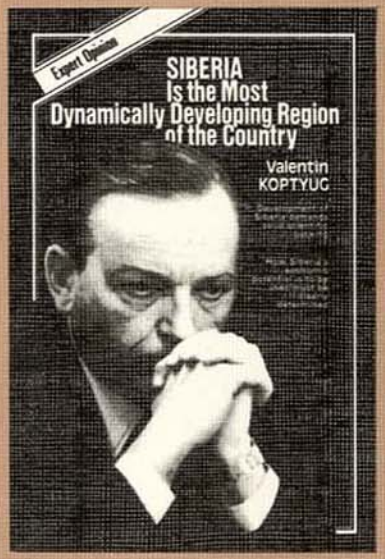

Valentin KOPTYUG

Valentin Koptyug, a specialist in organic chemistry, was elected full member of the USSR Academy of Sciences in 1979 at the age of 48. He has headed the Academy's Siberian Section since 1980, the same year in which he was elected Vice-President of the USSR Academy of Sciences.

Valentin Koptyug was born in 1931. He graduated from the D. I. Mendeleyev Chemical-Technological Institute in Moscow. In 1965 he defended his D.Sc. thesis. His main scientific interests are concentrated in the field of the isomerisation of aromatic compounds. In his work Valentin Koptyug has made a sizable contribution to the development of organic chemistry, having discovered a whole range of isomerisation reactions. His authoritative position in the field of science was one of the reasons why he was elected Vice-President of the International Association of Theoretical and Applied Chemistry.

As head of the Siberian Section of the USSR Academy of Sciences, Valentin Koptyug has been pursuing a policy of the priority development of basic research. In addition, he has been actively supporting research fundamental to technological progress.

Novosti Press Agency
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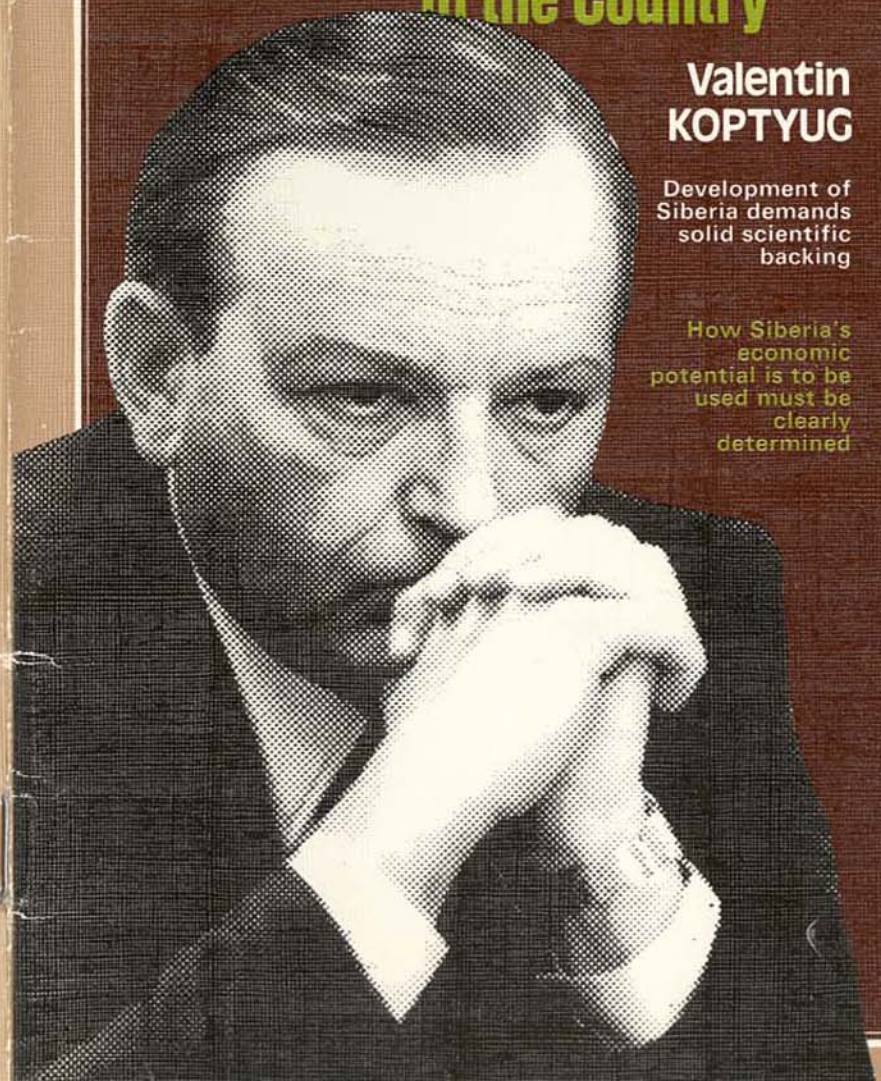
Expert Opinion

SIBERIA Is the Most Dynamically Developing Region of the Country

Valentin KOPTYUG

Development of Siberia demands solid scientific backing

How Siberia's economic potential is to be used must be clearly determined



Expert Opinion

Novosti Press Agency is putting out this new series for readers who are eager to obtain reliable and exhaustive first-hand information on the USSR's accelerated social and economic development.

The following issues have been published:

GURI MARCHUK, Academician and President of the USSR Academy of Sciences: "Science Will Help Speed Production"

ABEL AGANBEGIAN, Academician and eminent Soviet economist: "Make the Economy Responsive to Innovations"

VSEVOLOD MURAKHOVSKY, Vice Chairman of the USSR Council of Ministers, Chairman of the State Agro-Industrial Committee of the USSR: "The Whole Agro-Industrial Complex Will Undergo Changes"

VYACHESLAV SYCHYOV, Secretary, Council for Mutual Economic Assistance: "The Prospects for Our Cooperation Are Good"

KONSTANTIN FROLOV, Academician and Vice-President of the USSR Academy of Sciences: "We Count on Machine Building"

ANATOLI ALEXANDROV, Academician and eminent Soviet scientist: "Possessing Energy Resources Is Not Enough"

IVAN GLADKY, Chairman of the USSR State Committee for Labour and Social Security: "Social Programmes Benefit from Economic Restructuring"

MIKHAIL SHCHADOV, Minister of the Coal-Mining Industry of the USSR: "Coal Itself Isn't Outdated, But the Ways of Using It Are"

NATALIA GELLERT, Chairperson of the Standing Commission on Women's Living and Working Conditions and Mother-and-Child Care of the Soviet of Nationalities of the Supreme Soviet of the USSR: "We All Can Make the Most of Ourselves"

Many Siberian Projects Are the First of Their Kind in the World

The bowels of the Siberian earth have practically all the elements of the Mendeleyev periodic table. Almost three quarters of the USSR's known mineral, fuel and energy resources are concentrated in Siberia. Not only are one half of the world's coal deposits to be found in Siberia, but there are also diamonds, gold, iron, copper and nickel ores and other minerals there. Siberia accounts for one fifth of the world's forests, and the number of rivers in this region exceeds 50,000.

Siberia covers ten million square kilometres. In winter the temperature in some places drops to minus 60 degrees Centigrade and two thirds of Siberia are in the permafrost zone.

The natural and climatic conditions of this vast territory are extremely severe. Although it is rich in mineral resources and offers splendid prospects for development, it is sparsely populated. Mineral deposits are often located thousands of kilometres from the country's industrial centres. On top of all this there is a shortage of labour resources in the region. All these factors create tremendous difficulties in the economic development of Siberia and present complex problems. To solve these problems, vast material and labour inputs are required and the development of this territory demands solid scientific backing.

Academician Valentin Koptyug, Vice-President of the USSR Academy of Sciences and Chairman of the Presidium of the Academy's Siberian Section, gives insight into the work of the Siberian research force which is working toward accelerated scientific and technological progress in the region and the comprehensive development of Siberia. The development of this region is essential to meet the economic and social objectives set for the whole nation by the 27th CPSU Congress. He sets forth his views in an interview with Svetlana Vinokurova, scientific observer of Novosti Press Agency.

