. But the cooperative requires a patent without fail. An inventor's certificate, they say, protects absolutely nothing."

"They are right! But is it possible to prove that your invention is not connected with the fulfillment of an official assignment?

"Of course! I work as an aircraft designer, while the invention applies to medical equipment. The cooperative is prepared to pay all the necessary duties for the patent."

"At what stage is the examination of the application?"

"They have just issued a favorable decision."

"Then it is already too late. According to prevailing legislation only a patent can be freely exchanged at any time of its effect for an inventor's certificate. But in the other direction—alas. Perhaps, at the stage of the preliminary examination there were still chances, but now ask the expert to reject it or do not agree with the formula and submit it again, now for a patent. I can guarantee that you will have a hell of a time with the All-Union Scientific Research Institute of State Patent Examination. Why did you not immediately think about patent protection?"

"But I did not assume at all that I could obtain a patent, I did not know what rights it gives."

Patent illiteracy. The frightening incompetence in patent science of inventors, executives of various levels, colleague journalists, people's judges, experts of the All-Union Scientific Research Institute of State Patent Examination, personnel of patent services, people's deputies, and so on. I run into it practically every day. In contrast to computer or economic illiteracy, which one can realize well by oneself, the overwhelming majority of entirely well-informed and experienced specialists do not ponder the "virginity" of their knowledge in the area of patent science.

The most unpleasant thing is when incompetence becomes militant and the lack of knowledge replaces the abundance of self-confidence. I know that the majority of readers do not agree with me, but am firmly convinced: Before judging professionally the merits and drawbacks of the draft of the Law on Invention Activity, which is being discussed, it is necessary to obtain a patent education if only to the extent of the VGKPI.

The patent system, which was devised by mankind on 15 March 1474, in the past two centuries of intensive development has drawn up quite a number of axiomatic "rules of the game" between the inventor and the state. Without a certain level of patent culture, which presumes the mastering of these axioms, the invention of legal "perpetual motion machines" and "wooden bicycles" is inevitable.

Let us take as an example the deferred examination. Well, how am I to prove to the readers that it was devised not by malevolent bureaucrats from the State Committee for Science and Technology and the State Committee for Inventions and Discoveries, who decided to put off for six years the issuing of a patent? This system, which has been introduced today in the overwhelming majority of development countries, is an ideal means of sifting important, commercially significant inventions from mere nothings. After paying a small application duty (according to preliminary estimates in our country it will not exceed 30 rubles), the author obtains temporary protection of the invention. Then over the course of four years he can without haste seek an "introducer" in the person of a state enterprise or cooperative and ponder whether the obtaining of a patent is worthwhile. But if you are convinced in advance, instead of an application submit a petition for a full examination, play the duty for it, and there are no delays.

Not having understood the legal and economic point of the deferred examination, the parliamentary commission of the USSR Supreme Soviet in the next to last version of the draft of the Law recorded an amendment to Article 20: "The patent examination of an application is conducted upon completion of the preliminary examination, if there is no request of the applicant to postpone its consideration." Here everything has been turned upside down, the basic point of the deferred

system—the selection of significant inventions—was eliminated by one stoke of the incompetent pen of the deputies.

Well, what is to be done here? If I were a director, I would send the USSR people's deputies, who are members of the parliamentary commission for the draft of the Law, for mandatory training at the Central Patent Science Institute. Especially as during the current school year my institute was able to recruit only half of the planned admission of 200 people. Is it necessary to speak about the fact that a similar educational institution in Japan annually trains 5,000 certified patent experts?

I conduct a class at the school of the young efficiency expert attached to the Moscow House of Scientific and Technical Propaganda. Of the 100 people who enrolled 10 gathered. The average age of the young efficiency experts is close to 40. Is it, perhaps, uninteresting? Are there well-known things? But at the class two leading specialists of the country are examining the latest version of the new statute on efficiency proposals. The fundamentals of TRIZ—a science, which is vitally necessary for competent technical creativity—were covered in previous classes....

What is the matter? Pushkin in a moment of despair said that we as a nation are lazy and incurious. The Americans, the West Europeans, and the Japanese have gone far ahead. We will not yet catch up soon with South Korea. Will we confirm for a long time to come the sorrowful revelation of the great poet?

U.S.-USSR Delegation Meets Over Patent Rights, Protection

907A0214A Moscow NTR TRIBUNA in Russian No 5-6, 23 Mar 90 p 2

[Article by Candidate of Economic Sciences N. Lynnik, deputy chief of a department of the State Committee for Inventions and Discoveries, under the rubric "Panorama": "The Conflict of Rules"; first two paragraphs are NTR TRIBUNA introduction]

[Text] A delegation of Soviet specialists (Chairman of the State Committee for Inventions and Discoveries Yu.A. Bespalov headed it) has returned from a trip to the United States. The prospects of the development of Soviet-American relations in the area of scientific and technical cooperation were discussed with the leadership of the National Patent Office.

The American party raised an insistent demand before the Soviet party—to ensure the legal protection of intellectual and industrial property in the USSR on the basis of universally accepted principles.

The distressing situation, which has formed in our country in recent decades, has led to the complete lack of protection of authorship and the entire range of author's interests and rights to scientific and technical innovations. Here there are the dissolution of the real authorship in long lists of only nominally responsible bureaucrats, the distortion of an innovation due to careless execution and faulty technology, the arbitrary use of innovations by enterprises, which are unknown to the author, and, finally, their hopeless "shelving."

This monopoly, which was established in our country, of department-producers, which ignore the needs of consumers, had the result that two-thirds of the promising inventions do not find application in the country, while invention has become one of the most odious occupations. Hence the twofold loss: Either the lion's share of the domestic intellectual potential is idle or the most precious human losses, what is called a "brain drain," are occurring.

It is clear that civilized innovation, which values both reputation and commercial interest, cannot enter recklessly such a zone of arbitrariness. This is what makes problematic the establishment of bilateral and in general international scientific and technical contacts and cooperation with our country.

It is possible to break such a trend only by having brought domestic law and order in line with the statutes that are universally accepted in the world.

The first step has been taken: The draft of the Law on Invention Activity in the USSR has been prepared. There are now many disputes over it in our country. A portion of their participants are criticizing it without knowing that the document, which lies on the parliament desks, is far from the one which was published in the mass media.

Unfortunately, our parliament is extremely slow in approaching the consideration of this draft law, as well as the legislative solution of the problems of industrial and intellectual property in general. It is possible to explain this, but it is in no way possible to justify this.

The Supreme Soviet of the country is literally bending beneath the weight of legislative strains. Draft laws, the priority of which is self-evident for society, make up their lion's share. But then those, about which we are talking, are being knocked from priority positions by the stereotype, which passes them off as means of the legal protection of a supposedly narrow professional sphere, which is far from the most vital interests of all of society. It is a dangerous delusion....

Lawlessness in the area of intellectual and industrial property and inactivity do not and, besides, will not enable us to accomplish the most urgent and very burning tasks which concern each and everyone. These are ecological problems, energy problems, including those concerning nuclear power plants, questions of information technologies, on which the development of glasnost depends, and the work of the parliament itself, for example, its supply with information.

The conflict of our stagnation-model "rules of the game" in the area of scientific and technical progress with the rules of the world standard, which have been firmly established in this sphere, does not promise us any gain....

BSSR 1990 Annual Meeting Summarized

907A0185A Minsk SOVETSKAYA BELORUSSIYA in Russian 2 Mar 90 p 1

[Article: "The Steps of Perestroyka in Science"]

[Text] The session of the general assembly of the Belorussian SSR Academy of Sciences, which was held on 1 March in Minsk, was devoted to the urgent problems of the modernization and improvement of research work. The scientists examined the creative results of the past year and outlined a program of the development of perestroyka processes.

In the statements of the session participants it was noted that 1989, during which academic institutions actively converted to the new conditions of management and financing, was fruitful for scientists. In all 467 developments, the economic impact from the introduction of which came to 77.4 million rubles, found application in the national economy.

At the session the negative trends were also not avoided. For example, the fact that some scientists were carried away by the earning of money, having forgotten science in so doing, was spoken about. The difficulties with the financing of basic research were noted. Suggestions were made to establish a fixed share of the national income, which would be intended for these purposes. An alarming figure, which was heard at the session, also testifies to the attitude in the republic toward in-depth scientific research. In the total amount of financing of science the share of the assets, which are allocated for the support of basis research, is half as great as on the average for the country. Here the expenditures on the needs of the Belorussian SSR Academy of Sciences—"the flagship of science of the republic," as it is customary to say—come to only 7.2 percent of all the spending on science in the Belorussian SSR.

The scientists also devoted serious attention to the situation with the training of scientific personnel, with the support of research, and with the social protection of scientists. An exchange of opinions on the progress of the elimination of the consequences of the accident at the Chernobyl Nuclear Power Plant took place.

Achievements of Belorussian Inventor's Fund Detailed

907A0246A Minsk SOVETSKAYA BELORUSSIYA in Russian 25 Apr 90 p 2

[Interview with Leonid Mikhaylovich Gruzdilovich, director of the Fund for the Promotion of Invention and Rationalization Activity, by V. Bryl, under the rubric "Fact and Comments": "What Is the FID?"; date and place not given; first paragraph is SOVETSKAYA BELORUSSIYA introduction]

[Text] Only half a year has passed since the day of the founding of the Belorussian Republic Department of the Fund for the Promotion of Invention and Rationalization Activity (BRO FID). But by means of it tens of developments have already been completed, new models of equipment and technology and consumer goods have been developed. Satellite television systems and a new technology of the electroplating of nonferrous metals, expert systems and unique devices, which are patentable today in the United States, Canada, and other developed countries and promise a revolution in rail transport, radiotelephones and dosimeters, biological filters and nitrate meters...are being developed and introduced.

L. M. Gruzdilovich: The FID is an economic organization, relates FID Director Leonid Mikhaylovich Gruzdilovich. Our goal is the introduction and practical application of useful technical innovations. The main principle is "from the idea to the finished product." We bring inventions or proposals, which have been accepted by the FID for introduction and during tests have proven their reliability, at least up to a prototype, a small series, or a developed technology. For this 27 small enterprises have been set up here.

Small enterprises—and they are independent—are characterized not only by a small number of workers, but first of all by the capability to change over easily, to turn ideas quickly into goods, to use advanced methods of the organization and management of production, and to adapt promptly to the requirements of the consumer and by the willingness to take a reasonable commercial risk. The small enterprise is the main "unit," the primary "cell" of the FID.

We locate them, as a rule, on spaces leased from "giants." Often we also use their equipment. After all, if you like, it is possible to find underutilized equipment at nearly every large enterprise. In return there are original technologies, which have been tested on these capacities and have been developed to the stage of the assimilation of a prototype of a new product.

The further development of the FID in many respects depends on how the small forms of management in the republic will be developed. Incidentally, it is possible to do much already today. Thus, at a large enterprise tens of divisions and services and thousands of people are engaged in the preparation and support of production. While at a small one, given similar ranges of items and volumes of the information flows, only five to 10 people are engaged in them. Therefore, it is necessary to develop a set of services of outside organizations and to form a republic infrastructure of small enterprises. It is necessary already today to begin the establishment of institutions of the legal, financial, material and technical, information, and organizational methods support of their activity and to use a stimulating tax policy.

We are placing great hopes in the association of small enterprises, which is being established in Belorussia. It will help to draw up and to submit for the consideration of the Supreme Soviet and government of the republic drafts of the necessary decisions.

New Approaches to Coordinating S&T Work in Kazakhstan

907A0196A Alma-Ata VESTNIK AKADEMII NAUK KAZAKHSKOY SSR in Russian No 2, Feb 90 pp 11-17

[Article by V.D. Gladun, doctor of technical sciences, N.B. Matetskaya, candidate of economic sciences, and A.V. Pozdnyakov, candidate of physical and mathematical sciences: "On New Approaches to Coordinating Scientific Research"]

[Text] The current state of Soviet science is unacceptable for our society. Regardless of the scale of scientific potential created (the share of science in the gross national product in the USSR comprises 3.7 percent, in Japan—2.7, and in Great Britain—2.2 percent) ("Science and the Yardstick of Truth." Izvestiya, 6 February 1989), our science lags behind developed countries of the West in many leading areas of research, and the tendency is observed toward a growth in this process. The causes of this situation include the extensive growth of science; the low level of organization of research and development work; the virtually complete absence of influence of scientific organizations on the technical level of industry; scattering of scientific forces; absence of responsibility and interest of scientific collectives in higher results of their activity; dominance of administrative methods in management of science and engineering.

Cost-accounting in science is one of the elements of the radical economic reform, called on to break the negative tendencies in science. With the entry into effect as of January 1988 of the CPSU Central Committee and USSR Council of Ministers resolution "On Conversion of Scientific Organizations to Full Cost-Accounting and Self-Financing,"[1] it was assumed that cost-accounting would eliminate or somewhat mitigate negative tendencies, especially in the area of applying scientific developments. Cost-accounting should replace administrative levers with economic ones and, in the area of scientific and technical progress, it should open a way to utilize personal and collective interests, force scientific research institutes to choose the most topical themes, shorten the scientific production cycle, and achieve a world scientific and technical level.

However, today it is already possible to say that perestroyka in science cannot be reduced to the simple conversion of its institutions and organizations to cost-accounting. A clear tendency has been noted to reduce financing for science, and the amount of cost-accounting work by scientific institutions for industry is decreasing. The ideas of scientists, especially of a basic nature, are not materializing in practice. A paradoxical situation is being created: On the one hand, the development of cost-accounting and commodity-monetary relations in science is leading to the appearance of a market for scientific ideas, novelties and innovations, and on the other, the weak interest of enterprises in using the achievements of science and engineering, or the lack of receptivity on the part of industry and the new economic mechanism toward scientific and technical progress, does not let science to find a partner for implementing its proposals. The reduction of work on many scientific directions due to an absence of sources of financing, an aspiration of scientific collectives to find a sale for their ideas and developments on the foreign market (often under extremely unprofitable conditions), and the weakening of state influence on scientific and technical progress are a consequence of this. The conversion of science to the new methods of economic management has led to an inevitable reduction of expenditures for basic research. This ought to generate serious alarm. Regardless of the difficult economic situation in the country, science and scientific and technical progress should be considered the highest priority in the name of the future.

In order to implement a radical break in the matter of accelerating scientific and technical progress, as it seems to us, it is necessary to solve a two-part task:[2-10] in raising the role of the socialist market in scientific and technical progress to the utmost, we must ensure effective state influence on the process of creating and assimilating new equipment and technology. Incentives for scientific and technical progress should be generated through the interaction of supply and demand, consumption and production. Demand and consumption stimulate industry and the assimilation of new production first of all, because they create solvent market demand. Precisely it, in turn, determines the directions of development of social production, the nature of scientific and technical progress, and shapes the supply market. Consequently, a socialist market will be unable to develop successfully without including scientific and technical progress. In addition, the development of commodity-monetary relations requires the formation of a stable infrastructure for scientific and technical progress, which raises the role of state regulation in this area. The state should determine the overall strategies for economic and scientific and technical development, should encourage the innovation process in the country, and carry out research and development work of nation-wide importance.

The state scientific and technical policy should create conditions for conversion to fundamentally new technologies, technical equipment and materials, which increase the effectiveness of social production and ensure a qualitatively new level of resource conservation, ecological safety, and social development on the basis of improving the economic and organizational mechanism for using all developments by science.[11-13]

The basic form of state regulation in science and engineering should be state scientific and technical programs (GNTP) of various levels. In this regard, it is very important that they include not only the stages of scientific research and experimental design work, but mandatorily stipulate measures on organization of series production and saturation of the market with the corresponding goods. The number of such programs should be strictly limited. Three basic levels of state

scientific and technical programs can be singled out: Union-wide, republic (regional), and sectorial (intersectorial).

Extra-departmental independent scientific and technical and socioeconomic expert analysis of the most important state scientific and technical priorities should be a tool for forming the list of state scientific and technical programs. Noncommercial budget organizations, created specially for these purposes, should perform the functions of such expert analysis. Leading scientists and specialists of various sectors of science and the economy, involved on the basis of temporary labor agreements, should perform the expert studies. In case of need, foreign scientists could also act as experts.

It should be noted that scientific and technical programs have already been used in the practice of planning scientific and technical progress over several recent decades, but for the time being they have not made substantial changes in the condition of science and engineering. A cardinal change in the role of programs to implement the state scientific and technical policy is possible, in our opinion, only given the improvement of the principles and methods for long-term financing of state scientific and technical programs and for their inclusion in the system of new production relations that is taking shape. Only thorough financing of such programs will enable us to ensure the goal-oriented fulfillment of all work, when state orders in these programs will be backed by real economic incentives for the executors.

Along with the process of forming the draft state scientific and technical program, it is necessary to conduct economic research to reveal the most rational cooperation of enterprises in fulfilling the tasks of the program and develop approximate ways to implement scientific-technical and industrial cooperation.

The program leader should also be chosen by competition (as opposed to the situation now existing), and after approval of the draft program and the leader's candidacy, the financial, material and technical resources should be put at the disposal of the leader of the GNTP with all legal and economic consequences hence ensuing. The list of GNTPs and their leaders should be approved by the agencies for managing scientific and technical progress at the appropriate level (the USSR GKNT, the USSR Academy of sciences, the GKNT or Gosplan of Union republics, Union republic Academy of Sciences, ministries, and departments) and broad scientific society should be informed via the mass information media.

The financing of work on GNTP should be implemented basically at the expense of budget allocations according to the status and level of the GNTP, i.e., all-Union GNTPs are financed from the Union budget, republic—from the republic budget, sectorial or intersectorial—at the expense of centralized ministry and department funds, designated for the development of science and engineering. Along with this, it is necessary to stipulate economic conditions for utilizing the funds of ministries, departments, associations, enterprises, local budgets, cooperatives, etc., on the principles of shared participation in the financing of projects and of individual stages of work on a GNTP.

The program leader is charged with the leadership of organization of fulfillment of work on each GNTP. Scientific leadership of the program is implemented by the Problem Council, which is responsible for ensuring the high scientific and technical level of work on GNTP. The staff of the Problem Council on GNTP is approved (according to the level of the program) by the USSR GKNT and USSR Academy of Science, the GKNT or Gosplan of a Union republic and Union republic Academy of Sciences, and by interested ministries and departments. The Problem Council, on the basis of the GNTP goals and structures formulated by them, announces and organizes competitions for projects to implement the tasks of the GNTPs, according to the results of which the staff of implementers and the theme of NIOKR are formed within the limits of the allocated funds and estimated time periods for implementing the program. Practical planning, financing and control over the course of work on GNTP is implemented by an operative agency for management of the program, specially created during fulfillment of the program, which is to be accountable to the Program Council.

The intermediate and final results of work on GNTP projects are examined by the appropriate Problem Councils on GNTP, with the involvement of the scientific community, noncommercial expert organizations and separate independent experts for assessing the scientific and technical level of the innovations created, their economic and social effectiveness. On completion of research, the Problem Council and the leader of the program present the customer with a scientific-technical and financial report on the results of fulfillment of the projects and tasks of the GNTP and, especially important, with a forecast of the scientific-technical and socioeconomic consequences of implementing the program.

In order to stimulate work on the priority directions of a GNTP, an extensive system of economic levers, among which the most important are economic standards, including taxation, should be stipulated. In this regard, questions of granting tax privileges to enterprises and organizations, the developments of which are fulfilled at a Union-wide level, relate to the competence of all-Union bodies and are applicable throughout the country's territory; questions of granting tax privileges to enterprises and organizations, whose research is of priority at the republic (regional) level, relates to the competence of the republic and is applicable throughout the republic's territory; questions of granting tax privileges to enterprises and organizations, whose work is of priority at the departmental level, relates to the competence of departments, and is applicable at the sectorial level.

In order to encourage participation in the development and implementation of GNTP by the leading scientists

and specialists of various sectors of the economy, it is necessary to grant extensive rights to the leaders of the program and to the leaders of individual projects of programs in the area of payment for labor.

State scientific and technical programs are not exhausting the whole diversity of ways to organize scientific and technical activity in the country, including in basic science. We must more extensively practice competitive forms for conducting basic research and development work and we must attract for their financing not only the funds of Union or republic budget, but also goal-oriented funds, funds of all-Union organizations, etc.

We should especially consider the problems of development of basic research in the system of the USSR and Union republic Academies of Sciences. At present, the Academies of Sciences of the Union republics are scientific centers in which, as a rule, basic work financed from Union budget funds is concentrated. Along with this, implementing the principles of regional cost-accounting and self-financing enables the Union republics independently to define their own science policy and to implement the reorientation of work by republic academies toward the solution of applied, as well as of design and technological tasks for regional needs, often to the detriment of basic research, which does not yield rapid returns. Here, it is necessary to ensure optimal combination of state-wide and regional interests. For this, allocations from the Union budget for the financing of priority directions, GNTP, and basic and applied research should be used only for the targeted purpose. At the same time, basic and applied development work, most important for the development of the corresponding regions, should additionally be financed at the expense of republic budget funds.

Thus, the new cost-accounting principles, already accepted in the country, form the basis of the new approach to scientific and technical activity: the rejecting of financing of science and engineering from the base principle; conversion from the financing of scientific institutions, departments, laboratories, etc., to financing of programs, problems, and themes; the selection of projects, programs and themes on a competitive basis.

The direct dependency of an enterprise's economic position on the degree (level) of use of the achievements of science should be a way to implement economic relations between science and industry. A differentiated system of goal-oriented tax privileges for state, cooperative and other enterprises is suggested as a basic regulating tool.

In order to radically change the situation with the application of the achievements of scientific and technical progress in enterprises, to seriously influence the level of renovation of production and to increase of the share of production conforming to the world standard, we must form an integral economic mechanism that influences technical progress economically. We suggest building such a mechanism through a system of tax privileges in the form of discounts from deductions to the state budget and to the funds of higher organizations.

It would be expedient for the state to free from taxation that part of the profit (income) of enterprises, cooperatives and other commodity producers, which is directly spent to finance scientific development work. In this regard, scientific research can be performed using an enterprise's own resources, and funds for these purposes can be transferred directly to scientific centers, laboratories, institutes or transferred directly to various goal-oriented funds for scientific and technical development (state centralized funds, republic, regional, departmental funds for social organizations, etc.).

Along with the traditional sources of financing for scientific and technical work, extra-departmental goal-oriented funds for the development of science and engineering should be organized, deductions to which, on voluntary and, mainly, privilege principles, can be made by enterprises of any sector of the economy, regardless of the level of their subordination, by cooperatives, social organizations, and individual citizens. The goals of the creation and procedures for the formation of fund resources and the payment of subsidies should be stipulated in the statutes of each goal-oriented fund being created.

The interrelations of enterprises with state, republic and local budgets and with the higher organization should be structured on the principles of taxation of income (profit). At present, there are in fact individual standards for deductions from enterprise profits. In order to create equal economic conditions for all, the tax rate on income (profit) of an enterprise, starting in the 13th 5-year period, should be standardized for all enterprises. The mechanism for encouraging scientific and technical progress should operate through a developed and flexible system of tax privileges for enterprises, which effectively use the achievements of science and engineering. The differentiation of tax privileges will take into account the nature, amount and scientific and technical level of the innovations introduced. The most complete privileges should be received by enterprises, applying domestic developments which meet the world standard. The nature of privileges will change, if the enterprise uses joint developments of Soviet and foreign scientists or purchases patents, equipment or technology abroad.

Privileged taxation, right up to complete freedom of payments to the budget for the first year of mastering a new product, should be supplemented by measures to strengthen the enterprise investments funds. In particular, deductions of income from the output of new production into the fund for scientific and technical and social development of the enterprise, depending on what kind of development work (domestic or foreign) will be used in its production, should be stipulated.

The system of tax privileges for deductions from enterprise income (profit) into the budget should be supplemented by a system of differentiated privileges according to deductions into the funds of higher organizations.

State scientific and technical policy should support a differentiated, flexible policy in the area of giving credit for expenditures on science, scientific research, and new equipment and technology. There should be differentiated percentage rates for credit according to the priority directions of NTP, depending on the share of participation of domestic and foreign capital in the development work and in other forms.

In order to put the state tax policy into practice in the area of scientific and technical progress, we should organize a special tax service whose functions would be to develop the principles, forms and methods of taxation depending on the degree of use of the achievements of domestic and foreign science in industry: supervision of the activity of enterprises in the area of NTP. It is necessary to stipulate double subordination of the proposed tax service: The part that controls the activity of state, cooperative and other enterprises is subordinate to the financial bodies of the corresponding level, and the part that develops tax policy in the field of NTP—to the USSR GKNT, the GKNT of Union republics, or the Gosplans of Union (autonomous) republics if there is no GKNT in the structure of the Union republic council of ministers.

For the effective functioning of the proposed system of state expert analysis and the special tax service, a qualitatively new level of information support is needed, primarily for scientific and technical information. It is necessary to develop new forms and create new information services, capable of ensuring the compatibility of the existing system of scientific and technical information to the proposed system for management of NTP. Thus, we should form cost-accounting services for NIT in the councils for the planning and coordination of scientific research by the USSR and Union republic Academies of Sciences, with the following functions: the creation and systematic filling of a "scientific potential" information bank; the formation and systematic filling of an "achievements of science and engineering" information bank; the development and filling of a "problems of industry" information bank; the drafting of proposals on cooperation between science and industry at the corresponding level for information support (all-Union, regional, departmental).

Bibliography

1. "*O Korennoy Perestroyke Upravleniya Ekonomikoy*" [On the Radical Restructuring of Economic Management]. A collection of documents. Politizdat, Moscow, 1987.

2. "Deciding Where the Money Goes." NATURE, vol 329 No 10, 1987, p 569.

3. "A New Agenda for Science." AMERICAN SCIENTIST, vol 75 No 4, 1987, pp 447-448.

4. "A New Agenda for Science." AMERICAN SCIENTIST, vol 75 No 3, 1987, pp 335-336.

5. "BMFT: Verschiebungen Der Forderung." NATURWISSENSCHAFTEN, Vol 74 No 8, 1987, p 404.

6. "Uniquely West German Research Grants." J. Boeckh. NATURE, Vol 328 No 7, 1987, pp 305-308.

7. Paton, B.Ye. "On Carrying Out Scientific Tasks and Organization of the UkSSR AN under the New Methods of Financing and Management." VISNYK UkSSR AS, No 4, 1989, pp 3-7.

8. Aleshin, S.M., Krasheninnikov, V.M., Naumov, V.V. "Cost-Accounting and Price-Setting in Science." FINANSIROVANIYE V SSSR, No 11, 1988, pp 44-49.

9. Pochem, "Science in Cost-Accounting and Beyond." NARODNOYE KHOZYAYSTVO BELORUSSII, No 9, 1988, pp 8-9.

10. Golovkov, A., Lomakin, I. "Scientific Cost-Accounting and State Support." NAUKA I OBRAZOVANIYE, No 1, 1989, pp 82-92.

11. Lakhtin, G. "The Development of Cost-Accounting in Science." VOPROSY EKONOMIKI, No 8, 1989, pp 113-121.

12. Semenova, N.N. "*Nauka v Sisteme Obshchestvennogo Proizvodstva*" [Science In the System of Social Production]. Novosibirsk, 1989.

13. Felzenbaum, V. "The Economic Meaning of Scientific and Technical Progress." VOPROSY EKONOMIKI, No 5, 1989, pp 130-141.

Kazakh Academy of Sciences Calls for Halt to Nuclear Weapons Testing

907A0223A Alma-Ata VESTNIK AKADEMII NAUK KAZAKHSKOY SSR in Russian No 3, Mar 90 pp 74-75

[Article: "The Appeal of the Field Session of the General Assembly of the Kazakh SSR Academy of Sciences to the Leaders of the Nuclear Powers"]

[Text] We, the scientists of the Kazakh SSR Academy of Sciences, appeal to the conscience and common sense of politicians, in whose hands are the future and the very existence of mankind, and call upon the leaders of the nuclear powers to achieve the quickest agreement on the complete banning of nuclear weapons testing.

The peoples of earth have been living for 45 years under the fear of the nuclear threat. All these years the specter of a planetary catastrophe has not left the world. Our times are opening a new historical stage, when the hope

for deliverance from the horrors of nuclear war is acquiring real outlines. Mankind, which has grown tired from waiting for the apocalypse, has, at last, finally realized that nuclear weapons are not a means of politics and the waging of war, they threaten inevitable self-destruction. In a possible nuclear war there will be neither winners nor losers. That is why the principle of the incompatibility of civilization and nuclear weapons is being realized more and more. The very fact of their existence should be outlawed.

For us, the residents of Kazakhstan, weapons of mass destruction are not an abstract concept, but a tragic reality. During more than 40 years of nuclear explosions enormous ecological, biological, and moral harm, which is difficult to predict with respect to its consequences, has been done to the republic. The intensive mining and processing of uranium ores, the increase of radioactive wastes, and the continuation of nuclear tests at the range near Semipalatinsk are factors which govern the increase of the tension in the ecological, social, and political situation in Kazakhstan and adjacent republics. The presence of a number of other military ranges in the republic and the radiation effect of nuclear explosions in neighboring China are aggravating even more the disastrous situation.

It has been established that a direct consequence of radiation exposure is the occurrence of specific diseases, the treatment of which for the present is ineffective. It is possible to assert that an ecological disaster, which should not be ignored by the world community, has befallen the republic. Any political considerations lose their meaning in face of these misfortunes.

We are speaking on behalf of all the people, on behalf of the entire population of Kazakhstan and are expressing its alarm and pain. On the land of Semipalatinsk, as in other regions of nuclear tests on earth, a knot, in which the fates of all mankind have been interwoven, has been tied. And in order to undo it those at the helm of state power need not only political breadth, but also real human compassion. We hope that the leaders of the nuclear powers will display these qualities and, realizing the all their responsibility to mankind, will immediately focus attention on the settlement of the question of the complete banning of nuclear tests. Millions and millions of people expect this from them. We are adding our voice to the demands for the immediate and mutual halt of nuclear tests. Expressing support for the noble ideas of the Nevada-Semipalatinsk Movement, as well as the Appeal of the Kazakh SSR Council of Ministers to the USSR Government and the USSR People's Deputies, we demand the immediate halt of nuclear explosions at the range near Semipalatinsk and everywhere. The consolidation of the achieved positive results in the campaign for detente, arms reduction, and international security is a vital task of the present. The banning of nuclear tests in all media will be a logical continuation of the struggle for a new world order and the elimination of the threat of the destruction of the earth's civilization.

Mankind should enter the third millennium free from the nightmare of self-destruction. It is the duty of all honest people of the planet, regardless of nationality and class and social affiliation, to contribute to the achievement of this goal.

We are also addressing to our colleagues—the scientists of the entire world—the call to support our appeal and to devote all efforts and knowledge to the cause of building confidence and mutual understanding among peoples and among the leaders of states. The time has come, when the maximum combining of the efforts of everyone, to whom peace is dear and who is coming out in favor of the further development of disarmament processes and the complete elimination on earth of weapons of mass destruction, is necessary.

Regional Development, Environment Dominate KaSSR AS General Meeting

907A0230A Alma-Ata VESTNIK AKADEMII NAUK KAZAKHSKOY SSR in Russian No 3, Mar 90 pp 8-13

[Speech by President of the Kazakh SSR Academy of Sciences and Academician of the Kazakh SSR Academy of Sciences U. M. Sultangazin at a field session of the General Assembly of the Kazakh SSR Academy of Sciences: "Opening Speech"; date and place not given]

[Text] The field session of the General Assembly of the Republic Academy of Sciences is beginning its work at a very difficult time for the country, on the threshold of the Second Congress of USSR People's Deputies. This is placing great responsibility on us, the participants in the forum, which is devoted to the solution of the problems of the comprehensive development of the West Kazakhstan Region. In 1949 the first field session of the Kazakh SSR Academy of Sciences, at which the problems of the study and efficient use of the natural resources of West Kazakhstan were discussed, was held here on the initiative of the first president of our academy, Academician K.I. Satpayev. The decisions and recommendations of that session played a definite role in the development of the productive forces and the expansion of scientific research, the problems and prospects of the region. And all the same many of these problems have also not lost their topicality today. It must be admitted that the Academy of Sciences during the past decade did not devote proper attention to this region, which is strategically important not only for our republic, but also for the entire country. Moreover, situations of an ecological, social, and interethnic nature are taking a most urgent turn here.

The basic task of this field session of the academy is to discuss jointly with executives of the republic and the oblasts of West Kazakhstan and representatives of union and republic organs of power the most important, key problems of the development of the region, to specify the social order of the national economy for science, and to

draw up a set of specific recommendations and solutions. Here we should proceed from the priority of the interests of man and the support of his normal vital activity.

With the discovery of enormous reserves of petroleum and gas in the Caspian Sea area West Kazakhstan joined the ranks of the leading petroleum- and gas-bearing regions of the country and in the very near future will become the second petroleum-producing region in importance after Western Siberia. In hypothetical petroleum reserves West Kazakhstan is quite comparable to several Arab countries, for example, the United Arab Emirates.

The very large Karachaganak Gas Condensate Field in Ural Oblast is being developed. It is also necessary to mention Aktyubinsk Oblast, which for a long time has been a "monopolist" in the Union with respect to reserves and the extraction of chromite ore. The development of the very rich Chilisay Phosphorite Deposit has been started here. The region is maintaining its positions with respect to resources of potassium salts and borates (Lake Inder). Facilities of the USSR Ministry of Medium Machine Building (the Prikaspiyskiy Mining and Metallurgical Combine at Mangyshlak) hold an important place in the structure of the economy of the region. The resources of raw materials for the production of various construction materials are also very significant. There are also reserves of other minerals. Consequently, West Kazakhstan has all the prerequisites to become in the very near future a major structural unit of the national economy of the republic and the country as a whole, which includes within it extractive, treatment, and processing works.

The development of petroleum and gas resources, especially of such a unique field as the Tengiz Field, requires much forethought, the consideration of the diverse consequences of technical and technological decisions, and the reliability of the economic, ecological, and social preparation of production. The Tengiz Field has still been studied insufficiently well geologically, that is, the geometry of the pools, the location and form of the petroleum-water contact, and a number of other important quantitative and qualitative characteristics have not been determined. The working of the field without a knowledge of its geological nature might ruin such a unique field.

At the Institute of Geological Sciences imeni K.I. Satpayev of the Kazakh SSR Academy of Sciences there are important scientific developments on the formulation of the principles of the scientific forecasting of the productivity of mineral resources and the establishment of the potential resources of hydrocarbons. Our scientists could give a scientifically substantiated geological and economic evaluation of deposits of petroleum, gas, phosphorites, chromites, mineral ores, and nonferrous metals and identify objects of priority development.

The institutes of the Kazakh SSR Academy of Sciences have a number of practically valuable proposals on the increase of the level and degree of complete use of raw materials. In this connection the developments and proposals of the institutes of chemical sciences, organic catalysis and electrochemistry, metallurgy and ore dressing, as well petroleum and natural salts chemistry are of interest. The development of efficient catalytic processes and catalysts for the obtaining of ethylene and propylene and of methods of removing from them impurities, which decrease the quality of the polymer materials being synthesized, as well as new catalysts of the cracking and reforming of heavy petroleum fractions is being carried out. The pilot section of the Balkhashmed Production Association for the production of magnetite anodes for the protection of gas and petroleum pipelines of West Kazakhstan against corrosion has been prepared for start-up. There are also the promising proposals of metallurgists on the extraction of vanadium and nickel from high-viscosity petroleums by means of catalysts based on titanium oxides.

The institutes of the Kazakh SSR Academy of Sciences, first of all of the chemical and metallurgical type, should direct attention to further research, which ensures the increase of the degree and level of the complete use of the mineral raw materials being extracted, particularly hydrocarbon raw materials, phosphorite, chromite, and boron ores, and mineral salts. Here it is necessary to draw particular attention to the necessity of establishing works for the processing locally of the raw materials being extracted with the obtaining here of a final commodity product.

It is extremely important, when beginning the working of petroleum and gas fields, to guarantee the complete safety of the technology at all stages of work and to ensure the reliability of all the technological, engineering, and construction configurations and hookups and a normal ecological situation in the region. In real life we are observing that the plans of the development of territories are drafted without the comprehensive scientifically substantiated forecasting of the ecological condition. Meanwhile the situation, especially in regions of the development of petroleum and gas fields, is extremely unfavorable. In the region the scale of desertification and the damaging of the soil and plant cover is increasing, aridity and the corrosiveness of the air together with the intensification of wind erosion are growing, the anthropogenic contamination of the air, soils, and the entire environment with petroleum and gas products is increasing.

Biologists of the Academy of Sciences (botanists, soil scientists, zoologists, and others) were among the first to sound the alarm with regard to the aggravation of the ecological situation in the Caspian Sea area. If they had listened in time to their conclusions, substantiations, and warnings, perhaps, it would have been possible to avoid many negative consequences. It is well known that the Caspian Depression is a unique faunal natural object (particularly with respect to the number of migratory

birds) and a region of a poorly formed soil and plant cover, which is extremely dynamic and susceptible to rapid degradation. Unfortunately, the warnings of scientists were ignored. Now from the load of heavy equipment and transport thousands of hectares of pasture lands are becoming unserviceable, deep ruts are forming, the soil cover is being disturbed, and dangerous seats of the erosion of soils are appearing. In the region of the development of the Tengiz Field large tracts of natural pastures have been removed from circulation, while in the region of the Karachaganak Field agriculturally fruitful lands have been removed from circulation.

At the same time there is not sufficient budget financing for biological and ecological research, the local soviets do not have the assets for this, while union and republic departments and their enterprises are not displaying interest and are not earmarking the necessary assets for scientific development. Due to this biologists cannot perform effective work on the landscaping of population centers of West Kazakhstan, on the establishment of health protection forest covers, on soil protection measures, and on the protection of the flora and fauna of the region. The systematic comprehensive study of plants and animals, the establishment of the laws of their propagation, and the elaboration of proposals on the efficient use of natural resources and on the observance of ecological conditions are necessary here. The study of the genetic consequences of the radiation and chemical contamination of nature, as well as the search for means of preventing remote genetic damages are assuming particular importance.

It is advisable to introduce in practice the detailed examination of projects of the development of petroleum and gas fields of West Kazakhstan. The development of methods of biotechnological recultivation and the destruction of contaminated territories, soils, and water and the study of the possibilities and directions of the efficient working for the needs of agriculture of saline soils, which are widespread in the region, should be continued.

Biologists must help in the organization of combined expeditions for the examination of zones of the disturbance of the ecological equilibrium and special comprehensive research on ecology with the enlistment of specialists of different types and in the development of models of ecological forecasting. It is naive to assume that scientists of the Kazakh SSR Academy of Sciences are capable of solving all the most difficult problems of West Kazakhstan. For example, the implementation of a system of long-term monitoring (the constant and comprehensive tracking of the state of the environment) will require considerable expenditures, the use of expensive diagnostic equipment, advanced instruments, and various hardware, and trained skilled personnel. The ecological troubles are complicating the already difficult situation with the solution of the social problems of the region. Precisely ecological disturbances and unsatisfactory social conditions (poor housing, a deficient diet, a shortage of drinking water) are seriously worsening the situation with health care in the oblasts of West Kazakhstan. The high infant mortality is causing alarm.

The problem of water supply and the provision of water is acquiring greater and greater importance for West Kazakhstan. The methods of the electrodialytic desalination of natural mineralized waters and the demineralization of industrial sewage, which were developed by the laboratory of ion-exchange resins of the Institute of Chemical Sciences of the Kazakh SSR Academy of Sciences, merit immediate and extensive introduction. If at the Mangyshlak Power Combine imeni 60-letiya SSSR they were to organize the production of desalination plants with a capacity of up to 500 cubic meters a day, they could completely solve the problem of the supply of drinking water to many small population centers, sovkhozes, kolkhozes, and remote pastures. Moreover, hydrogeologists of the academy have studied throughout the territory of West Kazakhstan the formation, location, and use of ground waters, which are suitable for water supply, the irrigation of lands, therapeutic purposes, and heat and power supply and as prospecting criteria of petroleum and gas pools and ore deposits. Promising horizons and basins of fresh artesian and ground waters were identified, new deposits were established, and a large number of regional and local hydrogeological maps, which make it possible to estimate objectively and to use efficiently the water resources of the depths, were compiled.

It is safe to assert that scientists will be able to help with their developments to solve fundamentally for West Kazakhstan the problem of water supply and the provision of water (at least drinking water). It will be necessary to integrate the work of hydrogeologists, biologists, and chemists on the development of more advanced productive and economical methods of the desalination of mineralized waters and the treatment of sewage. Here one should set more categorically for enterprises the requirement of the conversion to closed (circulating) water supply.

The fact that in connection with the intensive development of deposits of the region and the large-scale launching of construction, road, reclamation, and other work the real threat of the complete destruction and disturbance of the ecology of unique monuments of antiquity has arisen, is arousing the anxiety of historians and figures of culture and the discontent of the local population. Owing to its geographic location the Eastern Caspian Sea region since extreme antiquity was a zone of intensive ethnocultural contacts and is one of the most interesting regions of the Eurasian steppe in the cultural historical respect. For example, the complex of sanctuaries of Sarmatian times in the small town of Boyt in Mangystauskiy Rayon is a monument of not only union, but also world importance. There are monuments of the history of culture of later periods, which are sacred places for all the Kazakh people, for example, the burial site of poet and batyr Makhambet Utemisov in Inderskiy Rayon.

The thoughtless, disrespectful attitude toward historical monuments and their destruction are insulting for the indigenous population and incompatible with the principles and morals of civilized society. This is also having a negative effect on interethnic relations.

The extremely aggravated economic, personnel, social, and interethnic problems of the region require immediate study and the formulation of specific scientific recommendations on their solution and consideration. This is posing great tasks for economists, sociologists, philosophers, lawyers, historians, and other social scientists of the academy. The social sciences should have a positive influence on the formation of social consciousness. It is expedient to organize the comprehensive study and the implementation of work on the restoration, preservation, and protection of monuments of history and archeology. It is necessary to prevent quickly their barbaric destruction in the zone of the development of petroleum and gas fields and the performance of large-scale construction, reclamation, road, and other operations.

Of course, science itself also needs to regroup forces, having oriented them toward the study of the most urgent issues, and to overcome the "remainder principle" with respect to ecological and social research. Precisely with allowance made for this centers for the study of ecological, social, national, and interethnic problems were organized under several academic institutes. And there is every reason to expect that the activity of the centers (including with respect to West Kazakhstan) will yield its positive results.

Under present conditions the greatest success is being achieved by the automation of production processes and the extensive introduction of information science in the daily activity of man in various spheres of the economy of the region. Scientists of the Physical and Mathematical Sciences Department of the Kazakh SSR Academy of Sciences should provide effective assistance in these matters. The efficient implementation of information science and automation will also have a substantial influence on the favorable settlement of personnel questions and the rejection of special effort methods of work.

The use of the possibilities connected with the conversion of enterprises of the defense sectors of industry merits serious attention. The implementation of developments of academic institutes is possible at these enterprises. Moreover, one should not confine oneself to partial solutions—programs of the large-scale cooperation of the sectors being restructured with academic science of Kazakhstan are needed.

The need exists to raise the question of the establishment in West Kazakhstan with the participation of scientific institutions of the Kazakh SSR Academy of Sciences of interbranch scientific technical complexes or scientific technical complexes. This is important not only for speeding up the use of the available scientific reserve, but also for introducing elements of competition for institutes of our academy in the introduction of their developments. The formation of engineering technical centers and the development on the basis of proposed joint ventures of scientific production cooperation with foreign partners are also advisable. Such cooperation can promote and stimulate the establishment of comparatively small, technologically equipped, automated, efficiently operating enterprises for the output of science-intensive products. Finally, it is necessary to get down to the actual settlement of the question of the organization of the West Kazakhstan Scientific Center of the Kazakh SSR Academy of Sciences with its orientation toward the scientific support of the development of the petroleum and gas chemistry complex and the metallurgical complex and toward the study of the ecological and social problems of the region. Here one should simultaneously think over the questions of the attachment here of scientific personnel and the development of the base of sociocultural and personal service and housing.

Thus, the Kazakh SSR Academy of Sciences should substantially increase its role in the settlement of the current questions and the accomplishment of the long-range tasks of the development and location of the productive forces of West Kazakhstan, which are based on the possibility of scientific and technical progress. Systems research on the problems of the comprehensive development of natural resources, energy and resource conservation, ecology, and the balanced development of the economy of the region should serve as the basis of the formulation and implementation here of a unified scientific, technical, and social policy.

The performance of such work is advisable within the Comprehensive Program of the Development of West Kazakhstan. The leading role in the formulation of this program should belong to the Kazakh SSR Academy of Sciences, which owing to its status will be able to overcome departmental narrow-mindedness and to solve problems from the standpoint of the priority of national economic interests.

The establishment of the comprehensive program is also necessary because the Academy of Sciences in many directions does not have an adequate potential for the leading scientific support of the development of West Kazakhstan; therefore, the Eastern Department of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin and VUZ [higher educational institution] and sectorial science should be enlisted in the fulfillment of the program on the basis of the extensive and close integration of their activity with the Kazakh SSR Academy of Sciences.

The comprehensive program should be considered and approved by the republic Council of Ministers and the USSR State Committee for Science and Technology with the allocation of the necessary amounts of additional financing of the work (perhaps, by the establishment of a special centralized fund of the Kazakh SSR Council of

Ministers by means of deductions from ministries and departments, enterprises of which operate on the territory of West Kazakhstan).

As was noted recently during the discussion in the Politburo of the CPSU Central Committee of the Concept of the Development of the Siberian Department of the USSR Academy of Sciences, in spite of the complications and the economic difficulties, which the country is experiencing, it is necessary to find means for the support and the increase of the budget financing of basic research—for the sources of technical and technological solutions, which revolutionize social production, lie precisely in it. Permit me to express confidence that the Kazakhstan CP Central Committee and the republic government will also treat our problems with understanding and will support our suggestions.

Report on Kirghiz Academy of Sciences 1990 Annual Meeting

907A0181A Frunze SOVETSKAYA KIRGIZIYA in Russian 7 Mar 90 p 3

[Article by KIRTAG commentator Yu. Blyum: "What Is Science Giving Perestroyka?"]

[Text] Scientists attempted to give an answer to this question at the annual general assembly of the Kirghiz SSR Academy of Sciences, which was held on 28 February. The assembly, to which representatives of sectorial and VUZ [higher educational institution] science were also invited, took place under the banner of the constructive search for the solution of urgent problems.