Q.: What is Siberia's role and place in the national economy of the USSR today?

A.: Over the last two decades Siberia has become the USSR's biggest fuel and energy supply base. In addition, territorial-production complexes have been established there of great importance for the national economy. The standard of living and the working conditions of the people in Siberia have improved considerably.

The region's share in the country's economic potential is expanding rapidly. In 1984 Siberia, which accounts for eight per cent of the USSR's population, provided 62 per cent of the oil, 54 per cent of the gas and 33 per cent of the coal produced in the country. Siberia furthermore accounted for 25 per cent of the metals, 12 per cent of the chemical fibre, 26 per cent of the commercial and sawn timber, 12 per cent of the grain and 9 per cent of the meat and milk.

Today Siberia is the most rapidly developing region in the country. Economists contend that the average annual growth of production in Siberia should exceed the average growth on the national level by approximately 20 per cent.

The permafrost zone accounts for two thirds of Siberia's overall area, or six million square kilometres. Oimyakon—the cold pole of the Northern Hemisphere—is located here (record temperature—minus 71° Centigrade). There is no other place in the entire world that is as cold as Oimyakon, excluding Antarctica, which is uninhabited.

Q.: How will this be achieved?

A.: First and foremost by accelerating scientific and technological progress. This in turn will be assured by concentrating scientific efforts on the technical re-equipment of the economy.

Q.: What means are available to the Siberian Section of the USSR Academy of Sciences in pursuing this task?

A.: It should be mentioned that Siberia's research centres are more or less uniformly distributed throughout this vast area. They are located in Novosibirsk, Irkutsk, Yakutsk and Ulan-Ude, the last two being capitals of Autonomous Republics. Many-sided research centres have been established in Tomsk and Krasnoyarsk. There are individual research institutes and laboratories in Tyumen, Kemerovo, Chita, Kyzyl, Omsk and Barnaul. Our strategy is to push science steadily to the East.

When the Siberian Section of the USSR Academy of Sciences was established three decades ago, about 80 doctors and 750 candidates of science arrived in Siberia from the European part of the country. Today the overwhelming majority of specialists in Siberia with scientific degrees have been trained at the Siberian Section, which has become a major scientific force in the eastern part of the country. The Siberian Section has close to 9,000 scientists and 19,000 engineers and technicians, of which about 5,000 are candidates and over 600 doctors of science; 35 are full members and 58 corresponding members of the USSR Academy of Sciences. The Siberian Section not only meets its own needs for trained researchers, but also exercises a powerful influence in setting up the faculties at institutes of higher learning in Siberia and the research staffs at its sectoral (applied) research institutes.

I would also like to call your attention to the level of basic

research. The contribution that the Siberian Section's scientists can make to world science depends on the potential which is acquired in basic research in the more outstanding fields of science. Basic research produces results which are revolutionary in the development of new equipment and technology.

Here is a recent case in point. A team of scientists working under Yuri Molin, a member of the USSR Academy of Sciences, has actually created a new field of chemistry. The team has disclosed the effect of even very weak magnetic fields on certain types of chemical reactions. As a result, researchers now have at their disposal new methods of controlling chemical reactions.

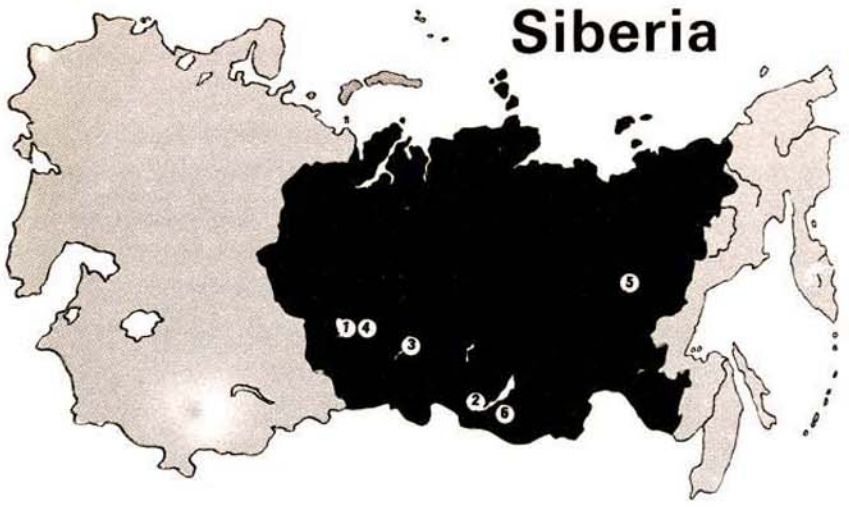
I have cited an example from a field which is close to my own scientific interests, chemistry. But I could cite examples from other fields of science as well, such as high energy physics, mathematics and biology.

Q.: How can these results be applied in practice?

A.: As we prepared for the adoption by the government of the USSR's Twelfth Five-Year Plan for Economic and Social Development (1986-1990) we made an "inventory" of the results achieved by the Section in basic and applied research aimed at providing industry and agriculture with fully prepared solutions. We selected some 300 projects in the fields of new equipment, technology and materials.

Most of these projects will find application in engineering—a key field in production. Some of them will be used in the manufacture of semiconductor materials and microelectronic elements. Other important projects include research in laser measuring instruments used by computers, means to automate research and control production processes, and research in new energy and resource-saving chemical processes.

For instance, the Institute of Chemical Kinetics and Combustion, which works under the auspices of the Siberian Section of the USSR Academy of Sciences, has developed new installation called the Hydroscope. It will enable the



Area—close to 10 million square kilometres
Population—25 million people of 50 different nationalities

SIBERIA'S SCIENCE CENTRES

The Siberian Section of the USSR Academy of Sciences was established in 1957. It comprises:

1. THE NOVOSIBIRSK RESEARCH CENTRE *(NOVOSIBIRSK).*

Located here are the Siberian Sections of the V. I. Lenin All-Union Academy of Agricultural Sciences and the USSR Academy of Medical Sciences, more than 100 research and design institutes, close to one half of the research potential of the Siberian Section of the USSR Academy of Sciences, and the Siberian Section's presidium.

2. THE EAST SIBERIAN BRANCH *(IRKUTSK).*

Siberia's second largest research centre (the largest being the one in Novosibirsk) is located in Irkutsk. The main lines of research here are physics of solar-terrestrial ties, organic chemistry, geochemistry, studies in the earth's crust, energy supply and power engineering, geography and ecology.

3. THE KRASNOYARSK BRANCH *(KRASNOYARSK).*

Its research efforts are concentrated on meeting the needs of the Krasnoyarsk Territory. The findings of the scientists are widely applied in forestry. The centre is working on new optical and magnetic materials, automated management systems for industrial enterprises, chemical technologies and dynamic models of industries.

4. THE TOMSK BRANCH *(TOMSK).*

Research is being conducted here in atmospheric optics, laser physics, strong current electronics, durability physics and oil chemistry.

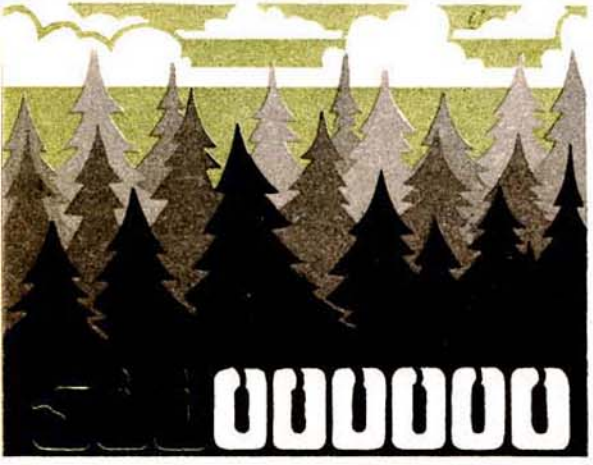
5. THE YAKUTIAN BRANCH *(YAKUTSK).*

The research of this branch is concentrated on the problems of the North: the search for and extraction of minerals in the permafrost zone, the development of machines and structures which can function under severe climatic conditions.