In the opening speech President of the Kirghiz SSR Academy of Sciences Academician A.A. Aliyev told how the concept of the development of the Kirghiz SSR Academy of Sciences under the conditions of perestroyka is being implemented. Having emphasized the importance of the leading development of basic research for scientific and technical progress, he acknowledged that very modest results had been achieved precisely in this sphere. Science of Kirghizstan, which has gained leading positions in the country in a number of scientific directions, which were founded by Academicians P.I. Chalov, I.T. Aytmatov, O.D. Alimov, V.M. Popov and Corresponding Member U.A. Asanaliyev, Academician M.M. Mirrakhimov, and others, in the 1980's did not make progress in the development of its previous achievements. The poor material and technical supply of laboratories, the shortcomings in the training of reliable scientific successors, and the conservatism of traditional academic structures had an effect here.

The steps on democratization and the expansion of glasnost, which the presidium of the academy is taking, are helping to overcome these stagnation phenomena. The decentralization of the management of science is taking place, the rights of departments, institutes, and laboratories are being broadened. The new organizational structure of the academy made it possible to reduce by 40 percent the size of the management apparatus. The Impuls Scientific Engineering Center and the department of biopharmacology were established and acquired legal independence, the Issyk-Kul Scientific Center for the formulation of effective steps on the improvement of the ecological situation in the basin of Lake Issyk-Kul and the Southern Kirghiz Educational Scientific Center for the scientific support of the national economic complex of Osh Oblast were organized.

Many scientific collectives are continuing to work actively on the introduction of their developments in practice. As in past years, the largest economic impact was obtained from the assimilation in agricultural production of preparations for the diagnosis, preventive treatment, and treatment of sheep and large-horned cattle, which were developed by scientists of the Institute of Biochemistry and Physiology. Maps of the seismic zoning in the cities of Frunze, Osh, Dzhalal-Abad, Kyzyl-Kiya, and Naryn were introduced. The developments of the Institute of Physics, the Institute of Automation, and the Institute of Physics and Mechanics of Rocks yielded an appreciable economic return.

The seven engineering centers, interbranch scientific technical complexes, and scientific production associations made a substantial contribution to the integration of science and production. However, a number of ministries and departments to this day have not gotten rid of the disdainful attitude toward science. The republic State Agroindustrial Committee is skimping on the allocation of production areas to engineering centers, the Ministry of the Construction Materials Industry also cannot find common ground with scientists. Sooner or later such an attitude toward science will push enterprises and even entire sectors to the side of scientific and technical progress.

Academician of the Kirghiz SSR Academy of Sciences T.K. Koychuyev, academician secretary of the Social Sciences Department, in his report told about the accomplishment of the key tasks of perestroyka in economic and philosophical science, jurisprudence, history, and linguistics.

Academician of the Kirghiz SSR Academy of Sciences I.T. Aytmatov, academician secretary of the Physical, Technical, and Mathematical Sciences Department, in his report covered the results of the work of physicists, mathematicians, and specialists in the field of automation, mining mechanics, the physics and mechanics of rocks, geology, and seismology.

The report of Academician of the Kirghiz SSR Academy of Sciences and the All-Union Academy of Agricultural Sciences imeni V.I. Lenin A.M. Mamytov, department academician secretary, was devoted to the problems of the development of the biological, chemical, and technological sciences.

Academician V.P. Zhivoglyadov, chief scientific secretary of the Kirghiz SSR Academy of Sciences, analyzed the organizational activity of the presidium of the academy.

The academicians and corresponding members of the Kirghiz SSR Academy of Sciences, the associates of scientific subdivisions, and the executives of sectorial institutes and higher educational institutions, who spoke during the discussion, evaluated the work of the leadership of the academy and expressed a number of critical remarks and constructive suggestions on the improvement of the forms and methods of the organization of scientific research and on interaction with educational centers and production enterprises.

In his statement Chairman of the Kirghiz SSR Council of Ministers A. Dzhumagulov stressed the exceptionally great importance of the rapid development of scientific research and the introduction of the achievements of scientific and technical progress in all the sectors of the national economy.

The scientific organizations of the Academy of Sciences, he said, are making a definite contribution to the development of the economy and culture of the republic. In recent years several steps have been taken on the restructuring of the activity of institutes, the strengthening of the ties of science and production, and the improvement of the material and technical base. At the same time the development of science as a whole and the introduction of its achievements in production have thus far been proceeding very slowly. The available potential of the Academy of Sciences is having an extremely weak influence on the development of the national economy. We are developing poorly pilot experimental works, the structure of the subdivisions of the academy is being improved slowly. Forces and resources are being poorly concentrated on the solution of specific problems, priority importance is not being attached to the implementation of comprehensive goal programs, although they have been formulated rather well. The material and technical base of the majority of scientific institutes does not make it possible to conduct research at a sufficiently high level.

The coordination of scientific research work is practically not being carried out, the republic government is forced to solve a number of vitally important problems for the republic, without having the necessary scientific substantiation, since until very recently basic research on them was not conducted. As an example it is possible to name the problems of economic reform, the improvement of the system of management at the republic and regional level, self-financing, research in the area of the history of Kirghizia, national-Russian bilingualism, and so on.

The changeover of institutes to the new methods of financing and management is in many respects of a formal nature. The economic methods of the management of science are being poorly used. Advanced forms of scientific activity and flexible organizational structures—temporary creative collectives, problem laboratories, leasing groups, and others—are being used extremely inadequately. For the present there is only talk about real competitive financing. The conducting of alternative research, if only as an experiment, is not being practiced.

This testifies, A. Dzhumagulov noted, that the presidium of the republic Academy of Sciences and the executives of departments and institutes are continuing to work in the traditional style, by habitual methods, and in organizational structures which became fixed over many years. The recently established scientific centers are also being formed in the traditional way, the formation of the Issyk-Kul Scientific Center was seriously dragged out. The conducting of research in accordance with special-purpose projects, which are financed on a contractual and competitive basis, should be used more extensively.

The priority directions of the development of the national economy of the republic and the problems of the development of the social sphere, the agroindustrial complex, and the production of goods for the people are still poorly reflected in the themes of research of scientific institutions. Migration processes and the questions of the training of national personnel for the national economy have been poorly studied. There are no practical proposals on the development of mountainous regions—but the situation is difficult, there is much talk about it, but there are no specific proposals. And what about the problems of the efficiency, competitive ability, and development of the traditional sectors of industry—machine building, the mining sector, power engineering? It is difficult to overestimate their role in the formation of the economy and the social sphere.

And do the questions of the training of national personnel and the education of a cultured, comprehensively developed person in the family, at school, at the higher educational institution, and in the work collective really not merit attention? We have, unfortunately, very big flaws in the cultivation of a healthy way of life.

As before, for scientific organizations it is most profitable to participate in the implementation of union scientific and technical programs, which makes it possible to ensure stable annual financing (often from the republic budget) and relieves them of responsible for the end result, inasmuch as often an intermediate stage of the program is performed and it concludes mainly with the drawing up of the corresponding report. In contrast to the other republic academies ours is almost not performing experimental design work.

The further democratization of scientific life, the elimination of administration by mere decree and monopolism in science, and the broadening of the rights and responsibility of research collectives leave much to be desired.

At present the list of scientific and technical programs for the start of the 13th Five-Year Plan is being examined in the republic government. A decision has been made on the establishment, starting in 1991, of a republic special-purpose fund for the financing of priority scientific and technical research that is of particularly great importance for the development of the economy and culture of the republic. Proposals on the restructuring of the management of scientific and technical progress are being prepared with the participation of scientists.

A. Dzhumagulov expressed confidence that scientists will make a worthy contribution to the further development of the economy and culture of the republic.

Latvian Council of Ministers Announces Awards for S&T

907A0222A Riga SOVETSKAYA LATVIYA in Russian 12 Apr 90 p 3

[Decree of the Latvian SSR Council of Ministers "On the Awarding of the 1990 Prizes of the Latvian SSR Council of Ministers" of 9 April 1990]

[Text] The Latvian SSR Council of Ministers resolves:

To award the 1990 prizes of the Latvian SSR Council of Ministers for the development and assimilation in production of highly efficient equipment, advanced technology, and new materials to the collectives of authors:

1. Doctor of Chemical Sciences Professor Gunar Yanovich Dubur, deputy director of the Institute of Organic Synthesis of the Latvian Academy of Sciences, associates of the same institute: Candidate of Chemical Sciences Valeriya Vasilyevna Kastron, scientific associate, Candidate of Medical Sciences Rasma Oskarovna Vitoline, senior scientific associate, Doctor of Medical Sciences Agris Adolfovich Kimenis, lead scientific associate, Candidate of Biological Sciences Inte Oskarovna Tersone, senior scientific associate, Candidate of Biological Sciences Viktor Yakovlevich Parinov, senior scientific associate; Khelmut Karlovich Priyeda and Viya-Mara Yanovna Galvine, chiefs of shops of the Experimental Plant of the Institute of Organic Synthesis of the Latvian Academy of Sciences, associates of the same plant: Oleg Nikolayevich Akifyev, chief of a laboratory, Viyestur Viktorovich Teraud, deputy director; Doctor of Medical Sciences Professor Nikolay Andreyevich Andreyev, director of the Scientific Research Institute of Cardiology of the Latvian SSR Ministry of Health, Candidate of Medical Sciences Anton Petrovich Skutelis, senior scientific associate of the same institute; Candidate of Chemical Sciences Yuriy Arkadyevich Fialkov, lead scientific associate of the Institute of Organic Chemistry of the Ukrainian SSR Academy of Sciences, Candidate of Chemical Sciences Svetlana Vladimirovna Shelyazhenko, junior scientific associate of the same institute; Doctor of Medical Sciences Vladimir Grigoryevich Kukes, head of a chair of the 1st Moscow Medical Institute—for the work "The Development of the Technology of the Antihypertensive Preparation Foridon, the Development and Introduction of Its Peroral Form" in the amount of 15,000 rubles.

2. Doctor of Technical Sciences Professor Imant Karlovich Iyevin, general director of the Silava Scientific Production Association of the Latviyas mezhs Latvian Republic Forestry Production Association, associates of the same association: Vitaut Pranovich Bartushauskas, deputy director of the Kalsnava Forest Experimental Station of the Silava Scientific Production Association, Candidate of Technical Sciences Yuris Yulyevich Kevinsh, senior scientific associate of the Latvian Scientific Research Institute of Forestry Problems of the Silava Scientific Production Association, Ignat Yuryevich Grugulis, chief engineer of the Yurmala Timber Management, Khariys Yakubovich Treymanis, operator of the Yurmala Timber Management; Candidate of Technical Sciences Gunards Voldemarovich Berzinsh, foreman of the Tsesis Interfarm Timber Combine of the Tsesis Agroindustrial Association; Roman Fridrikhovich Kumerov, general director of the Gauya Latvian Scientific Production Association, Candidate of Technical Sciences Aldis Pavlovich Ozolin, chief project designer of the same association; Yuriy Yazepovich Chakstin, director of the Bolderayskiy Combine of the Complete Processing of Timber, associates of the same combine: Sergey Alekseyevich Samoylov, chief process engineering, Yuriy Ivanovich Zhagars, chief of a shop; Candidate of Economic Sciences Yan Aleksandrovich Yanov, deputy director of the Institute of Economics of the Latvian Academy of Sciences—for the work "The Technology and Equipment for the Efficient Use of the Biomass of Wood in Tile Production" in the amount of 12,000 rubles.

3. Doctor of Technical Sciences Narimants Karlovich Saleniyeks, professor of the Riga Technical University, associates of the same university: Vilnis Valdovich Akmens, graduate student, Normunds Yanovich Eglitis, engineer, Ivars Igorevich Indulens, senior scientific associate, Candidate of Technical Sciences Armins Augustovich Petersons, lead scientific associate, Zintis Karlovich Plyaveniyeks, scientific associate—for the work "The Computer Technology and Equipment for the Assurance of the Quality of Production on Automatic Rotary Conveyor Lines, Which Ensures the Increase of Production Efficiency" in the amount of 6,000 rubles.

[Signed] Chairman of the Latvian SSR Council of Ministers V. Bresis

Administrator of Affairs of the Latvian SSR Council of Ministers K. Litsis

Riga, 9 April 1990.

Extensive Changes in Staff of MSSR Academy of Sciences Presidium

907A0245A Kishinev SOVETSKAYA MOLDAVIYA in Russian 18 Apr 90 p 2

[Article by an ATEM correspondent: "The New Composition of the Presidium of the Moldavian SSR Academy of Sciences"]

[Text] More than half of the Presidium of the Moldavian SSR Academy of Sciences as compared with the previous composition was replaced. For the first time all the members of the academy, both academicians and corresponding members, participated in the election of its members.

Linguist Kh.G. Korbu, botanist M.F. Lupashku, and physicist S.I. Radautsan, who are prominent Moldavian scientists and public figures and academicians of the Moldavian SSR Academy of Sciences, were elected vice presidents. Corresponding Member of the Moldavian SSR Academy of Sciences G.V. Shishkanu was elected chief scientific secretary of the presidium of the academy.

Academicians D.V. Gritsu and A.D. Ursu were approved as academician secretaries of the Physical, Technical, and Mathematical Sciences Department and the Biological and Chemical Sciences Department. Before the election of the new academy members Academician Kh.G. Korbu was charged to perform the duties of academician secretary of the Social Sciences Department.

There were elected as members of the new presidium of the academy: from the Physical, Technical, and Mathematical Sciences Department—Academicians of the Moldavian SSR Academy of Sciences T.I. Malinovskiy and V.A. Moskalenko; from the Biological and Chemical Sciences Department—Academician of the Moldavian SSR Academy of Sciences V.Kh. Anestiadi; from the Social Sciences Department—Corresponding Member of the Moldavian SSR Academy of Sciences A.I. Timush.

Report on UzSSR Academy of Sciences 1990 Annual Meeting

907A0220A Tashkent PRAVDA VOSTOKA in Russian 10 Apr 90 p 3

[Article (UZTAG): "Academic Science: Reserves and Prospects"; first paragraph is PRAVDA VOSTOKA introduction]

[Text] As was reported, the annual general assembly of the Uzbek SSR Academy of Sciences was held on 6 April. The tasks of scientific collectives and scientists of the republic in the solution of the urgent problems, which follow from the requirements of the day and the restructuring of economic and social life, were discussed.

In the report of President of the Uzbek SSR Academy of Sciences M.S. Salakhitdinov and in the statements it was emphasized that today large-scale and complex tasks have been set for scientists of the republic. They require that science become an integral component of restructuring processes and all the changes occurring in Uzbekistan—in economic relations and social and spiritual life.

The past year was a stage of the search for new, more intensive forms of the organization of science, the extension of democratic principles in the management of scientific institutions, and the increase of the responsibility of scientists for the end results of work. Research was completed on 537 budget-carried themes, among which are 315 basic jobs, 111 exploratory jobs, and the same number of applied jobs. Of them 108 themes were included in all-union programs and 109 were included in republic programs. In all 12 themes were performed in accordance with the comprehensive program of scientific and technical progress of the CEMA member countries.

Last year a number of important scientific results—both in the area of basic research and in applied operations—were obtained in the republic. Including in the field of high energy physics, mathematics, electronics, thermal physics, chemistry and the chemistry of plant substances, microbiology, geology and geophysics, archeology, and other directions. Much attention was devoted to the increase of the practical significance of scientific research. The results of 106 developments with an annual economic impact of nearly 12 million rubles were introduced in the national economy.

Advanced forms of the integration of science and production were developed. On the basis of scientific subdivisions three interbranch scientific production centers and a large number of sectorial laboratories operated and temporary scientific production collectives were established.

At the same time the assembly participants noted that the effectiveness of scientific developments does not satisfy today's requirements. Resources are being released slowly from traditional scientific directions for the development of research on new, promising themes. Moreover, the analysis of the proposals of scientific research institutions for the plans for the 13th Five-Year Plan shows that thus far substantial changes in the structure of scientific research in the direction of the development of priority directions have not occurred.

The need to launch at the republic Academy of Sciences an intensive search for new, more efficient methods of management and advanced forms of the organization of science, which are aimed at the broadening of democratization, the elimination of the excessive centralization of the management of scientific research institutions, and the increase of the responsibility of scientific collectives for the end result, was spoken about at the assembly. It was emphasized that starting in 1991 the republic will change over to the new principles of financing. Scientific themes will be financed on the basis of competitions by central departments, from which up

to now assets have been received by scientific institutions of the republic. In this situation scientific research collectives will have to prove the right to one development or another and to confirm the competitive ability and economic justifiability of the themes being elaborated.

Last year of the 215 themes, which were submitted for competition to the departments of the USSR Academy of Sciences, only 119 were accepted. But at the republic academy there are reserves for the significant updating of research themes and the search for new priority directions.

The assembly participants noted that the activity of institutions of science in the republic has not yet become a real motive force of scientific and technical progress. So that the new methods of the management of science would begin to work to full effect and the level and pace of scientific and technical progress would actually increase, it is necessary to develop an effective economic mechanism of contact between science and production. Here it is necessary to strengthen the organizational legal relations among the participants in the "Research—Production—Consumption" cycle and to improve the system of material interest of each of them.

For the increase of the effectiveness of scientific research it is important to ensure the actual participation of academic science in the management of the entire cycle of the development and introduction of highly efficient equipment. Hence, the strengthening of the material, technical, and experimental base of scientific institutions is necessary. Much is already being done in this direction. For example, the question of the construction of a pilot plant of scientific instrument making in Tashkent Oblast has been settled. With its placement into operation it will be possible to produce instruments not only for the republic, but also for the entire Central Asian Region.

The need to mobilize the efforts of scientific collectives for the solution of the key problems of the socioeconomic development of the republic: The cotton complex, ecology, health care, and resource conservation, was stressed at the assembly.

The times urgently require, the speakers noted, the increase of the efficiency of the research activity of economists, philosophers, historians, linguists, and literary scholars. The in-depth scientific study of the problems of interethnic relations is necessary.

The improvement of the training of young scientists, it was said at the assembly, and the use for this of the extensive possibilities of instruction at major scientific centers of the country and the world should become an important factor of the intensive development of science.

Report on UkSSR Academy of Sciences 1990 Annual Meeting

907A0221A Kiev PRAVDA UKRAINY in Russian 29 Mar 90 p 3

[Article (RATAU): "The General Assemblies of the Departments of the the Ukrainian SSR Academy of Sciences"]

[Text] The general assemblies of the departments of the Ukrainian SSR Academy of Sciences were held in Kiev on 27-28 March. At them the results of the scientific activity of the institutions of the republic Academy of Sciences during the past year were examined and the tasks for 1990 and the concept of the development of the Ukrainian SSR Academy of Sciences were discussed.

In the reports of the academician secretaries of the departments and in the statements it was noted that the collectives of academic institutions had concentrated their efforts on the intensification of perestroyka, the further development of basic research, the determination of the priorities of scientific research, and the broadening of the rights and independence of institutes.

During the past year important basic research results were obtained and four scientific discoveries were made in the field of polymer chemistry, colloid chemistry, molecular biology, and cell engineering. Particular attention was devoted to the solution of nature conservation problems, to the analysis and the development of means of overcoming the adverse ecological circumstances, which have formed in the republic, and to the elimination of the consequences of the accident at the Chernobyl Nuclear Power Plant.

In 1989, 2,230 works were introduced in the national economy, 2,908 author's certificates for inventions were received, and 42 license agreements were signed, 29 of them were concluded through direct contacts between institutions of the Ukrainian SSR Academy of Sciences and foreign partners.

At the same time the participants in the assemblies noted that in recent times the working conditions of scientific institutions have deteriorated, many questions of the organization of research remain unresolved, the prestige and social significance of the work of the scientist and his social protection are decreasing. As a result the influx of young forces into science has decreased sharply.

While discussing the concept of the development of the Ukrainian SSR Academy of Sciences, scientists drew attention to the fact that today the process of democratization is being poorly developed at its institutions, while in the management of science there are still quite a number of elements of administration by mere decree and bureaucracy. And the methods of management, which are being used here, are more suited for ordinary sectorial structures than for scientific institutions. Life itself, the speakers stressed, has faced the academy with the need to restructure many aspects of its activity. It is

necessary to increase the role of the scientist and to make precisely him, not the manager and the administrator from science, one of the central figures of its restructuring.

In the reports and statements much attention was devoted to questions of environmental protection. At the assemblies it was stressed: The time has come to reconsider the treatment of ecology as something secondary.

At the assembly of the General Biology Department the proposal was made to establish an institute of ecology. In order to organize it by the traditional method a number of difficult problems would have to be solved. These are facilities, financing, the alienation of divisions and laboratories from other departments.... "I am not certain that one should take precisely this path," Yu.Yu. Gleba, academician secretary of the department, noted. "We have now introduced parallel competitive financing, in case of which the role of the institute as an organizational unit is becoming more blurred, while scientific subdivisions, on the contrary, owing to direct financing are becoming independent to a significant degree. Therefore, it is now possible to ecologize any institute, having allotted it considerable assets precisely for ecological themes."

The present sociopolitical situation in the country determines the special role of social scientists in the solution of a number of urgent problems. They were discussed at the assembly of the departments of the Social Sciences Section. The responsibility of scientists in the forecasting of the social processes that are occurring in the republic is increasing. However, today they are greatly indebted to society. And first of all they have much more to do in the study of the interethnic interrelations of the peoples of our country.

The sphere of scientific research in the area of the spiritual culture of the Ukraine requires basic changes, it was stressed at the assembly of the Literature, Language, and Art Department. The lag of the humanities behind the requirements of the times is due to the former approach to the subject of research, which was based on dogmatic, stereotypic principles and the remainder principle of financing. Therefore, the return of prestige to integrated studies of spiritual culture at an advanced level with the use of computer hardware is today an urgent and pressing task.

Responsible officials of the Ukrainian CP Central Committee and the Ukrainian SSR Council of Ministers, executives of a number of republic ministries and departments, institutions and enterprises, sectorial scientific research institutes and higher educational institutions, and representatives of creative unions and public organizations participated in the work of the assemblies.

Improving Ukrainian Computer Technology, Production

907A0219A Kiev ZNANYA TA PRATSYA in Ukrainian No 3, Mar 90 pp 4-6

[Article: "Where Is My Personal Computer?: Why Ukrainian Industry Can't Manage To Mass Produce PCs" by Yuriy Khlystun]
[Text]

"NeXT", or Continuation of One Youthful Initiative

This premiere took place a year and a half ago in the largest auditorium of San Francisco's "Davis Symphony Hall". Nearly 3000 leaders of companies, engineers, scientists, university professors, and journalists were present—the technocratic elite of the U.S.. It was organized by the idol of youth, the live embodiment of "success American style", extravagant Steven Jobs. For those who are at all interested in informatics, this name is familiar—the personal computers "Apple" and "Macintosh" made Jobs, their creator, famous.

Since 1976, 21 year old Steven Jobs and Hewlett-Packard's 25 year old Steve Vozniak, have joined forces to amaze the world with their intellectual "games." These leading lights of the newly created "Apple Computers" were unusually energetic: The ambitious young men thought their slogans, "a computer for everyone", and "work through play", when realized, could change the world beyond recognition. This was probably the main reason why John Scully, the 44 year old vice president of Pepsico, became involved in solving the crisis in Apple Computer which was caused by competition with IBM. Jobs attracted the famous businessman, Scully, with the prospect of becoming a reshaper of the world, and convinced him to shed his blessings on the market. Even though eventually they went their separate ways, both men are still working toward this goal.