6. THE BURYAT BRANCH *(ULAN-UDE).*

The basic research of this branch provides scientific backing to regional problems for the development of the Buryat Autonomous Soviet Socialist Republic and nearby territories.

geologists to appraise the underground water reserves without drilling wells. Using the Hydroscope, which is one-of-a-kind, water can be found at a depth of up to 100 metres. It will be of use not only in the drought-afflicted areas of the country, but also in the northern zones where water is in a frozen state. The problem of finding "running" water, which the Hydroscope is capable of detecting, is an urgent one in the north. The Hydroscope has made it possible to speed up the search for water and to conduct this search at a much lower cost. Furthermore, it is now possible to appraise more accurately the underground water resources in areas currently under development. The Hydroscope was used in building a water supply system for the Urengoi gas condensate fields in 1983-1985 and helped save 13.5 million roubles.



Siberian forests occupy an area of 500 million hectares which exceeds the area of all of Western Europe. The Siberian taiga forests can generate enough oxygen to meet the demand of one quarter of the Earth's inhabitants.

The world press has given a great deal of coverage to the unique operations conducted by Professor Svyatoslav Fyodorov, director of the Moscow Scientific Research Eye Microsurgical Institute. His success has largely been possible due to the advanced instruments at his disposal. Several large Western companies have purchased licenses for the manufacture of these instruments. Thus, Professor Fyodorov is making broad use of diamond scalpels which are sharpened using a process developed at the Institute of Geology of the Yakutian Branch of the Siberian Section, USSR Academy of Sciences. But the sharpening of diamond scalpels is only one of the many ways the technique for precision thermochemical treatment of diamonds can be applied. The technique developed by the Yakutian Branch can also be used for efficient manufacture of unique drawing dies. It is already being applied in the tool-manufacturing industry where it is opening up new opportunities.

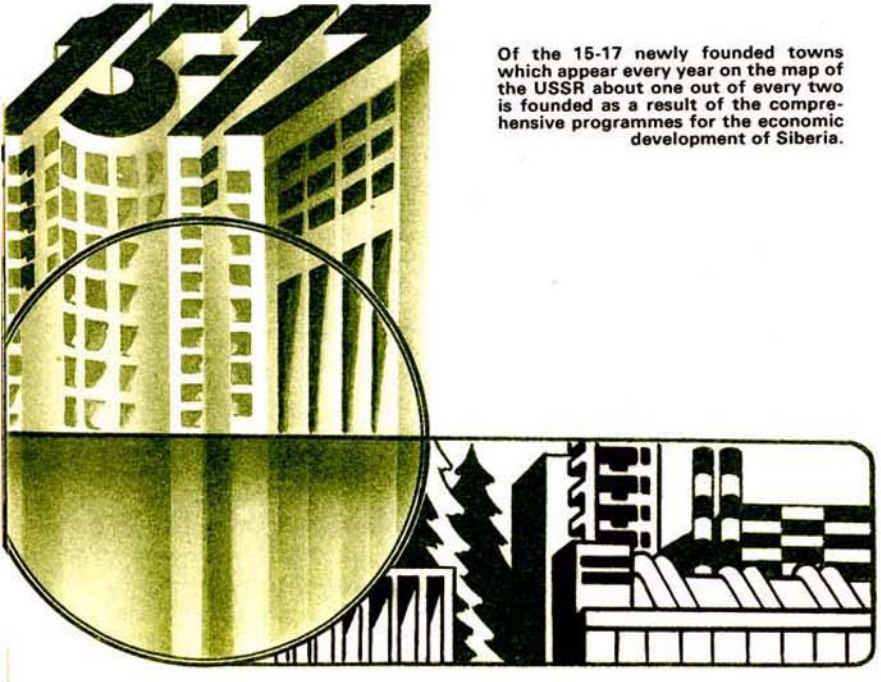
The Institute of Atmospheric Optics of the Siberian Section has produced a series of laser devices and installations in combination with computers for research in the lower and upper atmosphere. They will be applied in weather research and in the monitoring of atmospheric pollution in big industrial centres.

Q.: The emphasis on research in technology at the institutes of the Academy of Sciences will, apparently, call for changes in the organisational structure of the Siberian Section too, won't it?

A.: Yes, it will. The present policy is to combine research with development and design. This is a natural course in the development of science. Such a system has already been worked out and introduced in the Institute of Nuclear Physics, one of the Siberian Section's largest institutes. It is

actually what is often referred to as a science-and-engineering centre.

The Institute's pilot plant manufactures electro-physical equipment which is being used in many sectors of the national economy. Its products include two series of high-output electron accelerators for irradiation of polymers to make them more resistant to chemicals, and to increase their durability and resistance to heat. These accelerators are also used in the manufacture of thermocontracting (shrinking) polymer products, such as collars for the insulation of welded joints of gas and oil pipelines and for the development of composite structural materials. These new products are protected by authors' certificates of the USSR and also by patents in the USA, Great Britain, Switzerland and France. The accelerators are being exported to Hungary, the GDR, Japan and Finland.



Of the 15-17 newly founded towns which appear every year on the map of the USSR about one out of every two is founded as a result of the comprehensive programmes for the economic development of Siberia.

Lately several countries have displayed interest in a project of a Synchrotron Radiation Centre. The Centre is working on a complex made up of specialised accumulators—sources of synchrotron radiation of the Sibir-1 and Sibir-2 installations.

The creation of science-and-engineering centres is important for accelerating scientific and technological progress and for advancing research. We have established an independent design organisation which has a pilot plant at the Krasnoyarsk Scientific Centre. We are expanding the pilot plants at the Irkutsk centre and strengthening the Yakutsk and a few other centres. We are also working on the problem of uniform development of a design and pilot plant base for all the research centres in the region.

Q.: It seems as though science, interacting with various economic sectors, will "invade" all spheres of life in order to reduce the time needed to solve the outstanding economic problems. Is this so?

A.: Yes, this is exactly how things stand. The acceleration of scientific and technological progress is necessary first and foremost for carrying out social programmes, in other words, for the people.

The process of integration is characteristic of science itself. For instance, the Siberian Section of the USSR Academy of Sciences has been carrying out a programme for effective prevention of the encephalitic tick in cooperation with the USSR Academy of Medical Sciences. Cooperation with the sectoral academies of medical and agricultural sciences essentially involves the pooling of manpower resources and the experience of specialists in various fields of knowledge to realise large-scale programmes of great importance for the Republic. The same practice has been applied at the Siberian Section of the V. I. Lenin All-Union Academy of Agricultural Sciences in carrying out the programme for winter grain crops.

We have also tried to make broader use of planning as a lever for cutting down the time required to put into practice newly-developed products and processes. Before the

Twelfth Five-Year Plan (1986-1990) was inaugurated, the Siberian Section submitted for consideration the processes and products it had developed to the State Planning Committee of the USSR and to that of the Russian Federation, as well as to the ministries and departments concerned. Over one hundred and thirty proposals have been included in the current five-year plan.

Q.: But isn't there also feedback from plans for promoting development and the introduction of new products and processes in vital economic sectors?

A.: Yes, there is. We have amended our plans for basic research to gear our efforts toward the most important fields outlined in the Guidelines for the Economic and Social Development of the USSR for 1986-1990 and for the Period Ending in 2000. At the same time we took into account the task of pooling the efforts of the countries of the socialist community in five fields of high priority which were formulated in the Comprehensive Programme for Scientific and Technological Progress of CMEA Member Countries up to the Year 2000. These fields include electronisation of the national economy, comprehensive automation, atomic power generation, new structural materials and technologies for their manufacture and processing, and also biotechnology.

As for your question about changes in the organisational structure of science, I would like to say that we are flexible and ready to make changes in this area.

There are some 50,000 rivers in Siberia. The power generating potential of only two Siberian rivers—the Yenisei and the Lena—exceeds that of all the rivers in the USA. Of Siberia's one million lakes, Lake Baikal especially stands out. It is the deepest lake in the world (1,620 metres) and has 20 per cent of the world's fresh water reserves.