This premiere resulted from the fresh start Jobs made when he left his company to establish a new one, which he felt would suit his plans better. The computer "NeXT" is proof that the "Macintosh" tradition is alive, and that ambitious ideas continue to inspire the designer. "NeXT" is known for thorough construction and well researched design. For the first time, for mass produced PCs, storage was built into external memory on an optical disk with the incredible capacity of 256 Mbytes, which will become 3 Gbytes in the future.

But the numerous technical highlights of "NeXT" do not obscure the main fact: The computer contains a unique artificial intelligence which enables people to work on it even if they don't know Basic, Pascal or C. What this means for non-programmers is evident.

Thirty-five year old Jobs has been one of the key figures in world informatics for 15 years. Of necessity, we want to ask, "Where are our Ukrainian young, venturesome innovators?" It is hard not mention the general lag in the informatics industry in our country, one of the main

causes of which is the ill conceived decision to copy Western models. This decision caused many original Ukrainian ideas in cybernetics to falter. When we consider the development of personal computers, "MIR", built on the concept of analytical calculations of academician V.M. Glushkov, is especially noteworthy. "MIR" stands for "Machine for Engineering Calculations", which differentiates the principles it works on from those of the ordinary computer: Results in this model were not calculated, they were found by means of analytical transformations. In other words, "MIR" operated not with digits but with formulas, which turned it into a personal computer for mathematicians, theoretical physicists and engineers.

In the West, personal computers appeared in the seventies, when an explosion in availability of microprocessors made it possible to reduce large computers to table models. Then followed the technology of personal computation, which transformed the owner of a PC into a likeness of an independent prospector in the Klondike of information. In the meanwhile the genie of artificial intelligence within the matte black frame of "NeXT" introduced human intellect to a speed of information interaction which can only be compared to cosmic.

Now we are left to conjecture about how the ideas of "MIR", had they been carried through on time, would have influenced the development of informatics in the world. Experience shows that those who copy end up in a perpetual catch-up mode; they lag behind the leaders, the gap constantly widens.

The capabilities for producing everything - microelectronics to peripheral equipment - have long been available in Kiev. But some industries were under the Ministry of Electronics, others under the Ministry of Radio Industry, and still others under the Ministry of Communications. Researchers and designers worked in the Academy of Sciences of the Ukrainian SSR, in the MINVuZ, or in other ministries. Protection of turf! Precisely because of this divisiveness, plans of the mid-80s which had been made by an ad hoc collective of creative young people organized by the Kiev Council of young scientists and specialists were dashed. The group included experts from the V.M. Glushkov Institute of Cybernetics of the AS UkSSR, the Kiev Polytechnic Institute, the factory "Mayak", the Korol'ov Production Association and the NPO "Krystal" (today known as NPO "Microprocessor"). The idea was not bad. The "Neutron" was developed by the Institute of Cybernetics and produced by the Korol'ov Association in a limited edition as a special order at a cost too high for mass production. Using the model as a basis, a popular version was to be produced.

I don't know for sure how events developed in this ad hoc collective, but here is what we have today. In three different concerns we find three computers in various stages of completion: the PC of the "Neutron" family (a Korol'ov product), "Electronika" MC1421 (from NPO "Microprocessor"), and the scientific-game model "Poshuk"(an "Elektronmash" product). What are the chances of seeing them on a store shelf? For the time being, insignificant. And the price? The "Neutron" will cost around ten thousand roubles.

What progress has there been outside Kiev? Development and production of the PC PK-01 "L'viv", intended for use in informatics and calculation technology, has been completed.

What does the future hold after this historical account? The hope that schools, especially in the villages, will finally supply their graduates with computers so as to improve their chances for competing against graduates from large cities.

Dangerous Illusions Are Lost

While our industry only promises to fill the shelves with inexpensive and dependable computers, this scarce product is being imported by foreign trade organizations, businesses with hard currency, joint ventures, and cooperatives which manage to get currency by selling goods on the Western market. According to estimates, the domestic market for personal computers is estimated to be 500 million dollars. That is, that many dollars' worth of computer technology is reaching us. This includes computers made available through joint ventures, which until recently, when imported parts began to be assembled into PCs here, were in a precarious state of health. Joint means the use of "their" computers and "our" software. Automated work stations, systems, instrument groupings, etc., are available. Only entire systems can be bought, which, of course, is much more expensive than just the computer. What if an organization needs only a computer? Hard currency is needed. Joint ventures explain: "Eventually, we will sell them for roubles - when roubles become convertible." But the buyer who can spare tens of thousands of roubles and wants a computer today, can get it by purchasing an entire system.

Cooperatives, which have become one more intermediary between the product and the customer, are active partners with joint ventures. The more intermediaries, the higher the price. So, at the end of last year, there was a free market price of 75,000 to 80,000 roubles for one IBM PC/AT, which is worth five to eight thousand dollars (depending on the configuration). Customs added oil to the fire by requiring private individuals who brought computers into the country to pay $5,000 in duty. This was reflected immediately in black market prices. Customs figures for the first half of last year indicate that over 20,000 PCs were brought into the USSR in this manner. How many of them fell into the hands of sharks for resale is hard to say, but the fact that an owner of such a PC is not permitted to sell it to a government organization or business forces him to deal with a cooperative rather than a legitimate store. However, through the cooperatives, he can propose to sell it as part of an entire system to a government organization. What kind of system it is depends on the specific case.

Sometimes it is what is really needed, and other times, it is just whatever is enough to legitimize the resale.

Law enforcement agencies attest to the fact that computers have become the cause of increased criminal activity. For this reason, computer owners are advised to install grates on their windows, metal doors, and to get a bulldog! The hunt for their valuable product is in full swing.

Understandably, import is no solution for our country, which very much needs computer technology (25 to 30 million PCs). Illusions that it was possible have begun to dispel; they are no longer so dangerous, although "peddlers" who bring PCs into the USSR from the "West" want to continue doing so for as long as possible. Some of the reactions that might be tried in this situations are: quick production of our own PCs based on Western licenses; assembly of components bought from foreign countries; shared production with foreign countries. Academician Ye.P. Velikhov, for example, feels that hard currency could be earned through an intelligent swap. If our industry could quickly gear up to produce high quality wide body airliners (which is what our powerful defense branches should be producing instead of clothes washers, threshers, and cheese makers), then at today's high prices the sale of five air buses would provide enough hard currency to pay for computers for a one year informatics program.

"PERCOM" - Chance for a Breakthrough

But the goal is still to satisfy our need for an opportunity to buy with this money technology and equipment, and to prepare personnel for future businesses. This, in turn, could quickly help us to a universally acceptable standard of engineering and information technology. Federal support for such initiatives as the shareholding association "Perkom" for producing PCs is a future method for investing hard currency (see "Znannya ta Pratsya" ("Knowledge and Work"), No. 2 this year. Here is why. Nearly 40 businesses in the Ukraine and Russia have joined to form a successful manufacturing grouping. Economic interests unite everyone involved in creating PCs from NDI and KB to factories producing microelectronics and peripheral equipment. Why couldn't ministries involved in producing instruments cooperate to produce computers in the past? How are we to regard the fact that national planning efforts were unsuccessful in coordinating businesses for producing personal computers? Every outfit went its own way. It would have been good if they had been governed by the rules of competition, but government agencies obviously avoided this. Thus Minradioprom produced "Agats", then ES-1840 and its modifications; MEP masterminded DBK and "Electronic"; Minprilad, the "Iskra" and "Neva". They were all built on a unique basis, different software, different peripherals, which did not connect with other computer models. As a result, at the beginning of this year, we had only ES-1841 and "Neuron", which were up to the program standards of IBM PCs. The program standard consisted of more than 12 thousand units on a world wide basis. But it is instructive to realize what kind of lines - not in stores, but rather in government purchasing departments - formed to buy these. It is clearly necessary to invest the buyers' money in development and upgrading in order to reduce the wait in line.

The first to suggest this were the founders of the shareholder association "Perkom". They invited the engineers to join the Association so that their interest in investment and collective responsibility for its growth would help to break the old habits which prevented a positive interplay between industrial capabilities, and intellectual and financial resources. Why shouldn't shares be sold to everyone who has a personal interest in a personal computer?

What kind of computer does "Perkom" foresee? That will become clear when science and engineering concepts are formulated by the Association. But we are sure that, to make the PC competitive, the most current technology must be used. What specifically? For example, the Korol'ov group is planning to produce the "Diplomat", a compact PC with a small footprint. It is true, that this is not such a new idea; Japanese companies are selling computers with liquid crystal screens which are convenient for business use, and for journalists and all those who spend much time on the road. Back in the mid-80s the division of optoelectronics of the Institute of Semiconductors of the AS UkSSR produced a liquid crystal screen with such a high contrast that text could be read from it in broad daylight.

This technology should have been seized by manufacturers, but seems to have gone unnoticed, because our other computers do not have such screens. Maybe "Perkom" will not overlook it. We should be aware that the Semiconductor Institute did not become a shareholder in the Association, because an academic institution does not have 100,000 roubles to invest, especially in view of the requirement for fiscal responsibility. Still, the hundred million rouble statutory "Perkom" fund will be available for funding the necessary research, and to develop lagging and new products.

One more news item which is of international significance. The small dimension (the size of an average book) external memory storage on replaceable optical cylinders is among the assets of the Institute on the Problems of Recording Information of the AS UkSSR. Their use in personal computers will sharply decrease the cost of storing information, because one cylinder stores 200 Mbytes, which is the equivalent of 100 book volumes each with 500 pages. Advanced technology assures production of one billion units per year. The Institute has already received samples of the unique devices which are not available anywhere else in the world. Mass production will begin this year. It would be most surprising if "Perkom" would not build on this sensational development. It would be an impossibility at this point.

UDC 338

Analyzing, Comparing S&T Indicators of Various Countries

907A0226A Moscow IZVESTIYA AKADEMII NAUK SSSR: SERIYA EKONOMICHESKAYA in Russian No 2, Feb 90 pp 61-71

[Article by V. V. Kiseleva, T. Ye. Kuznetsova, and L. E. Mindeli: "The Basic Directions of the Intercountry Analysis of the Level of Development of the Scientific Potential"; first paragraph is IZVESTIYA AKADEMII NAUK SSSR: SERIYA EKONOMICHESKAYA introduction]

[Text] In the work the problems and principles of intercountry comparisons, which are used for the evaluation of the positions of the USSR in the global economic, scientific, and technical process, are examined. The peculiarities and limitation of the traditional approach to intercountry comparisons, which is based on the simple reproduction of the volume or structural characteristics of the development of science and technology, are analyzed in detail. The principles developed by the authors of intercountry comparisons of scientific potentials of a broader class, which are based, in particular, on the identification of the laws of development, which are common to all countries, and the specific peculiarities, which operate at the national level and are determined by the nature of economic relations, national science policy, and so on, are presented in the article.

The increase of the intensity and the expansion of the forms of world economic relations are one of the most characteristic phenomena of the present era. Under these conditions the importance of concrete economic research in the area of intercountry comparisons is steadily increasing. The intercountry analysis makes it possible to evaluate the positions of the USSR in global economic, scientific, and technical processes and to determine the directions of the further development of specialization and cooperation and the forms of participation of the USSR in the international division of labor. The growing role of scientific and technical progress in the modern dynamic world requires the devising of new principles of international comparisons in the area of scientific and technical development and approaches to them. The results of such comparisons are of vital importance for the development of the strategy and tactics of USSR economic, scientific, and technical policy. The specific successes of the leading capitalist, as well as the socialist countries in the assimilation of the achievements of scientific and technical progress and the scale of their activity, which is aimed at the stimulation of research and development and their introduction in economic practice, make it incumbent to treat more carefully the critical study and interpretation of the experience gained in this area for the purpose of its use under the socioeconomic conditions of our country.

The comparative analysis of the scientific potentials of countries makes it possible to evaluate the level of their development and to identify the basic trends, which are characteristic of various sectors and subsectors of the economy, fields of scientific knowledge, and other spheres of scientific research activity. International comparisons of scientific potentials as a subject area of the brovelopment of the direction, which it is possible to regard as comparative analysis proper. At present the efforts of developers are concentrated mainly on the identification of the similarity and differences of the content and definitions of Soviet and fader class of economic comparisons are classified according to many criteria: the goal, the range of coverage of objects, the degree and methods of comparisons, and others. The state of Soviet research in this area is characterized by the preferential deoreign statistics: the specification of concepts, the reduction to a common range of coverage of the volume and structural characteristics of the scientific potential of the USSR and other countries, the statistical accumulation of characteristics (in this case comparability with respect to individual indicators and their dynamics is achieved), the obtaining of various value estimates in a common currency, and so on.

The procedural questions connected with this research so far have not been completely settled due to serious differences in the system of national statistics keeping in the USSR and other countries. Here some differences in the methodology and methods of calculation are of a fundamental nature, which leads to qualitative nonuniformity, others are connected with the content of individual indicators and can be overcome in the process of the reduction to a comparable form of the classifications of sectors, the nomenclature of specialties, the nomenclature of types of activity, which are included in research and development, and so on. In this direction research in the USSR has been conducted for quite a long time, and within it specific results have been obtained. In particular, the reevaluation of the data on scientific personnel in the USSR and other countries envisages the specification of the concepts "science worker," "scientific personnel," the nomenclature of specialties, the categories of science workers of the highest skills, the unit of accounting (natural persons, or the equivalent of full employment—EPZ), and so on.

The limitedness of comparative studies proper consists in the fact that given any accuracy of the analysis the quantitative changes, which it is possible to trace on its basis, poorly reflect the qualitative aspects of the comparisons, the place and role of the scientific potential in the system of the economy of different countries, and the advantages of individual countries in some subject areas or others. For example, specific evaluations of the components of the scientific potential do not make it possible to determine to what extent they satisfy the goals of social and economic development. This also decreases the practical value of the obtained indicators—qualitative incomparability leads to uncertainty in the evaluation of the possibilities of adopting foreign experience when forming the scientific potential. The fact

that in case of any depth of the comparative analysis proper the researcher remains in the area of evaluations of one degree of accuracy or another, is also of no small importance. Even if the problem of "full" compatibility is viewed only from a purely statistical point of view, it is also practically insoluble for countries with a traditional established system of statistics keeping. Thus, in case of the estimation of the expenditures on scientific research in some countries (France, the FRG, the USSR, the European CEMA countries, and others) the spending on the development of the humanities is taken into account, in other countries (Great Britain, the United States) this spending is excluded from the total amount of expenditures on science (in Great Britain the spending on the development of the social sciences is also not considered).

The estimate of the capital expenditures on science pertains to the specific nature of statistical reporting of various countries. In the majority of countries (including the European CEMA member countries and the USSR) these expenditures are calculated by a separate line and are taken into account in the estimates of the total amount of expenditures in the sphere of research and development. The official statistics of the United States and several other countries, in which data on capital spending are published incompletely, inasmuch as they do not include data on the capital spending on science in the private sector, constitutes an exception. The information, which characterizes the role of the state in the financing of research and development, also differs: In the United States this is the spending of the federal government, in other countries this is the spending of all state subdivisions. The statistics of the personnel of science also differs substantially. In particular, with respect to the USSR and other CEMA countries all the data are published in so-called physical persons, with respect to the developed capitalist countries they are published in the equivalent of full employment (with respect to Great Britain in the equivalent of full employment only for the state and branch sector, with respect to Japan in persons employed directly in research and development).

The difficulties of the use of Soviet statistics for comparisons are also aggravated by other differences both in the entire system of estimates and in the statistical filling of individual indicators. The attempts to adjust the amount of expenditures in the sphere of research and development are the most vivid example. In the USSR detailed comparative studies of the structure and individual elements of these expenditures have been made, the analogous and specific types of expenditures, which are taken into account in the statistics of individual countries, have been distinguished, and so on. However, the effectiveness of such studies is small, inasmuch as they, of course, cannot overcome a number of substantial contradictions of Soviet statistics of expenditures, for example, double counting, which, according to our estimates, constitutes up to a third of the expenditures taken into account in the sphere of research and development. (Only in 1988 did Soviet statistical organs begin work on the estimation and elimination of the amount of double counting.) These and other examples illustrate the functional incompatibility of various indicators, which is a consequence of statistical (quantitative and qualitative) incompatibility. The often cited example with the high proportion of psychology specialists among scientists, who are engaged in basic research in the United States (as compared with the USSR), is typical in this sense. While using the corresponding estimates, researchers, however, do not take into account the fact that the level of scientific, technical, and economic development, which had been achieved in the United States by the early 1980's, led to the shift of the emphases when evaluating the quality of labor in the direction of the increase of the role of psychological factors, which, in turn, also caused the rapid increase of the need for the results of research in this area.

In our opinion, at present comparative studies of a broad class, which are based on the systems description of the mechanism of the economic activity and functioning of the scientific potential in the system of national priorities of the development of the country, are promising. The switch from relations like "more-less" to relations like "better-worse" signifies that when posing any task it is necessary to specify in advance the goals of the comparison and, subject to them, the set of comparable indicators and the acceptable level of accuracy. The switch from the comparison of statistical indicators (comparison in the narrow sense of the word) to comparisons of the qualitative characteristics of the scientific potential and its place in the system of economic relations of each country (comparison in the broad sense of the word) does not signify the rejection of traditional approaches to intercountry analysis. Different methods of the specification and reevaluation of the indicators of the national statistics of countries are an integral component of any intercountry study.

The development of new approaches to intercountry analysis involves the specification of the criteria of the evaluation of the quality of the potential, which, in turn, are governed by the entire set of conditions of the socioeconomic development of the country. Thus, the comparison of the indicators of the scientific and technical potential is based everywhere on the expenditure principle—according to the cost of the conducting of research and development. However, this criterion is not the only one, other criteria (which are external and internal for science) also exist. For the evaluation and choice of priorities of the resource supply of science it is necessary to take into account such conditions, which are external for science, as political motives, the state of similar research abroad, economic motives,[1] and the social and ecological consequences of scientific research. It is possible to group with the internal criteria of the quality of the scientific potential the level of the skills and material and technical supply of scientific personnel and the organization and structure of the management of the scientific potential, the level of the material and technical supply of science, the mobility of scientific

personnel, the lag in the assimilation of the results of research and development, and so on.

The laws of the development of the scientific potential of every country are characterized by a complex set of these interconnected criteria. For the comparative studies of scientific potentials it is proposed to compare sets of quantitative indicators (a large portion of which characterize the structural properties of the potential) with respect to various features: first, the structure of the priorities of research and development for each country; second, the characteristics of the conformity of the available potential to these priorities. The possibility of using foreign experience in case of this approach should be traced through the chain goals—priorities—structural characteristics of the quality of the potential (as a means of achieving the goals). For the reduction of the set of characteristics to a consistent picture it is proposed to use simulation scripts (with different weights of the countries, goals, and different structural characteristics).

The nature of the description of the real mechanism of the functioning of the scientific and technical potential depends on the choice of indicators; the indicators of the national statistics of the country, in our opinion, correspond to a greater extent to this task, moreover, the form of their presentation, the corresponding elements of the economic mechanism, and their reflection in statistics change with the passage of time. There corresponds to each level of development of productive forces its own specific form of "existence"; the laws of the development of the scientific and technical potential and the system of the goal orientation of society not only change with the passage of time, but also include various space and time breakdowns, which are times are incompatible with each other (local and national, short-range and long-range goals, and so on).

For example, the dominant significance of applied research and development in the United States as compared with the countries of Western Europe in the 1960's and 1970's was regarded by the government of this country as evidence of the advantages of the American economy and its greater receptivity to the achievements of technical progress. By the later 1970's, when a relative lag of economic growth and the loss of important positions in world trade had appeared in the United States, this circumstance began to be regarded as an obstacle in the way of economic development. In this situation the following was clearing traced: The preference of the short-range effects of technical progress to the long-range effects decreased the effectiveness of its end results. It was shown that basic research is one of the basic sources of economic growth. The establishment in Japan of technopolises, which was proposed by the government as the general direction of development, is an example that illustrates the growth of an economy which is oriented toward long-range goals [1, pp 17, 18]. As a tool of regional policy these industrial production centers are aimed at the accomplishment of short-range tasks—the development of lagging regions. As a tool of scientific and technical strategy they are aimed at the future, inasmuch as they are the potential of a new technical spiral.

Let us examine several peculiarities of the economy of developed capitalist countries and the USSR and on the basis of individual examples analyze the interconnection between the criteria and the structural characteristics of the scientific potential. The political motives of the formation of the potential can be reflected, in particular, by the following indicators: by the share of the spending of the state budget in the total amount of expenditures on research and development (the direct participation of the state in the development of this sphere), by the functional structure of the state budget, by the sharing of the government in the financing of basic research, by sectorial science, by the share of military spending in the budgets of spending on research and development (the ratio of the expenditures on military and civilian research and development), by the dynamics of the corresponding indicators, and so on. Some of these parameters for developed capitalist countries and the USSR are cited in Table 1. The data cited in it show what an enormous role the state and, in state strategy, military political motives play when forming the resources that are channeled into the sphere of research and development in developed countries. And although the state spends on the conducting of research and development a relatively small portion of its resources (in the USSR 3.5 percent of the state budget, in the United States about 6 percent of the budget of the federal government),[2] according to some estimates one-fourth of the world spending on research and development falls to the military sector and is concentrated for the most part in a few countries.

Table 1. State Spending in the Sphere of Research and Development of Developed Capitalist Countries and the USSR in 1982-1983, Growth Rate

Country	Expenditures on Research and Development			Share of state in the financing of science, percent
	General	State	Military	
United States	1.09	1.07	1.13	47
Great Britain	0.92	0.95	0.94	49
France	0.78	0.98	0.88	57
FRG	0.997	0.97	1.03	41
Japan	1.14	1.07	1.14	26
USSR	1.06	1.086	—	48.3[1]

1. 1986.

Note: Sources [7, 12].

In the early 1980's spending on military projects made up 70 percent of the government allocations and 30 percent of the allocations of private firms in the capitalist countries (it is also possible to add here the

allocations for space research—five to six percent). About 20 percent of all the scientific, engineering, and technical personnel (for the United States about 42 percent) worked for the military sector [8, 10]. This concentrated flow of resources (which exceeds by ten- to twentyfold the amount of resources being channeled into other sectors) distorts the goal structure of research and development. The high proportion of development, which is intended for military purposes, is one of the factors responsible for the need for the additional increase of the resources of science by means of state financing; military political motives change both the structure of the sources of the financing of research and development and the significance of specific performers.[3] The share of the military sector in the resources, which are being channeled into the sphere of research and development, should also be taken into account when using the statistics of research and development in different countries. Thus, in case of the comparison of the laws of scientific and technical progress in Japan and the United States on the basis of official data the conclusion is often drawn that in Japan the role of state financing of research and development is relatively small (the share of the state in the financing of research and development is less than half as much as in the United States). However, with allowance made for the allocations to the military-industrial sector of the United States, which "eats up" the lion's share of the assets, the direct financial influence of the state on the development of the sphere of research and development in both countries is approximately equal—20-22 percent.

The influence on military political strategy on the structure of the financing of research and development by the state and on the policy of the distribution of assets among individual projects is under the close attention of many economists. Thus, according to the estimates of a number of American economists, the "optimum" of state expenditures in the sphere of research and development (the portion of the expenditures on research and development, which is actually connected with the gaining of knowledge) does not exceed $12 billion (estimates for the early 1980's).[4] The remainder of the assets—about three-fourths of the budget—is distributed only with allowance made for political and socioeconomic tasks.