Q.: You have mentioned the basic research being conducted at the Siberian Section of the Academy. What are its specific features?

A.: Basic research is essential for applied research. We want to find "niches" in research that would not overlap with the work being conducted at institutes in Moscow, Leningrad and Kiev.

The Institute of Nuclear Physics can serve as an example. It is working on problems in high energy physics, but along lines which are not followed anywhere else in the Soviet Union. This makes it possible to make fundamentally new discoveries. It was at this Institute that contrary beam circular accelerators first appeared. The institute was also the first to use synchrotron radiation and to design contrary electron-positron and proton-antiproton beam installations. Today the contrary beam method is used in accelerators the world over to achieve high energy interaction between elementary particles. The European Nuclear Research Centre (CERN) in Geneva, for example, uses accumulators with contrary proton-proton beams. The USSR, the USA and CERN all have projects underway on contrary proton-antiproton beams.

The Siberian Section's basic research is another important point. Heavy emphasis is put on mathematical modelling and this affects all our work.

Another important aspect of the Siberian scientists' research is the orientation toward fields of special importance to the region. For example, why does the Yakutian Branch study cosmic particle fluxes and their interaction with the Earth's magnetic field and the upper atmosphere? Because

cosmophysical phenomena tend to be very intense at higher latitudes and because they play a powerful role in radio communications in the vast areas of the North. The Institute of Permafrost Research is also, naturally, located in Siberia. This institute was where new types of foundations for building in the permafrost zone were developed. How structural materials function in lower temperatures is a rather broad problem of great interest in many fields of science. Because metal becomes brittle when subject to low temperatures, this problem is an especially serious one in the North. For example, the service life of machines is much shorter there. To help resolve these problems and to work out the scientific basis for the manufacture of equipment to operate under "northern conditions", the Institute of Physico-Technological Problems of the North has been set up under the auspices of the Yakutian Branch.

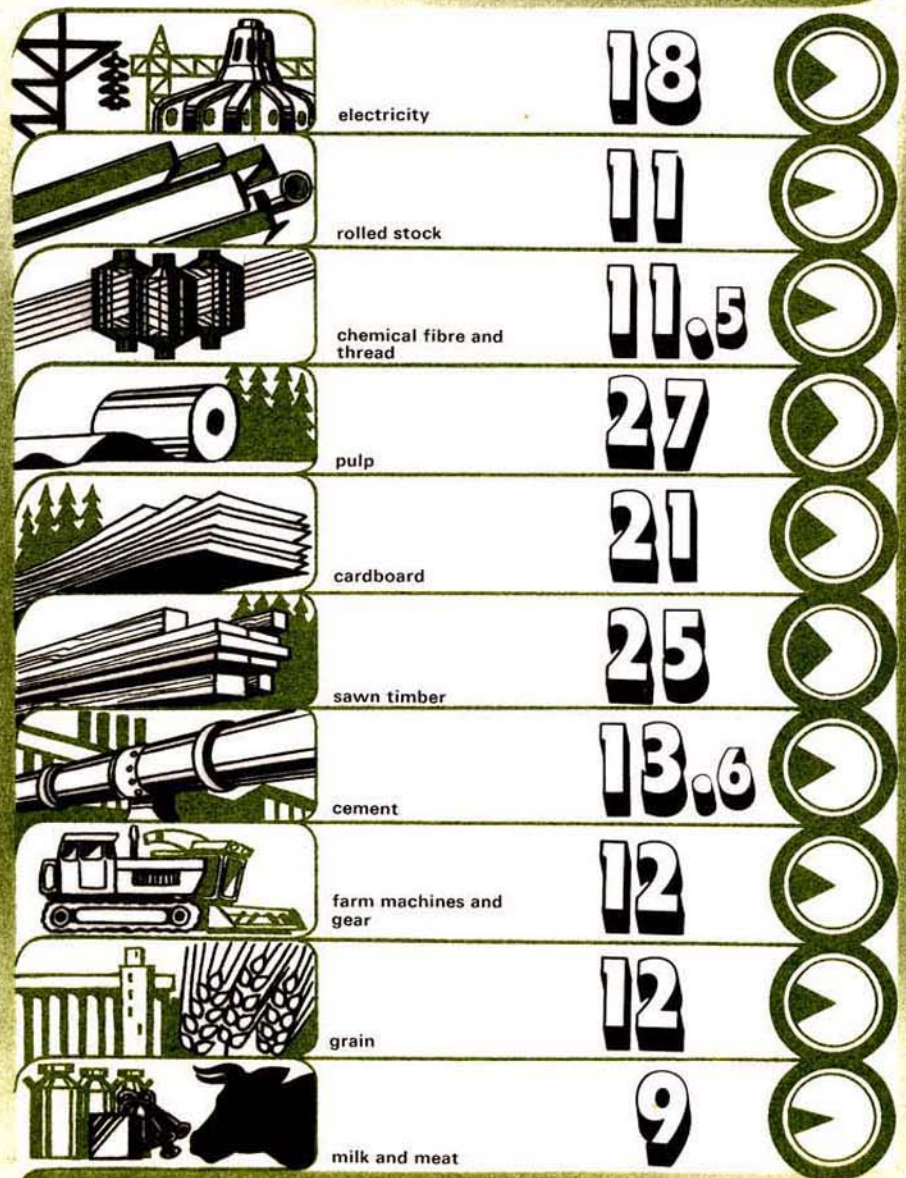
Q.: The development of new regions is a difficult and complicated undertaking. Does the USSR have the technical resources needed to accomplish this task? Will our country be able to get by using its own resources or will we have to turn to Western firms for help?

A.: The answer is unequivocal. Yes, our country is prepared for this undertaking. And there are plenty of examples to support this statement.

In the late 1970s James Carter, President of the USA, imposed a ban on export of oil equipment to the USSR. Has this affected our oil production? Not in the least. Western Siberia was supposed to yield from 300 to 310 million tons of oil, but the yield was actually 312 million tons. Its natural gas output was to reach 125-155 billion cubic metres, but it actually reached 156 billion.

When the West refused to deliver large diameter pipes, scientists from the USSR Academy of Sciences developed multilayer pipes capable of withstanding far greater pressure and having a higher transmissive capacity than the undelivered Western pipes. Furthermore, the Soviet-produced pipes are more reliable, which is of extreme

SIBERIA'S SHARE IN THE USSR'S TOTAL PRODUCTION * (per cent)



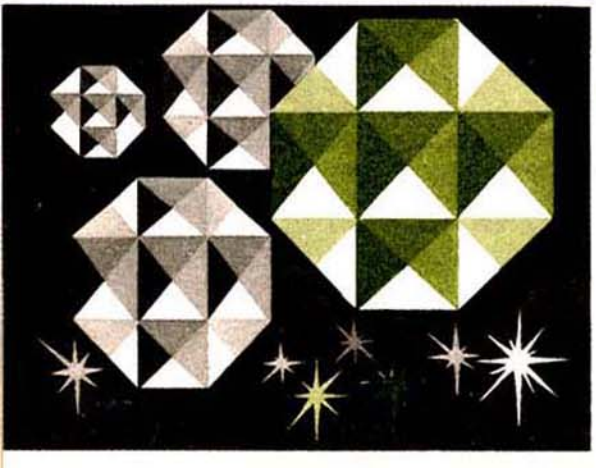
* Including the Far East.

importance in the permafrost conditions near Urengoi, i.e. beyond the Arctic Circle.

President Reagan also imposed an embargo, this one on the sale of certain kinds of equipment to the USSR, such as gas pumps and other similar gear. The Soviet Union, which has a highly developed aircraft engineering industry, had no difficulty in developing and manufacturing engines for gas pumps. Working in co-operation with other countries of the socialist community, within only a few months we put into serial production 25 megawatt gas pumping installations in the form of complete units.

The refusal to supply us with pipelayers was no surprise. We immediately started to manufacture them ourselves.

However, broad international co-operation is more beneficial for the economies and societies of all the countries concerned. Otherwise it wouldn't make any sense to engage in trade. But at the same time no ban or embargo will ever be fatal for us. Discrimination backfires against those who practise it, in this case against US firms. They incurred considerable losses, while our rate of development has not slowed down. This is all especially true today: our country's industries are being radically restructured and modernised, and in Siberia a very large network of engineering projects are under construction.



Siberia is the USSR's diamond mining centre. Diamond deposits were discovered in kimberlite tubes in Yakutia in 1954. The biggest diamond to be mined in the USSR was found in Siberia in 1980—a 342.5 carat (over 68 gramms) precious stone.

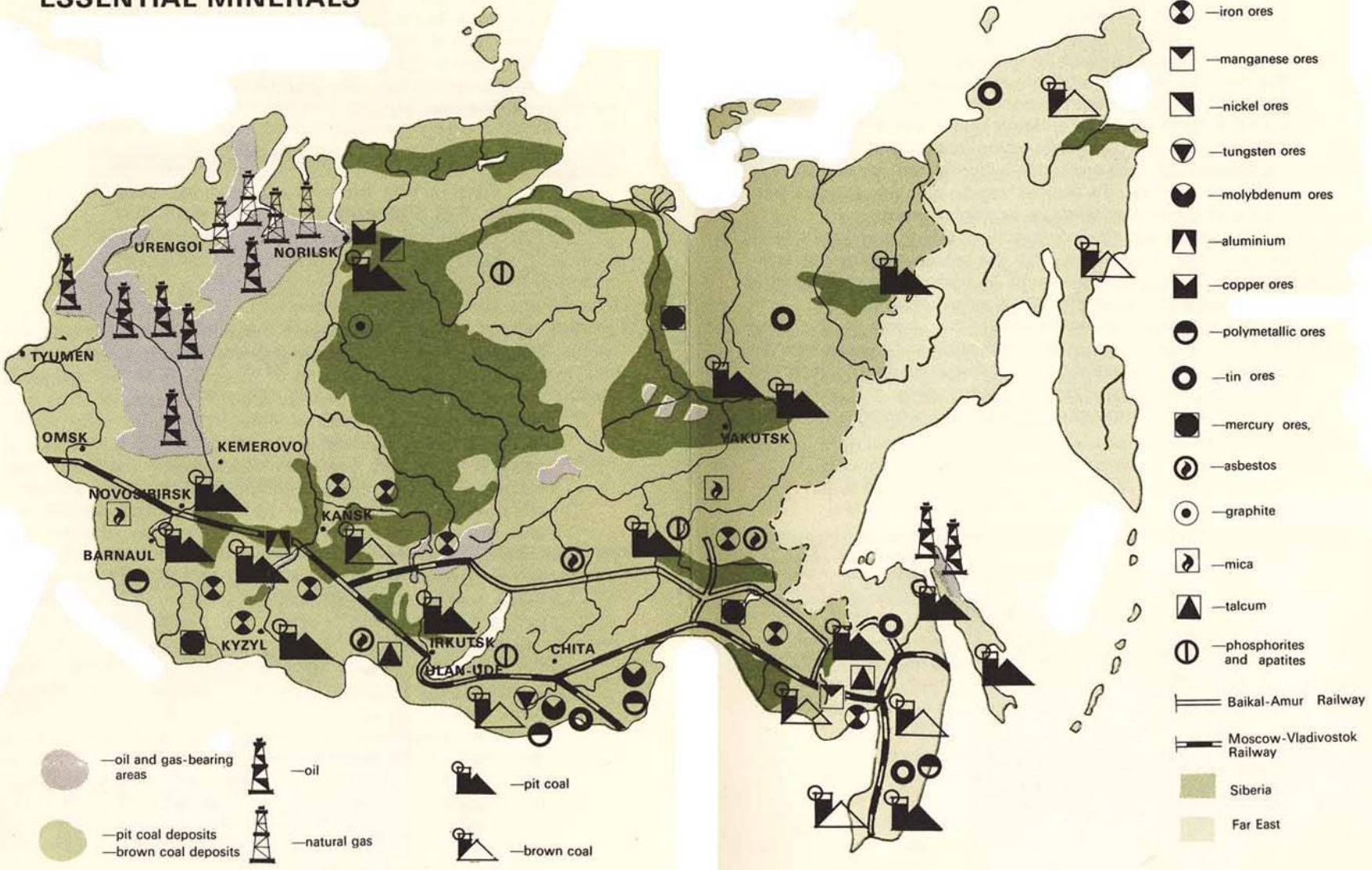
Incidentally, our scientists maintain that the ban on the sale of Western technologies and equipment to the USSR has often had a positive effect on our economic development. The reason is that such bans force Soviet industry to find answers on the basis of Soviet research and development and thus our own scientific achievements are put into practice more rapidly.

Q.: Siberia has been a pioneer in many fields. But those projects typical of this region that are very complicated apparently demand a unified scientific approach. Is this so?

A.: In 1978 all research relating to Siberia was incorporated into a single comprehensive programme entitled Sibir. This programme is to be carried out in the course of several five-year plan periods. One of its major objectives is to achieve a high level of efficiency for the production facilities being developed in Siberia. This will make it possible to recoup the extra costs arising from the new industrial centres' remote location from the older, industrially developed regions, from the severe climatic conditions, and from the necessity to develop a more durable infrastructure than in any other areas. The programme Sibir provides sound scientific backing, and substantial assistance in the comprehensive and effective development of natural resources and in building up the productive forces.

Siberia is being developed as a component of the USSR's overall national economic complex. Therefore, some of the items listed in the programme Sibir are an inherent part of other national programmes and initial phases of special-purpose comprehensive scientific and engineering programmes. This guarantees that the scientific and technical policy for the region is uniform from the research stage to the production stage. Most of the Siberian Section's 300 new projects mentioned above are products of the programme Sibir. Today many of these projects play a role in national or sectoral plans for the development of new equipment and technologies. Thus, the part is never separated from the whole.

LOCATION OF DEPOSITS OF ESSENTIAL MINERALS



To make up for the shortage of raw material resources in the more developed industrial regions in the western and south-western regions of the USSR, we have had to make big investments in Siberia. The investments here go mainly for carrying out large-scale regional programmes, such as the West-Siberian oil-and-gas complex, the Kansk-Achinsk fuel-and-power generating complex—still in the works, the construction of the Baikal-Amur Railway and the economic development of the surrounding areas, and for the establishment of large territorial-industrial complexes, and big industrial centres (the Norilsk region and the Tobolsk petrochemical complex serve as examples here).

This policy sets the priorities in working out Sibir's subprogrammes. At the same time the programme Sibir streamlines the aims and final results of various fields of science and intersectoral research into a single system.

Siberia's entire scientific force has been recruited to choose the path of scientific-technological progress in the country's eastern areas. The scientists have analysed the situations and prospects for each region and economic complex taking into account the sectoral-intersectoral and national interests.

The Baikal-Amur Railway has considerably increased the through-put capacity of the Western Europe-Japan container bridge. The route has been shortened: it is now 13,800 kilometres from Rotterdam to Yokohama instead of 21,000 kilometres by sea via the Suez Canal or 23,200 via the Panama Canal.

Q.: What you're saying is that the programme Sibir will on the one hand sum up the results of research and on the other will serve as an instrument in the development of the region?

A.: I would say that the programme Sibir will not only sum up these results, but will also guide future research in a logical direction.

Initially the programme covered geological exploration and biological and economic research. It is worth noting that heavy emphasis in the Siberian Section has been put on the earth sciences, a manifestation of the importance placed on connecting basic research closely to the region's specific features. We must be able to determine the places where geologists should prospect for essential mineral deposits. For instance, the Nepski potassium deposits were discovered in East Siberia on the basis of a forecast made by Academician Aleksandr Yanshin. These deposits are the biggest in the USSR, if not in the whole world. Academician Vladimir Sobolev, while working at his desk, predicted that diamond deposits were to be found in Yakutia. At the time his forecast was a big sensation the world over.