When analyzing the influence of political factors of the dynamics and structure of the scientific potential, it is necessary to take into account the following important things: the magnitude of the drain of resources of civilian sectors, the extent of the equivalence of the technological development of civilian and military sectors, and the possibilities of the "commercialization" of military research and development and the conversion of the military sector of the economy. Changes of the sociopolitical orientation, economic conditions, government programs, and so on first of all affect the civilian sectors of the economy. The data cited in [2] are a good illustration of this. The policy of the "economy" of budget outlays of the administration of R. Reagan found expression in the following relationships: The spending on the functioning of basic research in traditional areas increased during 1985-1986 by only 1 percent (with allowance made for inflation), while in military sectors it increased by 16.6 percent, including by 11 percent due to allocations of the Department of Defense; the ratio between the spending on military and civilian research and development at the same time came to 7:3 (as compared with 6:4 in 1981). Military research and development consume an enormous portion of the allocations for research in the most important sectors of the economy: Thus, in the area of the production of computer hardware the U.S. Department of Defense accounts for 50 and 85 percent of the state assets allocated for the development of respectively basic and applied research. According to the data for 1985, in high technology sectors the share of military products came to 27 percent, in traditional sectors—12 percent, and in other sectors—15 percent, moreover, the estimate of the index of prices for military research and development and military products exceeds by two to seven percent the index of prices of the gross national product, which it is customary to use for the evaluation of research and development. The exchange of technology as one of the types of national resources between military and civilian sectors of the economy in all countries owing to the lack of preparation of civilian sectors for the use of advanced military technology and the necessity of ensuring secrecy, according to some western estimates, takes about 10 years. This means that enormous amounts of advanced technologies (in the United States the share of high technology sectors in the gross national product by the early 1990's had approached 10 percent) are outside "normal" economic exchange. In connection with this in many developed countries, including the USSR, the question of adopting a special program, which is intended for the more extensive use of the results of military research and development, is being discussed. The selective orientation of research and development toward civilian or military goals also signifies the necessity of changing the internal structure of science: According to our estimates, a positive and statistically significance correlation between the indicators of the spending on military purchases and the share of expenditures on basic research to the total amount of the expenditures on research and development is observed. Such a connection also has a causal interpretation: The maximum saturation of the economy with military products of a specific generation after some time (the lag comes to approximately four to five years) leads to the devising of new military equipment, which begins with basic research in research and development.

Let us dwell on the peculiarities of the influence of economic and foreign economic factors on the formation of the scientific potential. This influence can be characterized by the following indicators: the parameters of economic effectiveness, which are estimated according to the increase of the pace of economic growth or labor productivity per unit of expenditures; the technical and

economic characteristics of the sectors of the national economy, which characterize its economic and export potential, particularly the parameters of the sectorial science-intensiveness, capital-output ratio, labor-intensiveness, and capital-intensiveness, labor productivity, and its relationship with the output of products; the share of exports in the gross national product or the gross product, the ratio of the export-import flows in individual sectors, the share of high technology sectors in the export, import, and output of products of individual sectors; the indicators of patent and license relations; the share in the world production of especially important types of products, the dynamics and sectorial structure of manpower resources, the goal structure of innovations,[5] the relationship of the amount of expenditures and the number of introduced jobs (inventions, patents), the ratio of the indicators of the science-intensiveness of high-technology sectors, base sectors, and other sectors, the degree of dissemination of research and development by sectors, the possibilities of duplication, the payback periods by sectors, and so on.

The priorities of economic and social development also have a direct effect on the structure and scale of financing of basic research (as a whole and by individual directions). Here it is possible to distinguish the breakdown of resources by fields of knowledge, the indicators of the specialization of individual countries in the area of the development of fields of knowledge, the characteristics of the interconnection of scientific and production specialization, and so on. It is necessary to combine the comparison of the indicators of the breakdown of allocations by fields of knowledge by countries with the analysis of the breakdown of the expenditures on applied research by sectors of physical production and the nonproduction sphere. Some of these data are cited in Table 2 [7, 12].

Table 2. Some Structural Characteristics of the Scientific Potential of Developed Countries, 1982-1983, Percent

Indicator	United States	Japan	FRG	France	Great Britain	USSR
Share of spending on basic research	12	13	20	21	12	9.9
Share of basic research conducted by the state	14	12*	24	22	30	45 **
Share of the state in financing of sectors						
electrical equipment	40	2	21	30	46	66 ***
instrument making	76	2	65	65	68	46
transport machine building	14	2	9	10	10	56

* And other organizations.

** With respect to the USSR Academy of Sciences and the academies of sciences of the republics as a percent of the total amount of basic research in 1985, estimate of the author.

*** The share of financing from centralized sources, 1986 estimate.

The orientation toward sectors, which are most promising from the standpoint of the strengthening of the international positions of the country, leads to the appearance of directions of development, which are similar for different countries, but the possibilities and degree of realization of these guidelines in developed countries vary (see Table 3), the competition in this area is very high, and the positions of the individual countries change constantly. At the same time, in spite of the nonuniformity of development on the long-term level, the trend toward the concentration of the resources of research and development in strategic spheres, which are closely connected with the export potential, undoubtedly exists (Table 3-5). As to the CEMA member countries, although their economic, scientific, and technical potential is quite high, its possibilities have not been completely realized, therefore, the place of these countries in the international division of labor is low. Thus, the per capita export volume in these countries is one-fourth as great as in the EEC Countries (in the European CEMA member countries—two-thirds as great, in the USSR—two-sevenths to two-fifths as great), ten-seventeenths as great as in the United States, and five-twelfths as great as in Japan. In world exports of machine building products the share of the USSR does not exceed 2 percent [4].

Table 3. The Export of Science-Intensive Products by Developed Capitalist Countries

Exporter countries	Growth rate, %			Share of world market			
	1965-1984	1976-1980	1981-1984	1965	1975	1980	1984
Developed countries	15.0	19.5	3.7	100	100	100	100
Including:							
France	15.3	19.5	0.8	7.5	8.2	8.2	7.3
FRG	14.3	18.4	-0.2	16.5	16.5	15.8	13.6

Table 3. The Export of Science-Intensive Products by Developed Capitalist Countries (Continued)

Exporter countries	Growth rate, %			Share of world market			
	1965-1984	1976-1980	1981-1984	1965	1975	1980	1984
Japan	22.5	24.5	14.1	7.2	12.1	15.2	22.4
Great Britain	13.2	21.6	2.9	12.2	10.0	11.0	8.4
United States	15.0	18.7	4.6	28.4	26.3	25.5	26.4

Note: Source [13]

Table 4. Ranked Structure of Branches of U.S. Industry in 1970-1982

Branch	A	B	C
Aerospace	1	9	1
Machine building	—	—	—
electrical equipment	2	2	5
general	3	3	9
transport	4	10	2
Chemistry	5	6	6
Industrial rubber	6	4	3
Fabricated metals products	7	5	10
Pulp and paper	8	11	4
Petroleum refining	9	1	7
Metallurgy	10	12	12
Textile	11	8	11
Food	12	3	8

Note: A, B, and C are the ranks (in ascending order) respectively of: the spending on research and development (the share in sales), the average annual growth rate of exports, and the average annual growth rate of production (1980-1985).

Table 5. Sectorial Structure of the Economy of Japan During 1970-1980, Percent

Sector	Expenditures on research and development, share in sales	Average annual growth rate	Share in output		
			1965	1980	1982
Aircraft industry	13.8	—	—	—	—
Machine building	—	—	—	—	—
electrical equipment	3.6	9.7	4.7	6.3	6.8
precision	2.9	7.1	0.7	0.7	0.8
general	2.0	8.0	5.2	5.8	6.3
transport	2.3	6.3	4.7	4.6	4.3
Chemistry	2.6	7.6	3.2	3.5	3.6
Industrial rubber	2.0	6.8	1.9	1.9	1.9
Ceramics	1.2	6.8	1.7	1.7	1.7
Ferrous metallurgy	1.1	6.5	7.0	6.9	5.9
Textile	0.6	3.1	3.3	2.4	2.0
Wood processing	0.5	6.3	1.6	1.6	1.5
Food	0.5	5.4	6.0	5.3	5.3

Note: Source [1, pp 111, 112, 142].

Perhaps, only two countries constantly hold stable positions in the world export of science-intensive products—the United States and Japan. The ranks (in ascending order) of the structural characteristics of the sectors of U.S. industry are cited in Table 4. These data show that as a whole over the 12-year period the sectors with high spending in the sphere of research and development were most dynamic in the output of products and their export. It is unquestionable that a clear interconnection is not observed here, but the deviations from this regularity, apparently, are connected with the fact that the U.S. export potential developed in an evolutionary manner, as the capacious domestic market was saturated. Precisely for this reason the positions of such traditional sectors as the food, textile, and petroleum refining sectors are strong in it. However, recent data testify that the importance of these sectors in the export flows is constantly decreasing. The average growth rate of exports during 1978-1985 came for chemistry to 7.9 percent, the pulp and paper industry—5.4 percent, the textile industry—0.9 percent, the food industry—0.7 percent, the aerospace industry—9 percent, the production of office equipment—17 percent, pharmacology—9.6 percent, the production of scientific instruments and tools—6.1 percent, and the production of plastics—8.7 percent.

Foreign economic strategy is most closely connected with the structural characteristics of the scientific potential of Japan (see Table 5). The present strategy of development of this country and the changes of the sectorial structure are directly oriented toward exports (although the share of exports in the gross national product of Japan is relatively small—about 10 percent, in industry it is 50 percent); moreover, in contrast to the majority of other developed countries the increase of exports in the most promising directions is taking place at the same time as the saturation of the domestic market. In turn, the policy of Japan in the area of research and development is closely interconnected with the export strategy. As was indicated in [4], the specific nature of the economy of this country is such that precisely the export strategy influences the formation of the industrial structure which is competitive on an international scale. Back in the middle of the 1960's the reorientation of export interests from traditional sectors, which have a low scientific and technical potential (for example, the textile industry), to science-intensive production emerged. Japan entered the new stage of industrial development with a relatively lower potential than other countries. During the 1950's and 1960's 15-25 percent of its capital investments in the processing industry were connected with the import of technology, the bulk of the outlays on research and development were spent at the stage of development (at corporations, more than 75 percent). In the opinion of several economists, this had the result that Japan lagged for a long time behind other countries in the number of innovations of a fundamental nature—8 percent (the United States—27.4 percent, France—23.5 percent, the FRG—13.6 percent) and basic discoveries, while holding a leading place in innovations like improvements—38.5 percent (France—11.8 percent, Great Britain—4 percent, the FRG—36.4 percent) [5, p 180].

The data of Table 5 show which sectors of the economy of Japan are developing most rapidly, how the share of the most science-intensive sectors in the output of products is increasing, and what role the sectors play in the export potential of the country. Among these sectors the most science-intensive and dynamic ones (except the aviation industry)—the electrical equipment sector, precision machine building, the automotive industry, agricultural machine building, chemistry (chemical fibers, pharmaceuticals, organic chemistry)—are also characterized by a growth rate of exports, which is higher than on the average for the processing industry. These sectors constitute the nucleus of the competitive sectors that are most promising in the long run.

The insoluble nature of the methodological problems, which form the "closed" circle in which research in the area of international comparisons is developing, in our opinion, testifies that the discussions on the choice of a strictly fixed set of indicators, which are used in comparisons, are incorrect. A specific set of indicators, which are suitable for comparison, and a measure of the similarity with respect to countries correspond to each specific task. The evaluation of the quality of the comparisons in each individual case should be carried out with an accuracy that does not exceed the accuracy of the data used for the accomplishment of this problem.

The implementation of the proposed approach to the full extent requires the accomplishment of an entire set of particular tasks, the most important of which are the following:

— the analysis of the set of socioeconomic conditions of the development of the scientific potential of the individual country; the formation of possible versions of the development of the scientific potential subject to the scripts of socioeconomic and political development;

— the comparison of the mechanisms of the "link-up" of the economy and science at the macrolevel and the level of individual sectors; the analysis of the mechanism of the formation of the demands on the quality of the scientific potential in each country, including the study of the dependence of the technical and economic parameters of reproduction and the structure (dynamics) of the potential;

— the analysis of the interconnection of the goals of scientific and scientific and technical policy and the entire set of national goals of the country; the study of the peculiarities of the formation of a general state scientific and scientific and technical policy and specific measures of the government (including measures of budget financing);

— the analysis of the adequacy of the structure (and dynamics) and the forms of the state regulation of the potential in each country to the goals of its socioeconomic development;

— the analysis of the mechanism of the functioning of the scientific potential; the formation of a set of structural evaluations of the scientific potential in the context of: the evaluation of the factors of the priority of basic and applied science; the evaluation of the distribution of resources among the directions of basic research; the analysis of the breakdown of applied research by sectors subject to the priority of the development of sectors and sectorial complexes;

— the evaluation of the indicators of the influence of the dynamics of the potential on the state of foreign economic relations; the evaluation of the level of basic research as a factor of the competitive ability of the country on the world market.

Within the framework of the proposed approach to intercountry comparisons an analysis of the interconnection of the goals of scientific and scientific and technical policy and the entire set of national goals of the country was made: The "positions" of science in the structure of the budget spending of the USSR and the United States were evaluated and the priorities of the spending of assets of the budgets of research and development of developed capitalist countries were cross-linked and aggregated [6]. When studying the expenditures on research and development subject to the aims of scientific and technical and economic policy the dynamics of the functional structure of the budget was regarded as a reflection (not always an unambiguous one) of the relative priorities between national goals.

The speeding up of the dynamics of spending by functions was regarded as the increase of the priority of the goal, which is achievable by means of these functions. Three levels of goals (for the United States) were analyzed. It was assumed that the analysis of the structure of spending of the government by items of spending (by functions) gives grounds for the determination of the indicators of the priority of expenditures on research and development. The goals of scientific and technical policy depend directly on the nationwide goals. The priority of the items of spending by functions of the budget of research and development determines the nature of the priority and, consequently, the dynamics of the allocations for the development of various fields of sciences within the framework of the budget. The total amount of financial resources of research and development depends on the amount of budget allocations and the relationship of national goals and the conditions and possibilities of the decentralized financing of research and development.

On the basis of the available data on the budget spending of the USSR and the United States the priority of the expenditures on the development of science and the spending on other goals, in the financing of the achievement of which the state participates, was compared. For the evaluation of the quality of the comparisons the conformity of the goal orientation of the spending of assets by items of the budget was analyzed. Three basic directions of the spending of assets were examined: defense, the economy, and social development (including the spending on the development of science). The measurement of the similarity of the structure of the budget in both countries by the method of main components made it possible to distinguish in their budgets the main factors, the dynamics of which is characterized by similar trends, to evaluate the set of indicators, which form each factor, and to measure the magnitude of change of the factors.

The possibility of the broader use of the proposed approach was evaluated on the basis of more extensive data on the statistics of the budget of research and development of the United States. As in the previous case, the dependence of the amount of resources (financial), which are being channeled into the sphere of research and development, on the goal parameters of social development was identified and analyzed and on this basis the indicators of the "science-intensiveness" of budget functions were formed. When forming these indicators the necessity of achieving the set of goals of social development given different combinations of the priorities between these goals was taken into account. A regression model of the formation of state spending in the sphere of research and development was built on the basis of the generalized characteristics of the budgets of the U.S. Government (the total budget, the budget of research and development, the "budget" of spending by directions of basic research).

Finally, research was conducted on the structurization of the spending in the sphere of research and development of the five leading capitalist countries (the United States, Great Britain, the FRG, Japan, and France), which was carried out in accordance with the goal criterion, which makes it possible to identify not only the subjective preferences, which constitute the basis of economic and scientific and technical programs, but also several objective laws in the relationship of the goals and means of national policy.

The conducted research is affording an opportunity for the changeover to a new stage of intercountry analysis in the direction of functional comparisons: The study of the methods of improving scientific and technical strategy on the basis of a formalized description of the similarity and specific nature of the mechanisms of the budget financing of science and the connection of science, technology, and production should become the next step. The analysis of the processes of the planning and economic "realization" of the assets, which are being channeled in succession into science and the introduction of new equipment and technology, can serve this goal.

Footnotes

1. For example, the economic status of the country, the share of the resources, which are being allocated by society for the development of research and development, the influence of scientific research on production, the effect of the introduction of new equipment and technology, and the receptivity of production to the results of research and development.

2. Here and below in the text (if there are no special stipulations) the following sources are used: the yearbook "Narodnoye khozyaystvo SSSR" [The USSR National Economy] for the corresponding years and [8].

3. According to American data, the share of the internal assets of firms, which are allocated for the conducting of research and development, in the civilian sectors of the economy exceeds by more than fourfold the share of internal assets in military sectors (70 and 15 percent) [11].

4. The element of development in military sectors and approximately half of the applied research are not taken into account. See footnote 3.

5. The studies of the goal structure of innovations of a number of capitalist countries show that their bulk is aimed at the saving of raw materials and materials: in Japan—34 percent, the United States—21 percent, and the EEC countries—47 percent, at the saving of manpower: in Japan—6 percent, the United States—40 percent, and the EEC countries—14 percent, at the saving of fixed capital—respectively 7, 7, and 11 percent, and at the meeting of new needs—13, 13, and 9 percent [3, p 73].

Bibliography

1. C. Macmillan, "The Japanese Strategy of the Industrial System," Moscow, Progress, 1988.

2. MIROVAYA EKONOMIKA I MEZHDUNARODNYYE OTNOSHENIYA, No 3, 1987.

3. "Nauchno-tekhnicheskiy progress i kapitalisticheskoye vosproizvodstvo" [Scientific and Technical Progress and Capitalist Reproduction], Moscow, Mysl, 1987.

4. EKONOMICHESKOYE SOTRUDNICHESTVO STRAN-CHLENOV SEV, 1988.

5. "Yaponiya. Yezhegodnik" [Japan. A Yearbook], Moscow, Progress, 1987.

6. "Problemy resursnogo obespecheniya nauki" [Problems of the Resource Supply of Science], preprint, Moscow, IEP NTP AN SSSR, 1988.

7. "Narodnoye khozyaystvo SSSR v 1987 godu" [The USSR National Economy in 1987], Moscow Finansy i statistika, 1988.

8. MIR NAUKI, No 3-4, 1986.

9. "Science and Engineering Indicators. Annual Report of the President of the US. Statistical Abstract of the US. National Patterns of Science and Technology."

10. SCIENCE AND POLICY, Vol 13, February 1986.

11. "Science Policy Study: Hearings Before the Task Force on Science Policy of the Committee on Science and Technology, House of Representatives, 99th Congress, 2nd Session," Washington, Government Printing Office, 1986.

12. "OECD Science and Technology Indicators. Resources Devoted to R&D," OECD, Paris, 1985. "Science Indicators," NSF, 1985.

13. "National Patterns of Science and Technology," 1984. "Statistical Abstract of the USA," 1987.

People's Deputies Answer Questionnaire on Inventions, S&T Progress

907A0243A Moscow IZOBRETATEL I RATSIONALIZATOR in Russian No 3, Mar 90 pp 6-8

[Interview with USSR People's Deputies S. N. Fedorov, D. A. Granin, B. Ye. Paton, V. S. Bolbasov, G. Kh. Popov, A. A. Denisov, Ye. P. Velikhov, Yu. A. Ryzhov, B. V. Gidaspov, and I. V. Gorynin, by IZOBRETATEL I RATSIONALIZATOR parliamentary correspondents I. Krylov, Yul. Medvedev, and Yu. Yegorov: "People's Deputies Answer Us"; date and place not given; first seven paragraphs are IZOBRETATEL I RATSIONALIZATOR introduction]

[Text] 1. How do you appraise the pace and scenario of perestroyka in light of what happened at the 2d Congress of USSR People's Deputies?

2. What are the role of invention under present conditions and your attitude toward the postponements of the passage of the Law on Invention Activity in the USSR?

3. A number of deputies voiced the opinion of sorts that for 1990 a "timeout" had been given for scientific and technical progress. Do you share this point of view?

4. The economic policy, which is planned for the next few years, leaves the impression of "reverse repetition." Whereas the first five-year plans were implemented "at the expense" of the countryside, it is planned to implement the coming one in part "at the expense" of the base sectors of the national economy. Should one not be afraid of planning "at the expense" of someone, having in the past a painful precedent?

5. Do you agree with the assertions that among the basic causes of the serious economic situation in the country, the increasing shortage of goods, and so forth one should name cooperatives?

6. If you could, would you agree to forecast the subsequent fate of our society and our state on the paths of

perestroyka, basing yourself on what the 2nd Congress of USSR People's Deputies showed?

S. N. Fedorov:

1. We are attempting today to democratize the political system, while the economy remains centralized in full, in the Stalinist manner. And until laws on property are introduced, until the elimination of state ownership of property occurs, it will not be possible to restructure the economy. The economic program of the government, which was adopted at the congress, is a cowardly program. As a surgeon, I can understand, but not excuse, this cowardice. The country is in such a situation, when steps are necessary immediately. I believe that in six years half of the property, at the least, should be at the disposal of the population. The pace proposed by the government is too slow.

2. The Law on Invention will be needed when a market of intellectual property has appeared. It is then that an inventor will be able to bring his ideas to it and to sell them at a price which he himself considers fair.

D. A. Granin:

1., 2. Indeed, they are not mentioning scientific and technical progress at the congress, other themes worry the deputies today. The congress is too broad as it is with respect to themes, I would narrow it. It is falling short of the expectations, inasmuch as the Supreme Soviet was unable to turn out the priority laws by the congress. I group with them the laws on property, on land, on the press, and on local self-government. For me the Law on Invention does not belong to this list. The situation today with the very foundations of our life is too difficult. All the problems of invention and scientific and technical progress will sound completely different after the key issues of property and cost accounting are settled.

The problems of the inventor are only a small part of the problem of creativity and the creative person as a whole. Our people have not been involved at all in creative activity due to the overpowering priority of the state form of property. When there appear for a person his own land and production unit, when he becomes the joint manager of production, then his head will begin to work in a completely different way. But until this happens, the brains of millions of our compatriots as before will be shut off during the eight-hour workday. A person who is a creator begins with a person who is a manager.

B. Ye. Paton:

3. Quite recently we said quite justly that perestroyka is possible only on the basis of the acceleration of scientific and technical progress. Today everyone has already forgotten this. The achievements of technology no longer interest industry—the enterprises and sectorial scientific research institutes, which have been converted to cost accounting, are trying to derive an immediate profit. Only capitalist firms "are tearing from our hands" our promising developments.

For example, the industrial assimilation of nine new materials, which were included in the comprehensive program of scientific and technical progress "Promising Materials," will make it possible by 2005 to save more than 30 million tons of rolled steel products. But first allocations are needed in order to set up the industrial production of these materials. But today no one is giving us them—they are sending us to seek a client for each promising material, so that he would finance development. I am certain that this is the affair of the Council of Ministers, which is obliged, on the basis of the priority of statewide interests, to find the resources for the development and production of new materials.

2. As to the Law on Invention, I consider it top-priority. An acceptable version of it was prepared back during the summer, and I cannot understand for what reasons this law thus far has not been passed. I, in any case, have spoken several times in favor of its quickest discussion and passage.