Siberia is made up of regions that vary widely in their structure and origin. The exploration and study of these regions help solve highly important questions in geology, geophysics, geocryology and geography. In their basic research in the earth sciences, in the history of the earth's development, and in the processes of the formation and distribution of mineral deposits, the Siberian scientists have formed a theoretical basis for locating the most essential mineral raw materials. Geologists working in the field have used this formulation in practice. The Institute of Geology and Geophysics of the Siberian Section of the USSR Academy of Sciences headed by Academician Andrei Trofimuk plays the leading role in this field.

The large-scale programme for the development of the region was naturally worked out primarily according to geological forecasts and appraisals of the biological resources. However, as the programme progressed, specialists in practically all fields of knowledge had to pitch in.

In 1984 the programme Sibir acquired the status of a long-term regional programme of national importance. Today it includes pre-plan social-economic projects, resource problem studies, the search for concrete technical solutions to urgent sectoral problems and studies in ecology. More than 400 organisations under 60 ministries have been enlisted to carry this programme out. It calls for a national and intersectoral approach in accomplishing major economic tasks.

To solve all of Siberia's problems it is vital to provide the programme with scientific backing, to display a comprehensive approach to the tasks and to combine these tasks closely. For instance, the situation today in the fuel-and-energy complex—the pivot of Siberia's economy—has grown complicated. This is the result of the miscalculations we made in determining the growth rate and development ratio of individual aspects of the complex which are essential to its various sectors. Such miscalculations are very costly.

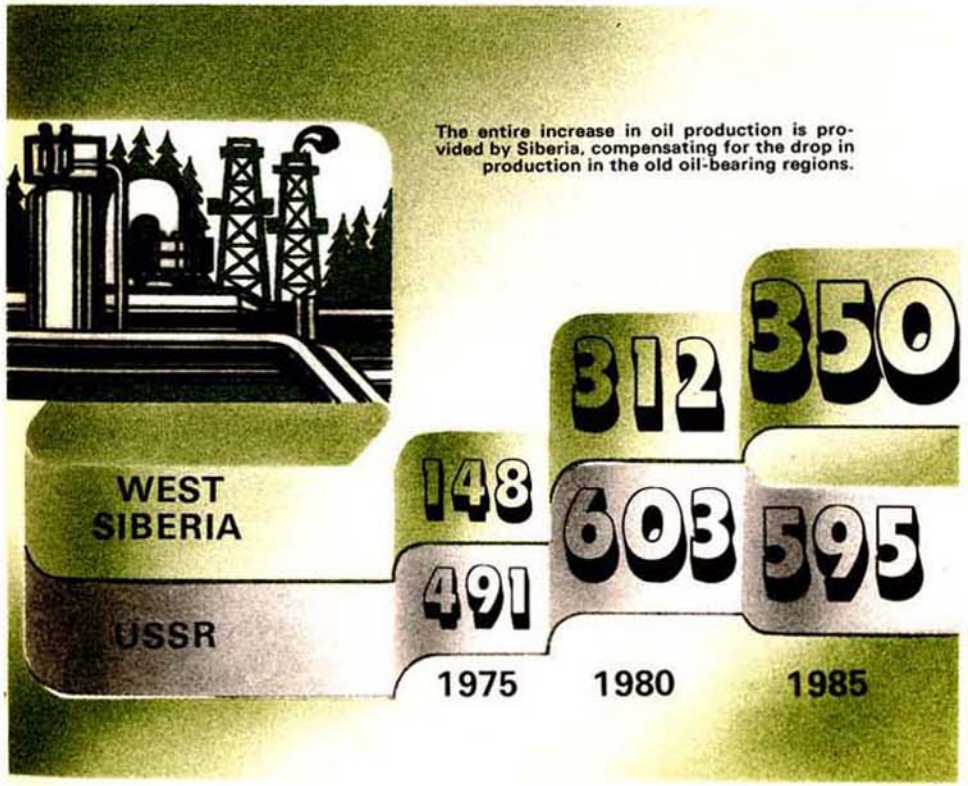
All this puts Siberia's economists and scientists engaged in analysis and forecasts in other disciplines in a highly responsible position: they are the scientific backing needed for planning and management.

As we work to solve the most urgent problems, we must be looking far ahead even today. It is vital to determine clearly the most rational and efficient ways to use Siberia's huge potential.

In summer 1985 the Siberian Section of the USSR Academy of Sciences held an all-Union conference on developing Siberia's productive forces and on accelerating scientific-technological progress in the region. The purpose of this conference, which became an important phase in the work of the programme Sibir, was to find answers to the above questions. The conference was held in several stages, which enabled scientists to prepare materials based on the knowledge and experience accumulated by a large group of researchers, industrial executives, planners, and representatives of local government and Party bodies. The results of the conference are taken into account in the Guidelines for the Economic and Social Development of the USSR for 1986-1990 and for the Period Ending in 2000. Addressing a meeting of the Party-economic aktiv of Tyumen and Tomsk Regions in September 1985, Mikhail Gorbachev, General Secretary of the CPSU Central Committee, supported the weighty propositions put forth at this conference on switching over to a new stage in the development of Siberia's productive forces.

The Siberian Section has worked out a new programme called "The West-Siberian Oil-and-Gas Complex". Its purpose is to make use of the latest scientific and technological achievements to accomplish a three-in-one task; to increase the output of hydrocarbons, to make rational use of the natural resources and to ensure the balanced development of the complex. This is why a research centre of the

OIL PRODUCTION (INCLUDING GAS CONDENSATE, million tons)



Academy of Sciences is being opened in Tyumen. An Institute on Problems Bearing on the Development of the North—the firstling of the future Tyumen research centre—has already been set up.

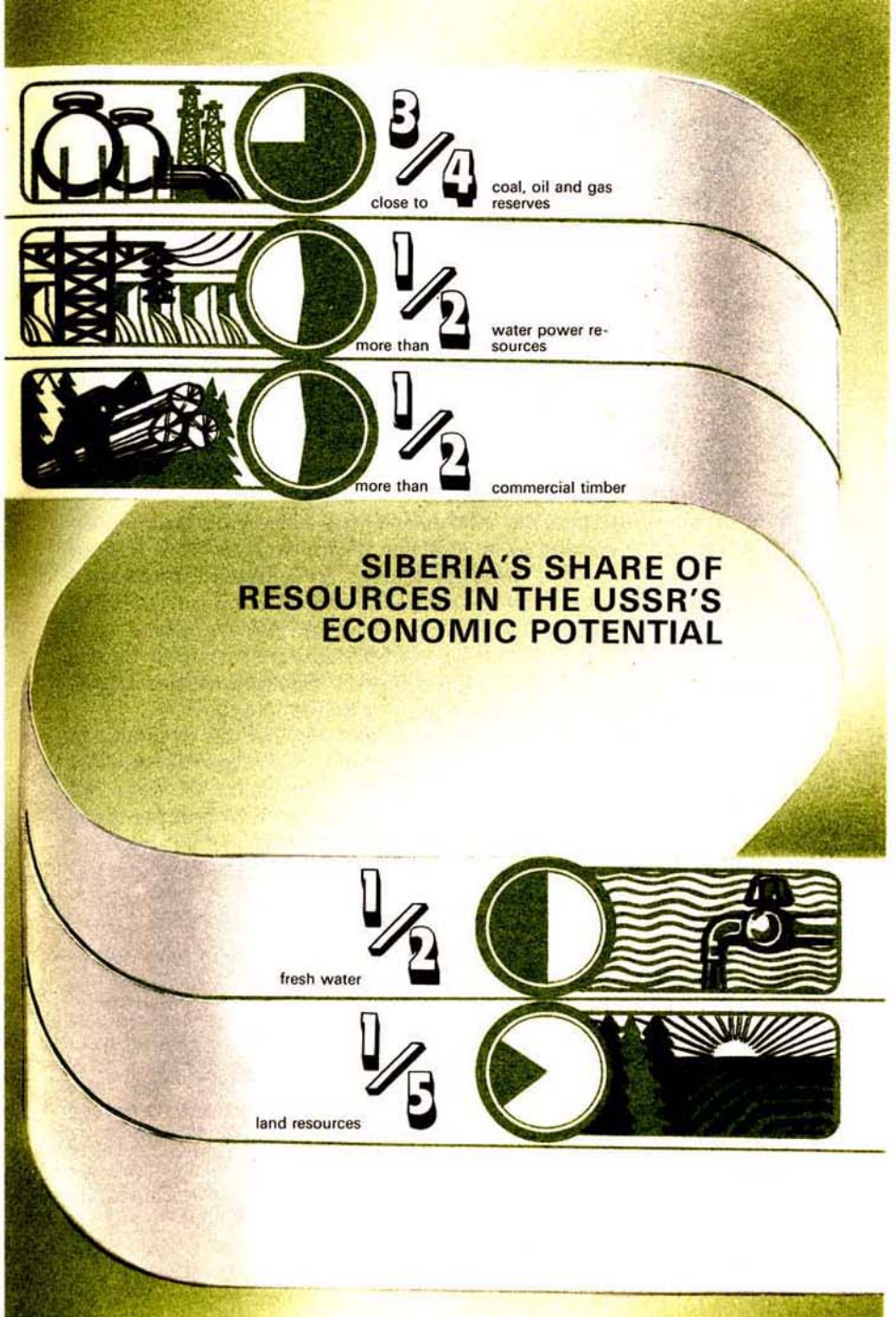
It is essential for the expanded production of hydrocarbons that the way be paved for the development of new deposits and that the search for these deposits be carried out on a sound basis. But this is not all that is needed. The level of development in new equipment and technologies also plays a very important role.