V. S. Bolbasov:

2. I put my name down for a statement at the congress, but they did not let me speak. I wanted to speak in addition on the question of establishing a deputy group of inventors. All the preliminary documents were prepared by me. More than 30 people's deputies, who are prominent inventors and scientists, agreed to become members of the group. Academician B.Ye. Paton gave me much support in its establishment. But in the secretariat of the congress they could not even duplicate for us the materials on the formation of this group. Here is the attitude toward the creators of progress and the intellect of the nation for you.

All fall our commission examined suggestions on the draft of the Law. In addition it also considered 16 alternative drafts: those of Professor V.A. Dozortsev, inventors Yu.S. Polinov and N.N. Knyazev, Tsapovich from the city of Gelendzhik, and others. They took all that was most valuable and radically revised the draft. In it they gave the inventor as much as possible. Only the author disposes of a patent, while the amount of his reward was increased by threefold—to 15 percent of the profit derived due to the use of the invention. Those who contributed to introduction can also receive up to 30 percent of the profit from an invention, the author himself also has the right to the payment of a bonus for promotion, provided he participates in this work. N.I. Ryzhkov promised me that in the immediate future this draft will be published in the press.

The persistent contempt of many people's deputies and deputy groups for this document, which is simply amazing for me, is hindering the passage of the Law. I cannot understand the position of prominent economist G.Kh. Popov, who, while engaging in the search for means of getting the country out of the most deep crisis, does not see the main one of them—to use as much as possible the creative potential of inventors and efficiency experts.

G. Kh. Popov:

2. I want least of all that my negative opinion on the Law on Invention would offend our inventors. I consider them the foundation of our society. A country, which does not take care of inventors, is doomed. During my life I have been faced many times with how they belittle them and for decades do not want to recognize inventions, but then select them. The rights of inventors in our country are being violated at every level.

Therefore, I studied most carefully the draft of the Law on Invention. In addition to absolutely necessary things—such as the patent and license—in it there is much unnecessary rubbish. My main objection is that the state should not make the evaluation of an invention. In any country of the world the state merely determines whether or not to give the inventor patent rights, in our country it constantly interferes in the evaluation of the effectiveness and the feasibility of the use of an invention. Only the market, in my opinion, can determine the effectiveness of an invention.

While the administrative system is retained, I foresee the possibility of enormous pressure on organs of the examination of inventions and the imposition of joint authors on the inventor. A different political and economic system is already necessary even simply to record the right to an invention.

A. A. Denisov:

1. Perestroyka was begun, apparently, from the wrong end. It was necessary to begin from the legal base of the changes, which we intended to carry out in the country. Only given our lack of political culture and our habit not to take the laws into consideration was it possible to advance recklessly. Perestroyka proved to be, in essence, illegal. It required actions which run counter to the prevailing constitution. Therefore, they began to talk about a rule-of-law state. Now we are hastily correcting the situation, but, it must be acknowledged, after already having committed a large number of follies.

7. In Russian traditions there were the aspiration for unity and the dislike of dissent. The engineering corps publicly renounced participation in politics. This was even a posture, a maneuver. Now everything has change. We, do you know, are breaking sharply with traditions. After the revolution and until recently the community of views and the preeminence of politics were supported by directive. But now the directives are being repealed. No wonder that after ordered like-mindedness extreme views immediately appeared and spread. This is a painful, difficult reality. Some people are advocating the abolition of politics and ideology in general, others are not capable of giving up the habitual politicization of exclusively practical issues. Engineers are among both. Thus, the statements of N.I. Ryzhkov, an engineer by his roots, begin most often with political declarations. But it seems to me that if you direct the economy, say: Such-and-such and such-and-such are expedient, while this is inexpedient. But one must not begin with the fact that such-and-such and such-and-such are unacceptable for us. Private property—it is unacceptable. Obviously. Beforehand. Then a situation, which it is impossible to call into question in any way, is cited. Nikolay Ivanovich and I are squabbling over this. In my opinion, such a precept is not the best thing in him for the manager of the economy. This would be appropriate for Gorbachev, although he precisely does not adhere to very categorical positions, to which, in particular, his article in PRAVDA testifies.

6. I have been dealing all my life with applied dialectic logic. The applications were also technical, in many fields, mainly in the development of designs of immovable parts. I will cite an example: Of the types of pumps there is such a type, in which all the parts remain in place, while an electric field directly drives the liquid. As a specialist in dialectic logic I foresee that we are rapidly approaching sensibility. That is, first of all the understanding of democracy as patience. And this will now be observed. That is, apparently, there will be "the half-decay of the state." Half-decay from the standpoint of our imperial ideology. Either this way or not at all. He that is not with us is against us. This is a consequence of the fact that we lost dialectics long ago. Although we repeat it every other word, we are adhering in reality to an exclusively binary logic. No intermediate positions are conceived of. We are gradually beginning to arrive at an understanding of the narrowness of such an approach. This is the service of Gorbachev. Although they are also reproaching him with this—with regard to the two chairs and everything like that—I believe that psychologically his great service is that he professes everywhere "the third way." It is not these that will win or those, either we will defeat them or they will defeat us. If our psychology is pliant to the lessons of dialectics, and I believe in this, we will succeed in avoiding the main danger—social cataclysms.

Ye. P. Velikhov:

2. I believe that the delay of the passage of the Law on Invention is correct. When I joined in the preparation of this law, in many issues it came to questions of property. We proposed variants—they said to us: This is impossible. We came up against the fact that only one property—state property—exists. I do not think that it is necessary to postpone for a long time, but when we pass the Law on Property, there will also be more extensive opportunities for the discussion of a law on inventions. In general it has already been discussed and has undergone national discussion. It is necessary to go to the Supreme Soviet. I am not resisting, I am conveying only the general assessment of the Supreme Soviet.

3. There is, of course. Not only a "timeout" and not only for this year, but in general they have turned their back on scientific and technical progress.

Yu. A. Ryzhov:

1. We will talk a long time about crime, will increase the number of good investigators, will strengthen the forces

of law and order and build new places of confinement, while the personnel for these places will increase, because we have washed our hands of training, science, education, and educated people. Perpetual motion is resulting, and there will never be an end to this faulty reproduction.

5. I do not share them. Without alternative economic formations we will never get out of our poverty. It is merely necessary to introduce them competently, to foresee the consequences, and to have the proper tax and other policy, which gives an equal basis to both state and cooperative enterprises for growth. All types of property should be equal and not declared, but guaranteed, otherwise all the same one—according to our mentality—will be considered good, while the other will be considered bad, and this will not lead to anything good.

B. V. Gidaspov:

4. This frightens me. Take note of the approach to conversion. To make irons instead of missiles.... We can all get into trouble from such help. Including the peasant. If we swing from one extreme to the other, believe me, this will be bad for the countryside, first of all.... In Leningrad together with a general designer of tanks we developed a series of small and medium agricultural mechanisms of the most different purposes.

3. A "timeout" for scientific and technical progress for 1990 and the 13th Five-Year Plan? How serious is this? Scientific and technical progress is the only thing, by means of which we can hold out and survive.

I. V. Gorynin:

2. By the efforts of lawyers, strictly speaking, simply in conformity with monopolism and the absurdity of economic criteria inventors in our country were forced to impose their technical solutions on production, then to spend years on proving the right to receive a reward, and this reduced to naught the role of invention in technical progress today.

3. Scientific and technical progress was reflected quite poorly in the report of the government "On Steps on the Improvement of the Economy." Owing to the initiative of the representatives of the engineering group of deputies—I, in particular, came forth with this—the scientific and technical line received fairly good expression in the final document. Scientific and technical progress is perceived in our country by many people as a vogue. But in the country the energy expenditures are excessive, because we use low-strength, low-alloyed steels, our components are characterized by a high metal content. Here it is not a vogue, but economics.

5. Cooperatives can implement that portion of the proposals of inventors, which are aimed at the improvement of technological process. As to basic research, cooperation, it seems to me, does not have the necessary capabilities—either with respect to personnel or with respect to equipment. Our institute is connected with many cooperatives. Such a thing is turning out that, as a rule, we cannot conclude any contract: Enterprises are overloaded. But a related cooperative attached to this enterprise willingly accepts and does the job. So that under present conditions we do not have the opportunity not to deal with cooperatives.

6. The best economic minds in our country and throughout the world are trying to form forecasts of our future. My opinion is that the experience of several years of perestroyka, which we have, shows that extreme radicalism is more dangerous than, perhaps, not having the speed of reforms, which, it seems, should exist.

[Box, pp 6-7]

Svyatoslav Nikolayevich Fedorov, honored inventor of the USSR, corresponding member of the USSR Academy of Sciences and the USSR Academy of Medical Sciences, director of the Mikrokhirurgiya glaza Interbranch Scientific Technical Complex, a member of the editorial board of IZOBRETATEL I RATSIONALIZATOR. He voted for the decree "On Steps on the Improvement of the Economy...."

Daniil Aleksandrovich Granin (German), writer, winner of the USSR State Prize, member of the editorial board of IZOBRETATEL I RATSIONALIZATOR. He voted for the rejection of the program proposed by the government in order to charge the Chairman of the USSR Council of Ministers to accept the resignation of those members of the government, who had not coped with this task.

Boris Yevgenyevich Paton, president of the Ukrainian SSR Academy of Sciences, academician of the USSR Academy of Sciences, twice Hero of Socialist Labor, director of the Institute of Electric Welding of the Ukrainian SSR Academy of Sciences, honored inventor of the USSR. He voted in favor of the decree "On Steps on the Improvement of the Economy...."

Vladimir Sergeyevich Bolbasov, honored inventor of the Belorussian SSR, candidate of technical sciences, member of the USSR Supreme Soviet, chairman of the parliamentary commission for the preparation of the Law on Invention. He voted against supporting the decree "On Steps on the Improvement of the Economy..." and for taking into consideration the program proposed by the government.

Gavriil Kharitonovich Popov, doctor of economic sciences, professor, editor in chief of the journal VOPROSY EKONOMIKI, cochairman of the interregional deputy group, head of a chair of Moscow State University. He voted for taking into consideration the program proposed by the government.

Anatoliy Alekseyevich Denisov, doctor of technical sciences, professor of Leningrad Polytechnical Institute imeni M.I. Kalinin (Leningrad), author of 63 inventions, member of the USSR Supreme Soviet (the Committee

for Questions of Ecology and the Efficient Use of Natural Resources). He voted against supporting the decree "On Steps on the Improvement of the Economy..." and for taking into consideration the report submitted to the Congress.

Yevgeniy Pavlovich Velikhov, academician, vice president of the USSR Academy of Sciences, member of the USSR Supreme Soviet. He voted in favor of the decree "On Steps on the Improvement of the Economy...."

Yuriy Alekseyevich Ryzhov, doctor of technical sciences, professor, rector of the Moscow Aviation Institute, member of the Presidium of the USSR Supreme Soviet. He voted against supporting the decree "On Steps on the Improvement of the Economy...."

Boris Veniaminovich Gidaspov, corresponding member of the USSR Academy of Sciences, doctor of technical sciences, first secretary of the Leningrad Oblast Committee and City Committee of the CPSU, chairman of the credentials commission of the Congress of USSR People's Deputies. The author of 250 inventions. By his own admission, "I have earned well on author's certificates." "I do not wait for laws.... I come to an enterprise, which may become a potential user of this invention, let us, I say, establish a joint Soviet-Soviet enterprise, I give my invention, the planning and design documentation, I make some instruments and types of equipment, than in three, five, 10 years I receive a portion of the profit from this enterprise." He voted against supporting the decree "On Steps on the Improvement of the Economy...."

Igor Vasilyevich Gorynin, academician, director of the Prometey Central Scientific Research Institute of Construction Materials (Leningrad), author of a number of inventions. He voted in favor of supporting the decree "On Steps on the Improvement of the Economy...."

Scientists Answer Questionnaire on Science's Needs

907A0202A Moscow SOVETSKAYA ROSSIYA in Russian 15 Apr 90 2nd edition pp 1, 3

[Interview with Corresponding Member of the USSR Academy of Sciences V. Zubov, professor of Leningrad State University (Leningrad), Academician V. Bolshakov, director of the Institute of Plant and Animal Ecology (Sverdlovsk), Corresponding Member of the USSR Academy of Medical Sciences V. Trufakin, acting chairman of the Presidium of the Siberian Department of the USSR Academy of Medical Sciences (Novosibirsk), and Doctor of Physical Mathematical Sciences G. Zherebtsov, director of the Siberian Institute of Terrestrial Magnetism, Ionosphere, and Radio Wave Propagation (Irkutsk), by SOVETSKAYA ROSSIYA correspondents A. Molokov, D. Usachev, V. Ivanitskiy, and N. Fokina, under the rubric "Today Is the Day of Soviet Science": "The Invisible Integral"; date not indicated; first five paragraphs are SOVETSKAYA ROSSIYA introduction]

[Text] Are nuclear physicists repairing a primus stove? There is no paradox here. Inflation is forcing some scientists to seek a higher paying occupation. At times through the combining of jobs, but at times...also instead of their basic job. The growing economic difficulties are placing science in a contradictory and extremely difficult position: The perennial shortage of instrument supply is being aggravated by a new phenomenon—the collapse of scientific schools. Strategists are still thinking about how to combine the functions of the large academy and the scientific periphery, but the threat of the mass departure abroad of specialists under contracts is imminent. Moreover, far from just from scientific research institutes of the capital. Well then, what is our science: The cause of the present destabilization of society, as many people believe, or one of the main national properties, which it is necessary to save first of all?

The editorial board asked scientists to answer the questions:

1. What is characteristic today in the interrelations of science and society?

2. What should the state support of the intellectual potential of the country be like in order to give new impetus to the development of science?

3. Of what does your scientific collective not have enough in order that it would earn to full effect and would attain the world level of scientific research?

Corresponding Member of the USSR Academy of Sciences V. Zubov, Professor of Leningrad State University (Leningrad)

1. A strange situation has formed, when in the highest leading spheres of society not only do they not know the leaders of "large-scale science" and do not have information about its achievements, but, what is more, they officially make assertions about the lag of Soviet science behind world scientific and technical progress. This is given the fact that our country has a huge scientific and technical reserve, while in the basic directions of the natural sciences it has forged far ahead. The "leaders," for example, of mathematical science of the world live and work in the USSR.

First of all the scientists, who shun microphones, do not feel drawn to the television screen, and avoid photo journalists, ensure a breakthrough to the highest world level of knowledge. Our statesmen do not know them, but their books, articles, and monographs are at any university of Europe or America.

But there are functionaries from science, who, having seized management posts, are trying to create the impression that we should go to the West for training, while in reality the opposite is happening—the West is

learning from us. The real scientist is well aware: In basic development we have surpassed everyone.

What is disturbing is the retirement of science "into itself," which has emerged in recent times. This is a dead end path. For example, mathematical science, if it does not lose touch with production, first of all the processes of the development of the latest technology and equipment, advances in 7-mile steps. And vice versa.

2. When about 20 years ago our state was faced with the problem of the lag of mathematical research behind the level achieved in countries of developed science, the government of the country called leading scientists together and addressed to them the question: "What is to be done?" As a result a decree, which relied on the recommendations given by them, was adopted. Specific assignments were given to ministries, departments, and organizations, the necessary assets were allocated. But the primary thing is: Collectives were given the corresponding powers. The complete freedom of scientific inquiry was granted. At that time, in particular, at Leningrad University the faulty of applied mathematics and control processes and, under it, the Institute of Computational Mathematics and Control Processes also emerged.

I believe that the state support of the intellectual potential should also consist in this—to assign a specific problem to scientists and to let science develop. It is also extremely important to ensure feedback. It is possible to introduce scientific achievements only at the level of government decisions, but, unfortunately, it is often difficult or else impossible to get a response in the topmost level of the state.

We received from A. Kosygin the assignment to find the optimum ratio in the development of the sectors of animal husbandry between the number of hogs, cattle, and poultry. I will not talk about the the long maze of research, which scientists of Leningrad State University and the All-Union Academy of Agricultural Sciences imeni V.I. Lenin headed by Academician L. Ernst conducted over 10 years. But the conclusion was unexpected. We proved convincingly—mathematically—that wherever there is a misalignment of hog raising—and we have threefold more hogs than there should be—food is short, the country is forced to import grain. The nonequilibrium state of animal husbandry is costing our state 4.5 billion gold rubles. But when the results and proposals were ready, not only the prime minister, but also state policy were changed—the increase of commodity production in animal husbandry is now planned through the increase of the share of concentrated fodders in the diet of animals. And although this does not fit the model calculated by mathematicians, they are no longer listening to us.

3. As regards specifically our Leningrad Center of Applied Mathematics, it is necessary to fulfill the decree of the USSR Council of Ministers, which was adopted 20 years ago, on the transfer to us of a building in the center of Leningrad. Allocated to our collective, it proved to be in the hands of the Leningrad Oblast Agroindustrial Committee.

Academician V. Bolshakov, Director of the Institute of Plant and Animal Ecology (Sverdlovsk)

1. Those scientists, who conducted an election campaign for the mandate of people's deputy of the RSFSR or the local Soviets, will confirm that one of the most widespread questions at meetings with voters was a question like: "How did you, scientists, bring the country (republic, oblast, city) to such a rotten state?" In the television debates I, for example, was literally stunned by a question asked over the telephone by one of the voters: "Why did you sign the permit for the construction of nuclear power plants in the Urals?" Such a reaction is the reverse of my demand for the mandatory ecological assessment of such projects. Unfortunately, this trend—to regard science in general and individual scientists in particular as the causes of the negative phenomena of our life—is now appearing clearly in society.

But at the same time society is sensing more and more strongly the need for the scientific analysis of new processes and problems and for the elaboration on its basis of scientifically substantiated strategies and tactics, forecasts. More and more people, who have a command of scientific thinking, are coming to the management of state, party, and soviet organs. For example, for the first time in the entire history of our Sverdlovsk Oblast specialists, who have academic degrees, were elected both the chairman of the oblast Soviet of People's Deputies and first secretary of the oblast party committee.

2. Now in the management of science emphasis is being placed on the diversity of the forms of scientific organization—temporary collectives, centers of creativity, and so on. But the concept of the scientific school is disappearing before our eyes. But many famous scientific schools of ours enriched world science with outstanding discoveries. Continuity in science and the opportunity for young people to become familiar with scientific inquiry are the most important component of the development of the intellectual potential of the country. The very membership in a specific scientific school from time immemorial was already a stimulus for creativity.

The campaign against so-called monopolism in science, which has now been launched, greatly disturbs me—no school with traditions and continuity can be formed from temporary collectives with constantly changing managers, which are being promoted in every way. In classical (biological) ecology there are several scientific schools. One of them is the Ural school, of which my teacher—Academician S. Shvarts—was the founder. The basic scientific approaches with respect to many situations are different, for example, from the approaches of our colleagues from the Moscow school. But does this really make us adversaries? Not at all, on the contrary, it

makes it possible from different standpoints to work on the most complicated problems of modern ecology.

In my opinion, the monopolism, which one should really fear, pertains most often to the regular distortions in the organizational management of science.

3. What does an outlying, even though recognized institute lack for the attainment of the world level? It is in a second-rate position! This is if you compare it with central institutes of the USSR Academy of Sciences, which are similar in size and themes. Who of the "outlying" scientists of the level of doctor of sciences can actually influence the work of scientific councils of the academy, problem councils, coordinating committees, and commissions? It is possible to count such scientists on your fingers. On the presidium of the USSR Academy of Sciences in recent years there was not, and there is not now, with the exception of the chairmen of the regional departments, a single prominent scientist from an outlying institute. Add here that due to difficulties with registration, housing, and the wage fund we are being reinforced mainly by personnel of local higher educational institutions. While this, I assert as an ecologist, does not lead to flourishing: Any population can function and develop at a high level only by being diversified. In short, it is a hard to accomplish task for an institute from the provinces to attain the world level of research. We are placing hopes in the Russian Academy which is being established.

Corresponding Member of the USSR Academy of Medical Sciences Trufakin, Acting Chairman of the Presidium of the Siberian Department of the USSR Academy of Medical Sciences (Novosibirsk)

1. However sad it is, in our relations we are continuing "to throw about stones," trying to hit with them far more painfully. I want to believe that this trend will abate, for already today there is gradually coming to the "accusers" the understanding: Without science, without its foundation—knowledge as the basis of any creative, constructive activity—society is unable to function. For me an indicator of the occurring gradual turn in the relations of science and society is the large-scale enlistment of scientists as experts of national economic projects. Today in the country people have also perceived as proper the news that scientists have been included on the Presidential Council.

2. In order to begin to support the intellectual potential, it is necessary first to establish a system of its reproduction. Today it is absent. And, realizing this, everyone is filling this gap in his own way. Higher educational institutions by means of contests select capable children for their boarding schools and specialized classes, enterprises are trying to open their own vocational educational subdivisions. From time to time cooperatives begin to engage in the search for geniuses. Alas, there is little professionalism in all this, there is more "amateurism."

At the same time as the depletion of the stratum of young talented people a huge "brain drain" abroad is taking place. A process, which is not less terrible in its consequences, is the "brain drain" from the basic fields of science to cooperatives, cost accounting associations, and various associations. In essence the systematic robbing of the future is occurring: The intellectual potential of the nation is being eroded.

It is high time for our parliamentarians to study this problem in all its multidimensionality and to search for means of its solution. Kind parting words are good, but financing, equipment, and the inclusion of our scientists in international programs and in the international scientific community are also necessary.

3. When the brigade of emergency medical assistance of the Institute of Clinical Immunology flew off to Bashkiria to the region of a railroad catastrophe, there was at its disposal, in addition to everything necessary, T-activin—a drug which "patches holes" in the human immune system. It is irreplaceable in the treatment of the consequences of serious injuries and burns, but on the condition that it will be applied properly, that is, to a person who has such defects of the immune system. Otherwise the valuable drug becomes useless. Our development, which has been rated highly by experienced medical personnel, also serves precisely the evaluation of the "competence" of the immune system. Scientist, including me, worked about 10 years on it. But what kind of "labor" was this? First there were not enough instruments, then not enough reagents, then not enough compounds.

In order to attain the world level of scientific research, it is necessary first of all to raise to the appropriate level the respect for the personality of the scientist-creator and to provide his creative labor with everything necessary.

Doctor of Physical Mathematical Sciences G. Zherebtsov, Director of the Siberian Institute of Terrestrial Magnetism, Ionosphere, and Radio Wave Propagation (Irkutsk)

1. The current problems of the country, inflation, for example, are not passing over scientists and are forcing many to seek a higher paying occupation than a job at a scientific research institute. There are as many cases as you like: A graduate student defended his dissertation and...left for a cooperative. Alas, this at times is of greater prestige than conducting basic research, from which there is no immediate result. A stereotype of thinking is also coming into play: They are attempting to adapt academic science all but to the solution of local economic problems. Although its task is the constant search for the truth. One must not "harness" it, on the contrary, it is necessary to emancipate it—then the greatest return will come from it.

2. I believe that science needs not management, but finances. But when ministries and departments, which know in advance what result they need, finance science, they transform it—whether you like it or not—into a

servant. It is necessary to regulate the relations of science and the state, a law on science is needed.

The Russian Academy should give impetus to the development of science. We hope that it will overcome the unnecessary division of science into academic and VUZ [higher educational institution] science. In all developed countries they are united.