Q.: What new solutions are in sight here?

A.: Prospecting for oil and gas costs several billion roubles a year. Of every hundred wells drilled, on the average only 30 are promising.

The Siberian scientists have developed a multiwave method of seismic prospecting. It helps reveal not only the geometry of the beds, but also the nature of the horizons, i.e. identify those that are saturated with hydrocarbons and those with water. This method makes it actually possible to locate hydrocarbon deposits directly. When hardware based on this method was employed in West and East Siberia, the number of productive wells increased to 70-80 per 100.

The task has been set to intensify the process of oil extraction and to raise the yield to 60 per cent. The main method used in the Soviet Union for maintaining the pressure in the bed is to pump water into it. This being so, it would be expedient to add chemical agents to the water which would expel the oil, i.e. force active substances to surface. Such substances have already been developed by the Institute of Chemistry of the Tomsk Branch of the Siberian Section. They are all inexpensive which are put out in large quantities. Solutions of this kind have already been tested. It is believed that the employment of these substances will increase the yield in only one field in the Tomsk Region by close to 100,000 tons of oil a year.



Q': The Kuzbas and the Kansk-Achinsk fuel-and-power generating complex will be the main suppliers of electricity generated by coal-burning plants. What are the prospects for their development?

A.: The Kuzbas supplies the USSR's most inexpensive high-grade coal. The key to intensification here is open-pit mining. As far as the process of extraction is concerned, it is planned that in the immediate future the hydraulic technique will be employed more widely for transporting coal by pipeline. A coal pipeline is already under construction. Research is being conducted in underground gasification of coal in fields which cannot for various reasons be worked using the open-pit technique or are not economically suitable for conventional mining. In the Kuzbas coal is now being mined at great depths. It is therefore essential to conduct experimental research and research in creating models and forecasting of phenomena taking place as a result of high rock pressure. This research is done by the Institute of Coal of the Siberian Section of the USSR Academy of Sciences in the city of Kemerovo.

We are faced with a multitude of very serious problems in the development of the Kansk-Achinsk fields. The reserves here of brown coals having a wide range of uses are estimated at 600 billion tons. Various ways to process these coals are being presented. One proposal is to generate electricity by burning coal in a magnetohydrodynamic plant. But this is only the beginning.

Due to the discoveries of Siberian scientists who have created mechanisms for accelerated soil formation on landscapes ruined by the mining industries in Siberia and the Far East, thousands of hectares of land have been reclaimed for farming and afforestation. Having determined how nature replenishes itself, the researchers of the Siberian Section of the USSR Academy of Sciences have started to do the same using man-made resources. They have developed several processes for the recultivation of land, speeding up the work nature accomplishes in about 50 to 100 years. By applying the findings of these scientists, it has been possible to gather harvests on lands that were abandoned by miners only two years before. The initial per hectare yields have averaged 20 centners of grain crops.

In short, the emphasis is on developing waste-free, resource-saving technologies which could drastically reduce production costs. It is no secret that a large share of the ecological problems we face is the result of inadequate production processes.

Q.: Construction on the 3,200 kilometre Baikal-Amur Railway, which will play a large role in the development of the national economy, began over 10 years ago. Won't the development of the areas surrounding the railway be an equally formidable task?

A.: The Baikal-Amur Railway will be used to realise many objectives. It will be a transport artery and will promote our foreign economic relations. At the same time it will help in the economic development of a new zone. It will serve as a base for our advance to the North along planned lines and it will be key in the development of resources in the north.

We started construction in what was once wilderness area.

In 1975 a Scientific Council for Problems Bearing on the Baikal-Amur Railway was set up to coordinate all research. It was headed by Academician Abel Aganbegian. Many of the Council's recommendations on the strategy for the development of the Baikal-Amur Railway zone and the stages of progress are now being realised together with the solution of difficult economic and social problems. For instance, the builders took into account the seismic hazards on various sections of the route. Working hand-in-hand with mathematicians, economists produced an economic and mathematical model for the construction plans. It was a very complicated mathematical problem in the theory of schedules. An economic algorithm and software programme were worked out for the model to be tested by computer. The system was used for the management of the entire construction process. Biologists and soil scientists appraised the prospects for the use of the land. Medical researchers conducted large-scale studies on man's ability to adapt to the conditions in the North. They appraised the

effect of the environmental factors on human health and on the people's working and living conditions.

At present more than 20 institutes of the Siberian Section alone are conducting research on problems relating to the Baikal-Amur Railway. In addition, branches of the sectoral academies, sectoral research and design institutes and institutions of higher learning are also contributing to this research effort.

The development of the area through which the Baikal-Amur Railway passes is beyond doubt an even more formidable task. This territory, covering 1.6 million square kilometres, is practically a wilderness area. The bases from which its development could be started are few in number. However, the energy resources in the areas along the Baikal-Amur Railway are already under development. These include the Neryungri open coal pit in the South Yakutian coal fields whose reserves are estimated at several tens of billions of tons of high quality coal. The 1,300 megawatt Zeya and 2,000 megawatt Burei hydraulic power plants have been completed. They will help increase the power supply to the new projects in areas along the Baikal-Amur Railway and in the Soviet Far East.

The Baikal-Amur Railway will become another one of the Soviet Union's industrial belts, as soon as the building of a chain of territorial-production complexes has been completed.

Q.: Would you please give us more details on the new, resource-saving technologies?