3. The international contacts of scientists and higher educational institutions are expanding, but our bureaucratic machine is putting "spokes in the wheels." Take the drastic steps on the part of Aeroflot—it introduced restrictions which hinder currency-free exchange. True, under the pressure of the community it lifted them by the end of the year.... It is also difficult for us to receive a colleague from abroad. A large number of social problems arise.

The question of the financing of science seems all but trivial, but is not losing urgency became of this. Take the system of grants. It seems to be rather good: Win the competition and prove that your program is better than others, and you will receive money for its implementation. But how is it in practice? Our institute receives from the state 4 million rubles a year. In all 2.5 million rubles are used for monitoring, which includes regular long-term observations of the parameters of circumterrestrial space: the magnetic field, cosmic rays, observation of the sun, and so forth. There remain for science 1.5 million rubles. And this is at our quite large institute and given the present jump in prices! However good the system of grants is, it is first necessary to give academic science base financing, so that it could breathe more or less easily.

UDC 614.876(477)

Health Specialists Alarmed at Chernobyl Radiation Norms

907A0244A Moscow MEDITSINSKAYA RADIOLOGIYA in Russian No 1, Jan 90 pp 7-9

[Article: "The Statement of a Group of Scientists, Who Work in the Field of Radiation Safety and Radiation Medicine, in Connection With the Situation Resulting From the Accident at the Chernobyl Nuclear Power Plant"]

[Text] The radiation situation in the rayons of the Belorussian SSR, the RSFSR, and the Ukrainian SSR, which were contaminated as a result of the accident at the Chernobyl Nuclear Power Plant, is validly arousing the alarm and concern of scientists, the population, and the community.

The radiation levels in these rayons owing to physical processes and the implemented protective measures continue to decrease. At the same time the emotional strain of the population is steadily increasing. The formed situation is being discussed extensively by the mass media; here in a number of cases the opinion about the catastrophic consequences of the accident for the life and health of many thousands of people, especially the child population, is being expressed. Here all abnormalities, which are identified in the process of comprehensive many-sided examinations, are linked with the effect of radiation.

On this basis irresponsible, scientifically unsound decisions are being formulated and the confidence in practically any medical and hygienic recommendations is being undermined.

We, specialists in the field of radiation protection and medicine, consider it our duty to set forth the basic principles of setting radiation standards, which are based on the present state of radiobiological and medical science. They, in our deep conviction, should be followed when implementing medical hygiene measures in these rayons, and first of all when settling questions connected with the evacuation of people.

Two periods are distinguished in the formation of the radiation situation in the contaminated territories. The implementation of measures, which prevent immediate adverse changes of the health of people in connection with the effect of radiation, was the basic task of radiation protection during the first (initial) period. This task was for the most part accomplished.

Unfortunately, it was not entirely possible in good time and everywhere to prevent radioactive iodine from entering the thyroid gland by the taking of compounds of stable iodine.

The fate of children, whose thyroid gland was irradiated by radioactive iodine in doses exceeding 200 rem, is our basic anguish and alarm.

It is well known that the entrance of radioactive iodine into the thyroid gland and its external irradiation lead to acute hypothyroidism, especially among children, only if the dose achieves several thousand rem. However, temporary changes of the function of the thyroid gland are possible already in case of doses of several hundred rem. All these children are under close dispensary observation and, if necessary, appropriate treatment.

At the present, second stage the contamination of the territories with long-lived radioactive substances is a factor which determines the radiation situation. At present according to the data of hundreds of thousands of measurements of the body burdens among people, which live in the contaminated territories, as well as analyses of the radioactivity of the soil, food, water, and air, in these regions the individual dose comes to 2.5 rem a year and less and will decrease subsequently by a factor of two every seven to 14 years. The weighed many-sided analysis of the entire set of data, which were obtained over the past three years, led to the need to develop a fundamentally new concept—the regulations of the living of people in the contaminated territories.

For this purpose the National Commission on Radiation Protection attached to the USSR Ministry of Health (NKRZ) advanced the concept of the allowable lifetime dose.

What can the amount of this dose be?

All the experience of world and domestic radiation medicine convincingly testifies that substantial changes in the general state of health and the hemogram, which are identifiable by the most advanced methods, occur among irradiated people only in case of doses of more than 80-100 rem, which have been received in a short time (hours, days). In case of long-term irradiation, which continues over an entire lifetime, such changes were observed only in an experiment in cases of the exceeding of a dose of 10 rem a year and a dose amounting overall to hundreds of rem. Similar facts were obtained in case of the monitoring of X-ray technicians.

The National Commission on Radiation Protection when establishing the value of the maximum individual dose over a lifetime specified an amount equal to 35 rem. This amount is several fold less than the above-indicated values of the doses, in case of which adverse consequences of irradiation can appear, and in accordance with the used method of calculation for specific cases has an additional reserve.

Moreover, it was take into account that in accordance with the recommendation of the ICRP (the International Commission on Radiological Protection) for a enormous number of people, including children, who live around nuclear facilities, over more than 30 years irradiation in a dose of up to 0.5 rem a year, that is, the same 35 rem over 70 years of life, was allowed.

It is necessary to point out that in a number of regions of the world (China, India, Brazil, Northern Europe) large groups of people (up to several million) for a number of generations have lived under the conditions of a natural radiation background of 1-2 rem a year (70-140 rem over 70 years). Here no changes are observed in the frequency of oncological diseases and in the basic demographic indicators as compared with the corresponding control regions.

In choosing the maximum dose the National Commission on Radiation Protection is taking note of the fact that this amount—35 rem—also already contains a portion of the dose received during the first 3 years and comes in several population centers to up to half of the total irradiation recommended over a lifetime. While in a number of villages (Yasen and Shevchenko of Polesskiy Rayon of Kiev Oblast, Chudyany and Malinovok of Mogilev Oblast, and others), the decision on evacuation from which was made long ago, but so far for some reason has not been fulfilled, the maximum dose over a lifetime (35 rem) can be exhausted in the next few years.

For the bulk of the population for the coming years (1990 to 2060) with allowance made for the previously received irradiation in case of permanent residence until the end of life the doses will be in the range of 5 to 25 rem.

And nevertheless does the adopted approach eliminate completely the possibility of any radiation risk? No, it does not. However, it is necessary to evaluate quantitatively the extent of this risk, having compared it with the spontaneous (background) level of the same events: the occurrence of deformities, tumors, and hereditary defects.

For the evaluation of the above-listed adverse effects from small doses of radiation (less than 100 rem) modern radiation hygiene throughout the world is guided by the so-called linear thresholdless hypothesis. This hypothesis infers that any increase of the radiation dose leads to an increase of the likelihood of the development of oncological diseases and the appearance of hereditary pathology.

This does not at all mean that a tumor or deformity appears without fail with the hypothetical frequency and especially in a specific person. Nevertheless, it is possible to make a estimate of such a risk by relying on the most recent data, which have undergone the examination of authoritative international organizations, particularly the UN Scientific Commission on the Effects of Atomic Radiation (UN SCEAR).

Given a cumulative individual dose of 35 rem according to the linear thresholdless hypothesis from different estimates it is possible to expect the development over an entire lifetime of approximately 100-1,000 additional cases of cancer to the 13,000-18,000 cases per 100,000 people, which occur without irradiation. Thus, the additional cases of cancer in principle can come to 0.6 to eight percent of their total number over 70 years of life.

To correctly understand the significance of this value it is necessary to bear in mind that the annual increase of the spontaneous death rate from cancer from the most different, including unknown, causes is increasing in all countries. During the period of 1980-1985 in the USSR this increase came to 2 percent among men and 0.9 percent among women. Thus, the anticipated theoretically potential increase of the level of the death rate from cancer in connection with irradiation will be substantially less than the spontaneous increase. Hereditary defects are even less significant in frequency given the recommended amount of the dose in a lifetime.

The number of hereditary defects in the first two generations in case of a radiation dose of 1 rem is taken to be equal to 4 cases per 100,000 people a year with a spontaneous (background) level on the order of 6,000-7,000 cases.

As for the people, whose thyroid gland received a higher than usual dose as a result of the entrance of radioactive iodine, there are no scientific grounds to assume that

irradiation in a dose of 2 rem or less a year and overall of 35 rem in a lifetime will have an additional adverse effect on its condition.

The results of many years of observations of the state of health of the population, which was exposed to radiation in significantly large doses, are the most important confirmation of the validity of the concept of a lifetime dose of 35 rem. What are meant are the residents of Hiroshima and Nagasaki, who survived the atomic bombings, as well as the population of Chelyabinsk Oblast, which suffered from an accident at a radioactive waste storage pit in 1957.

It has been shown that the increase of the number of cases of so-called solid tumors in Japan is observed only after a dose of one-time irradiation of more than 100 rem, and of blood cancers (leukemias) and myelomas after a dose of more than 50 rem. An increase of genetic irregularities in connection with irradiation was not observed.

In case of the analysis of the data for Chelyabinsk Oblast a connection of the frequency of oncological diseases with the radiation doses was also not detected.

Let us now examine the alternative objections to the establishment of a dose of 35 rem when using it as a criterion for evacuation.

1. It is proposed to take as a basis for evacuation the density of the contamination of the territory with cesium-137. This proposal is absolutely unacceptable, inasmuch as given the same densities of the contamination of territories the body burdens on the population can vary substantially, by a factor of 20 to 50, due to the difference of the coefficients of the passage of radioactive cesium through the soil-milk-body or soil-diet-body food chains.

2. It is indicated that the contribution of strontium-90 and transuranic elements (particularly plutonium) is not taken into account in the body burden. In connection with this it should be emphasized that when substantiating the dose for a lifetime the allowable body burden was taken into account. Here all the sources of its formation should be taken into account.

According to the data of check analyses, the density of the contamination of territories with strontium-90 beyond the evacuation zone does not exceed 0.2-1.0 curie per square kilometer, although small localized "spots" with a higher density of contamination, which should be decontaminated naturally, can occur. It is well known that this radionuclide, when entering the body, is localized primarily in bone tissue.

When estimating the real body burden in each population center, it is naturally necessary also to take into account the contribution to the dose in the absence on contaminated territories of radioactive strontium.

The entrance into the human body of plutonium from the environment through food chains given the existing densities of contamination with this radionuclide is infinitesimal, in connection with this it is also possible to ignore its contribution to the radiation dose.

3. The question of the necessity of taking into account the role of the dust factor and what are called "hot particles" is being raised. It has been shown, however, that even within the 30-kilometer zone, which has the highest density of contamination with transuranics, their concentration in the air, which is due to wind lifting and technological dust formation, is less than the allowable concentration in our country and abroad for the population, while the radiation doses of the lungs are obviously less than the allowable doses.

The biological significance of "hot particles" was studied over many years. Individual aspects of the problem still need specification. However, on the basis of gained experience it is obvious the influence of "hot particles" on the development of lung tumors is far less than that of uniformly distributed radioactive substances or external gamma radiation.

4. The intensification of the effect of radiation by nonradiation factors (synergism) is one of the objections to the concept of 35 rem. This effect has been recorded only in the area of high doses (more than 100 rem at one time), moreover, the coefficient of intensification comes to not more than 2.0, while not exceeding, as a rule, 1.3. In the area of the doses and strengths of doses in question the synergistic effect is unreal.

5. Doses over a lifetime of 10 and 7 rem or respectively 0.13 and 0.1 rem a year are proposed as an alternative amount. In conformity with the linear thresholdless hypothesis the estimated probability of a radiation risk will decrease proportionately. In itself the principle of the decrease of the dose (and the dose regulations) to as low as possible a level is fully supported by us and has been officially recorded in domestic and foreign norms of radiation safety. Any reasonable economically and socially justified measures, which are aimed at the decrease of radiation doses to less than the established regulations, should only be welcomed. Taking into account, however, that the questions of the economic and social justification of these measures are in the competence of soviet and economic organs, we consider it our duty to draw attention to a number of things which are arising in connection with the suggestion on the introduction of very small (7-10 rem) numerical values of the maximum dose over a lifetime.

It should be taken into account that the natural radiation background in our country comes to approximately 0.2 rem a year. This means that it will be extremely difficult to find such regions, in which additional irradiation in the indicated amounts could be guaranteed to be observed and, especially, could be reliably supported by dosimetric monitoring.

It must also be kept in mind that this dose (7-10 rem) was already used up by the post-accident irradiation in the majority of population centers of the territories of strict

control or will be accumulated in the immediate future. Consequently, for the remaining 65 years of life the fraction of the regulated dose (7-10 rem) will be absolutely inaccessible for monitoring and measurements.

6. Let us also examine the suggestion on the acceptance of a dose of 10 and 7 rem from the standpoint of the serious psychosocial stress as are the involvement in the process of evacuating hundreds of thousands (up to 1 million) people and the inevitable harm to their health, which the disturbance of the already established style of life and the organization of their medical service and monitoring will do. Here the indications for evacuation in accordance with the criterion of 7-10 rem will appear for the residents of many quite large cities and rayon centers.

From a medical standpoint, in our deep conviction, the allocation of even a fraction of the resources, which are necessary for mass resettlement, for the needs of health care of the regions that suffered will yield an immeasurably greater impact. Suffice it to mention that the positive effect of priority medical service has already been demonstrated by the increase of the indicators of the health of the population of the Indian state of Kerala with a high natural radiation background, and even among the people who survived the atomic bombings of Hiroshima and Nagasaki. Among these latter, in spite of the mass one-time irradiation, the life expectancy increased noticeably and the indicators of health improved, as compared with other cities of Japan, where a similar level of health care was not provided.

Finally, doubts are arising about the feasibility of the support by practical actions of movements of the population, which are even more modest in scale and were urgently recommended by health care organs of the Union and republics more than a year ago. What is one to say about the resettlement of 1 million people, which is guaranteed on the medical and social level?

7. The assertion about the "growth" of the overall sick rate and the "deterioration of the health" of the population, especially children, is one of the widespread objections to the concept of safe living in contaminated rayons in case of the observance of a dose of 35 rem. Here the initial background of the sick rate and its natural "growth" in case of an expanded mass clinic system with the use of advanced, previously unavailable methods (immunological, endocrinological, and others) are not taken into account.

We are also taking particular note of the possible connection between the state of health of people and such adverse factors as the disturbance of the customary way of life and especially the diet in connection with the numerous, not always substantiated prohibitions and restrictions on the part of local organs, as well as with the difficult life situation experienced by the population.

Here we consider it our duty to note that many rayons that suffered are assigned to the category of endemic rayons. In the local diet a shortage of iron, iodine, and other vitally important elements and trace elements was observed even before the accident. But now, when temporary restrictions and prohibitions on the consumption of local foodstuffs, including berries, fruits, gifts of the forest, and others, have been introduced, it is possible, it would seem, to eliminate these shortages by bringing in full-value clean products. In reality, in spite of the constant appeals and demands of health care organs in many population centers there are not enough brought-in products, they are of low quality and are expensive. And it turns out that through the fault of local organs, which are responsible for the supply of the population of the rayons that suffered with foodstuffs, the quality of the diet is getting worse as compared with the pre-accident diet. The health of children is especially sensitive to this factor. Locally produced foodstuffs could be of particular importance here, if the organs of the Agroindustrial Committee would fulfill its immediate duty: the allocation of clean fodders and cultivated pastures to those who still have livestock in individual use. Unfortunately, thus far the proper order does not exist here, in spite of the existing strict decisions on this issue. And in the end due to the extremely inferior diet the health of the population, especially children, is suffering.

In connection with the foregoing we state with all responsibility that the limit, which has been substantiated and recommended by the National Commission on Radiation Protection as the criterion for the making of responsible decisions—35 rem over a lifetime—is the maximum dose, by which one should be guided with allowance made for all the socioeconomic conditions that are forming in each specific population center, rayon, and oblast for the making of the decision on evacuation or the possibility of further living in the territories in question.

We insist that if after a careful analysis of the formed situation in specific population centers it turns out that, on the condition of living that is normal and without any restrictions, the dose over a lifetime might exceed 35 rem, the population should be evacuated from such places.

It is important to note that many opinions on the state of health are formed not on the basis of high-quality generalized, statistically reliable data for a republic or oblast, but on selectively and tendentiously chosen fragmentary information on individual indicators and isolated observations in one contaminated rayon or another, without a comparison with the level of the doses and adequate monitoring. Such information, including that which comes from republic academic institutions, naturally attracts the attention of the mass media, thereby contributing to the formation of a negative public opinion, and increases the psychological load on the population of the rayons that suffered.

In conclusion it should be noted that at all the stages of its formulation the concept of the National Commission on Radiation Protection was accompanied by systematic

consultation and the careful examination of its individual aspects by competent international organizations, such as the IAEA, WHO, and the Scientific Commission on the Effects of Atomic Radiation attached to the United Nations, and was fully endorsed by them.

When drawing up this document we proceeded from the aspiration to bring people release from the real dangers, which arise in case of the unfounded moving of enormous contingents and aggravate the psychosocial harm that has already been done to them.

We are striving to help people develop an adequate weighed comparative assessment of the real and imaginary dangers for their health. This will enable them to choose a sound optimal decision in each specific situation and will make it possible to channel the economic resources of the region and country into actually necessary measures, which from world experience will be most effective for the preservation of their health.

We are addressing to the Supreme Soviet the suggestion to discuss immediately the entire set of data on the medical consequences of the accident at the Chernobyl Nuclear Power Plant and in the appropriate Commissions of the USSR Supreme Soviet, after a special hearing, to take under strict control the rigorous fulfillment of the recommendations when follow from the concept of the National Commission on Radiation Protection.

14 September 1989

[Signed] Doctor of Biological Sciences G.M. Avetisov; Academician of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin R.M. Aleksakhin; Professor N.S. Androsov; Candidate of Medical Sciences V.P. Aristov; Professor G.D. Baysogolov; Candidate of Medical Sciences A.G. Bazhin; Doctor of Biological Sciences M.I. Balonov; Doctor of Medical Sciences L.A. Buldakov; Doctor of Biological Sciences A.A. Vaynson; Candidate of Medical Sciences V.S. Voronin; Professor R.I. Gabuniya; Professor G.V. Goldobenko; Candidate of Medical Sciences P.V. Goloshchapov; Professor K.I. Gordeyev; Professor Yu.G. Grigoryev; Professor N.G. Gusev; Corresponding Member of the USSR Academy of Medical Sciences A.K. Guskova; Doctor of Medical Sciences Professor N.G. Darenskaya; Candidate of Technical Sciences Ye.V. Devyataykin; Candidate of Medical Sciences S.N. Demin; Doctor of Medical Sciences Professor I.G. Zhakov; Candidate of Physical Mathematical Sciences Yu.M. Zhuchenko; Candidate of Medical Sciences A.S. Zykova; Doctor of Biological Sciences A.A. Ivanov; Doctor of Physical Mathematical Sciences Professor V.I. Ivanov; Candidate of Medical Sciences Ye.V. Ivanov; Academician of the USSR Academy of Medical Sciences Doctor of Medical Sciences L.A. Ilin; Candidate of Medical Sciences N.Ya. Kabasheva; Doctor of Medical Sciences Z.I. Kalmykova; Doctor of Medical Sciences V.S. Kalistratova; Candidate of Medical Sciences Ye.P. Kondratenko; Candidate of Technical Sciences Yu.O. Konstantinov; Candidate of Medical Sciences M.M. Kosenko; Candidate of Medical Sciences V.V. Kreslov; Doctor of Medical Sciences N.A. Koshurnikova; Corresponding Member of the USSR Academy of Medical Sciences Doctor of Medical Sciences V.S. Koshcheyev; Doctor of Physical Mathematical Sciences V.A. Kostylev; Corresponding Member of the USSR Academy of Medical Sciences Doctor of Medical Sciences G.I. Lazyuk; Candidate of Medical Sciences V.K. Lemberg; Candidate of Medical Sciences B.G. Lobanov; Doctor of Technical Sciences Professor V.A. Logachev; Candidate of Medical Sciences E.R. Lyubchinskiy; Doctor of Biological Sciences A.M. Lyaginskaya; Candidate of Medical Sciences A.I. Mamin; Doctor of Technical Sciences Professor U.Ya. Margulis; Doctor of Medical Sciences Professor Ye.G. Matveyenko; Academician of the USSR Academy of Medical Sciences Doctor of Medical Sciences V.A. Matyukhin; Academician of the USSR Academy of Medical Sciences Doctor of Medical Sciences B.B. Moroz; Doctor of Medical Sciences K.N. Muksinova; Candidate of Medical Sciences G.O. Mushkacheva; Doctor of Medical Sciences Professor G.N. Novozhilov; Candidate of Medical Sciences N.D. Okladnikova; Candidate of Technical Sciences O.A. Pavlovskiy; Candidate of Medical Sciences V.S. Pesternikova; Candidate of Chemical Sciences R.I. Pogodin; Candidate of Medical Sciences O.G. Polskiy; Doctor of Biological Sciences Professor B.S. Prister; Doctor of Medical Sciences Professor O.A. Pyatak; Doctor of Medical Sciences Professor P.V. Ramzayev; Candidate of Biological Sciences S.A. Rogacheva; Doctor of Medical Sciences Professor M.I. Rudnev; Candidate of Technical Sciences M.N. Savkin; Doctor of Physical Mathematical Sciences Professor Yu.V. Sivintsev; Candidate of Medical Sciences A.M. Skryabin; Candidate of Biological Sciences V.F. Stepanenko; Candidate of Medical Sciences M.V. Sumina; Candidate of Biological Sciences K.G. Suslova; Candidate of Medical Sciences V.I. Telnov; Candidate of Medical Sciences F.D. Tretyakov; Doctor of Medical Sciences N.D. Tronko; Candidate of Technical Sciences I.V. Filyushkin; Candidate of Biological Sciences S.K. Firsakova; Candidate of Chemical Sciences G.V. Khalturin; Doctor of Medical Sciences Professor K.P. Khanson; Doctor of Biological Sciences V.F. Khokhryakov; Doctor of Medical Sciences Professor A.F. Tsyb; Candidate of Medical Sciences A.K. Cheban; Candidate of Medical Sciences V.A. Chudin; Doctor of Medical Sciences A.A. Chumak; Academician of the USSR Academy of Medical Sciences Doctor of Medical Sciences M.G. Shandala; Doctor of Medical Sciences Professor V.L. Shvedov; Doctor of Biological Sciences N.S. Shvydko; Doctor of Medical Sciences Professor A.A. Sheremetyev-Samusyuk; Candidate of Medical Sciences Yu.S. Shchebetenko; Doctor of Medical Sciences Ye.V. Epshteyn; Doctor of Biological Sciences Professor S.P. Yarmonenko; Doctor of Medical Sciences Ye.N. Antipenko; Doctor of Medical Sciences V.A. Buzunov; Academician of the USSR Academy of Medical Sciences

Ye.I. Goncharuk; Doctor of Physical Mathematical Sciences V.A. Likhtarev; Doctor of Medical Sciences V.G. Bebeshko; Candidate of Biological Sciences K.K. Dushukin

Training in Marketing Benefits Scientific Research Organizations

907A0213A Moscow NTR TRIBUNA in Russian No 5-6, 23 Mar 90 p 5

[Article by D. Ogorodnikov: "Marketing for Research"; first paragraph is NTR TRIBUNA introduction]

[Text] In November 1989 the author of this article did special course work at the London School of Business. Among the large number of other assignments in the educational process practical tasks on getting specific items to the consumer market were examined. The examination of the tasks, which were taken from practice and became educational tasks, showed all the complexity and at the same time the advantage of marketing. While observations of the life of the British capital merely confirmed the conclusions, to which we came in the auditorium.