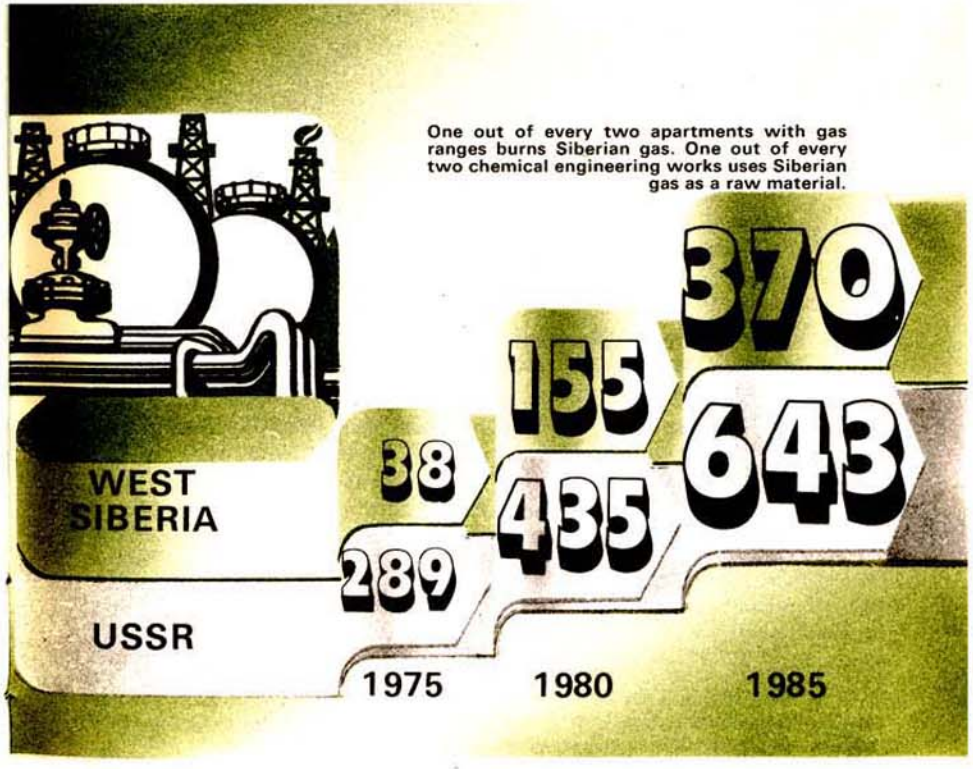
A.: I have already mentioned the radiation processes developed at the Institute of Nuclear Physics of the Siberian Section of the USSR Academy of Sciences. The use of electron accelerators at just the plants of the Ministry of Electrical Engineering Industry of the USSR resulted in the saving of 250 million roubles in the Eleventh Five-Year Plan period (1981-1985).

To cut down on the consumption of costly materials, in particular stainless steel, the Siberian Section's Institute of Thermal Physics together with a special design bureau has developed a plasma process and a new type of plasmatron which deposit a coat of tough, wear-resistant metal on a frictional surface. As a result, the service life of reconditioned tractor parts and other machine and drill elements is doubled or even trebled.

The explosion hardening technique used to strengthen frog cores doubles their service life. This means that this process halves the amount of high-manganese steel used in their manufacture.

In heat-and-power engineering, efficient combustion of

NATURAL GAS PRODUCTION (billion cubic metres)



fuel is a critical problem. The Siberian Section's Institute of Catalysis and a special design bureau have conducted research and development works which have formed a basis for highly economical small-sized catalytic heat generators. These make it possible to burn low quality fuels which are unsuitable for fuel-spray furnaces. The process takes place under relatively low temperatures thus preventing the formation of toxic combustion products and reducing to a minimum losses in liquid or gaseous fuel.

The Siberian Section's Institute of Thermal Physics and a branch of a sectoral institute have developed a closed, waste-free technique and a plasma-chemical installation for processing waste matter of organic and chlororganic industries to obtain commercial products.

During many of the chemical engineering production processes considerable losses of heat take place. In addition, they are characterised by large quantities of waste. Analysis has shown that the main reason why secondary, low temperature energy resources are used inadequately is that the carriers, namely liquids and gases, contain mechanical additions and salts that are hard to dissolve. At the same time the heat-exchange equipment in standard use is not suitable for such agents. To solve the problem, the research and development teams have had to produce special equipment. Thus, the thermal physicists have developed an installation that uses the heat of hot, liquid waste contaminated with salts and admixtures.

The Siberian Section's research institutes have carried out several projects for collective and state farms. Geneticists have produced a Siberian variety of the Albidum-12 wheat which can withstand the winter here. It ripens before the

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Modern engineering and technological solutions are born on the lines dividing various fields of knowledge. In December 1985 a decision was taken in the USSR on the establishment of intersectoral scientific and technological complexes designed to carry out the work-cycle from conception to production. One of these complexes is Katalizator, whose main research and organisation base is the Institute of Catalysis of the Siberian Section of the USSR Academy of Sciences. The Institute will be the coordinating centre in tackling the problem of improving the quality of industrial catalysts and developing new ones.

onset of the autumn rains and early snows which frequently prevent the rural workers in Siberia from gathering the entire harvest. Geneticists have also produced a winter rye known as the Sibirskaya kormovaya (Siberian fodder) which is highly resistant to the local winter conditions. In late May and early June it can make up for the lack of green fodder in Siberia, which is in short supply then. This variety is grown in many parts of the region.

Siberian biologists have also developed a Siberian strain of sheep for meat and wool. These sheep are maturing quickly and are highly promising for meat and wool production in Siberia's intensive farming regions. They are highly productive too, growing seven-eight kilogrammes of wool. The live weight of the average ram ranges from 110 to 115 kilogrammes.

The Siberian Section's Institute of Cytology and Genetics has developed nucleases which are a potent medicine for the treatment of human and animal virus diseases. Veterinary researchers have produced an inexpensive preparation—a bacterial endonuclease—effective in preventing and treating virus paralysis in bees and mulberry silkworms. It also acts as a stimulant increasing the productivity of a bee family by an average of five-twelve kilogrammes of honey per season.

The grain elevator in the port of Odessa, located in the Southern Ukraine, has been equipped with electron accelerators developed at the Institute of Nuclear Physics of the Siberian Section. They have helped save several hundred thousand tons of grain from being destroyed by insects. The Institute of Chemical Kinetics and Combustion has offered a new aerosol technique for treating plants with pest control agents. Losses are reduced five times, labour productivity soars tenfold and the quantity of toxic agents contaminating the soil drops to less than one hundredth.

Many of the products and processes of our institutes can be characterised as resource-saving developments. Among them are highly effective catalysers which increase product yields and at the same time help to economise on valuable metals. They are also used in cultivating man-made emerald, alexandrite and opal crystals, frost resistant steels and many other products.

Q.: What has science done for Siberia's social development?

A.: During the last few years the standard of living and working conditions of the Siberian population have improved. The rate of increase in per capita incomes and housing construction in Siberia has exceeded that of the Russian Federation as a whole. In the last 15 years 150 million square metres of housing have been built, the volume of household services available to the population has increased and dozens of hospitals have been opened. As a result, since 1975 the number of people resettling in Siberia has exceeded the number leaving.

But the rate of the social sphere's development has been slower than that of the production sphere. The section of the programme Sibir which deals with social development contains validated proposals which will help Siberia catch up with the country's European part in respect to the population's living conditions. The purpose is to ensure that by the year 2000 Siberia will boast a higher level of earnings, housing, pre-school and other children's establishments, supply of foodstuffs and consumer goods. Provisions have been made to extend privileges and increase payments from the social consumption funds, to raise pensions and students' stipends and to develop training facilities at schools and institutions of higher learning.

The demographic trends in Siberia have changed for the better. The birth rate is rising, mortality rate is declining and the rate of the population's natural growth is now somewhat higher. Scientists, and especially medical researchers, are paying extremely close attention to the needs of the people. The programme Sibir includes a special purpose sub-programme entitled Human Health in Siberia. This programme was worked out jointly by the Siberian Section of the USSR Academy of Medical Sciences and the Ministry for Public Health of the Russian Federation and covers an entire range of problems, from the adaptation of settlers to Siberian conditions to the expansion of the network of sanatoriums, vacation centres, recreation bases and the social-cultural sphere.

Q.: How do you conceive Siberia in the beginning of the third millennium?

A.: It should be mentioned that Siberia's economic development for the period ending in the year 2000 is determined by three factors. First, at the 27th CPSU Congress it was decided that facilities for extracting and processing fuel and mined raw materials and those for cutting and working timber as well as energy-intensive industries will be expanded. It was furthermore stressed that the processing industries, engineering in particular, should be developed along balanced lines.

Second, the plans envisage that the living standards of the population in Siberia and the Far East shall improve at a higher rate than those in the European part of the country.

Third, ecological factors will exercise a mounting effect on economic development. They will increasingly affect the plans and size of industries being built in Siberia. At the same time they will encourage the development of ecologically clean technologies.

Валентин Афанасьевич Коптюг
СИБИРЬ — ЭТО САМЫЙ ДИНАМИЧНО РАЗВИВАЮЩИЙСЯ РЕГИОН СТРАНЫ
Серия «Авторитетное мнение»
на английском языке
Цена 20 к.