Looking closely at the abundance in store windows, you clearly visualize the difficulties which any thing, even the most high-quality, most advantageous thing for the consumer (according to the notion of the producer), has getting onto the market. The real situation today is as follows: For successful companies in the structure of the price only 10 percent of the value on the market is spent directly on production (with all its overhead, payments for raw materials and components, and the wage). Average firms in the sense of success (their majority) estimate the direct making of a product at 15-17 percent of the wholesale factory cost. The share of the internal expenditures on the manufacture of a product of 20 percent of the price is the risk threshold. Only the manufacturers of scientific or science-intensive products can venture more—20-25 percent. Thus, in a healthy economy the expenditures on marketing, that is, the search for a consumer and his preparation for acquisition, advertising, the establishment and the support of the operation of a sales network, sales licenses, transportation arrangements and their effectiveness, and so forth, make up from three-fourths to nine-tenths of the cost of a product.

On first impression it might seem to many readers that the domestic economy for the present is still very, very far from this. Undoubtedly, if it is a question of the sales market. When it is a question of the market of domestic scientific products, then it seems that it is just as tight on it as it is for British shoemakers or haberdashers.

Take, for example, the program of research on high-temperature superconductivity. The importance and priority of this work are unquestionable. Therefore, within this program hundreds of research projects are being performed. And this is good in its own way. But today, in the opinion of one of the leading specialists in this field, soon "it will be possible to lay roofs" with the films made of superconductor materials that are being developed for the needs of electronics.

No one, of course, takes this literally, but it is easy to imagine how difficult it is to sell this scientific product to the consumer. Numerous results, technologies, and items in many respects coincide in their consumer properties. And it is very difficult for even the highly skilled (and according to market gauges, discriminating) consumer to make a choice. Whose technology or whose item is one to acquire, what will lead to technical and, subsequently, commercial success? A little imagination and it becomes clear that our "scientific market" is actually reminiscent of the abundance of goods on the selling floor of a department store on London's Oxford Street. And there are many similar examples.

Hence, too, the first attempts at the creation of new forms of the organization of science-intensive development with an orientation toward marketing. Thus, for the last 6 months an enterprising group of specialists from several machine building sectors and representatives of VUZ and academic science has been busy preparing for the establishment of the Association of Scientific and Technical Cooperation in Superconductor Technology. Not in order "to lay roofs" with superconducting film, but to introduce scientific achievements as quickly as possible. Along with the development of specific technical devices and instruments, among the priority tasks of the association the conducting of intensive marketing research and development over the life cycle of products, which have already been developed today within the State Program on High-Temperature Superconductivity, is planned.

Of course, today we will not being able to invest three-fourths of the value per sale in the establishment of a market of scientific products. But in the future, apparently, this is inevitable, and it is necessary to begin if only with something. The largest portion of the intellectual potential of the country is concentrated in the proposed priority of the economy. And its connection to the development of marketing technology will be a guarantee of the quality of such technology, the development and use of which are inevitable on the path of the improvement of the domestic economy.

"What is holding things up?" the reader will ask.

The loss of contact of the manufacturer of any product with its market fate is the source of the unsatisfactory situation. The present standard base is being formed under the dictation of two committee—the State Committee for Prices and the USSR State Committee for Labor and Social Problems.

But it is time to change over to the commercialization of science, so that scientists themselves and the manufacturers of the scientific product would not be cut off from the sale of their commodity and in any case could participate in the establishment of its value. It is advisable to regulate prices in a centralized manner only for presently scarce commodities and basic necessities. Meanwhile, the market of scientific products is overflowing, but is completely unorganized. And it is necessary to turn the fountain of procedural wisdom of our economic departments together with world marketing experience in the direction of the commercialization of applied science. Otherwise the return on the ruble invested in scientific research, which today is low as it stands, will continue to decrease.

All-Union Radiobiology Conference Describes Goals, Program

907A0208A Moscow RADIOBIOLOGIYA in Russian Vol 29 No 6, Nov-Dec 89 pp 846-848

[Article: "The Decision of the 1st All-Union Radiobiology Congress (21-27 August 1989)"]

[Text] The 1st All-Union Radiobiology Congress, which was held in Moscow from 21 to 27 August 1989, was a major review of the present state of Soviet radiobiology. In all 1,200 radiobiologists and scientists from related fields of science took part in the work of the congress. They represented 180 institutes, higher educational institutions, laboratories, and other scientific institutions of the USSR Academy of Sciences and the academies of sciences of the union republics, the USSR Academy of Medical Sciences, the USSR Ministry of Health and the ministries of health of the union republics, the All-Union Agricultural Academy imeni V.I. Lenin, the state agroindustrial committees of the union republics, the USSR State Committee for Public Education, and other ministries and departments (in all 16 departments) from 52 cities of 14 union republics. At the congress 12 plenary reports were heard, 20 sections, which encompass all the current directions of radiobiology and at which 635 reports were heard, operated, and seven round-table discussions were held.

The congress noted that Soviet radiobiology has made a substantial contribution to the development of world science. The results of basic research are being used fruitfully in settling important questions of the use of ionizing radiations in science, medicine, agriculture, and other areas of practical activity.

In our times, in connection with the development of atomic power engineering and radiation technology and the extensive use of ionizing radiations in various spheres of practical activity, the role and importance of radiobiology as a basic science are increasing, it is becoming a social order of society.

At the same time the congress noted the critical state of affairs in domestic radiobiology. The catastrophe at the Chernobyl Nuclear Power Plant highlighted this picture with all obviousness. In the atomic age knowledge in the area of the biological effect of ionizing radiations should be regarded as an integral element of the culture of modern man. Meanwhile, the programs of the training of even biologists and medical personnel at higher educational institutions do not envisage the teaching of radiobiology, even a specialization in this area is lacking.

For a number of years the tendency for radiobiological research to decrease and even the elimination of laboratories at a number of scientific research institutions of the country have been noted. Such a state of affairs is absolutely intolerable and even dangerous first of all in connection with the inevitable necessity of fulfilling a long-term program of operations on the elimination of the consequences of the Chernobyl accident. This became particularly obvious as a result of the discussion of these questions at the congress, which revealed the ambiguity and even the contradictory nature of the opinions of scientists on the basic questions of the evaluation of the existing radiation situation in the country, as well as the different points of view on the magnitudes of the permissible risk, in the determination of the necessity of additional research for the case of an unprecedented accident which in scale is similar to the Chernobyl accident.

The congress noted that the USSR Government is obviously underestimating the complexity of the radiation situation in the country and the role of radiobiology in the solution of the problems that have arisen.

The 1st All-Union Radiobiology Congress resolves:

1. To petition the USSR Supreme Soviet and the USSR Council of Ministers for the special-purpose financing, including foreign currency allocations, of scientific research in the field of radiobiology, the priority of which is determined by the Scientific Council of the USSR Academy of Sciences for Problems of Radiobiology. To commission the bureau of the Scientific Council to prepare the necessary documentation.

2. To propose to the Presidium of the USSR Academy of Sciences and the State Committee for Science and Technology to establish without delay in Moscow the head Institute of Problems of Radiobiology of the USSR Academy of Sciences with affiliates in a number of regions.

3. To direct the attention of the Presidium of the USSR Academy of Sciences and the All-Union Academy of Agricultural Sciences imeni V.I. Lenin to the significant lag of the material and technical base of basic scientific research in the field of radiobiology and to the necessity of earmarking foreign currency allocations for the development of an advanced material and technical base of this research.

To direct the attention of the Presidium of the USSR Academy of Sciences to the intolerability of the lack in the system of the USSR Academy of Sciences of strain experimental animals, which is putting domestic radiobiology in an exclusive position as compared with foreign researchers. To ask the Presidium of the USSR Academy of Sciences to establish a nursery of strain animals at the USSR Academy of Sciences.

4. To ask the Presidium of the USSR Academy of Sciences and the State Committee for Science and Technology to transform the Scientific Council of the USSR Academy of Sciences for Problems of Radiobiology into an interdepartmental scientific council for the complex problem "Radiobiology" attached to the Presidium of the USSR Academy of Sciences as a national coordinating center.

5. Taking into account the complexity of the ecologically adverse conditions which were created as a result of the accident at the Chernobyl Nuclear Power Plant:

5.1. Scientists of institutions of the USSR Academy of Sciences, the academies of sciences of the union republics, the USSR Academy of Medical Sciences, the USSR Ministry of Health, the All-Union Academy of Agricultural Sciences imeni V.I. Lenin, and other departments are to combine efforts within the single program "The Biological Effects of Small Radiation Doses," having devoted particular attention to the study of the remote effects of exposure and the mechanisms of the combined action of radiation and factors of a nonradiation nature and to the development of modifying agents. To ask the Presidium of the USSR Academy of Sciences and the State Committee for Science and Technology for additional financing of this program;

5.2. To propose to the State Committee for Science and Technology to establish in the 30-kilometer zone in the vicinity of the Chernobyl Nuclear Power Plant and in other regions international radioecological stations, at which Soviet scientists, as well as, under leasing conditions, scientists of the United States, the FRG, France, Japan, and other countries could work;

5.3. To draw attention to the necessity of expanding radiobiological research in various natural environments, having in mind first of all the elaboration of measures on the protection of the environment against radioactive contaminants;

5.4. To draw the attention of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin to the necessity of expanding research in the area of agricultural radiobiology, particularly in connection with the elaboration of practical recommendations on the possibility of conducting agriculture in localities with an increased radiation background;

5.5. To draw the attention of the USSR Council of Ministers to the necessity of the immediate production and delivery to the rayons of Belorussia, the Ukraine, and the RSFSR, which suffered from the accident at the Chernobyl Nuclear Power Plant, of the necessary quantities of radiation monitoring equipment (dosimeters, radiometers, human radiation spectrometers), using for this all possible channels, including import deliveries and the organization of joint ventures;

5.6. To draw the attention of the USSR Ministry of Health to the necessity of organizing in the rayons, which suffered, the highly skilled systematic dispensary survey of the population, including genetic monitoring, having directed particular attention to the contingent of children;

5.7. To consider it necessary to report to the population of the contaminated rayons information on the potential risks and to give it the right to decide the question of the possibility of living in these rayons.

6. To speed up basic research on the search for new radiation protectors and their introduction in medical practice. To expand the study of natural compounds, which are capable of reducing the risk of the remote consequences of the effect of small radiation doses, antimutagens, and anticarcinogens.

7. To draw the attention of the USSR Council of Ministers, the State Committee for Science and Technology, the USSR Academy of Sciences, and the USSR State Committee for Public Education to the necessity of the expansion of research in the area of radiation biotechnology and the use of its achievements in the national economy.

To ask the State Committee for Science and Technology to approve the unified all-union scientific and technical program "Radiation Biotechnology in the Agroindustrial Complex, Medicine, and Agriculture," which was drafted by the section of radiation biotechnology of the Scientific Council of the USSR Academy of Sciences for Problems of Radiobiology.

8. To petition the Presidium of the USSR Academy of Sciences, the presidiums of the academies of sciences of the union republics, the Presidium of the USSR Academy of Medical Sciences, the USSR Academy of Pedagogical Sciences, and the All-Union Academy of Agricultural Sciences imeni V.I. Lenin for the setting aside of vacancies of members of these academies in the specialty "Radiobiology" in the next election.

9. To petition the Presidium of the USSR Academy of Sciences, the USSR Academy of Medical Sciences, and the All-Union Academy of Agricultural Sciences imeni V.I. Lenin for the establishment of special prizes for scientific research in the field of radiobiology, radiation biotechnology, and radiation medicine.

10. To address to the USSR State Committee for Public Education a proposal on the convening of a conciliatory conference of the USSR State Committee for Public Education, the All-Union Academy of Agricultural Sciences imeni V.I. Lenin, and the USSR Ministry of Health for the discussion of the question of the introduction of interdisciplinary courses on radiobiology at universities, as well as at medical and agricultural higher educational institutions.

11. To commission the Scientific Council to coordinate the questions of the planned training of personnel of the highest skill in the area of radiobiology through special-purpose graduate studies and practical studies of young scientist at leading radiobiology laboratories of the country, as well as the organization of courses for the improvement of skills in the area of radiobiology.

12. For the increase of the level of the radiobiological, radioecological, and radiological literacy of the population of the country to commission the Scientific Council to organize the giving of series of lectures of leading

radiobiologists in various regions and statements in the press and on television and the making of scientific promotional movies.

To draw the attention of the USSR State Committee for Public Education to the unsatisfactory situation in connection with the lack of scientific and popular scientific literature on radiobiology and radioecology, which was especially aggravated after the elimination of the Publishing House of the USSR State Committee for the Utilization of Atomic Energy.

13. To establish the All-Union Radiobiology Society, which is called upon to promote the contact of scientists, the exchange of information, and the increase of the coordination of scientific research and its effectiveness. To address to the Presidium of the USSR Academy of Sciences a request on the registration of the society.

14. To expand in every possible way the international contact of radiobiologists as one of the necessary means of the development of science and the overcoming of the lag in a number of directions of radiobiology. To petition the Presidium of the USSR Academy of Sciences for the allocation of special assets for the practical training of Soviet scientists at leading radiobiology laboratories of the world, for the joining by our scientists of the European Radiobiological Society and other international organizations, and for their participation in the work of international scientific measures.

15. To regard as necessary the holding of all-union radiobiology congresses no less often than once every five years.

Koptyug Awarded 1990 Lenin Prize for Science, Technology

907A0211A Moscow PRAVDA in Russian 22 Apr 90 2nd edition p 1

[Article under the rubric "We Congratulate the Winners": "High Awards. The 1990 Lenin Prizes"; first paragraph is PRAVDA introduction]

[Text] The CPSU Central Committee and the USSR Council of Ministers supported the suggestion of the Committee for Lenin and USSR State Prizes in Science and Technology attached to the USSR Council of Ministers on the awarding of the 1990 Lenin Prizes.

The prizes were awarded to:

Academician Valentin Afanasyevich Koptyug, director of the Novosibirsk Institute of Organic Chemistry of the Siberian Department of the USSR Academy of Sciences; Doctor of Chemical Sciences Vladimir Aleksandrovich Barkhash, lead scientific associate, and Doctors of Chemical Sciences Vitaliy Davidovich Shteyngarts and Vyacheslav Gennadyevich Shubin, heads of laboratories, associates of the same institute—for basic research on the structure and reactivity of carbocations.

Academician Dmitriy Georgiyevich Knorre, director of the Novosibirsk Institute of Bioorganic Chemistry of the Siberian Department of the USSR Academy of Sciences; Doctor of Chemical Sciences Nina Ivanovna Grineva, director of a laboratory of the Scientific Research Institute of Experimental Hematology and Biotechnology of the All-Union Hematological Scientific Center; Corresponding Member of the USSR Academy of Sciences Rudolf Iosifovich Salganik, deputy director of the Institute of Cytology and Genetics of the Siberian Department of the USSR Academy of Sciences; Doctor of Chemical Sciences Zoya Alekseyevna Shabarova, professor of Moscow State University imeni M.V. Lomonosov—for the development of the principles of the addressed modification of genetic structures.

Academician Vladimir Semenovich Pugachev, adviser to the board of directors of the Institute of Problems of Information Science of the USSR Academy of Sciences—for works on the statistical theory of control processes.

Lenin Prize Awards for S&T Reach Record Low

907A0224A Moscow PRAVDA in Russian 23 Apr 90 1st edition p 2

[Article by Academician G. Marchuk, chairman of the Committee for Lenin and USSR State Prizes in Science and Technology attached to the USSR Council of Ministers, under the rubric "Get Acquainted: The Winners of the Lenin Prize": "The Authority of Science. Splendid, Siberians! Genetics Gets Revenge. The Models of Pugachev"; first paragraph is PRAVDA introduction]

[Text] This year only three Lenin Prizes were awarded in science and technology—the smallest number in one conferment in their entire 65-year history.

Apparently, it is possible to regard this fact as a symptomatic one, which is in keeping with the overall state of science, and first of all basic science, in our country. The substantial increase of the demands on works, which was recorded in the new Statute on the Lenin Prize, which took effect this year, also had an effect. And the new composition of the committee, which now consists of three independent departments, began to discuss more objectively, in greater detail, and in a more fault-finding manner each theoretical and practical result of the competitive work.

I believe that if we also succeed in the future in implementing the incorporated principles of the awarding of the prizes, we will steadily increase their prestige and, consequently, their influence on the development of the creative initiative of scientists and specialists.

It is pleasant for me, who worked long years at the Siberian Department of the USSR Academy of Sciences, to note the fact that six of the nine new winners are scientists of the Siberian Department.

Four of them—Academician V.A. Koptyug and Doctors of Chemical Sciences V.A. Barkhash, V.D. Shteyngarts, and V.G. Shubin—were awarded the lofty title for work in the field of organic chemistry. The winners studied in detail the laws of the formation and the chemical properties of carbocations—intermediate particles which are involved in a wide range of reactions of the synthesis of organic substances.

In the work the possibilities of the control of carbocationic reactions and the sufficiently accurate prediction of the primary direction of complex multipath reactions were substantiated theoretically. When conducting the experiments the authors used efficient computer systems, which were developed by them and made it possible to establish the structure of complex organic compounds on the basis of molecular spectra.

The work of the winners holds a leading position in world science and is revealing new promising directions in theoretical and industrial organic chemistry. Thus, the possibility of developing new, very advanced technological processes, which constitute the basis of large-tonnage works in case of the cracking of hydrocarbons and the synthesis of intermediate products in pharmaceutical chemistry, is appearing.

The work, which was performed by Siberians Academician D.G. Knorre and Corresponding Member of the USSR Academy of Sciences R.I. Salganik and Muscovites Doctors of Chemical Sciences N.I. Grineva and Z.A. Shabarova, "The Development of the Principles of the Addressed Modification of Genetic Structures," is a vivid example of the scientific achievements, which are capable of making revolutionary breakthroughs in engineering and technology, particularly biotechnology. The authors, who are scientists of the Siberian Department of the Academy of Sciences, the All-Union Hematological Center, and Moscow State University imeni M.V. Lomonosov, examined the chemical processes, which

occur in living matter and which for a long time were not accessible to knowledge. Directed mutagenesis—the obtaining of directed changes of the structure and functions of specified genes and individual sites of nucleic acids—was commenced. This was achieved by acting on targets—selected sites of nucleic acids, which code hereditary information. Fragments of natural DNA's with a high reactivity were used as probes. As a result the winners discovered and developed a general-purpose effective method of the chemical assembly of genetic structures, which made possible the entirely chemical synthesis of genes.

The development of the methodology and chemical approaches and the implementation of complementarily addressed modification—one of the first methods of mutagenesis in the world—are an outstanding achievement in bioorganic chemistry and molecular biology. The method has extensive practical possibilities. First of all prospects are being afforded for the obtaining of preparations with a directed antitumor and, in the future, antiviral action.

The altered genetic program has prospects of application in case of the synthesis of hormones or enzymes, which are intended not only for medicine, but also for agriculture and industry. Possibilities of studying the causes of the hereditary predisposition to cancer, premature aging, and the increased sensitivity of the body to radiation exposures are emerging. A unique method of studying the mechanisms of the functioning of genetic structures and mutagenic processes has also come into the hands of scientists.

These outstanding achievements in the field of biology testify to much, if you recall that in our country it was neglected for a long time, and before the early 1960's genetics was devastated. The research, which was conducted by the winners over the last 20 years, led to results which have received world recognition.

Academician V.S. Pugachev—one of the founders of the statistical theory of control processes—was awarded the Lenin Prize.

The Soviet school of probability theory has made a large contribution to world science. Our scientists laid the foundations of both the mathematical and the applied theory of random processes. The elaboration of the questions of the optimum control of systems under the conditions of the effect of random factors is linked first of all with the name of V.S. Pugachev.

The winner developed many effective methods of the analysis of random processes and their optimum control. A number of problems and methods, which were developed by the winner, at the moment of publication led the research of other authors. The works of V.S. Pugachev, given the high level of mathematical strictness, were always oriented toward practical application. They found implementation in the designing of automatic systems, which are of great importance for the national economy and defense. Academician V.S. Pugachev is using his longstanding experience in the development of further research and is making a large contribution to the fulfillment of the statewide program of the extensive use of the methods of mathematical simulation in practice.

In conclusion I want to congratulate the winners of the traditional review of the highest scientific achievements of the country, which was timed to coincide with the 120th anniversary of the birth of V.I. Lenin, to wish the new winners of the Lenin Prize further creative successes, as well as to express the hope that the task, which was posed by the logic of perestroyka for Soviet science—in the shortest time to see to the attainment of leading positions in the most important directions of basic research—will be embodied in the works of the present and future winners of the Lenin Prize.

Foreign Broadcast Information Service (FBIS) and Joint Publications Research Service (JPRS) publications contain political, military, economic, environmental, and sociological news, commentary, and other information, as well as scientific and technical data and reports. All information has been obtained from foreign radio and television broadcasts, news agency transmissions, newspapers, books, and periodicals. Items generally are processed from the first or best available sources. It should not be inferred that they have been disseminated only in the medium, in the language, or to the area indicated. Items from foreign language sources are translated; those from English-language sources are transcribed. Except for excluding certain diacritics, FBIS renders personal and place-names in accordance with the romanization systems approved for U.S. Government publications by the U.S. Board of Geographic Names.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by FBIS/JPRS. Processing indicators such as [Text] or [Excerpts] in the first line of each item indicate how the information was processed from the original. Unfamiliar names rendered phonetically are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear from the original source but have been supplied as appropriate to the context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by the source. Passages in boldface or italics are as published.

SUBSCRIPTION/PROCUREMENT INFORMATION

The FBIS DAILY REPORT contains current news and information and is published Monday through Friday in eight volumes: China, East Europe, Soviet Union, East Asia, Near East & South Asia, Sub-Saharan Africa, Latin America, and West Europe. Supplements to the DAILY REPORTs may also be available periodically and will be distributed to regular DAILY REPORT subscribers. JPRS publications, which include approximately 50 regional, worldwide, and topical reports, generally contain less time-sensitive information and are published periodically.

Current DAILY REPORTs and JPRS publications are listed in *Government Reports Announcements* issued semimonthly by the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, Virginia 22161 and the *Monthly Catalog of U.S. Government Publications* issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

The public may subscribe to either hardcover or microfiche versions of the DAILY REPORTs and JPRS publications through NTIS at the above address or by calling (703) 487-4630. Subscription rates will be provided by NTIS upon request. Subscriptions are available outside the United States from NTIS or appointed foreign dealers. New subscribers should expect a 30-day delay in receipt of the first issue.

U.S. Government offices may obtain subscriptions to the DAILY REPORTs or JPRS publications (hardcover or microfiche) at no charge through their sponsoring organizations. For additional information or assistance, call FBIS, (202) 338-6735,or write to P.O. Box 2604, Washington, D.C. 20013. Department of Defense consumers are required to submit requests through appropriate command validation channels to DIA, RTS-2C, Washington, D.C. 20301. (Telephone: (202) 373-3771, Autovon: 243-3771.)

Back issues or single copies of the DAILY REPORTs and JPRS publications are not available. Both the DAILY REPORTs and the JPRS publications are on file for public reference at the Library of Congress and at many Federal Depository Libraries. Reference copies may also be seen at many public and university libraries throughout the United States.